

**CITY OF PHOENIX, ARIZONA
OFFICE OF THE CITY ENGINEER
DESIGN AND CONSTRUCTION PROCUREMENT**



PROJECT SPECIFICATIONS AND CONTRACT DOCUMENTS

**FIRE STATION 74
PROJECT NO. FD57100020**

**PROCUREPHX PRODUCT CATEGORY CODE 912000000
RFx 6000001606**

AGREEMENT _____

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PROJECT NO.: FD57100020

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CALL FOR BIDS

**CITY OF PHOENIX
FIRE STATION 74
DESIGN-BID-BUILD**

PROJECT NO. FD57100020

**PROCUREPHX PRODUCT CATEGORY CODE 912000000
RFx 6000001606**

**BIDS WILL BE DUE: TUESDAY, AUGUST 20, 2024, AT 2:00 P.M.
SUBMITTED INTO THE DESIGN AND CONSTRUCTION PROCUREMENT BID BOX
LOCATED ON THE 1ST FLOOR LOBBY OF THE PHOENIX CITY HALL BUILDING,
200 W. WASHINGTON STREET, PHOENIX, ARIZONA, 85003**

**BIDS WILL BE READ: TUESDAY, AUGUST 20, 2024 AT 2:00 P.M.
ON 5TH FLOOR, ROOM 5 WEST
PHOENIX CITY HALL
200 W. WASHINGTON STREET
PHOENIX, AZ 85003-1611
*All times are local Phoenix time**

SCOPE OF WORK

The City of Phoenix is seeking a qualified contractor to provide construction services for the project listed below.

Phoenix Fire Station No. 74 is a new single-story building of approximately 13,233 square feet. The proposed facility includes three apparatus bays, 13 dormitories, fitness room, kitchen, and work/living space. The project also includes the construction of a helipad to be located adjacent to the station. The proposed project will disturb about 3.07 acres of the 7.74-acre parcel assigned to the project. The fire station is designed per the City of Phoenix Fire Department building design standards and will incorporate environmental design principals similar to LEED to reduce energy consumption and water preservation. The building envelop is composed of insulating concrete forms and concrete masonry unit walls with conventional wood, steel framing, and insulated metal deck roof.

A Small Business Enterprise goal of 13% has been established for this project.

PRE-BID MEETING

A pre-bid meeting will be held on Tuesday, July 30, 2024, at 10:00 a.m., at 200 W. Washington Street, City Hall Conference Room 5 West. At this meeting, staff will discuss the scope of work, general contract issues and respond to questions from the attendees. As City staff will not be available to respond to individual inquiries regarding the project scope outside of this pre-bid meeting, it is strongly recommended that interested firms send a representative to the pre-bid meeting.

REQUEST FOR BID PACKET

On Thursday, July 18, 2024, the bid packet may be downloaded from the City of Phoenix's eProcurement site at:

<https://eprocurement.phoenix.gov/irj/portal>

(OR)

C.F.B. 1

the City of Phoenix's "Solicitations" web page as. The web address is:

<https://solicitations.phoenix.gov>

Firms receiving a copy of the bid packet through any other means are strongly encouraged to download the bid packet from the City webpage.

Firms must be registered in eProcurement <https://www.phoenix.gov/finance/vendorsreg> as a vendor.

GENERAL INFORMATION

The City reserves the right to award the contract to the lowest responsible responsive bidder or all bids will be rejected, as soon as practicable after the date of opening bids.

The City of Phoenix will provide reasonable accommodations for alternate formats of the bid packet by calling Kevin Query at (602) 495-2461 or calling TTY 711. Requests will only be honored if made within the first week of the advertising period. Please allow a minimum of seven calendar days for production.

Questions pertaining to process or contract issues should be directed to Kevin Query at (602) 495-2461 or kevin.query@phoenix.gov.

Jeffrey Barton
City Manager

Eric J. Froberg, PE
City Engineer

Published: Arizona Business Gazette
Date: July 18, 2024
Date: July 25, 2024
District: 6

INFORMATION FOR BIDDERS

1. **102 BIDDING REQUIREMENTS AND CONDITIONS**, Add the following to **MAG and COP Supplement to MAG Section 102 BIDDING REQUIREMENTS AND CONDITIONS**:

INFORMATION FOR BIDDERS

A. **QUESTIONS ON PLANS AND SPECIFICATIONS**

Neither the Engineer nor the City of Phoenix will be held responsible for any oral instructions. Any changes to the plans and specifications will be in the form of an addendum. All Addenda will be posted online within the project folder at the following website:

<https://solicitations.phoenix.gov>

OR

<https://eprocurement.phoenix.gov/irj/portal>

For additional information prior to submitting your bid, contact:

Plans, Technical/Special Provisions, Proposal or Specifications:

NAME: Kevin Query, Design and Construction Procurement
ADDRESS: 200 W. Washington Street, 5th Floor, Phoenix, AZ 85003-1611
PHONE: (602) 495-2461 E-MAIL: kevin.query@phoenix.gov

SBE Utilization contact:

Equal Opportunity Department: (602) 262-6790

All questions regarding the plans and specifications must be received (in writing) at a minimum seven calendar days prior to bid opening. Questions received after that time may not be given any consideration.

B. **REQUEST FOR SUBSTITUTIONS**

Paragraph A, B, and C of MAG Section 106.4 are deleted and the following paragraphs substituted:

1. The Engineer will consider written request(s), by a prime bidder only, for substitution(s) which is/are considered equivalent to the item(s) specified in the Contract documents. The written request will be considered only if it is received at least twelve calendar days prior to the established bid date. Notification of acceptable substitutions will be made by addendum issued no fewer than seven calendar days prior to the established bid date. (A.R.S. 34-104)
2. The prime bidder, at his own expense, will furnish the necessary data of substitution and validate that the physical, chemical, and operational qualities of each substitute item is such that this item will fulfill the originally specified required function.
3. The substitution, if approved, will be authorized by a written addendum to the Contract documents and will be made available to all bidders. The bid date and the scheduled completion time will not be affected by any circumstances developing from this substitution.
4. The request will be submitted to Design and Construction Procurement, Attention Kevin Query, 5th Floor, Phoenix City Hall, 200 W. Washington Street, Phoenix, Arizona 85003-1611 or via email to kevin.query@phoenix.gov.

C. **BID BOND**

Bidders must submit a properly completed proposal guarantee in the form of certified check, cashier's check, or surety bond provided, for an amount not less than 10 percent of the total amount bid included in the proposal as a guarantee that the contractor will enter into a contract to perform the proposal in accordance with the plans and specifications. Surety bonds submitted for this project will be provided by a company which has been rated "A- or better for the prior four quarters" by the A.M. Best Company. ***A bid will be deemed non-responsive if not accompanied by this guarantee.***

The surety bond will be executed solely by a surety company or companies holding a certificate of authority to transact surety business in the State of Arizona, issued by the Director of the Department of Insurance pursuant to Title 20, Chapter 2, Article 1. The surety bond will not be executed by an individual surety or sureties even if the requirements of Section 7-101 are satisfied. The certified check, cashiers check, or surety bond will be returned to the contractors whose proposals are not accepted, and to the successful contractor upon the execution of a satisfactory bond and contract.

When providing a Surety Bond, ***failure to provide an "A- or better for the prior four quarters" bond will result in bid rejection.***

D. **LIST OF MAJOR SUBCONTRACTORS AND SUPPLIERS & LIST OF ALL SUBCONTRACTORS AND SUPPLIERS**

A bid will be deemed non-responsive if not accompanied by a properly completed and signed L.O.S.-1 "List of Major Subcontractors and Suppliers" form.

To assist in eliminating the practice of bid shopping on City construction projects, the Bidder shall list all Major Subcontractors and Suppliers to whom the Bidder intends to contract with that are equal to or greater than 5% of the base bid. The list of Major Subcontractors and Suppliers will be provided on the L.O.S.-1 "List of Major Subcontractors" form. Failure to properly complete and sign this form will result in bid rejection. This form is due with the bid.

If substantial evidence exists that bid shopping occurred on this project, the Bidder will be ineligible to bid on City or City-affiliated construction projects for a period of one year.

The list of All Subcontractors and Suppliers shall be provided on the L.O.S.-2 "List of All Subcontractors and Suppliers" form. This form is due three calendar days after bid opening by 5:00 p.m. All bidders will be required to submit the L.O.S.-1 form. The three lowest bidders will be required to submit the L.O.S.-2 form. If the L.O.S.-2 form is not submitted by the post-bid deadline, the Bidder will still be required to submit the document prior to award. If the Bidder fails to submit the required L.O.S.-2 form by the post-bid deadline, the Bidder's bid bond may be placed in jeopardy because the City may make a claim against the Bidder's bid bond for the cost difference between the lowest responsive and responsible Bidder's bid and the next lowest bid (and any additional costs involved in awarding the contract to the next lowest responsive and responsible bidder).

E. **BID SUBMITTAL**

The properly completed bid documents along with the ten percent bid guarantee will be submitted in a sealed envelope. The outside of the envelope will be marked as follows:

Bid of (Firm's Name, Address and Phone Number) _____
For: Fire Station 74
City of Phoenix Project Number: FD57100020

Sealed bids will be submitted to the bid box located on the first floor of the Phoenix City Hall Building, 200 W. Washington Street, Phoenix, Arizona, 85003 prior to the time and date specified for bid opening.

F. **BID WITHDRAWALS**

MAG Section 102-10, Withdrawal or Revision of Proposal, is hereby deleted and the following paragraph is submitted:

“No bidder may withdraw or revise a proposal after it has been deposited with the City except as provided in Phoenix City Code Chapter 2, Section 190.2. Proposals, read or unread, will not be returned to the bidders until after determination of award has been made.

G. **ADDENDA**

Acknowledge all addenda; a bid will be deemed non-responsive if all issued addenda for this project are not acknowledged in writing on Page P. -1.

The City of Phoenix will not be responsible for any oral responses or instructions made by any employees or officers of the City of Phoenix regarding bidding instructions, plans, drawings, specifications or contract documents. A verbal reply to an inquiry does not constitute a modification of the Invitation for Bid. Any changes to the plans, drawings and specifications will be in the form of an addendum.

It will be the responsibility of the prospective bidder to determine, prior to the submittal of its bid, if any addenda to the project have been issued by the Design and Construction Procurement. All addenda issued will be acknowledged by the bidder on Page P-1. All addenda (if any) will be available online within each project’s folder at the following website:

<https://eprocurement.phoenix.gov/irj/portal>

OR

<https://solicitations.phoenix.gov>

The contractors are responsible for ensuring they have all addenda for all projects they are submitting on. Prospective bidders are strongly encouraged to check the Solicitations website in order to ascertain if any addenda have been issued for the project.

H. **BID SUBMITTAL CHECKLIST**

All firms must be registered in the City’s Vendor Management System prior to submitting a bid. For new firms – the City will send an email to your firm with a vendor number within two days of submitting the request. The vendor number needs to be included on the cover of the bid proposal package/envelope. Information on how to register with the City is available at:

<https://www.phoenix.gov/finance/vendorsreg>

BID SUBMITTAL CHECKLIST

This checklist is provided to remind bidders of several of the required elements of the bid packages. It is not intended to be a comprehensive list of all the contract documents. Bidders are encouraged to review all of the Bid Instructions to determine compliance therein.

- Acknowledge all addenda? (Page P-1)
- Completed all of the Bid Proposal forms? (Pages P-1 to P-2 and P.S.-1)
- Included your Bid Bond (rated A- or better for the prior four quarters) or Guarantee Cashier's Check? (Page S.B.-1)
- Completed SBE Utilization form or a fully documented waiver package? (Page S.B.U.-1)
- Completed List of Major Subcontractors and Suppliers form? (Page L.O.S.-1)
- Completed Letter of Intent to Perform as Subcontractor/Supplier (L.O.I-1)

PLEASE DO NOT SUBMIT THE ENTIRE SPECIFICATION BOOK WHEN SUBMITTING YOUR BID. INCLUDE ONLY THE REQUIRED BIDDING DOCUMENTS.

POST-BID SUBMITTAL CHECKLIST

The three lowest bidders must submit completed contracts documents listed below, no later than three calendar days after bid opening by 5:00 p.m. The documents must be submitted to Design and Construction Procurement, 5th Floor, or can be sent by email to kevin.query@phoenix.gov.

- Completed List of All Subcontractors and Suppliers form (L.O.S.-2)
- Bidders Disclosure Statement? (Pages B.D.S.-1 to 4)
- Submit Affidavit of Identity (if you are a sole proprietor) (Page A.O.I.-1)

PRIOR TO CONTRACT EXECUTION

- Contractor must provide proof of license required to perform the work.
- Verification of Experience Modification Rate (EMR) – the awarded company will be required to provide an EMR verification letter from the insurance company prior to contract execution.

I. PERMITS

CITY RESPONSIBILITY – The City will be responsible for City of Phoenix review and permit(s) fees for building and demolition permits. The City will also pay review fees for grading and drainage, water, sewer, and landscaping. The City will also pay for utility design fees for permanent services.

CONTRACTOR RESPONSIBILITY – The Contractor will be responsible for all other permits and review fees not specifically listed above. The Contractor is responsible for the cost of water meters, water and sewer taps, fire lines and taps, and all water bills on the project meters until the project is accepted. Arrangements for construction water are the Contractor's responsibility.

The Contractor may elect to use a City fire hydrant for its source of construction water only if an existing water service connection is unavailable or inadequate. The Contractor will be required to comply with Phoenix City Code Section 37-13A.

The Contractor is specifically reminded of the need to obtain the necessary environmental permits or file the necessary environmental notices. Copies of these permits and notices must be provided to the City's Project Manager prior to starting the

permitted activity. In the case of Fire Department permits, a copy of the application for permit will also be provided to the Project Manager. This provision does not constitute an assumption by the City of an obligation of any kind for violation of said permit or notice requirements.

J. **CANCELLATION OF CONTRACT FOR CONFLICT OF INTEREST**

All parties hereto acknowledge that this Agreement is subject to cancellation by the City of Phoenix pursuant to the provisions of Section 38-511, Arizona Revised Statutes.

K. **CONTRACTOR'S LICENSE AND PRIVILEGE LICENSE AND CERTIFICATIONS**

Prior to bidding on this project, the bidder must possess the correct license to perform the work described in the plans and specifications. Prior to award of the contract, the successful bidder must provide to the Contract Procurement Section its Contractor's License Classification and number, its City of Phoenix Privilege License number and Federal Tax Identification number.

Bidder will submit the Bidder's Disclosure Statement as set forth in Pages B.D.S. - 1 to B.D.S. - 4 within three calendar days of bid opening by 5:00 p.m.

Unless provided otherwise in this solicitation, Bidder will be deemed non-responsive and the bid rejected if Bidder fails to possess the proper Contractor's and Business Licenses at the time of bid or fails to submit a substantially completed Bidder's Disclosure Statement as specified above.

L. **TAX LIABILITIES; DISCLOSURE OF CONVICTIONS AND BREACH(S) OF CONTRACT**

On or before the award of the contract for this project, the successful bidder will: (i) file all applicable tax returns and will make payment for all applicable State of Arizona and Maricopa County Transaction Taxes (ARS Sec. 41-1305) and City of Phoenix Privilege License Taxes (Phoenix City Code Sec.14-415); (ii) disclose any civil fines, penalties or any criminal convictions, other than for traffic related offenses, for violation of federal, state, county or city laws, rules or regulations including, but not limited to, environmental, OSHA, or labor compliance laws (collectively "Laws") by Bidder, Bidder's directors, managing members, responsible corporate officers or party who will be responsible for overseeing and administering this project (collectively "Bidder"); and (iii) disclose any material breach(s) of an agreement with the City of Phoenix, any termination for cause or any litigation involving the City of Phoenix occurring within the past three calendar years. Unless provided otherwise in this solicitation, the successful bidder will be deemed non-responsive and the bid rejected for any of the following: (i) Bidder's civil or criminal conviction, other than for traffic related offenses, for a violation of Laws within the past three calendar years; (ii) liability or culpability resulting in payment of fines or penalties in the cumulative total amount of \$100,000 or greater for a violation of "Laws" within the past three calendar years; (iii) material breach of a City of Phoenix agreement, termination for cause or litigation with the City of Phoenix within the past three calendar years; and (iv) Bidder's failure to disclose the information as required by this provision. Further, after award of contract, in addition to any other remedy, Bidder's failure to remit proper taxes to the City of Phoenix may result in the City withholding payment pursuant to Phoenix City Charter Chapter XVIII, Section 14 until all delinquent taxes, interest, and penalties have been paid.

State and Local Transaction Privilege Taxes:

In accordance with applicable state and local law, transaction privilege taxes may be applicable to this transaction. The state and local transaction privilege (sales) tax burden is on the person who is conducting business in Arizona and the City of Phoenix. The legal liability to remit the tax is on the person conducting business in Arizona. Any failure by the Contractor to collect applicable taxes from the City will not relieve the Contractor from its obligation to remit taxes.

It is the responsibility of the Contractor to determine any applicable taxes. The City will review the price or offer submitted and will not deduct, add or alter pricing based on taxes.

If you have questions regarding tax liability, seek advice from a tax professional prior to submitting a bid. Once the bid is submitted, the Offer is valid for the time specified in this Solicitation, regardless of mistake or omission of tax liability.

If the City finds over payment of a project due to tax consideration that was not due, the Contractor will be liable to the City for that amount, and by contracting with the City agrees to remit any overpayments back to the City for miscalculations on taxes included in a bid price.

For purposes of A.R.S. 42-5075(P), this contract is subject to A.R.S. Title 34.

Tax Indemnification:

Contractor will, and require the same of all subcontractors, pay all federal, state and local taxes applicable to its operation and any persons employed by the Contractor. Contractor will, and require the same of all subcontractors, hold the City harmless from any responsibility for taxes, damages and interest, if applicable, contributions required under federal, and/or state and local laws and regulations and any other costs including transaction privilege taxes, unemployment compensation insurance, Social Security and Worker's Compensation.

Tax Responsibility Qualification:

Contractor may be required to establish, to the satisfaction of City, that all fees and taxes due to the City or the State of Arizona for any License or Transaction Privilege taxes, Use Taxes or similar excise taxes, are currently paid (except for matters under legal protest).

Contractor agrees to a waiver of the confidentiality provisions contained in the City Finance Code and any similar confidentiality provisions contained in Arizona statutes relative to State Transaction Privilege Taxes or Use Taxes.

Contractor agrees to provide written authorization to the City Finance Department and to the Arizona State Department of Revenue to release tax information relative to Arizona Transaction Privilege Taxes or Arizona Use Taxes to assist the Department in evaluating Contractor's qualifications for and compliance with contract for duration of the term of contract.

M. **STANDARD SPECIFICATIONS AND DETAILS**

Except as otherwise required in these specifications, bid preparation and construction of this project will be in accordance with all applicable Maricopa Association of Governments' (MAG) Uniform Standard Specifications and Uniform Standard Details, latest revision, and the City of Phoenix Supplements to the MAG Uniform Standard Specifications and Details, latest revision.

N. **PRECEDENCE OF CONTRACT DOCUMENTS**

In case of a discrepancy or conflict, the precedence of contract documents is as follows:

1. Change Orders or Supplemental Agreements
2. Addenda
3. Contract Specifications/Special Provisions/Technical Provisions
4. The Plans
5. COP Supplement to MAG Standard Specifications and Details, latest revision
6. MAG Standard Specifications and Details, latest revision

The precedence of any Addenda falls within the category of which it represents.

O. **CONFIDENTIALITY OF PLANS & SPECIFICATIONS**

Any plans generated for this project must include the following statement in the Title Block on every page: "Per City of Phoenix City Code Chapter 2, Section 2-28, these plans are for official use only and may not be shared with others except as required to fulfill the obligations of Contractor's contract with the City of Phoenix."

P. **AUDIT AND RECORDS**

Records of the Contractor's direct personnel payroll, bond expenses, and reimbursable expenses pertaining to this Project, and records of accounts between the City and Contractor will be kept on the basis of generally accepted accounting principles and must be made available to the City and its auditors for up to five years following Final Acceptance of the Project.

The City, its authorized representative, and/or any federal agency, reserves the right to audit the Contractor's records to verify the accuracy and appropriateness of all cost and pricing data, including data used to negotiate the Contract and any change orders.

The City reserves the right to decrease Contract price and/or payments made on this Contract and/or request reimbursement from the Contractor following final contract payment on this Contract if, upon audit of the Contractor's records, the audit discloses the Contractor has provided false, misleading, or inaccurate cost and pricing data.

The Contractor will include a similar provision in all of its Agreements with subcontractors and suppliers providing services or supplying materials under the Contract Documents to ensure that the City, its authorized representative, and/or the appropriate federal agency has access to the Subcontractor's and Supplier's records to verify the accuracy of all cost and pricing data.

The City reserves the right to decrease the Contract price and/or payments made on this Contract and/or request reimbursement from the Contractor following final contract payment on this Contract if the above provision is not included in the Subcontractor's and Supplier's contracts, and one or more Subcontractors or Suppliers refuse to allow the City to audit their records to verify the accuracy and appropriateness of cost and pricing data.

If, following an audit of this Contract, the audit discloses the Contractor has provided false, misleading or inaccurate cost and pricing data, and the cost discrepancies exceed 1% of the total Contract billings, the Contractor will be liable for reimbursement of the reasonable, actual cost of the audit.

Q. **IMMIGRATION REFORM AND CONTROL ACT**

Compliance with Federal Laws Required. Contractor understands and acknowledges the applicability of the Immigration Reform and Control Act of 1986 and the Drug Free Workplace Act to it. Contractor agrees to comply with these Federal Laws in performing under this Agreement and to permit City inspection of its personnel records to verify such compliance.

R. **LEGAL WORKER REQUIREMENTS**

The City of Phoenix is prohibited by A.R.S. § 41-4401 from awarding a contract to any contractor who fails, or whose subcontractors fail, to comply with A.R.S. § 23-214(A). Therefore, Contractor agrees that:

1. Contractor and each subcontractor it uses warrants their compliance with all federal immigration laws and regulations that relate to their employees and their compliance with § 23-214, subsection A.

2. A breach of a warranty under paragraph 1 will be deemed a material breach of the contract that is subject to penalties up to and including termination of the contract.
3. The City of Phoenix retains the legal right to inspect the papers of any Contractor or subcontractor employee who works on the contract to ensure that the Contractor or subcontractor is complying with the warranty under paragraph 1.

S. **LAWFUL PRESENCE REQUIREMENT**

Pursuant to A.R.S. §§ 1-501 and 1-502, the City of Phoenix is prohibited from awarding a contract to any natural person who cannot establish that such person is lawfully present in the United States. To establish lawful presence, a person must produce qualifying identification and sign a City-provided affidavit affirming that the identification provided is genuine. This requirement will be imposed at the time of contract award. This requirement does not apply to business organizations such as corporations, partnerships or limited liability companies.

T. **LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED)**

If practical, the contractor will provide an easily accessible area to serve the construction site that is dedicated to the separation, collection and storage of materials for recycling including (at a minimum) paper, glass, plastics, metals, and designate an area specifically for construction and demolition waste recycling. The contractor must provide documentation that the materials have been taken to a Maricopa County approved recycling facility.

U. **CITY OF PHOENIX EQUAL EMPLOYMENT OPPORTUNITY REQUIREMENT**

1. In order to do business with the City, Contractor must comply with Phoenix City Code, 1969, Chapter 18, Article V, as amended, Equal Employment Opportunity Requirements. Contractor will direct any questions in regard to these requirements to the Equal Opportunity Department, (602) 262-6790.
2. Any Contractor in performing under this contract will not discriminate against any worker, employee or applicant, or any member of the public, because of race, color, religion, sex, national origin, age, or disability nor otherwise commit an unfair employment practice. The Contractor will ensure that applicants are employed, and employees are dealt with during employment without regard to their race, color, religion, sex, national origin, age, or disability and will adhere to a policy to pay equal compensation to men and women who perform jobs that require substantially equal skill, effort, and responsibility, and that are performed within the same establishment under similar working conditions. Such action will include but not be limited to the following: Employment, promotion, demotion or transfer, recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training; including apprenticeship. The Contractor further agrees that this clause will be incorporated in all subcontracts with all labor organizations furnishing skilled, unskilled and union labor, or who may perform any such labor or services in connection with this contract.

If the Contractor employs more than thirty-five employees, the following language will apply as the last paragraph to the clause above:

The Contractor further agrees not to discriminate against any worker, employee or applicant, or any member of the public, because of sexual orientation or gender identity or expression and will ensure that applicants are employed, and employees are dealt with during employment without regard to their sexual orientation or gender identity or expression.

3. *Documentation.* Contractor may be required to provide additional documentation to the Equal Opportunity Department affirming that a nondiscriminatory policy is being utilized.
4. *Monitoring.* The Equal Opportunity Department will monitor the employment policies and practices of suppliers and lessees subject to this article as deemed necessary. The Equal Opportunity Department is authorized to conduct on-site compliance reviews of selected firms, which may include an audit of personnel and payroll records, if necessary.

V. **PROTEST PROCEDURES**

Any bidder who has any objections to the awarding of a contract to any bidder by the City of Phoenix, pursuant to competitive bidding procedures, will comply with Phoenix City Code Chapter 2, Section 188." A copy of the Protest Policy is also available online at:

<https://www.phoenix.gov/streets/procurement-opportunities>

W. **DATA CONFIDENTIALITY**

As used in the Contract, "data" means all information, whether written or verbal, including plans, photographs, studies, investigations, audits, analyses, samples, reports, calculations, internal memos, meeting minutes, data field notes, work product, proposals, correspondence and any other similar documents or information prepared by, obtained by, or transmitted to the Contractor or its subcontractors in the performance of this Contract.

The parties agree that all data, regardless of form, including originals, images, and reproductions, prepared by, obtained by, or transmitted to the Contractor or its subcontractors in connection with the Contractor's or its subcontractor's performance of this Contract is confidential and proprietary information belonging to the City.

Except as specifically provided in this Contract, the Contractor or its subcontractors will not divulge data to any third party without prior written consent of the City. The Contractor or its subcontractors will not use the data for any purposes except to perform the services required under this Contract. These prohibitions will not apply to the following data provided the Contractor or its subcontractors have first given the required notice to the City:

- A. Data which was known to the Contractor or its subcontractors prior to its performance under this Contract unless such data was acquired in connection with work performed for the City;
- B. Data which was acquired by the Contractor or its subcontractors in its performance under this Contract and which was disclosed to the Contractor or its subcontractors by a third party, who to the best of the Contractor's or its subcontractor's knowledge and belief, had the legal right to make such disclosure and the Contractor or its subcontractors are not otherwise required to hold such data in confidence; or
- C. Data which is required to be disclosed by virtue of law, regulation, or court order, to which the Contractor or its subcontractors are subject.

In the event the Contractor or its subcontractors are required or requested to disclose data to a third party, or any other information to which the Contractor or its subcontractors became privy as a result of any other contract with the City, the Contractor will first notify the City as set forth in this section of the request or demand for the data. The Contractor or its subcontractors will give the City sufficient facts so that the City can be given an opportunity to first give its consent or take such action that the City may deem appropriate to protect such data or other information from disclosure.

The Contractor, unless prohibited by law, within ten calendar days after completion of services

for a third party on real or personal property owned or leased by the City, the Contractor or its subcontractors will promptly deliver, as set forth in this section, a copy of all data to the City. All data will continue to be subject to the confidentiality agreements of this Contract.

The Contractor or its subcontractors assume all liability for maintaining the confidentiality of the data in its possession and agrees to compensate the City if any of the provisions of this section are violated by the Contractor, its employees, agents or subcontractors. Solely for the purposes of seeking injunctive relief, it is agreed that a breach of this section will be deemed to cause irreparable harm that justifies injunctive relief in court. Contractor agrees that the requirements of this Section will be incorporated into all subcontracts entered into by Contractor. A violation of this Section may result in immediate termination of this Contract without notice.

Personal Identifying Information-Data Security

Personal identifying information, financial account information, or restricted City information, whether electronic format or hard copy, must be secured and protected at all times. At a minimum, Contractor must encrypt and/or password protects electronic files. This includes data saved to laptop computers, computerized devices or removable storage devices.

When personal identifying information, financial account information, or restricted City information, regardless of its format, is no longer necessary, the information must be redacted or destroyed through appropriate and secure methods that ensure the information cannot be viewed, accessed, or reconstructed.

In the event that data collected or obtained by Contractor or its subcontractors in connection with this Contract is believed to have been compromised, Contractor or its subcontractors will immediately notify the Project Manager and City Engineer. Contractor agrees to reimburse the City for any costs incurred by the City to investigate potential breaches of this data and, where applicable, the cost of notifying individuals who may be impacted by the breach.

Contractor agrees that the requirements of this Section will be incorporated into all subcontracts entered into by Contractor. It is further agreed that a violation of this Section will be deemed to cause irreparable harm that justifies injunctive relief in court. A violation of this Section may result in immediate termination of this Contract without notice.

The obligations of Contractor or its subcontractors under this Section will survive the termination of this Contract.

Y. **PROJECT MANAGEMENT INFORMATION SYSTEM (UNIFIER)**

The Street Transportation Department's Design and Construction Management (DCM) Division Project Manager may determine that use of UNIFIER will be required during this contract. The following information provides a guideline for utilization. Any questions related to the requirements of UNIFIER should be directed to the DCM Project Manager.

1. The contractor will be required to maintain all project records in electronic format. The City provides an Application Service Provider (ASP) web-based project management database which the contractor will be required to utilize in the fulfillment of the contract requirements. Although this electronic platform does not fulfill this requirement in its entirety, the contractor will be required to utilize this platform as the basis for this work.
2. The contractor can expect to use this ASP to process all primary level tri-partite contract documents related to the design or construction phase of the Project including but not limited to: requests for interpretation/information, potential Change Orders, construction meeting minutes, Submittals, Design Professional's supplemental instructions, and Payment Requests.

3. The contractor will be required to process information into electronic digital form. To fulfill this requirement, the contractor will provide all necessary equipment to perform the functions necessary to generate, convert, store, maintain, connect to web-based ASP and transfer electronic data.
4. The contractor will provide a computerized networked office platform with broadband internet connectivity. Wired or wireless is acceptable. This platform will function well in a web-based environment utilizing an internet browser compatible with the City's UNIFIER ASP system.

UNIFIER training will be provided through the City of Phoenix. Contact information will be provided to the firms under contract, to establish the set up with a log-in and password.

Z. **PROJECT STAFFING**

Key Personnel: Before starting work, Contractor must submit detailed résumés of key personnel involved in that work for City's approval (which City will not unreasonably withhold). If Contractor later desires to change key personnel involved in that work, Contractor must submit detailed résumés of the new personnel for City's approval (which City will not unreasonably withhold).

Qualified Staff: Contractor must maintain an adequate and competent staff of qualified persons—as City may determine in its sole discretion—during performance of this Master Agreement. If City in its sole discretion determines that any of Contractor's staff is objectionable, Contractor must take prompt corrective action or replace that staff with new personnel, subject to City's approval.

Third-Party Employment Brokers: Contractor and Subcontractors will not utilize a third-party labor broker for any construction worker under this Agreement. The Contractor and Subcontractors must be the employers of record for its construction staff under this Agreement.

AA. **NO ISRAEL BOYCOTT**

If this Contract is valued at \$100,000 or more and requires Contractor (a company engaging in for-profit activity and having ten or more full-time employees) to acquire or dispose of services, supplies, information technology, or construction, then Contractor must certify and agree that it does not and will not boycott goods or services from Israel, pursuant to Title 35, Chapter 2, Article 9 of the Arizona Revised Statutes. Provided that these statutory requirements are applicable, Contractor by entering this Contract now certifies that it is not currently engaged in, and agrees for the duration of the Contract to not engage in, a boycott of goods or services from Israel.

BB. **NO FORCED LABOR OF ETHNIC UYGHURS**

If this Contract requires Contractor (a company engaging in for-profit activity and having ten or more full-time employees) to acquire or dispose of services, supplies, information technology, goods, or construction, then pursuant to Title 35, Chapter 2, Article 10 of the Arizona Revised Statutes Contractor must certify and agree that it and any contractors, subcontractors, or suppliers it utilizes do not and will not use the forced labor of ethnic Uyghurs in the People's Republic of China or any goods or services produced by such forced labor. Provided these statutory requirements are applicable, Contractor, by entering this Contract, now certifies it is not currently engaged in, and agrees for the duration of the Contract to not engage in, (a) the use of forced labor of ethnic Uyghurs in the People's Republic of China; (b) the use of any goods or services produced by the forced labor of ethnic Uyghurs in the People's Republic of

China; or (c) the use of any contractors, subcontractors, or suppliers that use the forced labor or any goods or services produced by the forced labor of ethnic Uyghurs in the People's Republic of China.

CC. **COMPLIANCE WITH LAWS**

Contractor must comply with all existing and subsequently enacted federal, state and local laws, ordinances and codes, all applicable ADA requirements, regulations that are, or become applicable to this Agreement, and be in general conformance with PROWAG guidance. If a subsequently enacted law imposes substantial additional costs on Contractor, a request for an amendment may be submitted pursuant to this Agreement. Contractor is also required to certify its compliance with all applicable laws and Contractor must pass along these requirements to its Subcontractors. If any of Contractor's certifications is found to be false, the City may terminate this Agreement or impose other remedies due to the false certification.

DD. **HEAT MITIGATION**

Per Phoenix City Code G-7241, effective April 25, 2024, any Contractor whose employees and contract workers perform work in an outdoor environment under this contract must keep on file a written heat safety plan. The City may request a copy of this plan and documentation of all heat safety and mitigation efforts currently implemented to prevent heat-related illnesses and injuries in the workplace. The plan must also be posted where it is accessible to employees. At a minimum, the heat safety and mitigation plan and documentation required under this provision shall include each of the following as it relates to heat safety and mitigation:

1. Availability of sanitized cool drink water free of charge at locations that are accessible to all employees and contract workers.
2. Ability to take regular and necessary breaks as needed and additional breaks for hydration.
3. Access to shaded areas and/or air conditioning.
4. Access to air conditioning in vehicles with enclosed cabs. All such vehicles must contain functioning air conditioning by no later than May 1, 2025.
5. Effective acclimatization practices to promote the physiological adaptations of employees or contract workers newly assigned or reassigned to work in an outside environment.
6. Conduct training and make it available and understandable to all employees and contract workers on heat illness and injury that focuses on the environmental and personal risk factors, prevention, how to recognize and report signs and symptoms of heat illness and injury, how to administer appropriate first aid measures and how to report heat illness and injury to emergency medical personnel.

The Contractor further agrees that this clause will be incorporated in all subcontracts with subconsultants, sublicensees or sublessees who may perform labor or services in connection with this contract. Additionally, the Contractor agrees to require all subcontractors, sublicensees or sublessees to include this clause in all contracts with any third party who is contracted to perform labor or services in connection with this contract. It is the obligation of the Contractor to ensure compliance by its subcontractors.

SUPPLEMENTARY CONDITIONS

1. 103 AWARD AND EXECUTION OF CONTRACT, Add the following to Subsection 103.3 AWARD OF CONTRACT:

Contract award will be made to a responsive and responsible bidder based on the low total base bid or on the low combination of the total base bid and any selected alternate(s), whichever is in the best interest of the City. If unit pricing is required in the proposal, the extensions and additions will be verified to assure correctness. Award will be based on the revised total if any errors are found. Additionally, the Contractor will meet the minimum SBE subcontracting goal set for this contract or have been granted a full or partial waiver of the goal. The City expressly reserves the right to cancel this agreement without recourse or prejudice to Contractor until all parties have executed the agreement in full.

Any bidder that currently contracts with the City must be in good standing for its proposal to be considered responsive. For the purpose of this Invitation to Bid, good standing means compliance with all contractual provisions, including payment of financial obligations.

2. 103 AWARD AND EXECUTION OF CONTRACT, Add the following to Subsection 103.5, REQUIREMENT OF CONTRACT BONDS:

A. PERFORMANCE BOND AND LABOR AND MATERIAL BOND

Prior to the execution of a contract, the successful bidder must provide a performance bond and a labor and material bond, each in an amount equal to the full amount of the contract. Each such bond will be executed by a surety company or companies holding a certificate of authority to transact surety business in the State of Arizona issued by the Director of the Department of Insurance. A copy of the Certificate of Authority will accompany the bonds. The Certificate will have been issued or updated within two years prior to the execution of the Contract. The bonds will be made payable and acceptable to the City of Phoenix. The bonds will be written or countersigned by an authorized representative of the surety who is either a resident of the State of Arizona or whose principal office is maintained in this state, as required by law, and the bonds will have attached thereto a certified copy of Power of Attorney of the signing official. If one Power of Attorney is submitted, it will be for twice the total contract amount. If two Powers of Attorney are submitted, each will be for the total contract amount. Personal or individual bonds are not acceptable. Failure to comply with these provisions will be cause for rejection of the bidder's proposal.

B. BONDING COMPANIES

All bonds submitted for this project will be provided by a company which has been rated "A- or better for the prior four quarters" by the A. M. Best Company. **Failure to provide an "A- or better for the prior four quarters" bond will result in bid rejection.**

3. 103 AWARD AND EXECUTION OF CONTRACT, Delete Subsection 103.6, CONTRACTOR'S INSURANCE in its entirety and substitute the following:

103.6.1 General:

Contractor and subcontractors must procure insurance against claims that may arise from or relate to performance of the work hereunder by Contractor and its agents, representatives, employees and subconsultants. Contractor and subcontractors must maintain that insurance until all of their obligations have been discharged, including any warranty periods under this Contract.

The City in no way warrants that the limits stated in this section are sufficient to protect the Contractor from liabilities that might arise out of the performance of the work under this Contract by the Contractor, its agents, representatives, employees, or subcontractors and Contractor may purchase additional insurance as they determine necessary.

SCOPE AND LIMITS OF INSURANCE - Contractor must provide coverage with limits of liability not less than those stated below. An excess liability policy or umbrella liability policy may be used to meet the liability limits provided that (1) the coverage is written on a "following form" basis, and (2) all terms under each line of coverage below are met.

Commercial General Liability – Occurrence Form

General Aggregate	\$2,000,000
Products – Completed Operations Aggregate	\$1,000,000
Personal and Advertising Injury	\$1,000,000
Each Occurrence	\$1,000,000

- The policy must name the City of Phoenix as an additional insured with respect to liability for bodily injury, property damage and personal and advertising injury with respect to premises, ongoing operations, products and completed operations, and liability assumed under an insured contract arising out of the activities performed by, or on behalf of the Contractor, related to this Contract.
- Coverage must include XCU coverage.
- There shall be no endorsement or modification which limits the scope of coverage or the policy limits available to the City of Phoenix as an additional insured.
- City of Phoenix is an additional insured to the full limits of liability purchased by the Contractor.
- The Contractor's insurance coverage must be primary and non-contributory with respect to any insurance or self-insurance carried by the City.
- Contractor's policies must be endorsed to provide an extension of the completed operations coverage for a period of nine years.

Automobile Liability

Bodily injury and property damage coverage for any owned, hired, and non-owned vehicles used in the performance of this Contract.

Combined Single Limit (CSL)	\$1,000,000
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- The policy must be endorsed to include The City of Phoenix as an additional insured with respect to liability arising out of the activities performed by, or on behalf of the Contractor, related to this contract.
- City of Phoenix is an additional insured to the full limits of liability purchased by the Contractor.
- The Contractor's insurance coverage must be primary and non-contributory with respect to any

insurance or self-insurance carried by the City.

Worker's Compensation and Employers' Liability

Workers' Compensation	Statutory
Employers' Liability	
Each Accident	\$100,000
Disease – Each Employee	\$100,000
Disease – Policy Limit	\$500,000

- Policy must contain a waiver of subrogation against the City of Phoenix.
- This requirement does not apply when a contractor or subcontractor is exempt under A.R.S. §23-902(E), **AND** when such contractor or subcontractor executes the appropriate sole proprietor waiver form.

Builders' Risk Insurance or Installation Floater

Policy must be in an amount equal to the initial Contract Amount plus additional coverage equal to Contract Amount for all subsequent change orders.

- The City of Phoenix, the Contractor and subcontractors, must be named insureds on the policy.
- Special Causes of Loss coverage must be written on a replacement cost basis and must include coverage for soft costs, flood and earth movement.
- Policy must be maintained until whichever of the following must first occur: (1) final payment has been made; or, (2) until no person or entity, other than the City of Phoenix, has an insurable interest in the property required to be covered.
- Policy must be endorsed such that the insurance must not be canceled or lapse because of any partial use or occupancy by the City.
- Policy must provide coverage from the time any covered property becomes the responsibility of the Contractor, and continue without interruption during construction, renovation, or installation, including any time during which the covered property is being transported to the construction installation site, or awaiting installation, whether on or off site.
- Policy must contain a waiver of subrogation against the City of Phoenix.
- Contractor is responsible for the payment of all policy deductibles.

ADDITIONAL INSURANCE REQUIREMENTS:

A. NOTICE OF CANCELLATION

For each insurance policy required by the insurance provisions of this Contract, the Contractor must provide to the City, within five business days of receipt, a notice if a policy is suspended, voided or cancelled for any reason. Such notice must be mailed, emailed, or hand delivered to **Design and Construction Procurement, 200 W. Washington Street, 5th Floor, 85003.**

B. ACCEPTABILITY OF INSURERS

Insurance is to be placed with insurers duly licensed or authorized to do business in the state of Arizona and with an "A.M. Best" rating of not less than "B+VI." The City in no way warrants that the required minimum insurer rating is sufficient to protect the Contractor from potential insurer insolvency.

C. VERIFICATION OF COVERAGE

Contractor must furnish the City with certificates of insurance (ACORD form or equivalent approved by the City) as required by this Contract. The certificates for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf.

All certificates and any required endorsements are to be received and approved by the City before work commences. Each insurance policy required by this Contract must be in effect at or prior to commencement of work under this Contract and remain in effect for the duration of the project. Failure to maintain the insurance policies as required by this Contract or to provide evidence of renewal is a material breach of contract.

All certificates required by this Contract must be sent directly to Design and Construction Procurement via email at str.title34.procure@phoenix.gov. **The City project number, contract number and project description must be noted on the certificate of insurance.** The City reserves the right to require complete, certified copies of all insurance policies required by this Contract at any time. **DO NOT SEND CERTIFICATES OF INSURANCE TO THE CITY'S RISK MANAGEMENT DIVISION.**

D. SUBCONTRACTORS

Contractor's certificates shall include all subcontractors as additional insureds under its policies **OR** Contractor shall be responsible for ensuring and verifying that all subcontractors have valid and collectable insurance. At any time throughout the life of the contract, the City of Phoenix reserves the right to require proof from the Contractor that its subcontractors have insurance coverage. All subcontractors providing services included under this Contract's Scope of Services are subject to the insurance coverages identified above and must include the City of Phoenix as an additional insured. In certain circumstances, the Contractor may, on behalf of its subcontractors, waive a specific type of coverage or limit of liability where appropriate to the type of work being performed under the subcontract. Contractor assumes liability for all subcontractors with respect to this Contract.

E. APPROVAL

Any modification or variation from the insurance coverages and conditions in this Contract must be documented by an executed contract amendment.

103.6.2 Defense and Indemnification

To the maximum extent allowed by law, including Title 34 A.R.S., Contractor ("Indemnitor") agrees to defend, indemnify, and hold harmless the City of Phoenix and its officers, officials (elected or appointed), agents and employees (and any jurisdiction or agency issuing permits for any work included in the project, and its officers, agents and employees) ("Indemnitee") from any and all claims, actions, liabilities, damages, losses or expenses, (including but not limited to court costs, attorney fees, expert fees, and costs of claim processing, investigation and litigation) of any nature or kind whatsoever ("Losses") caused or alleged to be caused, in whole or in part, by the wrongful, negligent or willful acts, or errors or omissions of Indemnitor or any of its owners, officers, directors, members, managers, agents, employees, or subcontractors (Indemnitor's Agents") arising out of or in connection with this Contract. This defense and indemnity obligation includes holding Indemnitee harmless for any Losses or other amount arising out of or recovered under any state's workers'

compensation law or arising out of the failure of Indemnitor or Indemnitor's Agents to conform to any federal, state or local law, statute, ordinance, rule, regulation, or court decree. Indemnitor's duty to defend Indemnitee accrues immediately at the time a claim is threatened or a claim is made against Indemnitee, whichever is first. Indemnitor's duty to defend exists regardless of whether Indemnitor is ultimately found liable. Indemnitor must indemnify Indemnitee from and against any and all Losses, except where it is proven that those Losses are solely as a result of Indemnitee's own negligent or willful acts or omissions. Indemnitor is responsible for primary loss investigation, defense and judgment costs where this indemnification applies. In consideration of the City's award of this Contract, Indemnitor agrees to waive all rights of subrogation against Indemnitee for losses arising from or related to any work performed by Indemnitor or Indemnitor's Agents for the City of Phoenix under this Contract. The obligations of Indemnitor under this provision survive the termination or expiration of this Contract.

4. **104 SCOPE OF WORK**, Add the following to **Subsection 104.1.2 MAINTENANCE OF TRAFFIC**:

ADA AND ANSI ACCESS OF PREMISES DURING CONSTRUCTION

Contractor will maintain existing ADA and ANSI accessibility requirements during construction activities in an occupied building or facility. ADA and ANSI accessibility requirements will include, but not be limited to, parking, building access, entrances, exits, restrooms, areas of refuge, and emergency exit paths of travel. Contractor will be responsible for the coordination of all work to minimize disruption to building occupants and facilities.

5. **104 SCOPE OF WORK**, Add the following to **Subsection 104.1.4 CLEANUP AND DUST CONTROL**:

The Contractor will use a power pick-up broom as part of the dust control effort. No separate measurement or payment will be made for cleanup or dust control, or for providing a power pick-up broom on the job.

6. **105 CONTROL OF WORK**, Add the following to **Subsection 105.1, AUTHORITY OF THE ENGINEER**:

A. CONTRACT ADMINISTRATION

The definition of "Engineer" will read as follows:

"Engineer": All references to "Engineer" in these contract bid documents, including the MAG Specifications, will mean City Engineer.

B. PRECONSTRUCTION CONFERENCE

After completion of the contract documents, to include bonds, insurance and signatures and prior to the commencement of any work on the project, the Street Transportation Department, VPM Section, (telephone 602-256-4375), will schedule a Pre-Construction Conference. This will be held at 200 West Washington Street, Phoenix, Arizona.

Construction administration will be provided by City of Phoenix, Street Transportation Department, Design and Construction Management.

The purpose of this conference is to establish a working relationship between the Contractor, utility firms and various City agencies. The agenda will include critical elements of the work schedule, submittal schedule, cost breakdown of major lump sum items, payment application and processing, coordination with the involved utility firms, emergency telephone numbers for all representatives involved in the course of construction and establishment of the notice to proceed date. The Contractor

will also provide copies of all purchase orders and/or contracts with SBE subcontractors and suppliers used to meet the subcontract goals programmed for this project.

Minimum attendance by the Contractor will be a responsible company/corporate official, who is authorized to execute and sign documents on behalf of the firm, the job superintendent and the Contractor's safety officer.

C. AUTHORIZATION OF THE ENGINEER

The City may, at its discretion and without cause, order the Contractor in writing to stop and suspend work. Immediately after receiving such notice, the Contractor will discontinue advancing the work specified under this Agreement.

Such suspension will not exceed one hundred and eighty (180) consecutive days during the duration of the project.

The Contractor may seek an adjustment of the contract price and time, if the cost or time to perform the work has been adversely impacted by any suspension or stoppage of work by the City.

7. **105 CONTROL OF WORK**, Add the following to **Subsection 105.2 PLANS AND SHOP DRAWINGS**:

The Contractor will submit as many of the required shop drawings and product data submittals at the Pre-Construction meeting as practical and possible. All shop drawings and product data submittals will be submitted sufficiently in advance to allow adequate time for City review(s) and approval. The Contractor will submit early enough to allow enough time for reviews based on the assumption that a submittal may be marked "Revise and Resubmit" or "Rejected", requiring the Contractor to modify the submittal and resubmit for additional review(s) until acceptance.

A separate transmittal will be used for each specific item type, class of material or equipment for which a submittal is required. Multiple items under one transmittal will only be allowed when the items taken together constitute a complete manufacturer's package, or are so functionally related that the entire package should be reviewed as a whole. The contractor will submit six (6) hard copies of each shop drawing for review. **Email or FAX submittals will not be accepted.**

The Contractor will allow up to four (4) weeks for City review for each submittal. Some submittals may be simple and straightforward and may not require the full four (4) weeks, but other more complex submittals may take the full four (4) weeks.

8. **105 CONTROL OF WORK**, Delete **Subsection 105.8, CONSTRUCTION STAKES, LINES AND GRADES** and add the following:

Description

The work under this section shall consist of furnishing all materials, personnel, and equipment necessary to perform all surveying, staking and verification of the accuracy of all points which have been provided by the Engineer in the project plans.

Included in this work will be all calculations required for the satisfactory completion of the project in conformance with the plans and specifications. The work will be done under the direction of a registered professional surveyor employed by the Contractor.

Measurements of all removals and pay quantity items will be the responsibility of the Engineer.

When utility adjustments are a part of the contract, the Contractor will perform and be responsible for locating, tying and untying all manholes and valves that are discovered during the course of the contract. The Contractor will set all survey points, stakes, and references necessary for carrying out all such adjustments.

During installation and/or relocation of new water lines, valves, water meters and service connections, fire hydrants, sewer lines, sewer taps, clean outs, manholes, and other similar assets, the Contractor will record the final as-built location and provide additional information related to cost, manufacturer, and model numbers in a form provided by the Engineer.

The Contractor will furnish all traffic control, including flagging for survey and staking operations. Traffic control will be in accordance with the requirements of the City of Phoenix Barricade Manual.

The Contractor will keep field notes in bound field books. These books will be available for inspection by City personnel at all times and will become the property of the City of Phoenix upon completion of the project.

Construction Staking Requirements

Staking will be performed in accordance with the City of Phoenix's Survey Section Standard Requirements for Staking, As-Builts and Quantity Calculations, plus any special addenda provided by the Engineer. The Contractor will provide to the Engineer in writing, for the Engineer's approval, any special procedures that will be used for construction survey staking completion.

The project plans will include all the required benchmark and horizontal datum information to establish survey control on the project site and to complete the proper layout of the work. The project plans will identify a minimum of two City of Phoenix published Benchmarks, and identify additional temporary benchmarks at other convenient locations when applicable. After the Contractor has verified the accuracy of the control points established by the City, the Contractor will set all stakes necessary for construction in accordance with the City of Phoenix Survey Section Standard Requirements.

If errors are discovered during the verification process and the control points do not agree with the horizontal or vertical information shown in the plans, the Contractor shall promptly notify the Engineer in writing, and explain the problem in detail. The Engineer will advise the Contractor of any corrective actions which may be necessary.

The Contractor will exercise care in the preservation of stakes, references, bench marks and will reset them when they are damaged, lost, displaced or removed.

Any discrepancies in grade, alignment, locations or dimensions detected by the Contractor will be brought to the attention of the Engineer by letter. No changes in the project plans will be allowed without the approval of the Engineer.

The Engineer reserves the right to make inspections and random checks of any portion of the staking and layout procedure. If, in the Engineer's opinion, the work is not being performed in the manner that will assure proper control and accuracy, the Engineer will order any or all of the staking and layout work redone at no additional cost.

If any portion of the Contractor's staking and layout work is ordered redone, resulting in additional rechecking by the Engineer, the City will be reimbursed for all costs for such additional checking. The amount of such costs will be deducted from the Contractor's progress payment.

Inspection of the Contractor's layout by the Engineer and the acceptance of all or any part of it will not relieve the Contractor of their responsibility to secure the proper dimensions, grades and elevations for the work.

Record Drawings and As-builts

The Contractor shall maintain a record drawing (redlines) set of plans at the job site. These shall be kept legible and current and shall show all changes or work added in a contrasting, reproducible color. Two weeks prior to issuance of substantial completion, the Contractor shall submit, prior to final inspection, corrected redline drawings with all appropriate field changes clearly marked and labeled on the signed and approved plan sets. The Engineer shall be the sole judge as to the acceptability of the record drawing plans, before the information is incorporated into the final and accepted as-built set to be stored with the Central Records office.

Prior to final acceptance, the Contractor will provide a complete as-built set, sealed by a Registered Professional, showing all field modifications and final elevation, stations and offset of the completed improvements. For construction related to sewer, and water facilities, and other utilities, as-built information may be requested at the Engineer prior to completion of as-builts at no additional cost. The as-built plans shall be prepared in accordance with the requirements of this section and other applicable special provisions for this project. Additional As-built requirement can be found on the Streets Transportation Department Website, under the Community Reference Materials.

Measurement

Construction surveying and layout will be measured as a single complete unit of work.

A contingency item, Two-person survey party will be measured by the hour to the nearest half (1/2) hour. This item will only be measured for payment when the Engineer requires extra work beyond what is required to layout the construction of the approved plans. The Engineer will require field notes and invoice to validate the additional time.

Payment

Payment for construction surveying and layout will be by the lump sum and will be made as follows:

The item of two-person survey party is a contingent item and is established for the purpose of compensating the Contractor for additional staking and layout required as a result of extra work ordered by the Engineer. Payment will be made at the predetermined unit price shown on the bidding schedule for the survey party or parties used. The Engineer will be the sole judge as to whether the additional work will be performed by the Contractor. The amount per hour for a two-person survey party includes the cost of all work necessary to complete the extra work.

No payment will be made for the resetting of stakes, references, benchmarks, and other survey control.

9. **105 CONTROL OF WORK**, Add the following to **Subsection 105.15 ACCEPTANCE, paragraph (B) Final Acceptance:**

A. **SUBSTANTIAL COMPLETION**

The work may be judged substantially complete when all construction, including all applicable ADA requirements, has been completed with the possible exception of final inspection punch list work. The purpose of granting or acknowledging substantial completion is to stop contract time. This is particularly important to the Contractor if contract time is exhausted or nearly so and/or punch list work is

anticipated to extend beyond the allotted time. Granting of substantial completion will eliminate the possibility of incurring liquidated damages or additional liquidated damages beyond the substantial completion date, whichever case may apply.

In the event that the Engineer grants substantial completion, the Contractor will have thirty (30) days thereafter to complete punch list work, unless additional time is granted--in writing--by the Engineer. In no case will a Contractor be granted more than thirty (30) days to complete punch list work, unless there are extenuating circumstances such as delay in shipment of a specialized piece of equipment, labor strike, or other circumstances beyond the Contractor's control which would necessitate a further time extension.

B. PENALTY FOR FAILURE TO COMPLETE PUNCH LIST WORK WITHIN SPECIFIED TIME

In the event the Contractor fails to complete the punch list work within thirty (30) days following the contract completion date, or in the case of specialized situations within the additional time allotted by the Engineer, the Contractor may be declared in default, and the Engineer may order the work completed by others.

In the event of default, as described herein, the Engineer will withhold from the Contractor's final payment, an amount equal to at least twice the estimated cost of the remaining work. In addition, the Engineer will withhold the retention deducted from contract progress payments until all punch list work has been satisfactorily completed, whereupon twice the amount of the actual cost of completing the work will be deducted from the Contractor's final payment and the remaining funds, if any, including the contract retention, will be released in accordance with the conditions set forth in contract retention.

C. CONTRACT RETENTION

This project will not be considered complete until all work has been completed, including punch list work. Under no circumstances will a Contractor receive any portion of the legally retained progress payments until the City has granted a final acceptance and/or acknowledged substantial completion. The following conditions will apply to each case:

1. Substantial Completion: The Engineer may reduce outstanding contract retention to not less than one (1) percent of the total contract amount, upon granting substantial completion, if the value of the punch list work is estimated to be less than one (1) percent of the total contract.
2. Project Acceptance: Project acceptance implies that all punch list work is done and the improvements have been accepted by the City. Under these conditions, the retention will be fully released to the Contractor subject only to the signing of the standard claims affidavit and hold harmless clause required for all contracts.
3. Final Release of Contract Retention and/or Release of More Than Ninety (90) Percent of the Contract Funds: Prior to final payment and release of monies retained and/or in the case of substantial completion where the Contractor has requested a reduction in contract retention, the Contractor will be required to sign a claims affidavit agreeing to hold the City harmless from any and all claims arising out of the contract.

10. 107 LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC, Add the following to Subsection 107.1, LAWS TO BE OBSERVED, paragraph (C):

While every effort has been made to Blue Stake all known utilities, and to research and show on the plans, all

existing underground utilities based on the best available information, it will be the Contractor's responsibility to locate and pothole all existing utilities sufficiently in advance of anticipated new underground construction to identify any potential conflicts and allow reasonable time for the Engineer to determine solutions. Any claims for additional compensation or work required due to the Contractor's non-compliance with this provision will not be considered for payment by the City.

11. **107 LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC**, Add the following new paragraphs to **Subsection 107.1, LAWS TO BE OBSERVED**:

(G) FAIR TREATMENT OF WORKERS

The Contractor will keep fully informed of all Federal and State laws, County and City ordinances, regulations, codes and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any way affect the conduct of the work. He will at all times observe and comply with all such laws, ordinances, regulations, codes, orders and decrees; this includes, but is not limited to laws and regulations ensuring fair and equal treatment for all employees and against unfair employment practices, including OSHA and the Fair Labor Standards Act (FLSA). The Contractor will protect and indemnify the Contracting Agency and its representatives against any claim or liability arising from or based on the violation of such, whether by himself or his employees.

(H) DESERT TORTOISE MITIGATION

As stated in the Arizona Interagency Desert Tortoise Team (AIDTT) Management Plan (1996), if a desert tortoise is found in a project area, activities should be modified to avoid injuring or harming it. If activities cannot be modified, tortoises in harm's way should be moved in accordance with Arizona Game and Fish Department's "Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects", revised October 23, 2007 (or the latest revision), included in these contract provisions. Taking, possession, or harassment of a desert tortoise is prohibited by State law, unless specifically authorized by Arizona Game and Fish Department.

(I) BURROWING OWLS MITIGATION – MIGRATORY BIRD TREATY ACT OF 1918

While no burrowing owls have been seen at the project site, small animal burrows likely used by rodents and cottontail rabbits are present. In the event that burrowing owls are found on the site, the project will comply with the Migratory Bird Treaty Act of 1918 and relocate the birds prior to grading. A contact for relocation of burrowing owls is Bob Fox or Greg Clark of Wild at Heart, 31840 North 45th Street, Cave Creek, AZ 85331, 480-595-5047.

12. **107 LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC**, Add the following to **Subsection 107.2, PERMITS**:

A. HAUL PERMIT

On any project, when the quantity of fill or excavation to be hauled exceeds 10,000 C.Y. or when the duration of the haul is for more than twenty (20) working days, the Contractor will:

1. Obtain approval of the proposed haul route, number of trucks, etc., by the Street Transportation Department, and then;
2. Submit the proposed haul route plan to the Planning and Development Department and pay the appropriate plan-review fee (contact Planning and Development Department at 602-534-5933 for

current plan review fee, the cost of which will be considered incidental to the project), and after their approval;

3. Obtain the written haul permit from the Planning and Development Department.

NOTE: Obtaining the haul permit and the approval by Street Transportation does not release the Contractor from strict compliance with MAG Subsection 108.5, Limitation of Operations.

B. STORM WATER POLLUTION PREVENTION PLAN AND AZPDES PERMIT

Any project that disturbs one acre or more of the ground surface requires the Contractor to obtain an AZPDES permit and prepare a SWPPP. This project does require an AZPDES permit and SWPPP.

C. DUST PERMIT

Any project that disturbs more than 1/10 acre of soil requires an earthmoving permit from Maricopa County. Information and forms can be found at:

www.maricopa.gov/ag/divisions/permit_engineering/applications/Default.aspx

To facilitate and encourage strict compliance with the Maricopa County Air Pollution Control Regulations pertaining to fugitive dust control, the Contractor will submit the following documentation to the Engineer at the Pre-Construction meeting prior to conducting any earth moving or dust generating activities under the Contract.

- a. Copy of a valid Maricopa County Earth Moving (Dust Control) Permit applicable to the work or services under the Contract.
- b. Copy of the Dust Control Plan applicable to the work or services under the Contract.
- c. Documentation that all of the Contractor's on-site project managers have received the Comprehensive or Basic dust control training as required by Maricopa County Rule 310 based on project disturbed acres.

For construction sites where 5-acres or more are disturbed, the Contractor will designate and identify to the City an individual who has completed the dust control training as required for the site Dust Control Coordinator. The Dust Control Coordinator will be present on-site all times that earth moving or dust generating activities are occurring and until all ground surfaces at the site have been stabilized.

For construction sites less than 1-acre, the Contractor will designate an individual who has completed Basic Training to be on site at all times that earth moving or dust generating activities are occurring.

The Contractor will notify the Engineer within twenty-four (24) hours of any inspection, Notice of Violation, or other contact by the Maricopa County Air Quality Department with it or any of its subcontractors regarding the work or services under the Contract. A copy of any written communications, notices or citations issued to Contractor or any of its subcontractors regarding the work or services under the Contract will likewise be transmitted to the Engineer within twenty-four (24) hours.

The Contractor will prevent any dust nuisance due to construction operations in accordance with MAG Specifications, Section 104.1.3, Cleanup and Dust Control. The Contractor will use a power pick-up

broom as part of the dust control effort. No separate measurement or payment will be made for cleanup or dust control, or for providing a power pick-up broom on the job.

The Contractor agrees to indemnify and reimburse the City for any fine, penalty, fee or monetary sanction imposed on the City by Maricopa County arising out of, or caused by the performance of work or services under the Contract. The Contractor will remit payment of the reimbursable sum to the City within thirty (30) days of being presented with a demand for payment from the City.

D. TEMPORARY RESTRICTION AND CLOSURE SYSTEM (TRACS) PERMIT

The Contractor will obtain a TRACS permit for any construction that restricts access (partial or complete closures) on Major/Collector public streets, or complete closures on Local streets, sidewalks, bike lanes and alleys. The Contractor will obtain this permit in accordance with the City of Phoenix Traffic Barricade Manual, latest edition. The Contractor will follow all requirements of the TRACS permit during construction. The Contractor will obtain this permit before the Notice to Proceed date. Any construction delays caused by non-compliance with the TRACS permit or the City of Phoenix Traffic Barricade Manual requirements will be the responsibility of the Contractor.

E. DEMINIMUS DISCHARGE PERMIT

As required, if the Contractor anticipates the discharge of any amount of water from the City water or wastewater system during construction, the Contractor will be responsible for obtaining a DeMinimus Permit from the Arizona Department of Environmental Quality (ADEQ) for any discharge that will reach "waters of the U.S.", either directly or indirectly, and complying with all requirements of that permit. This includes all compliance reporting required by the permit. No separate payment will be made for obtaining or complying with this permit.

F. U.S. ARMY CORPS OF ENGINEERS SECTION 404 PERMIT

This project is subject to a U.S. Army Corps of Engineers 404 Permit (or U.S. Army Corps of Engineers Nationwide Permit (NWP)). The permit (or NWP) is included in these project specifications. The Contractor will comply with all requirements of this permit.

G. OTHER PERMITS

The Contractor may be required to obtain other permits from other agencies, such as the Arizona Department of Transportation (ADOT) or the Flood Control District of Maricopa County (FCDMC) before beginning work or restricting traffic in their right-of-way. The Contractor will be required to obtain these permits and comply with their requirements.

13. 107 LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC, Modify Subsection 107.8, USE OF EXPLOSIVES as follows:

Replace the words "Uniform Fire Code" with "Phoenix Fire Code".

14. 107 LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC, Add the following to Subsection 107.8, USE OF EXPLOSIVES:

While geotechnical information indicates some areas of hard rock, **NO BLASTING** will be allowed on this project due to the close proximity of two critical 66-inch transmission water mains, as well as many businesses and residences in the area.

15. **107 LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC**, Add the following to **Subsection 107.11, CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTY AND SERVICES**:

A. **UNDERGROUND FACILITIES**

The Contractor will make whatever investigation it deems necessary to verify the location of underground utility facilities. If such facilities are not in the location shown in the drawings, then (regardless of whether this is discovered prior to or during construction) the contractor's remedies, if any, pursuant to Art. 6.3, Chapter 2, Title 40, A.R.S. (A.R.S. 40-360.21 through 40-360.32, "Underground Facilities"), will be the contractor's sole remedy for extra work, delays and disruption of the job, or any other claim based on the location of utility facilities. Locations of utility facilities shown on drawings furnished by the City are to be regarded as preliminary information only, subject to further investigation by the contractor. The City does not warrant the accuracy of these locations, and the contractor, by entering into this contract, expressly waives and disclaims any claim or action against the City under any theory for damages resulting from location of utility facilities.

The Contractor will be responsible for obtaining all Blue Stake utility location information, and for performing all requirements as prescribed in A.R.S. 40-360.21 through .29, for all underground facilities, including those that have been installed on the current project, until the project is accepted by the City.

At least two (2) working days prior to commencing any excavation, the Contractor will call the BLUE STAKE CENTER, between the hours of 7:00 a.m. and 4:30 p.m., Monday through Friday for information relative to the location of buried utilities. The number to be called is as follows:

Maricopa County (602) 263-1100

B. **UTILITY-RELATED CONSTRUCTION DELAY DAMAGES CLAIM PROCEDURES**

The following procedure is intended to provide a fair and impartial process for the settlement of construction delay claims associated with unknown or improperly located utility facilities.

The Contractor will immediately notify, in writing, the Project Engineer of any potential utility-related delay claim.

The Contractor will immediately notify the appropriate liaison of the affected utility verbally, followed by a written notification.

The Contractor will coordinate an investigation of the situation with the affected utility and the City's Utility Coordinator. After resolution, the Contractor will provide written notification of the settlement of the claim to all affected parties. If the affected utility makes a decision to handle negotiations for a claim, their personnel will be responsible for monitoring the project and all negotiations with the Contractor regarding the claim.

The Contractor will determine to document requirements of the affected utility for their acceptance of responsibility for the claims. The Contractor will provide four (4) copies of the required documentation to the utility involved and two (2) copies of this documentation to the Project Engineer. The Contractor will obtain written confirmation from the utility company involved of their documentation requirements.

16. **108 COMMENCEMENT, PROSECUTION AND PROGRESS** Add the following to **Subsection 108.2, SUBLETTING OF CONTRACT**:

(F) PROMPT PAYMENT

1. Contractor Payment to Subcontractor or Supplier

Contractor will pay its subcontractors or suppliers within seven (7) calendar days of receipt of each progress payment from the City. The Contractor will pay for the amount of work performed or materials supplied by each subcontractor or supplier as accepted and approved by the City with each progress payment. In addition, any reduction of retention by the City to the Contractor will result in a corresponding reduction to subcontractors or suppliers who have performed satisfactory work. Contractor will pay subcontractors or suppliers the reduced retention within fourteen (14) days of the payment of the reduction of the retention to the Contractor. No Contract between Contractor and its subcontractors and suppliers may materially alter the rights of any subcontractor or supplier to receive prompt payment and retention reduction as provided herein. If the Contractor fails to make payments in accordance with these provisions, the City may take any one or more of the following actions and Contractor agrees that the City may take such actions: (1) to hold the Contractor in default under this agreement; (2) withhold future payments including retention until proper payment has been made to subcontractors or suppliers in accordance with these provisions; (3) reject all future bids from the Contractor for a period not to exceed one year from substantial completion date of this project; or (4) terminate agreement.

2. Alternative Dispute Resolution Between Contractor and Subcontractor or Supplier

If Contractor's payment to a subcontractor or supplier is in dispute, Contractor and subcontractor or supplier agree to submit the dispute to any one of the following dispute resolution processes within fourteen (14) calendar days from the date that any party involved gives written notice to the other party(ies): (1) binding arbitration; (2) a form of alternative dispute resolution (ADR) agreeable to all parties; or (3) a City of Phoenix facilitated mediation. When disputed claim is resolved through ADR or otherwise, the Contractor and subcontractor or supplier agree to implement the resolution within seven (7) calendar days from the resolution date.

3. Inspection and Audit

Contractor, its subcontractors and suppliers will comply with A.R.S. 35-214 and the City will have all rights and remedies to inspect and audit the records and files of Contractor, subcontractor or supplier, as afforded the State of Arizona in accordance with the provisions of A.R.S. Section 35-214.

4. Non-Waiver

Should the City fail or delay in exercising or enforcing any right, power, privilege, or remedy under this Section, such failure or delay will not be deemed a waiver, release, or modification of the requirements of this Section or of any of the terms or provisions thereof.

5. Inclusion of provisions in Subcontracts

Contractor will include these prompt payment provisions in every subcontract, including procurement of materials and leases of equipment for this Agreement.

6. No Third Party Benefits or Rights

Nothing contained in this Agreement is intended to benefit or confer any rights on any person or entity not a party to this Agreement, and no such person or entity, including but not limited to other

Contractors, subcontractors or suppliers, may assert any claim, cause of action, or remedy against the City hereunder.

17. **108 COMMENCEMENT, PROSECUTION AND PROGRESS**, Add the following to **Subsection 108.4, CONTRACTOR'S CONSTRUCTION SCHEDULE**:

No later than one (1) week after the Pre-Construction meeting (or one week after the Notice to Proceed date is firmly established), the Contractor will submit to the Engineer, two (2) copies of a detailed Critical Path Model (CPM) chart outlining the detailed progress of all major and critical elements of the project by weeks, from beginning of project to end. The chart will begin at the established Notice to Proceed date and progress on a calendar basis, week by week, to the end of the project.

The Contractor will submit updated CPM charts as required by the Engineer. This will typically be on a monthly basis. The required submittals of updated CPM charts may be less frequent than monthly, if approved by the Engineer.

Neither the City nor the Engineer will accept liability or responsibility for the reasonable or workable nature of the CPM schedules prepared and submitted by the Contractor—that responsibility will remain with the Contractor.

18. **108 COMMENCEMENT, PROSECUTION AND PROGRESS**, Add the following to **Subsection 108.5, LIMITATION OF OPERATIONS**:

A. **WORK HOURS**

Regular working hours will be defined as one 8-1/2 hour shift per day, Monday through Friday, exclusive of City holidays.

Work in excess of regular working hours will be defined as overtime. For overtime which becomes necessary, the Contractor will make a written request to the Engineer at least eight (8) calendar days before the desired overtime. The request will include the duration, dates, times, reason for overtime, and a statement of the consequences if overtime is not approved.

The Contractor will not schedule any overtime work which requires inspection, survey, or material testing without written permission from the Engineer two (2) working days before the proposed overtime work. The Engineer reserves the right to deny the requested overtime. If an overtime request is denied, the Engineer may extend the contract time at no additional cost to the City, including extended overhead costs.

Unscheduled Overtime

Overtime that is not requested and approved in accordance with the above procedure will be defined as unscheduled overtime. All costs (including appropriate overhead) will be paid by the Contractor by deduction from the contract.

Emergency Overtime

An emergency is defined as work required for a situation that is not within the Contractor's control.

With the Engineer's approval, the Contractor will be permitted to work overtime without being responsible for paying the City's costs.

19. **108 COMMENCEMENT, PROSECUTION AND PROGRESS, FORFEITURE AND DEFAULT OF CONTRACT:** Add the following to **Subsection 108.10,**

City's Right to Perform and Terminate for Cause

If the City provides the Contractor with a written order to provide adequate maintenance of traffic, adequate cleanup, adequate dust control or to correct deficiencies or damage resulting from abnormal weather conditions, and the Contractor fails to comply in a time frame specified, the City may have work accomplished by other sources at the Contractor's expense.

If Contractor persistently fails to (i) provide a sufficient number of skilled workers, (ii) supply the materials required by the Contract Documents, (iii) comply with applicable Legal Requirements, (iv) timely pay, without cause, Sub-consultants and/or Subcontractors, (v) prosecute the Contract Services with promptness and diligence to ensure that the Contract Services are completed by the Contract Time, as such times may be adjusted, or (vi) perform material obligations under the Contract Documents, then the City, in addition to any other rights and remedies provided in the Contract Documents or by law, will have the rights set forth below.

Upon the occurrence of an event set forth above, City may provide written notice to Contractor that it intends to terminate the Agreement unless the problem cited is cured, or commenced to be cured, within seven (7) days of Contractor's receipt of such notice.

If Contractor fails to cure, or reasonably commence to cure, such problem, then City may give a second written notice to Contractor of its intent to terminate within an additional seven (7) day period.

If Contractor, within such second seven (7) day period, fails to cure, or reasonably commence to cure, such problem, then the City may declare the Agreement terminated for default by providing written notice to Contractor of such declaration.

Upon declaring the Agreement terminated pursuant to the above, City may enter upon the premises and take possession, for the purpose of completing the Work, of all materials, equipment, scaffolds, tools, appliances and other items thereon, which have been purchased or provided for the performance of the Work, all of which Contractor hereby transfers, assigns and sets over to City for such purpose, and to employ any person or persons to complete the Work and provide all of the required labor, services, materials, equipment and other items.

In the event of such termination, Contractor will not be entitled to receive any further payments under the Contract Documents until the Work will be finally completed in accordance with the Contract Documents. At such time, the Contractor will only be entitled to be paid for Work performed and accepted by the City prior to its default.

If City's cost and expense of completing the Work exceeds the unpaid balance of the Contract Price, then Contractor will be obligated to pay the difference to City. Such costs and expense will include not only the cost of completing the Work, but also losses, damages, costs and expense, including attorneys' fees and expenses, incurred by the City in connection with the re-procurement and defense of claims arising from Contractor's default.

20. **108 COMMENCEMENT, PROSECUTION AND PROGRESS, TERMINATION OF CONTRACT:** Add the following to **Subsection 108.11,**

TERMINATION FOR CONVENIENCE

The Owner for its own convenience has the right for any reason and at any time to terminate the contract and require the Contractor to cease work hereunder. Such termination will be effective at the time and in the manner specified in the notification to the Contractor of the termination. Such termination will be without prejudice to any claims which the Owner may have against the Contractor. In the event of a termination for convenience, the Contractor will be paid only the direct value of its completed work and materials supplied as of the date of termination, and Contractor will not be entitled to anticipated profit or anticipated overhead or any other claimed damages from the Owner, Architect or the Engineer.

If the City is found to have improperly terminated the Agreement for cause or default, the termination will be converted to a termination for convenience in accordance with the provisions of this Agreement.

CANCELLATION OF CONTRACT FOR CONFLICT OF INTEREST

All parties hereto acknowledge that this agreement is subject to cancellation by the City of Phoenix pursuant to the provisions of Section 38-511, Arizona Revised Statutes.

21. **109 MEASUREMENTS AND PAYMENTS**, Add the following to **Subsection 109.4.3, DUE TO EXTRA WORK**:

ALLOWANCE FOR EXTRA WORK

Contract allowance items are provided for the purpose of encumbering funds to cover the costs of possible change order work. The amount of the allowance item is determined by the Engineer and is not subject to individual bid pricing. All bidders will incorporate the amount pre-entered in the bid proposal and will reflect the same in the total amount bid for this project.

This allowance item provides an estimated funding to cover unforeseen changes that may be encountered and corresponding extra work needed to complete the contract per plan. Unforeseen extra work, if any, will be as approved by the Engineer; for example, extension of unit bid prices, negotiated price or time and material, in accordance with MAG Specification Section 109.4 and 109.5.

It will be understood that this allowance item is an estimate only and is based on change order history of similar projects. It will not be utilized without an approved contract change order. It is further understood that authorized extra work, if any, may be less than the allowance item.

22. **109 MEASUREMENTS AND PAYMENTS**, Add the following to **Subsection 109.4 COMPENSATION FOR ALTERATION OF WORK**:

109.4.7 CHANGE ORDERS

Owner reserves the right to decrease adjustments made in any change order if, upon audit of Contractor's records, the audit discloses contractor provided false or inaccurate cost and pricing data in negotiating the change order. In enforcing this provision, the parties will follow the procedure provided in the Federal Acquisition Regulation (FAR) clause 52.214-27, found in 48 CFR Part 52.

23. **109 MEASUREMENTS AND PAYMENTS**, Delete Table 109-1 in **Subsection 109.9, DOLLAR VALUE OF MAJOR ITEM**, and substitute the following:

<u>CONTRACT AMOUNT</u>	<u>MAJOR ITEM IS DEFINED AS ANY ITEM EQUAL TO OR GREATER THAN THE FOLLOWING</u>
------------------------	---------------------------------------------------------------------------------

<u>CONTRACT AMOUNT</u>	<u>MAJOR ITEM IS DEFINED AS ANY ITEM EQUAL TO OR GREATER THAN THE FOLLOWING</u>
Up to \$1 million	\$15,000 or 3%, whichever is greater
\$1 million to \$3 million	3% of the original contract amount to a maximum of \$75,000.00
\$3 million to \$5 million	2.5% of the original contract amount to a maximum of \$90,000.00
Over \$5 million	1.5% of the original contract amount to a maximum of \$125,000.00

CONTINGENCY ITEMS

Contingency items which fall under the definition of a major item are subject to negotiation if decreased by more than twenty (20) percent.

Contingency items will not increase more than twenty (20) percent without being subject to renegotiation, regardless of the percentage of that item relative to the total contract amount.

24. **109 MEASUREMENTS AND PAYMENTS Subsection 109.7, PAYMENT FOR BOND ISSUE AND BUDGET PROJECTS**, Delete the first three paragraphs in their entirety and replace with the following **Subsection 109.7, PAYMENT FOR BOND ISSUE AND BUDGET PROJECTS**:

A. **PARTIAL PAYMENTS**

The contracting agency will make a partial payment to the Contractor on the basis of an approved estimate prepared by the Engineer or the Contractor for work completed and accepted through the preceding month. The notice to proceed date, which is designated for the specific project involved, will be used as the closing date of each partial pay period. Payment will be made no later than fourteen (14) days after the work is certified and approved. City will review payment requests and make recommendation of approval or denial within seven calendar days.

B. **PAYMENT RETENTION**

At the start of construction, ten percent of all pay requests will be retained by the City to guarantee complete performance of the contract. When the work is fifty percent complete, this amount may be reduced to five percent providing that construction progress and quality of work is acceptable to the City. Any funds which are withheld from the contractor will be paid no later than sixty days after completion of the contract and settlement of all claims.

In lieu of retention, the contractor may provide as a substitute, an assignment of money market accounts, demand deposit accounts, or time certificates of deposit (CDs) from a bank licensed by Arizona, securities guaranteed by the United States, securities of the United States, the State of Arizona, Arizona counties, Arizona municipalities, Arizona school districts, or shares of savings and loan institutions authorized to transact business in Arizona. These securities are referred to as "Qualified Securities."

Qualified Securities deposited in lieu of retention must be deposited into a separate account with a bank

having a branch located in the City of Phoenix and be assigned exclusively for the benefit of the City of Phoenix pursuant to the City's form of escrow and/or deposit agreement.

Escrow Agreement and Deposit Agreement forms may be obtained from the Contract Specialist assigned to the project.

25. **110 NOTIFICATION OF CHANGED CONDITIONS AND DISPUTE RESOLUTION** Add the following to **Subsection 110.1 GENERAL:**

SOILS INFORMATION

The material boring logs shown on the plans or included in these specifications are included for the Contractor's convenience only. It is not intended to imply that the character of materials shown in the logs is representative throughout the project. **The soil borings are indicative of the soil characteristics only at the location and to the depth of each of the borings.**

Even if not specifically shown in the geotechnical information provided, the Contractor may encounter large cobbles, boulders, caliche, conglomerate, hard rock, perched groundwater, historic or prehistoric cultural resources, or other differing site conditions on this project. **No additional compensation will be made for any differing site condition that may be encountered.**

INITIAL NATURAL/CULTURAL RESOURCES ASSESSMENT REQUEST FORM

Return completed form and project map showing maximum area of disturbance to: Andrea Love and James Marshall (andrea.love@phoenix.gov; james.marshall@phoenix.gov), Street Transportation, Office of the City Engineer, Environmental Section, Questions? Call (602) 495-6718

Requested Assessment Completion Date: 8/10/2023 (Average 1 month)
Anticipated Bid Date 12/4/2023 Anticipated Construction Start Date 3/4/2024
If WSD project, will STD administer construction? Yes No N/A

PROJECT INFORMATION

Project Type: New Construction
Project Name New Fire Station No.74 Project No. FD57100020-3
Project Location NW Corner of 19th ave & Chandler Blvd
Project Scope _____

Project consists of site adaptation of the Perlman previously designed Fire station No. 55 with a few minor changes including the addition of a 100-120 square foot S.C.B.A. Fill station and work, the addition of Decontamination showers/bathrooms in the place of the current fitness room, both spaces to meet the current NFPA requirements and to further reduce the cross contamination / exposure to carcinogens in the facility, add a fitness room on the support side of the facility to replace the space being used for the new Decontamination showers/bathrooms and add new wall and door(s) to separate the dayroom from the dining area.

Project is also to include the relocation of the existing park trailhead and parking, if necessary to accommodate the fire station Date project.

Project Dimensions (length and width of areas) _____

Total area of disturbance 2.27 AC Estimated max depth of disturbance below surface 3 ft
 JOC DBB CM@RISK DB
Will additional projects be bidding with this one? Yes No _____

Check the appropriate box if the project needs:

ROW from _____ TCEs from _____
 Structure Purchase and/or Removal (list) _____
Permission granted from landowner for City staff to be on property to conduct environmental review? Yes No

Land Ownership (check all that apply and specify entities)

Federal _____ State _____ Maricopa County _____
 City of Phoenix _____ Private _____ Tribal _____

Funding

Federal _____ State _____ Maricopa _____ Phoenix _____ Other _____

Permits

Federal _____ State _____ Maricopa _____ Other _____

PROPOSED ACTIVITY - CHECK ALL THAT APPLY (for new installation, relocation, rehabilitation, etc.)

<input type="checkbox"/> AC Patchback	<input type="checkbox"/> Catch basins	<input type="checkbox"/> Bus bay installation/repair
<input type="checkbox"/> ADA ramps	<input type="checkbox"/> Culverts	<input type="checkbox"/> Bus bay relocation (temporary/permanent)
<input type="checkbox"/> Bike Lanes	<input type="checkbox"/> Outfalls	<input type="checkbox"/> Bridge/Overpass
<input type="checkbox"/> Curb/Gutter	<input type="checkbox"/> Storm Drains	<input type="checkbox"/> Bulbout/Chicanes
<input type="checkbox"/> Medians	<input checked="" type="checkbox"/> Retention / Detention Basins	<input checked="" type="checkbox"/> Landscaping
<input checked="" type="checkbox"/> Paving	<input type="checkbox"/> Irrigation	<input type="checkbox"/> Multi-use Path
<input type="checkbox"/> Air-knifing/water vacuum	<input type="checkbox"/> Fire Hydrants (new/relocate)	<input type="checkbox"/> Street lights
<input type="checkbox"/> Sidewalks	<input checked="" type="checkbox"/> Potable waterline	<input checked="" type="checkbox"/> Other Utilities _____
<input type="checkbox"/> Street Widening	<input checked="" type="checkbox"/> Sanitary sewer	<input type="checkbox"/> Other _____
<input checked="" type="checkbox"/> Geotech Investigations	<input type="checkbox"/> Potholing	<input type="checkbox"/> Excavation method _____

Additional information - Check all that apply

Repair only - No new construction Canals/laterals-Name: _____
 Natural habitat (native desert or riparian habitat) Dry wash, river, wetland, or other body of water
 Known Historic district/site within/adjacent to project 100 Yr. Floodplain ---> Floodplain Notified: Yes No

Plans attached Yes No Plans 5 % Complete Quarter Section attached? Yes No

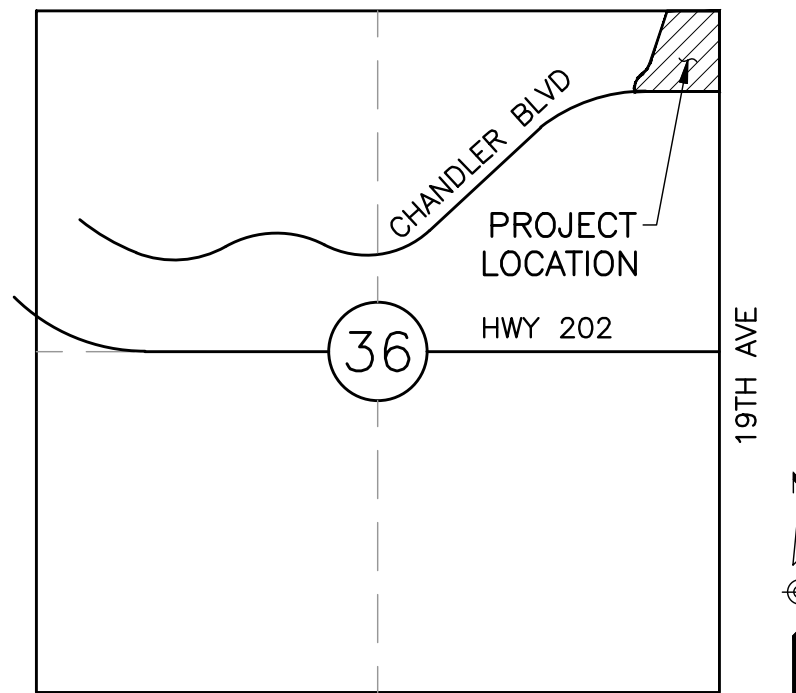
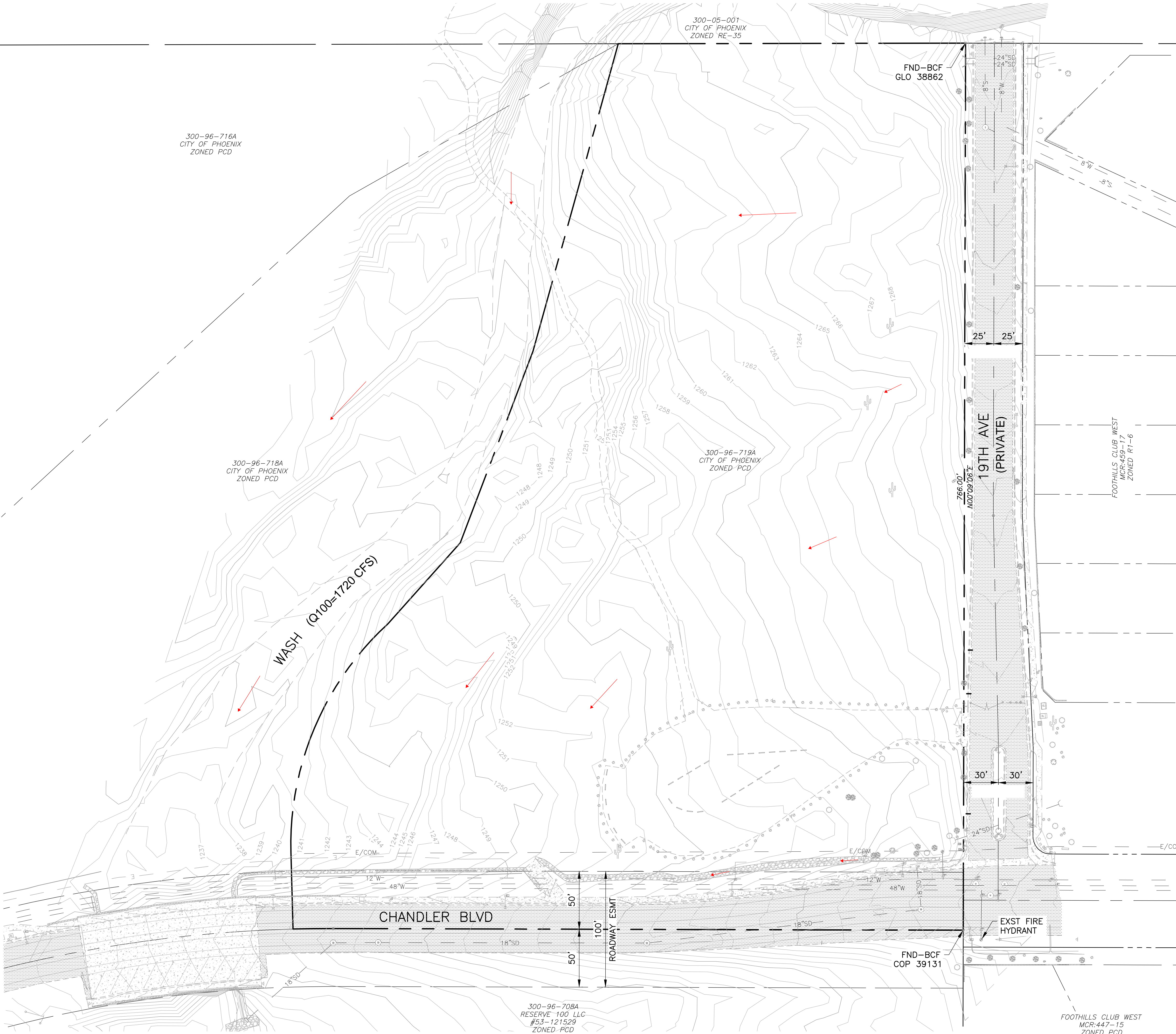
REQUEST SUBMITTED BY

Project Manager Jaime Garrido Dept. Streets Division PDP/DCM

Phone Number 602-327-9333

Signature  Date 7/7/2023

FILE://A:\2023\1023002.01_Phoenix_Fire_Station_74\CAD\23002.01_SPX-X-SITE.dwg DATE:5/9/2023 TIME:10:41 AM (by:jbm.lecm)



VICINITY MAP
SEC 36, T1S, R2E NTS

PROJECT INFORMATION

PARCEL 9 AREA = GROSS 7.74 AC NET 7.03 AC

EXISTING PROPERTY IS ZONED PCD.

PARCEL 9 OF "AMENDED STATE PLAT NO. 30 SOUTH MOUNTAIN 620" BOOK 1002, PAGE 50, MCR RECORDED 09/02/2008 SECTION 36, TOWNSHIP 1 SOUTH, RANGE 2 EAST

DIBBLE

1626 NORTH LITCHFIELD ROAD,
SUITE 150
GOODYEAR, AZ 85395
PHONE: 623.935.2258
CONTACT: SHANNON MAUCK, P.E.



200 WEST WASHINGTON ST
5TH FLOOR
PHOENIX, AZ 85003
PHONE: 602.256.4337
CONTACT: CHRIS KABALA, P.E.

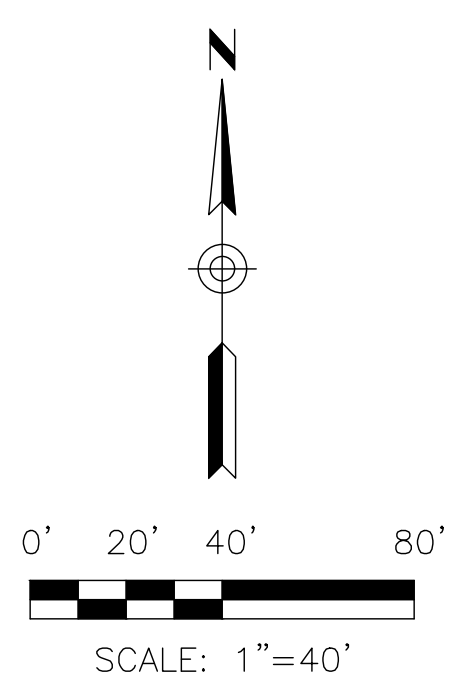
CITY OF PHOENIX
FIRE STATION 74
CHANDLER BLVD & 19TH AVE, PHOENIX, AZ

Issued for	Rev.	Date

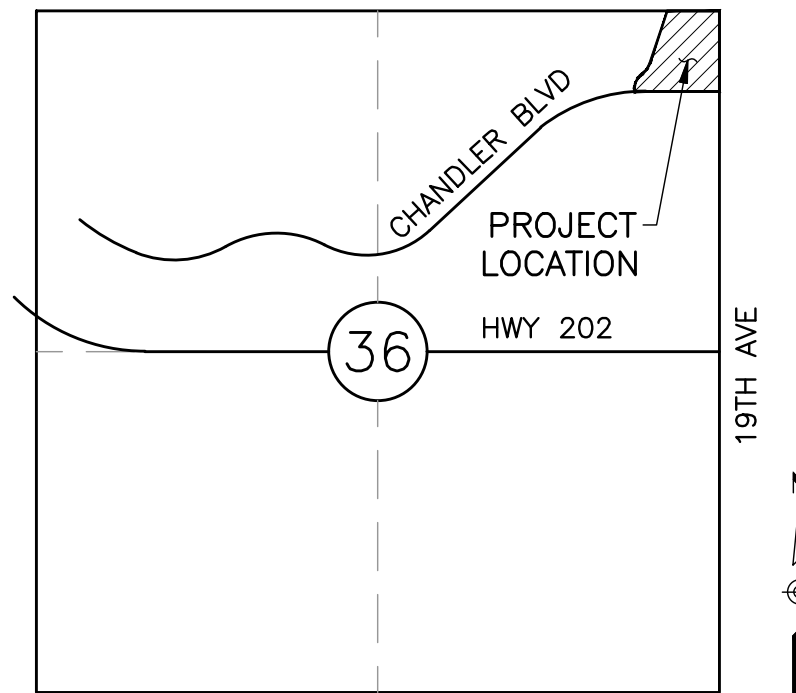
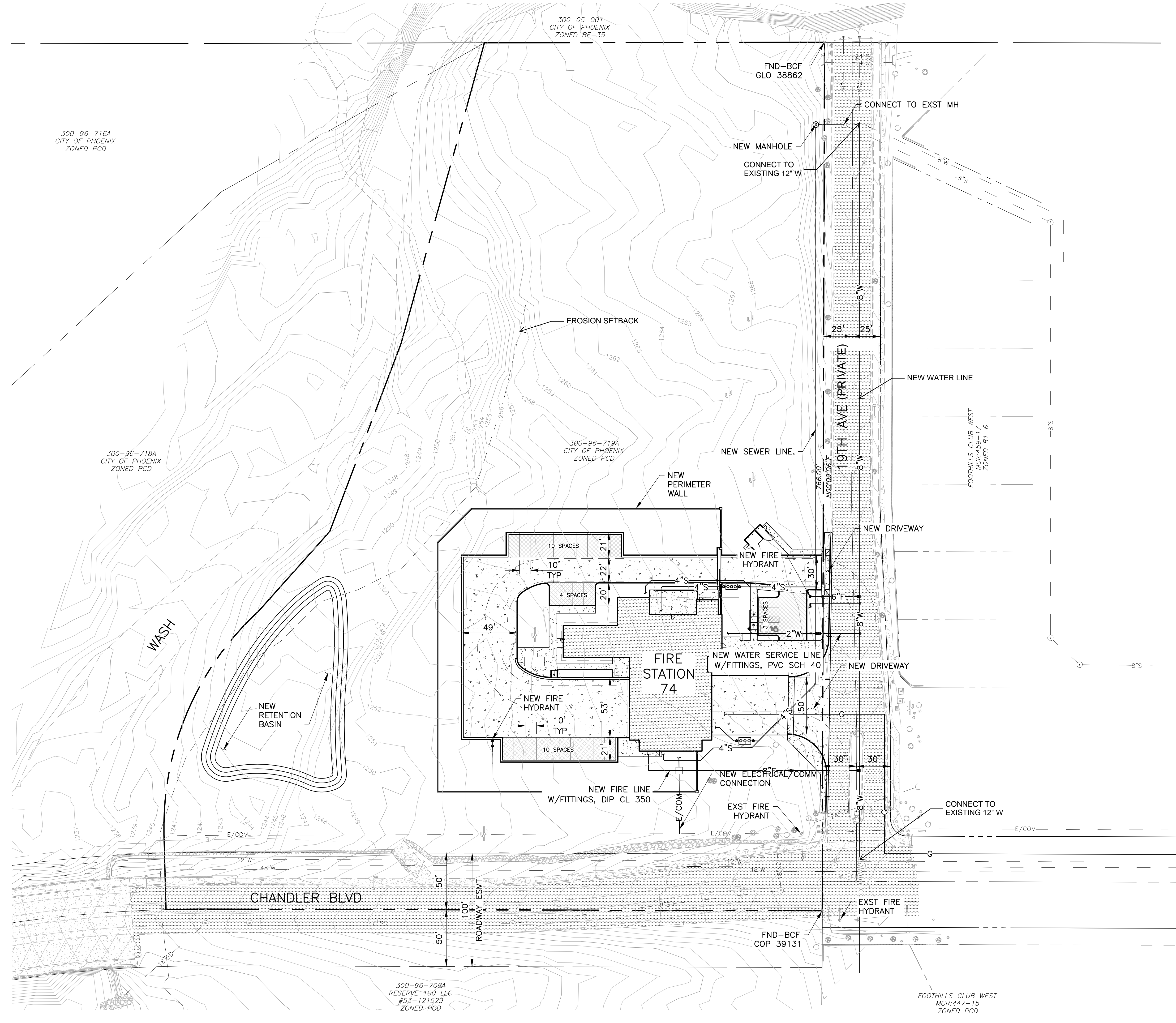
Project No. 1023002.01

Drawing Title
EXISTING CONDITIONS

Dwg No.
EX



FILE:J:\2023\1023002.01_Phoenix_Fire_Station_74\CAD\23002.01_SPX-X-SITE.dwg DATE:5/9/2023 TIME:10:00 AM (by:jbm,lecm)



VICINITY MAP
SEC 36, T1S, R2E NTS

PROJECT INFORMATION

PARCEL 9 AREA = GROSS 7.74 AC NET 7.03 AC

EXISTING PROPERTY IS ZONED PCD.

PARCEL 9 OF "AMENDED STATE PLAT NO. 30 SOUTH MOUNTAIN 620" BOOK 1002, PAGE 50, MCR RECORDED 09/02/2008 SECTION 36, TOWNSHIP 1 SOUTH, RANGE 2 EAST

SHEET INDEX

- SP1.1 SITE PLAN
- SP2.1 SITE PLAN DETAILS

CONTACT INFORMATION

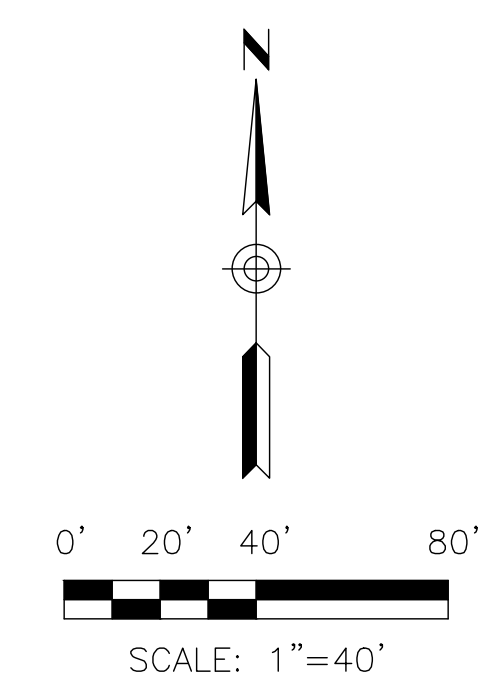
OWNER:
PHOENIX FIRE DEPARTMENT
2625 S 19TH AVENUE
PHOENIX, AZ 85009
P: 602.534.9875

ARCHITECT:

ENGINEER:
DIBBLE ENGINEERING
1626 N LITCHFIELD DRIVE
SUITE 150
GOODYEAR, AZ 85395
P: 623.935.2258
CONTACT: SHANNON MAUCK
www.dibblecorp.com

LANDSCAPE NOTE

EXISTING PLANT MATERIAL ADJACENT TO CONSTRUCTION SHALL BE PROTECTED IN PLACE AND REPLACED IN KIND IF DAMAGE OCCURS.



1626 NORTH LITCHFIELD ROAD,
SUITE 150
GOODYEAR, AZ 85395
PHONE: 623.935.2258
CONTACT: SHANNON MAUCK, P.E.



200 WEST WASHINGTON ST
5TH FLOOR
PHOENIX, AZ 85003
PHONE: 602.256.4337
CONTACT: CHRIS KABALA, P.E.

CITY OF PHOENIX
FIRE STATION 74
CHANDLER BLVD & 19TH AVE, PHOENIX, AZ

Issued for	Rev.	Date

Project No. 1023002.01

Drawing Title
SITE PLAN

Dwg No.
SP1.1

LEGEND

EXST	NEW
BENCHMARK	BACKFLOW PREVENTION DEVICE
MONUMENT FLUSH	CACTUS
MONUMENT IN HANDHOLE	DRYWELL
BACKFLOW PREVENTION DEVICE	FIRE HYDRANT
DRYWELL	FIRE DEPT CONNECTION
FIRE HYDRANT	GATE
FIRE DEPT CONNECTION	MANHOLE
GRATE	METER
GUY WIRE	PIPE CAP
MANHOLE (TYPE NOTED)	PULLBOX
METER (TYPE NOTED)	RIPRAP
PEDESTAL (TYPE NOTED)	ROCK
PULLBOX (TYPE NOTED)	SHRUB
SIGN	SIGN
STREET LIGHT	STREET LIGHT
TREE	VALVE
UTILITY POLE	CENTERLINE
VALVE (TYPE NOTED)	EASEMENT
EASEMENT	RIGHT-OF-WAY
PROPERTY LINE	FLOWLINE
RIGHT-OF-WAY	MASONRY WALL/RETAINING WALL
FENCE WIRE	MAJOR CONTOUR
FENCE CHAINLINK	MINOR CONTOUR
FLOWLINE	STORM DRAIN
GUARDRAIL	UTILITY LINE (TYPE NOTED)
MASONRY WALL/RETAINING WALL	NEW BUILDING
MAJOR CONTOUR	SEWER CLEANOUT
MINOR CONTOUR	MONUMENT LINE
UTILITY LINE (TYPE NOTED)	CENTER LINE
EXST BUILDING	PROPERTY LINE

ABBREVIATIONS

ABC	AGGREGATE BASE COURSE	FG	FINISH GRADE ELEVATION	R	RADIUS
AC	ASPHALT CONCRETE	F	FIRE LINE	RID	ROOSEVELT IRRIGATION DISTRICT
ADA	AMERICANS WITH DISABILITIES ACT	FL	FLOWLINE	R/W	RIGHT-OF-WAY
AVE	AVENUE	FO	FIBER OPTIC	REQ	REQUIRED
ACHH	ALUMINUM CAP IN HANDHOLE	FT	FOOT OR FEET	S	SEWER
BCHH	BRASS CAP IN HANDHOLE	G	GAS	S/W	SIDEWALK
BLDG	BUILDING	GB	GRADE BREAK	SCH	SCHEDULE
BM	BENCHMARK	HHWS	HEATING HOT WATER SUPPLY	SD	STORM DRAIN
BOT	BOTTOM	HHWR	HEATING HOT WATER RETURN	SEC	SECTION
C	CONCRETE ELEVATION	CHWS	CHILLED WATER SUPPLY	SHT	SHEET
CATV	CABLE TELEVISION	CHWR	CHILLED WATER RETURN	SHT	SHEET
CL	CENTERLINE	INV	INVERT	SPEC	SPECIFICATIONS
COMM	COMMUNICATION	IRR	IRRIGATION	SRP	SALT RIVER PROJECT
CONC	CONCRETE	MAG	MARICOPA ASSOCIATION OF GOVERNMENTS	STA	STATION
CONST	CONSTRUCTION	M	MONUMENT LINE	STD	STANDARD
DET	DETAIL	MOD	MODIFIED LINE	T	TOWNSHIP
DG	DECOMPOSED GRANITE	NTS	NOT TO SCALE	TW	TOP OF WALL
DIP	DUCTILE IRON PIPE	OHE	OVERHEAD ELECTRIC	TC	TOP OF CURB
E/P	EDGE OF PAVEMENT	OHT	OVERHEAD TELEPHONE	TEL	TELEPHONE
EB	ELECTRIC PULLBOX	P	PAVEMENT ELEVATION	TEMP	TEMPORARY
EL	ELEVATION	P	PAVEMENT ELEVATION	TYP	TYPICAL
ELEC	ELECTRIC	PKNG	PARKING	UNK	UNKNOWN
ESMT	EASEMENT	PL	PROPERTY LINE	UTIL	UTILITY
EXST	EXISTING	PROV	PROVIDED	VCP	VITRIFIED CLAY PIPE
F/C	FACE OF CURB	PUE	PUBLIC UTILITY EASEMENT	W	WATER
FF	FINISH FLOOR ELEVATION	PVC	POLY VINYL CHLORIDE	WM	WATER METER
		PVMT	PAVEMENT	WSE	WATER SURFACE ELEVATION

SITE DATA TABLE

ZONING:
PCD

SITE AREAS:

GROSS AREA = 7.74 ACRES
NET SITE AREA = 7.03 ACRES

BUILDING CODES:

- 2018 INTERNATIONAL BUILDING CODE
- 2018 INTERNATIONAL MECHANICAL CODE
- 2018 INTERNATIONAL PLUMBING CODE
- 2018 INTERNATIONAL ENERGY CONSERVATION CODE
- 2018 INTERNATIONAL EXISTING BUILDING CODE
- 2018 INTERNATIONAL FIRE CODE
- 2017 NATIONAL ELECTRICAL CODE
- 2009 ICC A117 ACCESSIBLE DESIGN
- 2018 NFPA 99 STANDARD OF HEALTH CARE FACILITIES CODE

BUILDING OCCUPANCY:

OCCUPANCY CLASSIFICATIONS - R-2/S
AREA LIMITS - 10% MAX
CONSTRUCTION TYPE V-B - ENTIRE BUILDING

BUILDING AREA BREAKDOWN:

GROUP R-2 6,007 GSF
GROUP S-1 5,131 GSF

TOTAL: 11,138 GSF

BUILDING HEIGHT:
HEIGHT OF THE BUILDING: 26 FEET
NUMBER OF STORIES: 1

PARKING & LOADING:

STAFF PARKING
PARKING REQUIRED ONE SPACE PER 1.5 EMPLOYEES
(10 PER SHIFT X2=20)
20/1.5=13.3 = 14 SPACES REQUIRED
TOTAL SPACES PROVIDED = 24

PUBLIC PARKING
PARKING REQUIRED ONE SPACE PER 300 SQ. FT.
(LOBBY, PUBLIC TOILET, CORRIDOR 103 AND FIRE FIGHTERS OFFICE = 481 SF)
481/300=1.6 = 2 SPACES REQUIRED
TOTAL SPACES PROVIDED = 2 TOTAL
TOTAL SPACES PROVIDED = 1 ACCESSIBLE + 2 SPACES

SITE COVERAGE:
AREA OF THE FIRST FLOOR = MEASURE BUILDING HATCH
FIRST FLOOR FOOTPRINT/NEXT SITE AREAS = ABOVE #/1,019,498= %

FLOOR AREA RATIO
GROSS BUILDING AREA/NET SITE AREA = 12,487/306,009 = 24.51%

LANDSCAPE:
GROSS SITE AREA: SAME AS ABOVE
NET SITE AREA: SAME AS ABOVE
TOTALE LANDSCAPE AREA REQUIRED (15% OF NET SITE AREA): 45,901 SF
TOTAL LANDSCAPE AREA PROVIDED: XXX,XXX SF

DIBBLE

1626 NORTH LITCHFIELD ROAD,
SUITE 150
GOODYEAR, AZ 85395
PHONE: 623.935.2258
CONTACT: SHANNON MAUCK, P.E.



200 WEST WASHINGTON ST
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CITY OF PHOENIX
FIRE STATION 74
CHANDLER BLVD & 19TH AVE, PHOENIX, AZ

Issued for _____ Rev. _____ Date _____

Project No. 1023002.01

Drawing Title
**SITE PLAN
DETAILS**

Dwg No.
SP2.2





Credit: AGFD



City of Phoenix
STREET TRANSPORTATION DEPARTMENT

Sonoran Desert Tortoise

(Gopherus morafkai)

The purpose of this flyer is to provide City of Phoenix employees and contractors working on City projects with basic knowledge to reduce the risk of impacting Sonoran Desert tortoise.

Legal Status:

The Sonoran Desert tortoise is a Tier 1A Species of Greatest Conservation Need in the State of Arizona, as defined by the Arizona Game and Fish Department (AGFD) and is a Candidate Species under the Endangered Species Act.

Species Description:

- Length: 8-15 inches
- Bottom shell yellowish and not hinged
- Hind limbs stocky and elephantine
- High-domed, brownish shell with a pattern and prominent growth lines
- Flattened forelimbs for digging, covered with conical scales

Where are they found?

- Rocky, steep slopes and lower mountain slopes
- Native desert scrubland
- Between 904 and 4,198 feet in elevation
- Washes and valley bottoms may be used in dispersal

Where are they active?

- Sonoran Desert tortoise spend the bulk of time in burrows, which provide protection from heat and cold
- Emerge from burrows on rocky slopes, desert scrub or grassland to feed, bask and breed, mostly during the monsoon season

How to avoid impacting Sonoran Desert tortoise:

- Scan ahead as you work
- ***If Sonoran Desert tortoise observed, STOP WORK, call the contact below and allow the tortoise to leave under its own power***
- Do NOT pick up or handle the Sonoran Desert tortoise unless the tortoise is in imminent danger. Improper handling can result in tortoise death. If a tortoise must be moved, strictly adhere to the following AGFD guidelines (rev. 9/22/2014): <https://s3.amazonaws.com/azgfd-portal-wordpress/PortalImages/files/wildlife/2014%20Tortoise%20handling%20guidelines.pdf>.
- When working in Sonoran Desert tortoise habitat, check for tortoises under parked vehicles before driving

Questions? Concerns? Think your project will impact Sonoran Desert tortoise? Contact the City of Phoenix Street Transportation Department, Environmental Services:

Andrea Love 602-495-6718 or via e-mail at <andrea.love@phoenix.gov>

Greta Halle 602-534-6030 or via e-mail at <greta.halle@phoenix.gov>



City of Phoenix
STREET TRANSPORTATION DEPARTMENT

Western Burrowing Owl

(Athene cunicularia)

The purpose of this flyer is to provide City of Phoenix employees and contractors working on City projects with basic knowledge to reduce the risk of impacting western burrowing owls.

Legal Status:

The western burrowing owl is protected under the Migratory Bird Treaty Act of 1918, as amended. All migratory birds and their parts (including eggs, feathers, and nests) are fully protected. They are also protected under Arizona State Law, Title 17-101, Title 17-235, and Title 17-236.

Species Description:

- Small, ground-dwelling owl (mass of approx. 5 oz.)
- Length: 7.6-9.9 inches, with long legs
- Wingspan: approx. 23 inches
- Round head, lacks ear tufts
- Distinct oval facial ruff, framed by a broad, puffy white eyebrow
- Bright yellow iris

Where are they found?

- Dry, open, short grass, treeless plains
- Human dominated landscapes such as:
 - Golf courses, airports
 - Agricultural fields, vacant lots
- Depends on other animals to construct burrows

Identifying an active burrow

- Western burrowing owls use burrows constructed by ground squirrels, badgers, coyotes, tortoises, etc., or may use pipes, culverts, and ditches.
- They may “decorate” the entrance to a burrow with cow, horse, or dog manure, feathers, vegetation, and trash items
- An active burrow may (not always) have owl excrement (“whitewash”) and/or pellets near the entrance

How to avoid impacting western burrowing owls:

- Scan ahead as you work
- ***If western burrowing owls or potentially active burrows observed, STOP WORK and MOVE at least 100 feet away from the owl or occupied burrow before resuming work***
 - Do not harass or “shoo” the owl away
- If the project cannot avoid or stay outside 100 feet of the owl or active burrow, call contact listed below

Questions? Need to work within 100 feet of a western burrowing owl or active burrow? Contact a City of Phoenix Street Transportation Department Environmental Quality Specialist:

Andrea Love 602-495-6718 or via e-mail at <andrea.love@phoenix.gov>

Greta Halle 602-534-6030 or via e-mail at <greta.halle@phoenix.gov>

Sources: Arizona Department of Transportation Environmental Planning Group Western Burrowing Owl Awareness Flyer
Arizona Game and Fish Department Animal Abstract: Western Burrowing Owl. Heritage Data Management System

Updated November 18, 2019



Credit: DesertUSA.com/animals/cliff-swallow.html



City of Phoenix
STREET TRANSPORTATION DEPARTMENT

Migratory Bird Treaty Act

(Applies to many birds in Phoenix)

The purpose of this flyer is to provide City of Phoenix employees and contractors with basic knowledge to reduce the risk of impacting species protected by the Migratory Bird Treaty Act.

Migratory Bird Treaty Act (MBTA)

Under the Migratory Bird Treaty Act of 1918, as amended, listed birds and their parts (including eggs, feathers, and nests) are fully protected. They are also protected under Arizona State Law, Title 17-101, Title 17-235, and Title 17-236. The MBTA states that it is illegal to:

- Pursue, hunt, take, capture, kill, possess, sell, purchase, barter, import, export, or transport any migratory bird, or any part, nest, or egg of any such bird.
 - 'Take' is defined as to "pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect."

More information regarding the MBTA can be found at:

- <http://www.fws.gov/birds/policies-and-regulations/laws-legislations/migratory-bird-treaty-act.php>
- <https://www.fws.gov/laws/lawsdigest/migtrea.html>

Where/When are they active?

- The nests of birds protected by the MBTA can be found in many places, including trees, shrubs, cacti, cattails, on the ground, in holes in the ground and on man-made structures including culverts, bridges, buildings, etc.
- The breeding cycle of most birds in Phoenix occurs between February 1 and August 31, although there are a few species that may nest outside that period. Some birds may be present year-round and others migrate, often during the late summer/early autumn period.

How to avoid impacting birds protected by the MBTA:

- If your project might impact active bird nests/burrows, work with one of the contacts below during the design process to make appropriate arrangements before the project activity begins. Necessary actions may include active nest surveys, seasonal restrictions, or obtaining a project-specific relocation permit from the U.S. Fish and Wildlife Service.
- When actively working, be aware of your surroundings. If you see a nest that appears active (chirping, aggressive or distracting adult bird behavior, eggs present, etc.) **STOP WORK** within 30 feet of the area and call one of the contacts below.

Questions? Work may impact birds protected by the MBTA? Contact a City of Phoenix Street Transportation Department Environmental Quality Specialist:

Andrea Love 602-495-6718 or via e-mail at <andrea.love@phoenix.gov>

Greta Halle 602-534-6030 or via e-mail at <greta.halle@phoenix.gov>

Updated November 18, 2019

CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN

Add the following new Section, **233 STORM WATER POLLUTION PREVENTION PLAN SUBMITTAL PROCESS**

233.1 DESCRIPTION

The Contractor will use the Arizona Department of Environmental Quality (ADEQ) Smart NOI program for all submittals located at this web address:

<https://az.gov/app/smarnoi/>

The location of this process may change and it is the responsibility of the Contractor to verify the correct web address. All fees are the responsibility of the Contractor. The Contractor will apply for a “Stormwater Construction General Permit” with the project type “MUNICIPAL/PUBLIC”.

Before any construction on site begins, the Contractor will submit the Notice of Intent (NOI) and the SWPPP through the Smart NOI program as the sole permittee. The Contractor will not commence any construction activities until the ADEQ send a written Notice Of Intent assigning an AZCON number.

As required by ADEQ the Contractor will submit a Notice of Termination (NOT) through the Smart NOI program. The Contractor will receive final payment only after receiving a written Notice of Termination Acknowledgement from ADEQ.

Projects Impacting Impaired Waters

Projects that will have any construction taking place within ¼ mile of the Salt River between 23rd Avenue and the confluence of the Gila River will impact “Impaired Waters”. These projects will require the Contractor to design, implement, and evaluate a Monitoring Plan for stormwater runoff from their construction activities. The Monitoring Plan must be site specific and will be submitted to ADEQ as an appendix to the SWPPP. ADEQ is the final authority in the approval of the monitoring plan. A copy of the SWPPP and the Monitoring Plan will be kept on-site at all times. Additional copies of the Monitoring Plan should be made available to all personnel who anticipate participating in stormwater monitoring activities. The Contractor will have a copy of the monitoring plan, approved SWPPP, NOI, and ADEQ Authorization to Discharge posted at the jobsite prior to ground disturbance.

Subcontractors

All subcontractors will comply with all AZPDES requirements under the supervision of the General Contractor, and will submit a completed, signed subcontractor certification form, thereby designating themselves as co-permittees.

233.2 SAMPLE SWPPP STRUCTURE

The following is a sample outline of the City requirement for a SWPPP submittal modeled after the ADEQ Construction General Permit Checklist. It will be the Contractor’s responsibility to meet all the ADEQ requirements for a SWPPP and retain a qualified consultant to complete the SWPPP, if necessary, at no additional cost to the City.

1 SITE DESCRIPTION

1.1 Project Name: **CONTRACTOR WILL FILL IN PROJECT NAME**

Project No(s): **CONTRACTOR WILL FILL IN PROJECT NUMBER**

1.2 Project Location: **CONTRACTOR WILL FILL IN FOR PROJECT SITE LOCATION**

1.3 Owner's Name:

City of Phoenix, Fire Department

1.4 Owner's Address:

200 West Washington Street, 5th Floor, Phoenix, Arizona 85003

1.5 Project Description: **CONTRACTOR WILL FILL IN PROJECT DESCRIPTION**

1.6 Runoff Coefficient and Soils Information:

A. Overall runoff coefficient of upstream drainage area will be unchanged by project.

B. Surface Soils Information: **(EXAMPLE ONLY, CONTRACTOR WILL FILL IN FOR PROJECT SITE LOCATION)**

<u>SOIL UNIT</u>	<u>SOIL TYPE (USDA TEXTURE)</u>	<u>PERMEABILITY (IN./HR.)</u>
<u>Laveen</u>	<u>Loam</u>	<u>0.6-2.0</u>
<u>Mohall</u>	<u>Clay Loam</u>	<u>0.2-0.6</u>
<u>Tucson</u>	<u>Clay Loam</u>	<u>0.2-0.6</u>
<u>Vecont</u>	<u>Clay</u>	<u>0.06-0.2</u>

1.7 Name of Receiving Water:

EXAMPLE: SALT RIVER, CONTRACTOR WILL FILL FOR PROJECT SITE LOCATION

2 CONTROLS

2.1 Erosion and Sediment Controls

2.1.a Stabilization Practices:

Stabilization practices on this site include:

- Permanent planting.

- Save selected existing trees.
- Decomposed granite
- **CONTRACTOR WILL ADD OR REMOVE STABILIZATION PRACTICES AS NECESSARY**

2.1.b Structural Practices:

May include:

- Temporary retention areas (subgrade excavation areas).
- Temporary catch basin inlet protection.
- Silt fence.
- Gravel filter berm.
- Temporary diversion dike.
- Straw bale barriers.
- Sandbag berm
- **CONTRACTOR WILL ADD OR REMOVE STABILIZATION PRACTICES AS NECESSARY**

2.1.c Narrative: Sequence of major activities.

CONTRACTOR WILL COMPLETE NARRATIVE

2.1.d Storm Water Management: **(CONTRACTOR WILL EDIT AS NECESSARY)**

Storm water drainage on will be provided by curb and gutter, catch basin inlets, and storm drains. No appreciable changes in runoff coefficients or in finished roadway grades will take place as a result of this project; therefore, no significant alterations of storm water drainage patterns or runoff quantities are expected.

During construction, storm water runoff will be managed by the following means, as conditions require:

- Temporary retention will be provided during roadway construction in areas excavated for subgrade.
- Silt fence, straw bales, sandbag berms, temporary diversion dikes, gravel filter berms or other BMP's as necessary to eliminate erosion may be used to prevent storm runoff from entering open storm drain pipes in excavated trenches. Temporary catch basin inlet protection may also be provided to remove sediment from drainage water before it enters the drainage system. Straw bale protection at outfall pipe locations may be employed during construction.

3 OTHER CONTROLS

3.1 Waste Disposal:

Waste Materials:

All waste materials including trash and construction debris from the site will be either disposed to a designated area immediately or collected and stored in securely-lidded metal dumpsters. The dumpsters will meet all local and State solid waste management regulations. The dumpsters will be emptied a minimum of once per week, or more often if necessary, and the trash will be hauled to an acceptable dump site. Lids will be closed at all times after work hours and during rain events. No construction waste materials will be buried on site. All personnel will be instructed regarding the correct procedures for waste disposal. Notices stating these practices will be posted on site, and the site superintendent who manages the day-to-day site operations, will be responsible for seeing that these procedures are followed.

ENTER PHONE NUMBER AND NAME OF SITE SUPERINTENDENT

Concrete washout will only be allowed in designated areas. The hardened waste will be disposed of weekly and before final inspection of the project.

Hazardous Waste:

All hazardous waste materials will be disposed of in the manner specified by local or State regulations or by the manufacturer. Site personnel will be instructed in these practices, and the site superintendent who manages day-to-day site operations, will be responsible for seeing that these practices are followed.

Sanitary Waste:

All sanitary sewage generated on-site will be collected from the portable units a minimum of twice per week or as required by local regulations. Units will have a berm placed around them to ensure no spillage can occur.

3.2 Off-Site Vehicle Tracking:

Traffic will be maintained on paved roadway throughout construction in order to reduce vehicle tracking of sediments. The paved street beyond the start and end of the project will be swept as often as necessary to remove any excess mud, dirt, or rock that may be tracked from the site by construction vehicles, but not less than once per week. Dump trucks hauling material to or from the construction site will be covered with tarpaulin before leaving the site.

4 DEMONSTRATION OF COMPLIANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS

The following Federal, State, and City regulations are followed in the preparation of this storm water pollution prevention plan:

- Section 402(p) of the Clean Water Act.
- Amended Section 405 of the Water Quality Act.
- "ADEQ Arizona Pollutant Discharge Elimination System General Permit for Discharge from Construction Activities to Waters of the United States, Permit AZG-2008-001."
- Flood Control District of Maricopa County "Drainage Design Manual for Maricopa County, Arizona, Volume III, Erosion Control."
- City of Phoenix Code 32C, "Storm Water Quality Protection."
- City of Phoenix "Grading and Drainage Ordinance for Purpose of Fulfilling NPDES Requirements."

5 MAINTENANCE/INSPECTION PROCEDURES

5.1 Erosion and Sediment Control Practices:

The following is a list of erosion and sediment controls to be used during the construction period:

5.1.a Stabilization practices for this site include:

- Permanent planting.

- Save selected existing trees.
- Decomposed granite.
- **CONTRACTOR TO ADD/DELETE AS NECESSARY**

5.1.b Structural practices for this site will include:

- Silt fence/straw bale barriers.
- Temporary diversion dike/gravel filter berm.
- Sandbag berm.
- Storm drain, curb and gutter, catch basins.
- Temporary catch basin inlet protection.
- Temporary retention in subgrade excavation areas.
- **CONTRACTOR TO ADD/DELETE AS NECESSARY**

5.2 Erosion and Sediment Control Maintenance and Inspection Practice:

Following is a list of the inspection and maintenance practices that will be used to maintain erosion and sediment control:

- All control measures will be inspected at least once every 7 days and within 24 hours after each rain event of 0.1 inch or greater.
- All measures will be maintained in good working order; if repair is necessary, it will be initiated within 24 hours of report. All changes will be completed within 14 days after an observation.
- Built-up sediment will be removed from silt fence when it has reduced the design capacity by 50%.
- Erosion control fabric and erosion control dikes will be inspected and any breaches promptly repaired.
- Permanent planting will be inspected for washout and healthy growth per specification requirements.
- A Compliance Evaluation Report will be made at each inspection to ensure all BMP's are functioning correctly.
- The site superintendent will be responsible for inspection, maintenance, and repair activities, and filling out the Compliance Evaluation Report.
- Personnel selected for inspection and maintenance responsibility will receive training from the site superintendent. They will be trained in all the inspection and maintenance practices necessary for keeping the erosion and sediment controls used on-site in good working order.
- Only one side of roadways will be excavated for subgrade preparation at a time. This area will serve as temporary retention while traffic is maintained on the paved other half of the road. This will serve to control storm water and minimize tracking of sediments.

6 INVENTORY FOR POLLUTION PREVENTION PLAN (CONTRACTOR TO EDIT AS NECESSARY)

The materials or substances listed below are expected to be present on-site during construction:

- | | |
|----------------------------|------------------------------|
| • Concrete | • Wood |
| • Asphaltic Concrete | • Paints |
| • Fertilizers | • Herbicide/Pesticide |
| • Petroleum-Based Products | • Soil Treatment Products |
| • Cleaning Solvents/Agents | • Other Building Materials |
| • Sealants | • Water Used in Dust Control |

6.1 Spill Prevention

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff:

6.1.a Good Housekeeping:

The following good housekeeping practices will be followed on-site during the construction period:

- An effort will be made to store only enough product required to do the immediate job.
- All materials stored on-site will be stored in a neat, orderly manner in their appropriate containers and, if possible, under proper cover and palletized.
- Liquid products will be placed on secondary containment pallets.
- Fuel tanks will be double walled.
- Drip pans will be used under all spigots unless on secondary containment.
- Products will be kept in their original containers with the original manufacturers' label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used up before disposing of the container.
- Manufacturers' recommendations for proper use and disposal will be followed.
- The site superintendent will inspect daily to ensure proper use and disposal of materials.
- Concrete washout will only be allowed in designated areas. The hardened waste will be disposed of weekly and before final inspection of the project.

6.1.b Hazardous Products:

These practices are used to reduce the risks associated with hazardous materials:

- Products will be kept in original containers unless they are not resealable.
- Original labels and material safety data sheets will be retained.
- If surplus product must be disposed of, manufacturers', or local and State recommended methods for proper disposal will be followed.
- Products will be monitored, an inventory will be conducted regularly, and documentation of all use and disposal will be maintained.

6.2 Product Specific Practices:

The following product specific practices will be followed on-site:

6.2.a Petroleum Products:

All on-site vehicles will be monitored for leaks and receive regular preventative maintenance to reduce any chance of leakage. Petroleum products will be stored in tightly-sealed containers which are clearly labeled. Any petroleum substances used on-site will be applied according to the manufacturer's recommendations. Spills and leaks from vehicles will be stopped immediately. Any leaking vehicle will have a drip pan placed under the leak until the unit is repaired. Secondary containment will be provided for all petroleum products stored onsite.

6.2.b Fertilizers, Herbicide, Pesticide, Soil Treatment:

All materials used will be applied only in the minimum amounts recommended by the manufacturer or as per specification. Once applied, materials will be worked into the soil to limit exposure to storm water.

On-site storage will be covered and palletized to limit contact with storm water. The contents of any partially-used bags or containers will be transferred to a sealable plastic bin to avoid spills.

6.2.c Paints:

All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm drain system or on the ground, but will be properly disposed of according to manufacturers' instructions or State and local regulations.

6.2.d Concrete Trucks:

Concrete trucks will not be allowed to wash out or discharge surplus concrete or dump wash water other than in a designated wash-out area. The hardened waste will be disposed of weekly and before final inspection of the project.

6.3 Spill Prevention Practices:

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:

- Manufacturers' recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area on-site. Equipment and materials will include, but not be limited to, brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically designed for this purpose.
- All spills will be cleaned up immediately after discovery using dry cleanup methods.
- The spill area will be kept well-ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous material will be reported to the appropriate State or local government agency, regardless of the size—ADEQ Hotline: (602) 771-4505; City of Phoenix Hazardous Spills Emergency: 911; City of Phoenix Hazardous Spills Safety Section: (602) 262-7555.
- The spill prevention plan will be adjusted to include measures to prevent this type of spill from recurring and procedures to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included.
- The site superintendent will be responsible for the day-to-day site operations, will be the spill prevention and cleanup coordinator. He will designate other site personnel who will receive spill prevention and cleanup training.

6.4 Documentation:

Documentation of all inspections, failed BMP's, corrective action and training will be maintained onsite with the SWPPP at all times during the project, and will be maintained for not less than three (3) years after the project is complete.

OTHER REQUIRED CERTIFICATIONS

The Contractor will complete and submit the following certification forms to the City before construction begins:

- Permittee Certification
- Contractor Certification
- Subcontractor Certification (for all Subcontractors as necessary)
- Operator's Compliance Evaluation Report

PERMITTEE'S CERTIFICATION

As Contractor of the **Fire Station 74** project, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Company

Name: _____

Title: _____

Signature: _____

Date: _____

CONTRACTOR CERTIFICATION

I certify under penalty of law that I understand the terms and condition of the General Arizona Pollutant Discharge Elimination System (AZPDES) Permit that authorizes the storm water discharges associated with industrial activities from the construction site identified as part of this certification. Further, by my signature, I understand that I am becoming a co-permittee, along with the subcontractors signing such certifications, to the general (AZPDES) Permit for the storm water discharges associated with construction activities of the **Fire Station 74** project. As a co-permittee, I understand that I, and my company, are legally required under the Clean Water Act, to ensure compliance with the terms and conditions of the storm water pollution prevention plan developed under the AZPDES Permit and the terms of the AZPDES Permit.

General Contractor and Responsibility

Name: _____

Title: _____

Signature: _____

SUBCONTRACTOR'S CERTIFICATION

I certify under penalty of law that I understand the terms and conditions of the General Arizona Pollutant Discharge Elimination System (AZPDES) Permit that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification. Further, by my signature, I understand that I am becoming a co-permittee, along with the owner(s) and other contractors and subcontractors signing such certifications, to the general AZPDES permit for the storm water discharges associated with construction activities of the **Fire Station 74** project. As a co-permittee, I understand that I, and my company, are legally required under the Clean Water Act, to ensure compliance with the terms and conditions of the storm water pollution prevention plan developed under the AZPDES permit and the terms of the AZPDES permit.

Authorized Representative of Subcontractor: _____

Signature: _____ Date: _____

For (Subcontractor Name): _____

Construction Activities: _____

Verification of Completion and Acceptance of Subcontractor's Work

All work to be performed by _____ (Subcontractor) as part of the _____ (Project) has been completed and accepted. Execution of this form absolves said subcontractor from liability for AZPDES violations which may occur subsequent to this date as a result of activities of the general contractor or other subcontractors.

Authorized Representative of Subcontractor: _____

Signature: _____ Date: _____

For (Subcontractor Name): _____

Verified by (General Contractor): _____

Authorized Representative of General Contractor: _____

Signature: _____ Date: _____

AZG-2008-001 General Permit for Construction Activities

Operator's Compliance Evaluation Report

This project requires inspection of storm water pollution controls (BMPs) on a choice of frequency described in the General Permit, Part IV. H. Attach sheets if more space is needed.

Project: _____ Date: _____

Name & Title of Inspector: _____

Qualifications of Inspector: Attached; or Shown in Sec. _____ of the SWPPP.

Periodic Inspection; or Rain Event inspection

Relevant weather information: _____

1. Location(s) of discharge from the site: None; or Description: _____

2. Location(s) of and identification of BMPs that need to be maintained; failed to operate or proved to be inadequate:
 None; or Description: _____

3. Location(s) where additional BMPs are needed: None; or Description: _____

4. Corrective actions required, including changes and target dates: None; or Description: _____

5. Identify all sources of non-storm water and the associated pollution control measures: None; or
Description: _____

6. Identify material storage areas and evidence of, or potential for pollutant discharge from these areas: None; or
 Description: _____

7. Identify any other apparent incidents of non-compliance: None; or Description: _____

8. If no incidents of non-compliance are identified in items 1 through 7 above, the inspector certifies that the construction project is being operated in compliance with the SWPPP and the General Permit.

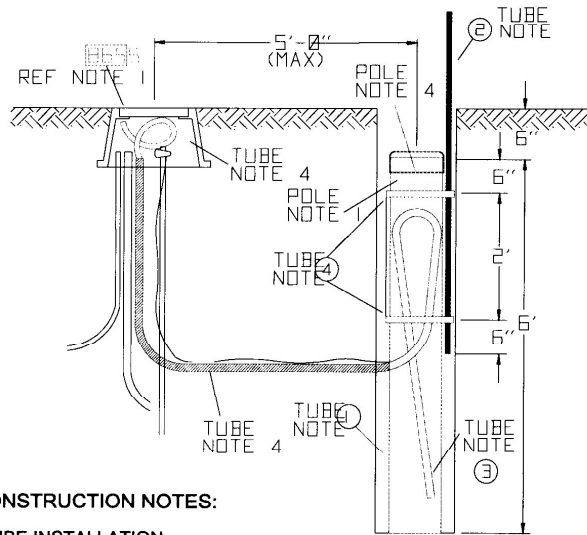
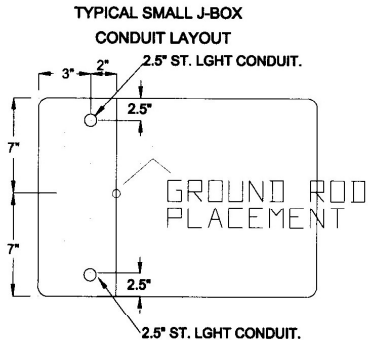
I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Certifying Signature: _____ Date: _____

Printed Name: _____

APS STREET LIGHT SONOTUBE, J-BOX, CONDUIT ETC (DWG)

1911



CONSTRUCTION NOTES:

TUBE INSTALLATION

1. DIG HOLE FOR TUBE 6"-6" DEEP BY EITHER OF THE FOLLOWING:
 - A. AUGERRED HOLE (16" MAX.)
 - B. SLOTTED STUB-OUT TRENCH
2. PLACE RED PLASTIC LOCATOR MARKER OUTSIDE OF TUBE AND STRAP IN TWO LOCATIONS.
3. PLACE STREET LIGHT FLEXIBLE CONDUIT IN TUBE WITH 10' COILED INSIDE. DO NOT MAKE SHARP BENDS. BEND END OF CONDUIT OVER AND INSERT DOWN INTO TUBE AS SHOWN. INSPECTOR TO INSURE FLEX IS NOT KINKED.
4. INSTALL OTHER END OF FLEX IN J-BOX. LEAVE SMALL COIL TO ALLOW LEVELING FOR FINAL GRADE. BACKFILL AFTER INSPECTION IS COMPLETE.
5. COMPACT SOIL TO AT LEAST 85% AROUND TUBE.

POLE INSTALLATION

1. ELECTRONIC MARKER WILL INDICATE LID LOCATION PER BLUE STAKE MARKINGS. WORK FORCES WILL DIG DOWN TO LID, REMOVE LID AND PULL FLEX FROM TUBE.
2. INSERT END OF FLEX THROUGH ACCESS HOLE AND PUSH IT UP THROUGH HAND HOLE AS STREET LIGHT POLE IS LOWERED INTO THE TUBE.
3. HOLD POLE SECURELY WHILE BACKFILLING TO AT LEAST 85% COMPACTION. TO COMPACT POLE IN PLACE, PEA GRAVEL (<3/4") MAY BE USED NEAR THE TUBE.
4. THE MARKER BALL ATTACHED TO THE BOTTOM OF THE "SONO" TUBE LID SHOULD BE RETURNED TO STOCK.

REFERENCES:

1. FOR J-BOX SEE SPEC 8655 THRU 8663.

CODE	1911	MATERIAL LIST	
ITEM	QTY	DESCRIPTION	APN
1	20	CONDUIT 1" PVC FLEX CORR	32900891
2	1	LOCATOR U. G. SERVICE	33101586
3	1	"SONO" TUBE 6FT X12IN	64672
4	2	TIE 30" SELF LOCKING	33107350
5	2	FOAM BACKFILL	00072046

APS	Street Light Sonotube, J-Box, Conduit & Pole Installation	
	WO#:	DATE: 5/14/03
	BY:	SCALE:
	FILENAME:	SHEET OF

BID PROPOSAL
CITY OF PHOENIX, ARIZONA
OFFICE OF THE CITY ENGINEER
PROJECT TITLE: FIRE STATION 74
PROJECT NO.: FD57100020
BOND ISSUE OR BUDGET PROJECT

PROPOSAL to the City Engineer of the City of Phoenix.

In compliance with the Advertisement for Bids, by the City Engineer, the undersigned bidder:

(Print or Type Contractor Name)

Having examined the contract documents, site of work and being familiar with the conditions to be met, hereby submits the following proposal for furnishing the material, equipment, labor and everything necessary for the completion of the work listed and agrees to execute the contract documents and furnish the required bonds and certificates of insurance for the completion of said work, at the locations and for the prices set forth on the inside pages of this form.

Understands that construction of this project will be in accordance with all applicable Maricopa Association of Governments' (MAG) Uniform Standard Specifications and Uniform Standard Details, latest revision and the City of Phoenix Supplements, latest revision to the MAG Uniform Standard Specifications and Details, except as otherwise required by the project plans and specifications.

No proposal may be withdrawn for a period of 50 days after opening without consent of the Contracting Agency through the body or agent duly authorized to accept or reject the proposal except in the case of federally-assisted projects.

Understands that his proposal will be submitted with a proposal guarantee of certified check, cashier's check or surety bond for an amount not less than ten (10) percent of the amount bid, as referenced in the Call for Bids.

Agrees that upon receipt of Notice of Award, from the City of Phoenix, he will execute the contract documents within 10 calendar days.

Work will be completed within 395 calendar days, beginning with the day following the starting date specified in the Notice to Proceed. The time allowed for completion of the work includes lead time for obtaining the necessary materials and/or equipment and approvals.

The bidder will acknowledge all addenda in writing. By writing the addendum number(s) below, the bidder agrees that this proposal is computed with consideration of the specification book(s) plus any addenda.

<u>ADDENDUM NO.</u>	<u>DATE</u>	<u>ADDENDUM NO.</u>	<u>DATE</u>
_____	_____	_____	_____
_____	_____	_____	_____

Bid Proposal

Project Name: Fire Station 74

Project No: FD57100020

Item No.	Description	Unit	Quantity	Total
1	Building Construction	LS	1	
2	Site/off site Improvements	LS	1	
3	Allowance No.1- Owner Directed Work	LS	1	\$ 100,000.00
4	Allowance No.2 - Appliances	LS	1	\$ 35,000.00
	<i>TOTAL BASE BID</i>			
				_____ & _____ /100
_____ DOLLARS (WRITTEN WORDS)				

PROPOSAL SUBMITTAL

PROJECT TITLE: FIRE STATION 74

PROJECT NO.: FD57100020

THIS PROPOSAL IS SUBMITTED BY _____

a corporation organized under the laws of the State of _____

a partnership consisting of _____

a joint venture consisting of _____

or individual trading as _____

of the City of _____

FIRM _____

ADDRESS _____

CITY _____ STATE ____ ZIP CODE _____

PHONE _____ VENDOR NO. _____

BY _____

Officer and Title (signature)

Officer and Title (print or type)

Date

WITNESS: If Contractor is an individual
(signature)

ATTEST: If Contractor is Corporation or Partnership
(signature and title)

SURETY BOND

City of Phoenix Project No.: FD57100020

That we, _____, as Principal, (hereinafter called the Principal) and the _____, a corporation duly organized under the laws of the State of _____, as Surety, (hereinafter called the Surety) are held and firmly bound unto the City of Phoenix as Obligee, in the sum of ten (10) percent of the total amount of the bid of Principal, submitted by him to the City of Phoenix for the work described below, for the payment of which sum, well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents and in conformance with A.R.S. #34-201.

WHEREAS, the said Principal is herewith submitting its proposal for FIRE STATION 74 _____

NOW, THEREFORE, if the City of Phoenix will accept the proposal of the Principal and the Principal will enter into a contract with the City of Phoenix in accordance with the terms of such proposal and give such Bonds and Certificates of Insurance as specified in the Standard Specifications with good and sufficient Surety for the faithful performance of such contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter into such contract and give such Bonds and Certificates of Insurance, if the Principal will pay to the City of Phoenix the difference not to exceed the penalty of the bond between the amount specified in the proposal and such larger amount for which the Obligee may in good faith contract with another party to perform the work covered by the proposal, then this obligation will be null and void, otherwise to remain in full force and effect.

Signed and sealed this _____ day of _____ A.D., 2024

Principal

Title

Mailing Address

Surety

WITNESS:

A.M. BEST RATING:



City of Phoenix

To: Jaime Garrido
Project Manager
Water Services Department

Date: 2/15/2024

From: Amy Thomas, Co-Chair
Tiana Madrid, Co-Chair *TM*
SBE Goal Setting Committee

Subject: SBE GOALS FOR NEW FIRE STATION #74
PROJECT: FD57100020-4 (DBB)

Attendees: Eric Froberg, Karina Matthiessen, Shamina Burch, Amy Thomas, Tiana Madrid, Jaime Garrido, and Chris Kabala

A Small Business Enterprise (SBE) goal of **13%** was established for the above referenced project in accordance with Chapter 18 of the City's Ordinance, A.R. 1.89.

The goal was derived from the current availability of certified SBE firm(s) in the following specified scope(s) of work:

- Concrete
- Flooring
- Roofing
- Site preparation, earthwork, excavation
- Surveying
- Masonry
- Pipeline
- Doors, frames, windows
- Plumbing
- Electrical
- HVAC
- Woods and plastics: millwork and finish carp

Only SBE subcontractors certified by the City of Phoenix under Chapter 18, Article VII of the Phoenix City Code are eligible to fulfill the participation goals as stated. A firm's certification must be current and in force at the date and time of the bid. The most current electronic listing of all certified firms can be accessed through the Internet at: www.phoenix.diversitycompliance.com/

If you have any questions or concerns regarding the goal for this project, please contact us at Small.Business.Enterprise@Phoenix.Gov.

Thank you for your continued support of the City's SBE Program.

c: Eric J. Froberg, City Engineer
Equal Opportunity Division Office
Design and Construction Procurement Section Office



City of Phoenix

Small Business Enterprise Program

SBE – DESIGN BID BUILD (DBB) CONTRACT CLAUSE

PROJECT #: FD57100020

CONTRACT #:

PROJECT TITLE: Fire Station 74

The City of Phoenix Small Business Enterprise Program (SBE) is managed and administered by the Equal Opportunity Department, Contract Compliance Division. Phoenix is one of the fastest growing, multicultural cities in the country and has shown a historical commitment to business diversity. The City strives to advance the economic growth of businesses through its Small Business Enterprise (SBE) Program.

Through a coordinated effort among several city departments, the SBE Program provides SBE certification, procurement opportunities, construction subcontracting utilization, small business management and technical assistance and educational services and networking opportunities.

The Small Business Enterprise (SBE) participation goal for this project is as follows:

SBE Required Goal = 13%

An annual SBE subcontracting participation goal has been established under this Contract. The Prime Contractor is required to demonstrate good faith efforts to utilize certified SBE firms to achieve this goal during the life of this contract.

For purposes of determining the Contractor's actual SBE utilization during and at the end of the project, the Contractor shall meet or exceed their **Proposed SBE Goal Percentage (as indicated on the Submitter's received SBE Utilization Form with their bid submittal)** for the contract, for ALL work performed on the project, including any amount paid for contingencies and allowances, and selected alternates. **The Proposed Goal shall meet/or exceed the Required Goal.**

For purposes of calculating the Contractor's "Proposed SBE Goal Percentage" on the Contractor's Statement of Proposed SBE Utilization form, bidders must not propose SBE subcontractors from areas identified on the bid form as contingencies and allowances or proposed alternates. Any SBE participation proposed from these areas will be not counted towards meeting the SBE goal requirement necessary for contract award.

The "Total Bid" shall be defined as the total of all the unit prices, or the lump sum total, including alternates and contingencies and allowances. The "Base Bid" shall be defined as the "Total Bid" minus "all proposed alternates" as determined by the project manager. Any additional dollars paid under this contract, including any selected alternate(s), shall be subject to the **Proposed SBE Goal Percentage** listed on the Contractor's Statement of Proposed SBE Utilization form.



City of Phoenix

Small Business Enterprise Program

SBE PROGRAM DEFINITIONS

Broker, Packager, Manufacturers' Representative, or Jobber means a firm that is not a manufacturer or regular dealer as defined herein.

Commercially Useful Function (CUF) means that a SBE firm is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. A SBE must perform at least 75% of the total cost of its contract with its own work force in order to be determined to be performing a CUF on the contract.

Contract is a written agreement obligating the seller or business enterprise to furnish goods or services as submitted and the Purchaser or Buyer to pay for such goods or services.

Contractor is an individual, partnership, joint venture, corporation or firm that executes a contract with the City to perform services requested by a solicitation or procurement. The Contractor may be direct or through an authorized representative.

Joint Venture (JV) is an association between two or more persons, partnerships, corporations, or any combination thereof, formed to carry on a single business activity. The JV is limited in scope and duration to this contract. The resources, assets and labor of the participants must be combined in an effort to accrue profit.

Manufacturer means a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract.

Purchaser for purposes of this contract means the City.

Regular Dealer or Supplier means a business that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. The firm must be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question.

Small Business Enterprise (SBE) means a small business that has been determined to meet the requirements for SBE certification with the City of Phoenix and whose certification is in force at the time of the award of business by the City. A directory of currently certified SBE firm is located at <https://phoenix.diversitycompliance.com>.

Subcontract a contract at any tier below the prime contract, including purchase orders.

Subcontractor is an individual, partnership, joint venture, corporation or firm that holds a contract at any tier below the prime contract, including purchase orders.

Successful Submitter is a Submitter who has been selected to perform services requested by a solicitation or procurement.



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Small Business Enterprise Program

SECTION I. SBE CERTIFIED FIRMS

Only firms certified by the City of Phoenix under Chapter 18, Article VIII of the Phoenix city code are eligible to fulfill the participation goal stated above. A firm's ***certification must be in the trade areas listed on the proposed utilization form and current and in force at the date and time of the bid opening deadline.***

The most current electronic directory of all certified **SBE** firms can be accessed at:

<https://phoenix.diversitycompliance.com>

If you need to verify certification status, please contact the Equal Opportunity Department at (602) 262-6790 and identify yourself as a prime contractor bidding on this project. Prime contractors should verify that the certifications of the SBE firms are current prior to bid opening. ***If a firm's certification expires and is not renewed prior to the bid-opening deadline, that firm will be ineligible to satisfy the goal.***

SECTION II. SBE BID PROCEDURES

The bid envelope shall contain all information and documents related to the SBE requirements of this section. ***Failure to properly complete the "Contractor's Statement of Proposed SBE Utilization" and "Letter of Intent to Perform as a Subcontractor/Supplier" forms, or submit a fully documented waiver request as described below, will result in bid rejection.*** The required documentation includes:

1. **A Contractor's Statement of Proposed SBE Utilization** - The form shall document the name of each SBE firm that will be awarded a subcontract; services to be performed by each subcontractor; dollar amount to be paid for those services; and the total dollar amount that is being proposed in SBE participation.
2. **A Letter of Intent to Perform as a SBE Subcontractor/Supplier** (required for each SBE subcontractor/supplier proposed) The form shall be completed by the SBE firm that will be awarded the subcontract. The form documents services to be performed by the subcontractor/supplier and the total dollar amount of the subcontract that will be awarded to the SBE. Only the services performed in the area(s) described by the SBE's certification description can be counted towards the SBE goal requirement.

The bidder's proposed utilization of SBE firms to fulfill the participation goal must be submitted on the "Contractor's Statement of Proposed SBE Utilization" form included in the specification packet. Additionally, each of the **SBE** subcontractors/suppliers the bidder is proposing to use to meet the goal requirement on this contract must complete the "Letter of Intent to Perform as an SBE Subcontractor/Supplier" (LOI) form. Both forms must be completed and submitted as part of the bid packet by the bid-opening deadline.

Failure to submit a completed "Contractor's Statement of Proposed SBE Utilization" and signed "Letter of Intent to Perform as an SBE Subcontractor/Supplier" form for each of the proposed SBE firms will result in a bidder being declared non-responsive to the requirements of these specifications and the bid will not be considered. The forms must contain the following:

1. The Certified SBE firm name and the certified trade or services to be performed.
2. The dollar amount of the proposed subcontract to be awarded to each SBE firm.
3. The total dollar amount of all SBE proposed subcontracts.

In instances where an exact dollar amount to be subcontracted with a SBE firm cannot be determined, the bidder shall indicate on Columns 3 and 4 of Part B Section 1 of the "Letter of Intent To Perform as a SBE Subcontractor/Supplier" form the minimum guaranteed hours/units and dollar amount that will be paid to the SBE firm. This situation applies only when a Contractor proposes to utilize a SBE firm that engages in work



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Small Business Enterprise Program

related to a broker, supplier or; a bid that is based on a per hour charge as in hauling/trucking or construction site security. Please note that this exception does not permit the Prime contractor to complete or modify any other part of the LOI document. Both, the SBE and the bidder must sign the LOI document prior to bid submittal. By signing the document, the bidder affirms that it has not altered or modified the document in any way other than, if applicable, entering the Unit/Hours and Total Quote Amount in Part B SECTION 1.

If a bidder proposes to utilize a firm not certified by the City of Phoenix and/or not certified in the proposed scope of work at the time of bid, the proposed utilization amount for that firm will be deducted from the total proposed SBE utilization amount used for determining if the bidder is responsive to the requirements of this section. Bidder shall not include any amount the SBE firm has indicated in the LOI document as work it will sublet or is not covered in their certification description in the Contractor's Statement of Proposed SBE Utilization form. Only amounts associated with the work to be performed by the SBE, and indicated in the SBE's certification description, may be counted towards the SBE participation goal requirement of this section.

If the reduced proposed SBE utilization is insufficient to meet the established participation goal required for this contract, and no waiver documentation has been submitted, the bidder shall be determined to be **non-responsive** to the requirements of this section and the bid will not be considered.

A certified SBE firm bidding as a Prime Contractor cannot count the work it will self-perform towards meeting the required SBE subcontracting goal.

A "Letter of Intent to Perform as a Subcontractor/Supplier" will be used in determining compliance with the requirements of this section. **The proposed subcontract dollar amount listed for each SBE firm on the "Contractor's Statement of Proposed SBE Utilization" must match the SBE dollar amount indicated in the boxed areas in Parts C, D or E of the signed "Letter of Intent to Perform as a Subcontractor/Supplier."** Failure to submit a completed LOI document with the SBE's and bidder's signatures shall be determined to be **non-responsive** to the requirements of this section and the bid will not be considered.

SECTION III. IF THE BIDDER IS UNABLE TO MEET THE GOAL

A fully documented waiver request detailing why the bidder has been unable to meet the SBE utilization goal in whole, or in part, and the "good faith" effort of the bidder to obtain SBE participation. In order to be viewed as good faith efforts, a bidder's activities must be consistent with all activities that could reasonably be expected from a bidder who was actively and aggressively seeking to meet the SBE goal. To show proof of having exercised good faith efforts in trying to obtain bids from SBE firms to meet the utilization goals. The following factors are illustrative of those matters that shall be considered when judging whether the bidder made "good faith efforts".

1. A cover letter addressed to the Street Transportation Procurement Section clearly indicating whether a full or partial waiver is being requested, the percentage to be waived, and the reasons the waiver is being sought.
2. If a partial waiver is being requested, a Bidder's Statement of Proposed Utilization listing firms that will satisfy the portion of the goal that will be met must be included with the bid proposal. Additionally, a Letter of Intent to Perform as a Subcontractor/Supplier from each SBE firm that is proposed to be utilized must be included with the bid proposal.
3. Proof of contact with SBE firms, including but not limited to, fax logs, telephone logs, mail receipts, etc, including documentation of the number of times that firms were contacted, the dates of contact, and the name, phone number, fax number, and address of the contact person associated with each SBE firm. Solicitation of SBE subcontractors must be consistent with the solicitation of all subcontractors and must clearly demonstrate that SBE firms had sufficient time to submit an effective response.
4. Copies of the documents submitted to all subcontractors requesting their bid. This should include the scope of work to be bid and performed on the project.



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5. Copies of bid responses/quotes from all subcontractors who bid to perform work on the project in the areas that SBE firms were also bidding on, including information as to why SBE bids were not considered.
6. Documentation that shows efforts made to provide assistance to SBE firms in the areas of bonding, insurance, or other contracting requirements.
7. Documentation of attendance at the pre-bid conference held for the project.
8. Documentation of contact made with City personnel seeking assistance in identifying eligible SBE firms for contracting opportunities on the project.

SECTION IV. SBE WAIVER PROCEDURES

Requests for a partial or full waiver of the SBE goal for the project including all Good Faith Documentation shall be submitted as part of the bid packet. The request will be reviewed to ensure compliance with the requirements of this section. If the request is determined to meet the requirements, a waiver hearing will be scheduled and the bidder notified of the date, time, and place of the hearing. All waiver hearings are open to the public. However, only the designated representative for the contractor and City staff may participate in the proceedings.

The contractor requesting the waiver may appear at the hearing to present their request and answer questions from the Waiver Review Committee regarding their submittal. The Committee will consider the information and documentation that was submitted at the time of bid. The bidder may not present additional or new information at the hearing. At the conclusion of the hearing process the Committee will make independent recommendations on the request for waiver. The presiding officer, on behalf of the Committee, will provide a written summary of the Committee's recommendations to the City Manager's designee, the City Engineer. The City Engineer will make the final decision to grant or deny the waiver request. The City Engineer's decisions shall be final. The City will notify the contractor regarding the final decision of the City Engineer.

If a partial or full waiver of the SBE goal is granted to a bidder, the bidder shall be considered to have met the project goals and their bid will be considered responsive to the requirements of this section. If a waiver is denied, the bidder is deemed non-compliant and non-responsive to the requirements of this section and their bid will not be considered.

Failure to submit the Contractor's Statement of Proposed SBE Utilization form and a LOI from each SBE firm proposed OR a fully documented waiver request at the time of bid will be cause to determine the bidder non-responsive to the requirements of this section.

SECTION V. LIMITATION OF THE USE OF SUPPLIERS AND BROKERS TO FULFILL THE SBE GOAL

Proposed expenditures to brokers and suppliers can be used to meet the utilization goal, provided that the combined applicable expenditures do not exceed 25 percent (25%) of the total SBE goal requirement. Contractors may count one hundred percent (100%) of the dollars proposed to be paid to a SBE supplier, and all costs associated with fees and commission to be paid to a SBE broker, up to the 25% limitation.

Supplier (or Wholesaler) is defined as firm that does not directly manufacture the product being supplied and has an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question. A supplier is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business.



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EXAMPLE: An SBE goal of 5% has been established on a project where the contractor has submitted a base bid of \$1,000,000. This results in a dollar goal of \$50,000 to be subcontracted to SBE's. The contractor proposes to contract with a SBE supplier for \$100,000. Only \$12,500, or 25 percent (25%), may be counted

towards achievement of the SBE goal for this project. The remaining \$37,500 must be achieved through the use of firms that are not suppliers or brokers.

Broker is defined as firm that arranges or expedites services or transactions through the use of individuals not directly employed by the company. Brokers are not regular suppliers. Only costs associated with the fees and commission paid to the certified firm for providing such services may be applied towards the SBE contract goal.

The following defines the expenditures to SBE firms that are NOT subject to the 25% limitation. The following expenditures may be counted in their entirety towards fulfilling 100% of the utilization goal:

1. Expenditures to certified SBE firms that operate and maintain an establishment or factory to produce, on the premises, the materials or supplies purchased for the contract.
2. Expenditures to a certified SBE fabricator that operates and maintains a factory to substantially alter materials or supplies before resale.
3. Expenditures, including fees and commissions, charged to provide bona fide technical and professional personnel recruitment for the contract. The total cost paid that shall be comparable to the industry standards customarily charged for the same or similar services.
4. Expenditures, including fees and commissions, charged for providing bonds and insurance specifically required for the performance of the contract. The total cost shall be comparable to the industry standards charged for the same or similar services.

All SBE firms proposed to participate on this contract opportunity must be SBE certified by the City of Phoenix prior to the date and time of the bid.

Participation on the contract will be calculated based on that portion (dollar value) of the contract that the SBE actually performs with its own forces. This includes the cost of supplies and materials obtained by the SBE for the work on the contract, **except** in cases when; it has been determined by the City *not* to be part of the firm's certification description; the SBE is certified as a "placer", "finisher", or "installer" of those materials only, or when the supplies and/or equipment it uses to perform its work is purchased or leased from the Contractor or its affiliate.

Special emphasis and care should be taken to ensure that the following types of participation are handled properly when preparing your bid packet, as failure to correctly calculate the allowable SBE participation in the following areas shall result in your bid being declared non-responsive if the SBE goal requirement is not met:

Fees & Commissions: SBE firms that supply a bona fide service for a fee or commission may be counted only to the extent of the fees or commissions charged by the SBE. This includes, but is not limited to, providing professional, technical, consultant, or managerial services, and bonds or insurance specifically required for the performance of a contract. Fees must be reasonable, not excessive, compared to fees customary for similar services.

EXAMPLE: A SBE firm that supplies uniformed officers for security or traffic control may count only the amounts charged as a commission. The hourly amount paid to the officers may not be counted. If the "per hour" bid amount to the prime contractor is \$35, and \$25 per hour will be paid to the officers, only \$10 per hour can be counted towards achieving the SBE goal. If the firm or bidder estimates that there will be 200 hours of work bid at a rate of \$35 per hour, only \$2,000 of the total \$7,000 bid could be counted.



City of Phoenix

Small Business Enterprise Program

Trucking & Hauling: The amount of a trucking/hauling subcontract that may be counted towards the utilization requirements may be limited. An SBE must itself own and operate at least one fully licensed,

insured, and operational truck that will be used on the contract. In addition, trucks the SBE leases without drivers under a long-term leasing agreement may be considered part of the trucking firm's workforce and

counted in full, provided the leasing agreement(s) is/are for a period of not less than 6 months and; **the leased vehicles have been recorded with the City's Equal Opportunity Department's Certification Office prior to the submittal of the LOI document.**

***EXAMPLE:** A SBE trucking firm uses seven trucks on a job; two are owned by the SBE and five are leased from other firms. If two of the five trucks are leased without drivers and the remaining three are leased with drivers from another firm, then the amount paid to the SBE for the services provided by the trucks it owns and the two it leases without drivers and operates with its own employees can be counted in full towards meeting the SBE requirements. The Contractor may not count any portion of the amount the SBE receives for the two trucks it leases with drivers towards the SBE utilization goal.*

SECTION VI. POST AWARD SBE COMPLIANCE INFORMATION - DBB

Submittal of a bid to the City of Phoenix shall constitute an agreement by the bidder to comply with the SBE utilization requirements of this section should the bidder be awarded a contract. This includes, but is not limited to, the following compliance activities:

1. The contractor shall contract, or attempt to contract, in good faith with all SBE firms listed on the Bidder's Statement of Proposed SBE Utilization form submitted with their bid. The subcontract shall be for an amount that is equal to, or greater than, the total proposed dollar amount listed on the form, with the exception of instances where the City changes a scope of work in the contract that would reduce the available work in the subcontractor's area of performance.
2. The contractor shall not reduce any of the proposed SBE scopes of work or amounts indicated on the Bidder's Statement of Proposed SBE Utilization form without first submitting a Request for Exemption and receiving approval in writing from the City's Equal Opportunity Department (EOD), Contract Compliance Division.
3. The contractor shall notify the City of Phoenix Equal Opportunity Department immediately if any firm listed on the Bidder's Statement of Proposed SBE Utilization form refuses to enter into a subcontract or fails to perform according to the requirements of the subcontract.
4. Any reduction of retention by the City to the contractor shall result in a corresponding reduction to subcontractors or suppliers who have performed satisfactory work. The contractor has 14 days from the date their retention reduction takes effect to reduce retention to the subcontractors.
5. The contractor shall return all retention monies to subcontractors at such time as the work originally proposed by the subcontractor, and expressed in the original subcontract agreement, is complete and the purchaser (City) has accepted the work and paid the prime for the work performed by the subcontractor. Retention shall be paid no later than 30 days after such payment is made by the City.
6. The contractor shall act in good faith to meet the contract SBE utilization goal and provide all necessary documentation to show proof of those efforts as requested by the City.

If for any reason the SBE firm is decertified prior to the execution of a subcontract agreement, the bidder shall find additional SBE participation in the amount equivalent to or greater than that which was originally proposed for the SBE firm. Bidder shall make every good faith effort possible in finding a SBE replacement in the proposed trade area first, before considering SBE participation in other trade areas.



City of Phoenix

Small Business Enterprise Program

SECTION VII. Subcontract Assurances

Each contract signed by the Agency and the Successful Bidder and each subcontract signed by the Successful Bidder with a Subcontractor, including Subcontractors with lower tier Subcontractors must include the following assurances verbatim:

Prompt Payment of Subcontractors *The Contractor and Subcontractor shall promptly pay its lower tier subcontractors, sub consultants, or suppliers upon receipt of payment from the City of Phoenix (Agency).*

Progress Payments: In accordance with the Arizona Revised Statutes (ARS), Section 34-221(G), the Contractor(s) shall promptly pay its subcontractors, sub consultants, or suppliers within seven (7) calendar days of receipt of each progress payment from the Agency. Any diversion by the Contractor(s) of payments received for work performed on the contract, or failure to reasonably account for the application or use of such payments, constitutes grounds for a declaration of breach of the contract with the Agency.

Retention Payments: If the Agency reduces the Contractor's retention, the Contractor shall correspondingly, within 14 days, reduce the retentions held against the Subcontractors and suppliers that have performed satisfactory work.

Release of Retention: The Contractor(s) shall ensure prompt and full payment of retentions to Subcontractors and suppliers when their work is complete, the Agency has accepted the work, and the Agency has paid the Contractor for the work. The Contractor shall pay each Subcontractor's and supplier's retention no later than 30 days after the Agency pays Contractor for the completed scope of work.

Changes to Subcontracts and Values *The City of Phoenix prohibits Contractor(s) from altering the Contractor's Statement of Proposed SBE Utilization form without receiving prior, written consent from the City. The Equal Opportunity Department must be informed, in writing, and in advance of the following:*

- *Reduction to the scope of work performed by subcontractors working on the contract*
- *Changes in any of the subcontract values resulting in a reduced dollar amount*
- *Replacement and/or release of any subcontractor after contract award*

Contractor(s) and Subcontractor(s) are required to complete a Request for Exemption Form and have the written approval of the Contract Compliance Office prior to taking action on any of the above listed matters related to SBE subcontractors.

In the event that any provision of this subcontract varies from the provisions of the contract or subcontract, the provisions for SBE contract compliance as contained in Administrative Regulation 1.89, Section IX, shall provide definitive guidance.

Disclaimer: *Nothing in this section prevents the Contractor or Subcontractor from enforcing its subcontract with a lower tier Subcontractor or supplier for defective work, late performance, and other claims arising under the Subcontract.*



City of Phoenix

Small Business Enterprise Program

SECTION VIII. RECORDS and REPORTING REQUIREMENTS

1. Records

During performance of the Contract, the Successful Submitter shall keep all records necessary to document the participation of all subcontractors and suppliers. The Successful Submitter shall provide the records to the Agency within 72 hours of the Agency's request and at final completion of the Contract. The Agency will prescribe the form, manner, and content of reports. The required records may include but not limited to:

- a) A complete listing of all Subcontractors and suppliers on the project;
- b) Each Subcontractor's and supplier's scope performed;
- c) The dollar value of all subcontracting work, services, and procurement;
- d) Copies of all executed Subcontracts, purchase orders, and invoices; and
- e) Copies of all payment documentation.

2. Reports

- a. The contractor shall participate in all compliance reviews determined necessary by the City. This includes, but is not limited to participating in on-site reviews, providing monthly utilization reports of SBE activity, providing signed copies of subcontracts and/or purchase orders with each SBE listed on the Bidder's Statement of Proposed SBE Utilization form, and complying with any and all requests for information the City deems appropriate for effectively monitoring this contract for compliance with the SBE Program requirements.
- b. The contractor shall provide regular, monthly report/audit information that will assist us in effectively monitoring your compliance with the SBE Program requirements. This shall include listing all subcontractors working on the contract and reporting payments into the Certification and Compliance System <https://phoenix.diversitycompliance.com>. Reporting audits shall include all payments received from the City and payments you have issued to all subcontractors and suppliers. **Copies of the first 2 pages of the Pay Request submittal are required with each report. All Monthly audit reports are to be completed online by the 15th of every month. (<https://phoenix.diversitycompliance.com>).**
 - i. The total of all payments received from the City during the previous month.
 - ii. The first two pages of each payment application submitted for those payments.
 - iii. All payments made to Subcontractors during the previous month.

Before the Agency processes the Successful Submitter's final payment and/or outstanding retention held against the Successful Submitter, the Successful Submitter shall submit to the Agency a final certification of full and final payment to each Subcontractor in the form prescribed by the Agency. The form must be completed and certified by the Successful Submitter's and each Subcontractor's duly authorized agents.

SECTION IX. PERFORMANCE OF A COMMERCIALY USEFUL FUNCTION

The prime contractor may count only expenditures to SBE subcontractors that perform a commercially useful function in the work of the contract, as defined in Chapter 18 Article VI of the City Code. A "commercially useful function" constitutes performing real and actual services related to the contract.

SBE subcontractors may enter into second-tier subcontracts consistent with normal industry practices. If an SBE subcontracts greater than twenty-five (25) percent of the work of their contract, the SBE subcontractor shall be presumed not to be performing a commercially useful function. In this event, the prime contractor will not be allowed to claim any expenditure to the SBE subcontractor.



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SECTION X. FAILURE TO COMPLY WITH THE SBE PROGRAM REQUIREMENTS

If the Equal Opportunity Department determines that the contractor will fail, or has failed, to meet the SBE subcontracting goals, and/or has failed to act in good faith to ensure compliance with the SBE conditions of its contract; it shall deem the contractor “noncompliant” and not in good standing. A noncompliant status shall result in the rejection of all future contract bids or offers for all projects or other procurements with the City until such time that the contractor has cured its breaches and demonstrates that it has faithfully performed its approved SBE utilization plan and all other provisions of this article required to be deemed in good standing. In addition to this action, the City may also exercise its option to impose any or all of the following remedies:

1. Withholding from the contractor ten percent (10%) of all future payments on the involved eligible project until it is determined that the contractor is in compliance;
2. Withholding from the contractor all future payments on the involved project until it is determined that the contractor is in compliance

Failure to cure a non-compliance status within the time frame provided by the City may result in further action, including but not limited to imposing any or all of the following sanctions:

1. Rejection of all future bids or offers from the contractor for any eligible project with the City or any of its departments or divisions for a period of (1) year after substantial completion of the contract.
2. Cancellation of the contract.



City of Phoenix

Small Business Enterprise Program

CONTRACTOR'S STATEMENT OF PROPOSED SBE UTILIZATION (DBB)

PROJECT NUMBER/TITLE: FD57100020-4 Fire Station #74

Required SBE Goal: 13%

SBE FIRMS	COMPANY NAME	SERVICES TO BE PROVIDED	SUPPLIER- (YES or NO) May not satisfy more than 25% of the Goal	SBE \$ AMOUNT from LOI Tables - Sections C, D, or E	Countable SBE \$ Amount (towards proposed goal)

<p>(\$ _____) - (\$ _____) - (\$ _____) = (\$ _____)</p> <p>Total Bid - Allowances & Contingencies - Alternates = Base Bid</p> <p>(\$ _____) ÷ \$ _____) X 100 = _____ % (NO ROUNDING)</p> <p>Total Proposed SBE Dollars ÷ Base Bid X 100 = Proposed SBE %</p> <p>Proposed SBE Percentage must equal or exceed the Required SBE Goal Percentage.</p> <p>Do NOT propose SBE dollars in scopes related to Alternates, Allowances, or Contingencies as part of meeting the required SBE %.</p> <p>All additional contract dollars, including selected alternates, contingencies, and allowances paid after award of contract, will be subject to the SBE contract goal %.</p>	<p>Total Proposed SBE Dollars</p> <p>\$ _____</p>
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------

I hereby certify by signing below the foregoing SBE firms shall be contracted to work on the trades identified above and/or supply material/equipment for this project.

*The information shown above is a **true reflection of the proposed subcontracts.***

COMPANY NAME: _____ EMAIL: _____ PHONE: _____

NAME : _____ TITLE: _____

SIGNATURE: _____ DATE: _____



City of Phoenix

Small Business Enterprise Program

Letter of Intent (LOI) To Perform as an SBE Subcontractor

(THIS FORM MUST BE COMPLETED BY THE SBE SUBCONTRACTOR – BOTH SBE SUBCONTRACTOR & PRIME SIGNATURE ARE REQUIRED)

Project Number: FD57100020-4
Contract #:

Project Description: Fire Station #74

TO: (Insert Name of Prime Contractor)

FROM: (Insert Name of SBE Firm)

A. The undersigned declares that the firm bidding to perform the work described herein, has been granted certification by the City of Phoenix (COP) as a Small Business Enterprise (SBE) in the area(s) of:

(COP) Certification Description:

B. The undersigned is bidding to perform the following scope(s) of work on the above referenced project:

SECTION 1 - COMPLETE THIS PORTION IF THE SCOPE OF WORK IS BEING BID BY UNIT PRICE OR HOURLY RATE SUPPLIER, BROKER, TRUCKING, HAULING, UNIFORMED OFFICERS MUST USE THIS SECTION

Table with 4 columns: Scope of Work, Unit/Hourly Rate, # of Units/Hours, Total Quote Amount

SECTION 2 - GENERAL OR SPECIALTY CONSTRUCTION TRADE AREAS MUST USE THIS SECTION

Table with 2 columns: Scope of Work, Total Quote Amount

C. Of the Total Quote Amount reflected in Part B-SECTION 2, the following scope(s) of work with the given amount will not be performed by the SBE or is/are not covered under the SBE's certification description:

Scope(s) of Work Amount \$

Subtract Amount in Part C above from the Total Quote Amount in Part B-Section 2 = * \$
* Only this amount shall be reflected on the Bidder's Statement of Proposed Utilization.

D. If trucking services are included in Part B - SECTION 1 above, SBE MUST complete the following:

Of the Total Quote Amount noted in part B-Section 1, the SBE affirms that the amount of * \$ shall be performed by drivers the firm employs, and trucks the SBE owns and leases without drivers.
(The amount referenced above is transferred from Step 9 of the Worksheet (L.O.I.W.-1). *Only this amount shall be on the Statement of Proposed Utilization)

E. All subcontractors providing Broker or Traffic Control/Security Services indicated in Part B-SECTION 1 above MUST Complete the Following:

Rate of the SBE's fees/commissions %; for a Total Amount in fees/commissions of: \$
The Percentage and Total Amount referenced above is transferred from Steps 2 and 3 of the Worksheet (page L.O.I. W.-1).
Only the Total Amt in fee/commissions shall be reflected on the Bidders Statement of Proposed Utilization.

Should the prime contractor receiving this form be selected for award of the contract, the undersigned affirms that he/she will enter into an agreement to perform the work bid herein.

(SBE Subcontractor Authorized Signature)

(Date)

(Print Name and Title)

(Phone Number)

By signing this LOI document, the Prime Contractor affirms that it has not altered or modified this document in any way other than, if applicable, entering the Unit/Hours and Total Quote Amount in Part B SECTION 1.

(Prime Contractor Authorized Signature)

(Date)

(Print Name and Title)

(Phone Number)



City of Phoenix
Small Business Enterprise Program

**LETTER OF INTENT TO PERFORM AS A SUBCONTRACTOR/SUPPLIER
INSTRUCTIONS AND WORKSHEET - L.O.I. W.-1**

A Letter of Intent to Perform as a SBE Subcontractor/Supplier (required for each SBE subcontractor/supplier proposed). The form documents services to be performed by the subcontractor/supplier and the total dollar amount of the subcontract that will be awarded to the SBE. Only the services performed in the area(s) described by the SBE's certification description can be counted towards the SBE goal requirement.

Part I. Trucking and Hauling: SBEs should indicate on Part B-Section 1 and Part D, of the LOI form, the information regarding trucks to be used in executing the contract. The City allows the counting of all payments for services provided by trucks which the SBE owns. Trucks which the SBE leases on a long-term basis and are operated with drivers the SBE employs may also be counted in full. The payments for short-term leased trucks, with or without SBE employed drivers cannot be counted.

Only trucks for which leasing agreements have been submitted and approved by EOD as part of the SBE firm's current certification file shall be considered eligible for counting towards the goal.

STEP ONE	STEP TWO	STEP THREE
Value of work expected to be performed by trucks owned by the SBE (2 Trucks)	Value of work expected to be performed by trucks leased (with drivers) by the SBE on a long-term basis (2 Trucks)	Combined value of work expected to be performed by other trucking firms and/or trucks leased (without drivers) by the SBE (3 Trucks)
\$20,000	\$20,000	\$33,000
STEP FOUR	STEP FIVE	STEP SIX
Estimated value for services provided by all trucks the SBE will use on the contract. (Add Steps One, Two, and Three)	Expected value of work performed by trucks not eligible for counting as SBE participation (Value in Step Three)	Total estimated value that can be counted for SBE participation (Subtract Step Five from Step Four)
\$73,000	\$33,000	\$73,000 - \$33,000 =\$40,000

Part II. Fees and Commissions: Insert the information from below under Step Three-Commission/Fees Percentage and the Countable Amount for SBE Participation into Part E of the LOI form. This part is applicable for the use of uniformed officers to provide traffic control and security and other services provided at an hourly rate by non-employees of the SBE contractor.

(The following information is provided as a sample only)

STEP ONE			
Total Number of Hours	Per Hour Bid Amount	Calculation Formula: Total Gross Bid Amount	
200	\$35	200 × \$35 = \$7,000	
STEP TWO			
Per Hour Bid Amount	Officers Hourly Rate	SBE Firm Commission/Fee	Calculation Formula: Fees/Commissions Percentage
\$35	\$25	\$10	(10 / 35) * 100 = 28.57%
STEP THREE			
Gross Bid Amount (from Step One)	Commission/Fee % (from Step Two)	Calculation Formula: Amount Countable for SBE Participation	
\$7,000	28.57%	\$7,000 × .2857 = \$2,000	

Part III. Construction Trade Areas: SBE must indicate in the Scope of Work of Part B-Section 2 of the LOI form, **all** scope(s) of work associated with the Total Quote Amount. The SBE must complete Part C of the LOI form by entering the Scope of Work and amount not expected to be performed by the SBE or which is not covered under the SBE's certification description. Subtracting this amount from the Total Quote Amount in Part B-Sect. 2 will result in the portion of work that can be counted as SBE participation.

CITY OF PHOENIX
LIST OF MAJOR SUBCONTRACTORS AND SUPPLIERS

PROJECT NO.: FD57100020

PROJECT TITLE: FIRE STATION 74

DESCRIPTION OF WORK OR MATERIALS (CONTRACTOR TO ENTER TRADE/SUPPLIER AREAS)	SELF-PERFORMED BY PRIME CONTRACTOR	SUBCONTRACTOR/SUPPLIER COMPANY NAME (IF NOT SELF-PERFORMED)	CONTACT PERSON	PHONE NUMBER	DOLLAR VALUE OF WORK OR MATERIALS IN BID
	<input type="checkbox"/> YES <input type="checkbox"/> NO				
	<input type="checkbox"/> YES <input type="checkbox"/> NO				
	<input type="checkbox"/> YES <input type="checkbox"/> NO				
	<input type="checkbox"/> YES <input type="checkbox"/> NO				
	<input type="checkbox"/> YES <input type="checkbox"/> NO				
	<input type="checkbox"/> YES <input type="checkbox"/> NO				

I hereby certify by signing below that the above listed companies will be utilized to perform work on this project for an **equal to or greater than 5% of the base bid**. These companies will not be removed or replaced without prior written approval by the City of Phoenix Project Manager. The City requires that ALL vendors providing work equal to or greater than 5% of the base bid are listed or you will be disqualified. If you are self-performing work, you must still list any suppliers for materials or list any subcontractors with whom you will directly contract.

COMPANY NAME _____ SIGNATURE _____

NAME & TITLE _____ PHONE NUMBER _____ DATE _____

EMAIL ADDRESS _____

CITY OF PHOENIX

LIST OF ALL SUBCONTRACTORS AND SUPPLIERS

PROJECT NO.: FD57100020

PROJECT TITLE: FIRE STATION 74

DESCRIPTION OF WORK OR MATERIALS (CONTRACTOR TO ENTER TRADE/SUPPLIER AREAS)	SELF-PERFORMED BY PRIME CONTRACTOR	SUBCONTRACTOR/SUPPLIER COMPANY NAME (IF NOT SELF-PERFORMED)	CONTACT PERSON	PHONE NUMBER	DOLLAR VALUE OF WORK OR MATERIALS IN BID
	<input type="checkbox"/> YES <input type="checkbox"/> NO				
	<input type="checkbox"/> YES <input type="checkbox"/> NO				
	<input type="checkbox"/> YES <input type="checkbox"/> NO				
	<input type="checkbox"/> YES <input type="checkbox"/> NO				
	<input type="checkbox"/> YES <input type="checkbox"/> NO				
	<input type="checkbox"/> YES <input type="checkbox"/> NO				

I hereby certify by signing below that the above listed companies will be utilized to perform work on this project. These companies will not be removed or replaced on the project without prior written approval by the City of Phoenix Project Manager. The City requires that ALL vendors providing work are listed or you will be disqualified. If you are self-performing work, you must still list any suppliers for materials or list any subcontractors with whom you will directly contract.

COMPANY NAME _____ SIGNATURE _____

NAME & TITLE _____ PHONE NUMBER _____ DATE _____

EMAIL ADDRESS _____

BIDDER'S DISCLOSURE STATEMENT

Authorized Contact for this Disclosure Statement

Name: _____

Title: _____

E-mail: _____

Phone number: _____

List any EIN, DBA, trade name, or other identity used in the last five years, the state or country where filed, and the status (active or inactive): (if applicable): _____

Business Characteristics

Business entity type – Please check appropriate box and provide additional information:

- | | | |
|--------------------------|-------------------------------|------------------------------------|
| <input type="checkbox"/> | Corporation | Date of incorporation: _____ |
| <input type="checkbox"/> | Limited Liability Company | Date organized: _____ |
| <input type="checkbox"/> | Limited Liability Partnership | Date of registration: _____ |
| <input type="checkbox"/> | Limited Partnership | Date established: _____ |
| <input type="checkbox"/> | General Partnership | Date established: _____ |
| <input type="checkbox"/> | Sole Proprietor | How many years in business?: _____ |
| <input type="checkbox"/> | Other (explain) | Date Established: _____ |

Was the business entity formed in the State of Arizona? Yes _____ No _____

If no, indicate jurisdiction where Business Entity was formed: _____

Business License Number and Classification: _____

Business Transaction Privilege License Number: _____

Special Use or other zoning permits required for Bidder's operation and performance of the services under this Agreement:

Is the Business Entity currently registered to do business in Arizona with the Arizona Corporation Commission? Yes_____ No_____ Not required _____ (if sole proprietor or general partnership)

Does the Business Entity have a City of Phoenix business privilege license? Yes_____ No_____ If "no" explain and provide detail such as "not required" or "application in progress" or other reason.

Is the Business Entity publicly traded? Yes_____ No_____

Is the responding Business Entity a Joint Venture? Note: If the Submitting Business entity is a Joint Venture, also submit a questionnaire for each Business Entity comprising the Joint Venture. Yes_____ No_____

Is the Business Entity's Principal Place of Business/Executive office in Phoenix? If "no" does the Business Entity maintain an office in Phoenix? Yes_____ No_____

Provide the address and phone number for the Phoenix office. _____

Is the business certified by Phoenix as a Small Business Enterprise? Yes_____ No_____

Identify Business Entity Officials and principal Owners:

Name(s) _____ Title _____ Percentage ownership ___%(Enter 0% if not applicable).

Name(s) _____ Title _____ Percentage ownership ___%(Enter 0% if not applicable).

Name(s) _____ Title _____ Percentage ownership ___%(Enter 0% if not applicable).

Name(s) _____ Title _____ Percentage ownership ___%(Enter 0% if not applicable).

Affiliates and Joint Venture Relationships

Does the Business entity have any Affiliates? Yes_____ No_____ Attach additional pages if necessary.

Affiliate name: _____

Affiliate EIN (if available):_____.

Affiliate's primary Business Activity:_____

Explain relationship with Affiliate and indicate percent ownership, if applicable. _____

Are there any Business Entity Officials or Principal Owners that the Business Entity has in common with this Affiliate? _____

Individual's name:_____

Position/Title with Affiliate:_____

Has the Business Entity participated in any joint Ventures within the past three years? Yes_____ No_____ (Attach additional pages if necessary)

Joint Venture Name:_____

Joint venture EIN (if applicable):_____

Identify parties to the Joint Venture:_____

Contract History

Has the Business Entity held any contracts with the city of Phoenix in the last three (3) years? Yes_____ No_____ If “yes” attach a list.

Integrity – Contract Bidding

Within the past three (3) years, has the Business Entity or any Affiliate been suspended or debarred from any government contracting process or been disqualified on any government procurement? Yes_____ No_____

Been subject to a denial or revocation of a government prequalification? Yes_____ No_____

Been denied a contract award or had a bid rejected based upon a finding of a non-responsibility by a government entity? Yes_____ No_____

Agreed to a voluntary exclusion from bidding/contracting with a government entity? Yes_____ No_____

Initiated a request to withdraw a bid submitted to a government entity or made any claim of an error on a bid submitted to a government entity? Yes_____ No_____

Initiated a request to withdraw a bid submitted to a government entity or made any claim of an error on a bid submitted to a government entity? Yes_____ No_____

For each “Yes” answer above, provide an explanation of the issues.

Integrity – Contract Award

Within the past three (3) years has the Business Entity or any Affiliate been suspended, cancelled, or terminated for cause on any government contract? Yes_____ No_____

Been subject to an administrative proceeding or civil action seeking specific performance or restitution in connection with any government contract? Yes_____ No_____

For each “yes” answer, provide an explanation. (Attach explanation on a separate sheet of paper).

Certifications/Licenses

Within the past three (3) years, has the Business Entity or Affiliate had a revocation, suspension, or disbarment of any business or professional permit and/or license? Yes_____ No_____

If “yes” provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, relevant dates, the government entity involved, and any remedial or corrective action(s) taken and the current status of the issues.

Legal Proceedings

Within the past three (3) years, has the Business Entity of any Affiliate:

Been the subject of an investigation, whether open or closed, by any government entity for a civil or criminal violation? Yes_____ No_____

Been the subject of an indictment, grant of immunity, judgment or conviction, (including entering into a plea bargain for conduct constituting a crime)? Yes_____ No_____

Received any OSHA citation and Notification of Penalty containing a violation classified as serious or willful? Yes_____ No_____

Had a government entity find a willful prevailing wage or supplemental payment violation? Yes_____ No_____

Been involved in litigation as either a plaintiff or a defendant involving a copyright or patent infringement violation or an anti-trust violation? Yes_____ No_____

Other than previously disclosed, for the past three (3) years:

(i) Been subject to the imposition of a fine or penalty in excess of \$1000 imposed by any government as a result of the issuance of citation, summons or notice of violation, or pursuant to any administrative, regulatory, or judicial determination? Yes_____ No_____

(ii) Been charged or convicted of a criminal offense pursuant to any administrative and/or regulatory action taken by any government entity? Yes_____ No_____

If “yes” provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, relevant dates, the government entity involved, and any remedial or corrective action(s) taken and the current status of the issues.

Leadership Integrity

If the Business Entity is a joint Venture Entity, answer “N/A – Not Applicable” to questions below:

Within the past three (3) years has any individual previously identified, or any other Business Entity Leader not previously identified, or any individual having the authority to sign, execute, or approve bids, proposals, contracts or supporting documentation with the City of Phoenix been subject to:

A sanction imposed relative to any business or professional permit and/or license? Yes_____ No_____

An investigation, whether open or closed, by any government entity for a civil or criminal violation for any business related conduct? Yes_____ No_____

DLB/dlb/828671V3



City of Phoenix
AFFIDAVIT OF IDENTITY

Your completion of this form is required by Arizona state law. A.R.S. §§ 1-501 and -50 only if you are a sole proprietor.

I, _____ (print full name exactly as on document), hereby affirm, upon penalty of perjury, that I presented the document marked below to the City of Phoenix, that I am lawfully present in the United States, and that I am the person stated on the document. (select one category only)

[] Arizona driver license issued after 1996. Print first four numbers/letters from license: [][][][]

[] Arizona non-operating identification license. Print first four numbers/letters: [][][][]

[] Birth certificate or delayed birth certificate issued in any state, territory or possession of the U.S. Year of birth: _____; Place of birth: _____

[] United States Certificate of Birth Abroad. Year of birth: _____; Place of birth: _____

[] United States Passport. Print first four numbers/letters on Passport: [][][][]

[] Foreign Passport with United States Visa. Print first four numbers/letters on Passport: [][][][] Print first four numbers/letters on Visa: [][][][]

[] I-94 Form with a photograph. Print first four numbers on I-94: [][][][]

[] USCIS Employment Authorization Document (EAD). Print first four numbers/letters on EAD: [][][][] or Perm. Resident Card (acceptable alternative): [][][][]

[] Refugee Travel Document. Date of issuance: _____; Refugee country: _____

[] U.S. Certificate of Naturalization. Print first four digits of CIS Reg. No.: [][][][]

[] U.S. Certificate of Citizenship. Date of issuance: _____; Place of issuance: _____

[] Tribal Certificate of Indian Blood. Date of issuance: _____; Name of tribe: _____

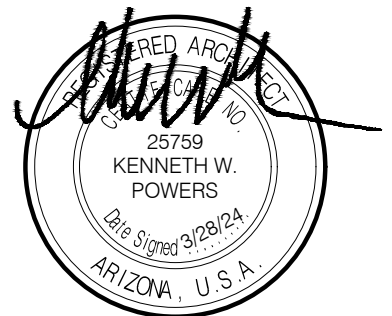
[] Tribal or Bureau of Indian Affairs Affidavit of Birth. Year of birth: _____; Place of birth: _____

Signed: _____ Dated: _____

PROJECT MANUAL TECHNICAL SPECIFICATIONS



City of Phoenix
Fire Station No. 74
1910 W. Chandler Blvd.
Phoenix, Arizona 85045



EXPIRES: 12-31-2024

Permit Review Submittal Set

ARCHITECT'S PROJECT NO. 323009
December 14, 2023

Perlman
Architects of Arizona
Perlman Architects
2929 N Central Ave
Suite 1600
Phoenix, Arizona 85016
480.951.5900

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GEOTECHNICAL DATA

PART 1 GENERAL

1.01 GEOTECHNICAL REPORT

- A. Soil Report (Geotechnical Investigation) provided by the Owner for design of this Project was prepared by Speedie and Associates, Inc. dated 7 June 2023.
- B. A copy of this report can be provided upon request by the Architect and shall be referred to for a complete description of the conditions at the site.

1.02 CONTRACTOR'S USE OF GEOTECHNICAL DATA

- A. This report was obtained only for the Owner's use in foundation and site hardscape design and is not a part of the Contract Documents. The report and log of borings is available for the Contractor's information but are not a warranty of the subsurface conditions. The Contractor may use the report at their own risk.
- B. The Contractor shall review the applicable portions of Geotechnical Investigation and the technical sections of this Project Manual. The Architect shall be notified of any discrepancies immediately. In the event of a conflict between the applicable portions of the Geotechnical Investigation and the technical sections, the stricter requirement shall govern.
- C. The Contractor shall visit the site and acquaint themselves with site conditions. Prior to bidding, the Contractor may make their own subsurface investigation to satisfy themselves with site and subsurface conditions.
- D. Make no deviations from the recommendations of the Geotechnical Investigation and the requirements of the Contract Documents without specific and written approval of the Owner or Architect.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

**REPORT ON
GEOTECHNICAL INVESTIGATION**

DESIGNATION: Phoenix Fire Station No. 74

LOCATION: NWC 19th Avenue & Chandler Boulevard
Phoenix, Arizona

CLIENT: Dibble

PROJECT NO: 230668SA

DATE: June 7, 2023

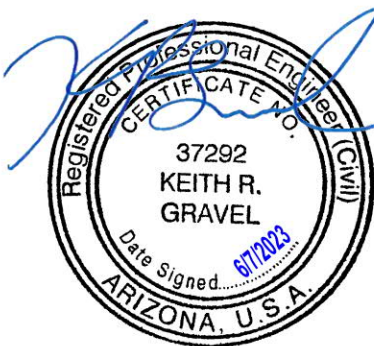


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1.0 INTRODUCTION

This report presents the results of a subsoil investigation carried out at the site of the proposed *Phoenix Fire Station No. 74* development to be located at the northwest corner of 19th Avenue & Chandler Boulevard in Phoenix, Arizona.

We understand that construction will consist of a fire station on 5 acres of undeveloped desert land. The building will be one to two stories with slab on grade and masonry or steel frame construction. Structural loads are expected to be light to moderate and no special considerations regarding settlement tolerances are known at this time. Adjacent areas will be landscaped or paved to support moderate passenger and truck traffic. Landscaped areas will be utilized for storm water retention and disposal. **We are not aware of any proposed underground stormwater retention tanks. If any are planned, we should be notified so that we may revise our recommendations accordingly.**

2.0 GENERAL SITE AND SOIL CONDITIONS

2.1 Site Conditions

The area of the proposed construction is bounded on the north and west by contiguous native desert, on the south by Chandler Boulevard, and on the east by 19th Avenue. The site currently consists of the *Bursera Trailhead* parking area and a partial wash along the southern boundary. Vegetation consisting of trace amounts of trees, moderate amount of brush, and a sparse amount of weeds were present on site. The site was previously undeveloped native desert land. The dirt parking area for the trailhead was developed in 2014. The site remained relatively unchanged since then. Refer to the following historical aerial photos for more details:

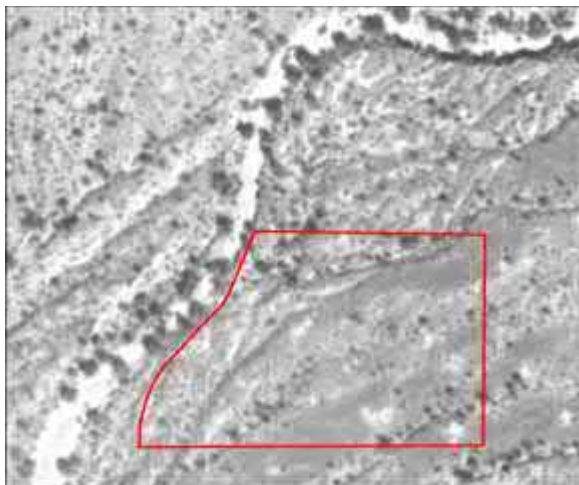


Figure 2.1.1 - Dated 1949



Figure 2.1.2 – Dated 2003



Figure 2.1.3 - Dated 2014



Figure 2.1.4 – Dated 2021

“Historical Aerial Photography,” *ArcGIS Web Application*. [Online]. Available: <https://gis.maricopa.gov> [Accessed: 31-May-2023].

2.2 Geologic Conditions

The site is located outside of known areas that have undergone considerable subsidence due to groundwater removal. Areas of subsidence are known under certain conditions to produce ground surface earth fissuring. However, subsidence is a basin-wide phenomenon that typically results in gradual differential elevation changes over long distances, and which would not affect the type of buildings proposed for this site. No evidence of earth fissures was observed on the site. Fissure gullies are typically localized and form over subsurface irregularities such as buried bedrock ridges, causing tensional stresses in the overlying sediments. Where such anomalies are not present, subsidence tends to be uniform over a wide area, thus having minimal effects on surficial structures. The closest documented active earth fissures are located at Sierra Estrella Mountain, approximately 12 miles southwest of the site. Based on local experience, subsidence and earth fissures historically have not been a problem in the vicinity of the subject site.

2.3 Seismic Design Parameters

The project area is in a seismic zone that is considered to have low historical seismicity. The seismicity of the Phoenix area has had only three magnitude 3.0 events in over 100 years. Liquefaction is not considered a concern as groundwater exceeds 50 feet below ground surface.

Although borings were not advanced to 100 feet, the average SPT values in the upper soils are well above 50 blows per foot and shallow auger refusal on very dense cobbles. Based on the nature of the subsoils encountered in the borings and geology in the area, it is our professional opinion that Site Class Definition, Class C may be used for design of the structures. In addition, the following seismic parameters may be used for design (based on ASCE 7-16 (IBC 2018), utilizing the ATC Hazards by Location Tool).

Table 2.3.1 Seismic Parameters

MCE ¹ spectral response acceleration for 0.2 second period, S _S :	0.168g
MCE ¹ spectral response acceleration for 1.0 second period, S ₁ :	0.065g
Site coefficient, F _a :	1.3
Site coefficient, F _v :	1.5
MCE ¹ spectral response acceleration adjusted for site class, S _{MS} :	0.218g
MCE ¹ spectral response acceleration adjusted for site class, S _{M1} :	0.097g
5% Damped spectral response acceleration, S _{DS} :	0.146g
5% Damped spectral response acceleration, S _{D1} :	0.065g
NOTE 1: MCE = maximum considered earthquake	

2.4 General Subsurface Conditions

Potential fill was noted at borings B-3 and SG-3 consisting of silty/clayey sand up to a depth of 1 foot. Discerning a contact point between fill and native soils is difficult to do within a small-diameter bore hole. Subsoil conditions at the site generally consist of layers of silty/clayey sand, clayey gravel, silty/clayey gravel, silty gravel, well- and poorly graded gravel with interbedded layers of silty sand and poorly graded sand to the termination depths of 11.5 to 20.9 feet. In addition, subordinate amounts of gravel and cobbles were noted in the soil profile. The standard penetration resistance test (SPT) values range from 27 to 50+ blows per foot (bpf). **Auger refusal on cobbles was encountered at boring B-1.** No groundwater was encountered during this investigation. Based on visual and tactile observation, the soils were in a ‘dry’ to ‘dry to moist’ state at the time of investigation.

Laboratory testing indicates in-situ dry densities of the upper soils ranged from 102.5 to 130.4 pcf with water contents of 2.0 to 3.2 percent at the time of investigation. Liquid limits range from 22 to 25 percent with plasticity indices ranging from 4 to 11 percent. The upper clayey soils exhibit a volume increase (**swell**) due to wetting of **less than 1 percent** when compacted to moisture and density levels normally expected during construction. ‘Undisturbed’ samples displayed moderate (2.3 to 2.9%) compression under incremental loading to a maximum confining load of 3,200 psf and minor to moderate (1.7 to 5.7%) additional compression due to inundation (**hydro-collapse**).

3.0 ANALYSIS AND RECOMMENDATIONS

3.1 Analysis

Analysis of the field and laboratory data indicates that subsoils at the site are generally favorable for the support of the proposed structures on shallow foundations and slab-on-grade subject to remedial earthworks. Grading plans were not provided, however it is assumed that the overall site grade will remain essentially the same (± 2 feet).

Field and laboratory testing indicates that the fine-grained upper soils are of variable relative density and susceptible to additional compression, potentially significant and rapid, due to inundation (**hydro-collapse**). Some of this moisture sensitivity may be the result of disturbed soil samples due to the very dense relative density. In addition, removal of the existing site features (vegetation and minor washes) will result in disturbance of the upper soils. This could cause excessive differential settlement resulting in cracking problems. Accordingly, recommendations are made to over-excavate and re-compact the bearing soils to increase density and reduce the potential for collapse. The over-excavated and re-compacted soil will mitigate, but not eliminate the potential for additional settlement if the deeper soils become wet. This will also ensure a uniform bearing condition for the new foundations. Attention must be paid to provide and maintain proper drainage to limit the potential for water infiltration of deeper soils.

An alternative to over-excavation and re-compaction is to deepen footings beyond the disturbed zone or through any fill to bear in the very dense soils less likely to be inundated with moisture. Deeper footings will also provide a higher allowable bearing capacity. This could be accomplished by extending the stem walls as necessary to allow footings to bear directly into the very dense native soil, or by over-excavating the planned footing width to expose the underlying dense native soil, and backfilling the excavation with structural concrete or a lean concrete slurry mix (500 psi) to the design footing bottom elevation. Verification of suitable bearing conditions will be required if this option is selected. Footings will need to bear in the dense to very dense native soils.

Excavation operations will be difficult due to the very dense cobble laden soils and will likely require the use of heavier equipment. . **Heavy duty equipment and/or rock removal will be required for deeper excavations.** The fact that an 8-inch diameter boring using carbide teeth was able to penetrate to a certain depth does not mean that the soils may be excavatable with standard equipment. Excavating contractors must determine means and methods. Groundwater is **not** expected to be a factor in the design or construction of shallow foundations and underground utilities.

For standard foundations to perform as expected, attention must be paid to provide proper drainage to limit the potential for water infiltration of deeper soils. It is assumed that the landscape plan will use mostly low water use or "green" desert type plants (xeriscape). It is preferred to keep irrigated plants at least 5 feet away from structures with irrigation schedules set and maintained to run intermittently. **Unpaved planter areas should be sloped at least 5 percent for a distance of at least 10 feet away from the building.** While this is the ideal condition, we recognize that this is not always possible to meet ADA slope requirements for the adjacent sidewalks. The slope may be reduced to 2 percent provide extra care is taken to ensure sidewalks and other hardscape features do not create a "dam" that prevents positive drainage away from the buildings that creates a "pond" adjacent to the building. Sidewalks should not be placed (or planters graded) that could create a "pond" adjacent to the building. Roof drainage should also be directed away from the building in paved scuppers. Pre-cast loose splash blocks should not be used as they can be dislodged and/or eroded. Roof drains should not be allowed to discharge into planters adjacent to the structure. It is preferred that they be directed to discharge to pavement (per photo example), retention basins or discharge points located at least 10 feet away from the building.



It is reiterated that shallow spread footings may be used for the exterior walls and other light interior columns since this is the most economical system available. However, this shallow system relies on the dry strength of the unsaturated native soils. A limited depth of re-compaction is recommended to increase density of the near surface soils that are more likely to encounter seasonal moisture changes, or deeper foundations. **The deeper native soils are moisture sensitive and could experience differential settlement if subjected to significant surface water infiltration.** Recognizing the need to minimize significant water penetration adjacent to the building perimeter that could detrimentally impact the building foundation, the following additional recommendations are made to protect foundations:

1. Take extra precaution to backfill and compact native soil fill to 95 percent in all exterior wall locations.
2. Avoid utility trenches passing through retention basins leading to the building. If unavoidable, backfill the trench with MAG Section 728 ½-sack CLSM to cut off preferred drainage paths.
3. Avoid placing retention basins next to building foundations. **A distance of at least 10 feet should be maintained between structures and the location of any retention basin maximum fill level and 15 feet from any UST.**
4. Create and maintain positive drainage away from the exterior wall for a minimum of 10 feet.
5. Avoid sidewalks, curbs or other elements that create a dam that could cause water to pond within 5 feet of the perimeter wall.
6. Include no irrigated landscape materials in the first 3 feet next to the building.
7. Between 3 feet and 5 feet, include only landscape materials that can be irrigated with a maximum of 1 gallon per hour emitter heads. Set and maintain irrigation controllers to prevent 24/7 flows.

8. Any landscape materials requiring greater than 1 gallon per hour irrigation, including turf, shall be at least 5 feet from the outside face of the building.
9. All irrigation feeder lines, other than those that supply individual emitters, shall not be placed closer than 5 feet to the building.

For exterior slabs-on-grade, frequent jointing is recommended to control cracking and reduce tripping hazards should differential movement occur. It is also recommended to pin the landing slab to the building floor/stem wall. This will reduce the potential for the exterior slab lifting and blocking the operation of out-swinging doors. Pinning typically consists of 24-inch-long No. 4 reinforcing steel dowels placed at 12-inch centers.

3.2 Site Preparation

The entire area to be occupied by the proposed construction should be stripped of all vegetation, debris, rubble, undocumented fills, and obviously loose surface soils. Tree removal should include the major root ball and any associated disturbed soils. Due to the disturbance of the surface soils, at least the upper 12 inches of native soils should be re-compacted prior to placing fills within the building footprint. **Depending on the type of equipment used, partial over-excavation may be required to attain the required moisture conditioning and compaction.**

As the **primary** recommendation, subsoils should be further over-excavated at least 2 feet below proposed footing bottom elevation **or existing grade, whichever is deeper**, extending at least 5 feet beyond the footing edges within all footing areas. The entire building pad does not require deep over-excavation if footing lines can be accurately located during grading operations. It may be more feasible to over-excavate the entire building pad if the building footprint is relatively small. A representative of the Geotechnical Engineer should examine the subgrade once sub-excavation is complete and prior to backfilling to ensure removal of deleterious materials. Fill placement and quality should be as defined in the "Fill and Backfill" section of this report.

As an **alternative** recommendation, footings may be deepened to bear on very dense native soils at a minimum depth of 2.5 feet below existing grades. Inadvertent footing over-excavation should be backfilled either with structural concrete or a lean slurry mix (500 psi) and not engineered fill. Footings can be deepened to encounter very dense native by over-excavating the planned footing width and backfilling with 2-sack Controlled Low Strength Material (CLSM). Footing subgrade must be clean, dry and free of loose and deleterious material. A representative of the Geotechnical Engineer should examine the footing subgrade to confirm that all footing excavations have been properly cleaned and expose suitable bearing stratum (either engineered fill or very dense undisturbed native soil, but not both).

Prior to placing structural fill, the exposed grade should be scarified to a depth of 8 inches, moisture conditioned to optimum (± 2 percent) and compacted to at least 95 percent of maximum dry density as determined by ASTM D-698. Pavement areas should be scarified, moisture-conditioned and compacted in a similar manner.

The silty fine sand soils may be sensitive to excessive moisture content and will become unstable at elevated moisture content. Accordingly, it may be necessary to compact soils on the dry side of optimum, especially in asphalt pavement areas. The reduced moisture content under slabs-on-grade should only be used upon approval of the engineer in the field.

3.3 Foundation Design

If site preparation is carried out as set forth herein, the following bearing capacities can be utilized for design.

Table 3.3.1 Foundation Bearing Capacities

Structure	Foundation Type	Foundation Depth ⁽¹⁾	Bearing Medium	Bearing Capacity	Comments
Minor Structures	Spread	1.5 ft.	Compacted Subgrade	1,500 psf	2
Main Structure	Spread	2.0 ft.	Min. 2 feet Engineered Fill	2,500 psf	3
		2.5 ft.	Very Dense Native	3,500 psf	4

Comments:

- Foundation Depth refers to minimum depth below lowest finished exterior grade within 5 feet of the structure.
- Minor structures such as screen walls, planter walls, etc. the bottom of footing excavation should be scarified to a depth of 8 inches, moisture-conditioned to optimum (± 2 percent) and compacted to at least 95 percent of maximum dry density as determined by ASTM D-698.
- Shallow spread footings bearing on *minimum* of 2 feet of engineered fill plus 8 inches pre-compacted subgrade extending at least 5 feet beyond the footing edges. Refer to the Figure 3.3.1 for details.
- Shallow Spread footings bearing a minimum of 2.5 feet below **existing grades** on dense to very dense undisturbed native soils. Refer to Figure 3.3.2 for details. Inadvertent over-excavation of footing depth should not be backfilled with soil, but the footing should either be deepened or backfilled with a 2-sack CLSM.

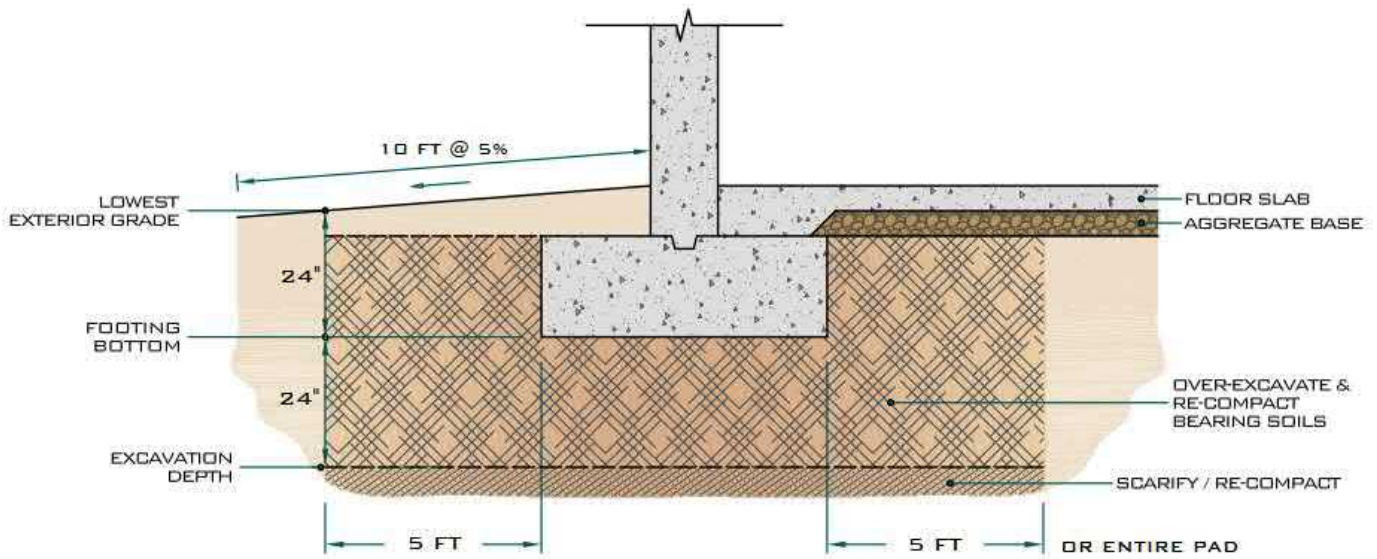


Figure 3.3.1 Foundation Detail – Bearing on Engineered Fill

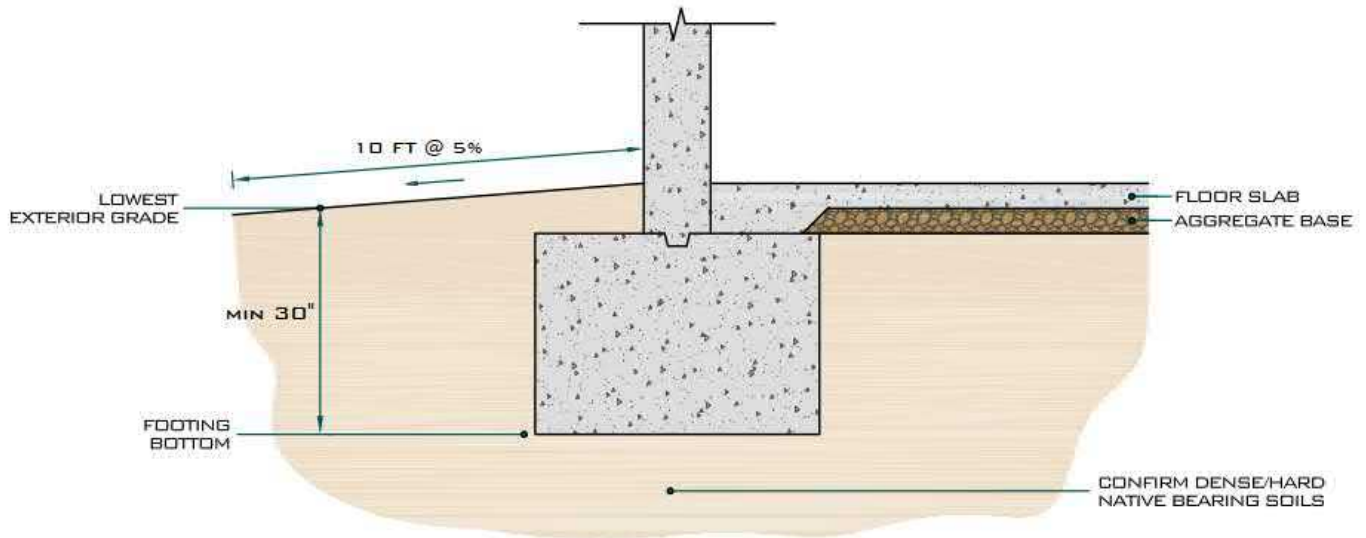


Figure 3.3.2 Foundation Detail – Deepened Footing

These bearing capacities refer to the total of all loads, dead and live, and are net pressures. They may be increased one-third for wind, seismic or other loads of short duration. These values may be increased by one-third as the allowable toe pressure for retaining walls. All footing excavations should be level and cleaned of all loose or disturbed materials. **Positive drainage away from the proposed buildings must always be maintained.**

Continuous masonry wall footings and isolated rectangular footings should be designed with minimum widths of 16 and 24 inches respectively, regardless of the resultant bearing pressure. Lightly loaded interior partitions (less than 800 plf) may be supported on reinforced thickened slab sections (minimum 12 inches of bearing width).

Estimated settlements under design loads are on the order of ½ to 1-inch, virtually all of which will occur during construction. Post-construction differential settlements will be on the order of one-half the total settlement, under existing and compacted moisture contents. Additional localized settlements of the same magnitude could occur if native supporting soils were to experience a significant increase in moisture content. **Positive drainage away from structures and controlled routing of roof runoff must be provided and maintained to prevent ponding adjacent to perimeter walls.** Planters requiring heavy watering should **not** be placed adjacent to or within 5 feet of the building. Care should be taken in design and construction to ensure that domestic and interior storm drain water is contained to prevent seepage. Roof drainage should be directed to paved areas or storm drains. They should not discharge into planters adjacent to the structures.

Continuous footings and stem walls should be reinforced to distribute stresses arising from small differential movements, and long walls should be provided with control joints to accommodate these movements. **Reinforcement** and/or frequent control joints are recommended to allow slight movement and prevent minor floor slab cracking **especially in floor areas to be covered with rigid tile.**

3.4 Lateral Pressures

The following lateral pressure values may be utilized for the proposed construction:

Active Pressures

Unrestrained Walls	35 pcf
Restrained Walls	60 pcf

Passive Pressures

Continuous Footings	300 pcf
Spread Footings and Drilled Shafts	350 pcf
Coefficient of Friction (w/ passive pressure)	0.35
Coefficient of Friction (w/out passive pressure)	0.45

All backfill must be compacted to not less than 95 percent (ASTM D-698) to mobilize these passive values at low strain. Expansive soils should not be used as retaining wall backfill, except as a surface seal to limit infiltration of storm/irrigation water. The expansive pressures could greatly increase active pressures.

3.5 Fill and Backfill

Native soils are considered suitable for use in general grading and engineered structural fill provided that any oversized material (>3 inches) is screened out. The silty fine sand soils may be sensitive to excessive moisture content and will become unstable at elevated moisture content. Accordingly, it may be necessary to compact soils on the dry side of optimum, especially in asphalt pavement areas. The reduced moisture content under slabs-on-grade should only be used upon approval of the engineer in the field.

If imported common fill for use in site grading is required, it should be examined by a Soils Engineer to ensure that it is of low swell potential and free of organic or otherwise deleterious material. In general, the fill should have 100 percent passing the 3-inch sieve and no more than 50 percent passing the #200 sieve. For the fine fraction (passing the 40 sieve), the liquid limit and plasticity index should not exceed 30 percent and 10 percent, respectively. It should exhibit less than 1.5 percent swell potential when compacted to 95 percent of maximum dry density (ASTM D-698) at a moisture content of 2 percent below optimum, confined under a 100 psf surcharge, and inundated.

Fill should be placed on subgrade which has been properly prepared and approved by a Soils Engineer. Fill must be wetted and thoroughly mixed to achieve optimum moisture content, ± 2 percent. Fill should be placed in horizontal lifts of 8-inch thickness (or as dictated by compaction equipment) and compacted to the percent of maximum dry density per ASTM D-698 set forth as follows:

A.	Building Areas	
	1. Below footing level	95 or slurry
	2. Below slabs-on-grade	95
B.	Pavement Subgrade or Fill	95
C.	Utility Trench Backfill	95
D.	Aggregate Base Course	
	1. Below floor slabs	95
	2. Below asphalt paving	100
E.	Landscape Areas	90
F.	Below onsite/offsite curb, gutter & sidewalks	95

3.6 Utilities Installation

Trench excavations for shallow utilities can be accomplished by conventional trenching equipment. Excavation into the more cobble laden soils may require heavy equipment. The fact that a boring or test pit was advanced to a certain depth does not mean that the soils may be excavated by normal means. The excavating contractor must make his/her own assessment as to excavatability. Trench walls should stand

near vertical for the short periods of time required to install shallow utilities, although some sloughing may occur in looser and/or sandier soils requiring laying back of side slopes and/or temporary shoring. Adequate precautions must be taken to protect workmen in accordance with all current governmental regulations.

Backfill of trenches above bedding zones may be carried out with native excavated material, provided over-sized materials (>3 inches) are removed. This material should be moisture-conditioned, placed in 8-inch lifts and mechanically compacted. Water settling is not recommended. Compaction requirements are summarized in the "Fill and Backfill" section of this report. The upper native soils do not meet the typical granular bedding and initial backfill requirements of large diameter CMP tanks. It is imperative that these materials need to meet MAG Standard Specification Section 601 or the drainage engineers design and manufacture recommendations.

3.7 Slabs-On-Grade

To facilitate fine grading operations and aid in concrete curing, a 4-inch-thick layer of granular material conforming to the gradation for aggregate base (A.B.) as per M.A.G. Specification Section 702 should be utilized beneath the slab. Dried subgrade soils **must** be re-moistened prior to placing the aggregate base if allowed to dry out, especially if fine-grained soils are used in the top 12-inches of the pad.

The native soils can store a significant amount of moisture, which could increase the natural vapor drive through the slab. Accordingly, if moisture sensitive flooring and/or adhesive are planned, the use of a vapor barrier **directly under the slab** is recommended. Vapor barriers should be a minimum 15-mil thick polyolefin (or equivalent), which meets ASTM E 1745 Class A specifications. Vapor barriers do increase the potential for slab curling and water entrapment under the slab. Accordingly, if a vapor barrier is used, additional precautions such as low slump concrete, frequent jointing and proper curing will be required to reduce curling potential and detailed to prevent the entrapment of outside water sources.

3.8 Asphalt/Concrete Pavement Design

If earthwork in paved areas is carried out to finish subgrade elevation as set forth herein, the subgrade will provide marginal support for pavements. The location designation is for reference only. **The designer/owner should choose the appropriate sections to meet the anticipated traffic volume and life expectancy.** The section capacity is reported as daily ESALs, Equivalent 18-kip Single Axle Loads. Typical heavy trucks impart 1.0 to 2.5 ESALs per truck depending on load. It takes approximately 1,200 passenger cars to impart 1 ESAL.

Table 3.8.1 Pavement Sections

Area of Placement	Flexible (AC Pavement)			Rigid (PCC Pavement)	
	Thickness		Daily 18-kip ESALs	Thickness PCCP	Daily 18-kip ESALs
AC	ABC				
Auto Parking	2.0"	4.0"	5	5.0"	13
Truck Parking, Main Drives, & Fire Lanes	3.0"	4.0"	25	6.0"	32
	3.5"	4.0"	50	7.0"	71
	4.0"	4.0"	131	8.0"	148

Notes:

1. Designs are based on AASHTO design equations and ADOT correlated R-Values.
2. The PCCP thickness is increased to provide better load transfer and reduce potential for joint & edge failures. Design PCCP per ACI 330R-87.
3. Full depth asphalt or increased asphalt thickness can be increased by adding 1.0-inch asphalt for each 3 inches of base course replaced.

Pavement Design Parameters:

Assume: One 18-kip Equivalent Single Axle Load (ESAL)/Truck
Life: 20 years

Subgrade Soil Profile:

% Passing #200 sieve: 17%
Plasticity Index: 8%
k: 200 pci (assumed)
R value: 59 (per ADOT tables)
M_R: 26,000 (maximum per AASHTO design)

These designs assume that all subgrades are prepared in accordance with the recommendations contained in the "Site Preparation" and "Fill and Backfill" sections of this report, and paving operations are carried out in a proper manner. If pavement subgrade preparation is not carried out immediately prior to paving, the entire area should be proof-rolled at that time with a heavy pneumatic-tired roller to identify locally unstable areas for repair.

Pavement base course material should be aggregate base per M.A.G. Section 702 Specifications. Asphalt concrete materials and mix design should conform to M.A.G. 710. It is recommended that a ½ inch or ¾ inch mix designation be used for the pavements. While a ¾ inch mix may have a somewhat rougher texture, it offers more stability and resistance to scuffing, particularly in truck turning areas. Pavement installation should be carried out under applicable portions of M.A.G. Section 321 and municipality standards. The asphalt supplier should be informed of the pavement use and be required to provide a mix that will provide stability and be aesthetically acceptable. Some of the newer M.A.G. mixes are very coarse and could cause placing and finish problems. A mix design should be submitted for review to determine if it will be acceptable for the intended use.

For sidewalks and other areas not subject to vehicular traffic a 4-inch section of concrete will be enough. For trash and dumpster enclosures a thicker section of 6 inches of concrete is recommended.

Portland Cement Concrete Pavement must have a minimum 28-day flexural strength 550 psi (compressive strength of approximately 3,700 psi). **It may be cast directly on the prepared subgrade** with proper compaction as recommended in the report **provided all joints are sealed. The contractor may elect to use a nominal thickness of compacted aggregate subbase to aid in fine grading and concrete placement.** Lacking an aggregate base course, attention must be paid to using low slump concrete and proper curing, especially on the thinner sections. The daily ESAL's capacities calculated are based on plain jointed design; no reinforcing is necessary. Joint design and spacing should be in accordance with ACI recommendations. Construction joints should contain dowels or be tongue-and-grooved to provide load transfer. Tie bars are recommended on the joints adjacent to unsupported edges. Maximum joint spacing in feet should not exceed 2 to 3 times the thickness in inches. Joint sealing with a quality silicone sealer is recommended to prevent water from entering the subgrade allowing pumping and loss of support. **If joints are not sealed, add a 4-inch aggregate subbase** to the pavement to reduce the potential for loss of support where water enters the joints.

Proper subgrade preparation and joint sealing will reduce (but not eliminate) the potential for slab movements (thus cracking) on the expansive native soils. Frequent jointing will reduce uncontrolled cracking and increase the efficiency of aggregate interlock joint transfer.


4.0 GENERAL


The scope of this investigation and report includes only regional published considerations for seismic activity and ground fissures resulting from subsidence due to groundwater withdrawal, not any site-specific studies. The scope does not include any considerations of hazardous releases or toxic contamination of any type.

Our analysis of data and the recommendations presented herein assume that soil conditions do not vary significantly from those found at specific sample locations. Our work has been performed in accordance with generally accepted engineering principles and practice; this warranty is in lieu of all other warranties expressed or implied.

We recommend that a representative of the Geotechnical Engineer observe and test the earthwork and foundation portions of this project to ensure compliance to project specifications and the field applicability of subsurface conditions which are the basis of the recommendations presented in this report. If any significant changes are made in the scope of work or type of construction that was assumed in this report, we must review such revised conditions to confirm our findings if the conclusions and recommendations presented herein are to apply.

Respectfully submitted,
SPEEDIE & ASSOCIATES, LLC


Jack D. Stransky, P.E.




Keith R. Gravel, P.E.



APPENDIX

FIELD AND LABORATORY INVESTIGATION

SOIL BORING LOCATION PLAN

SOIL LEGEND

LOG OF TEST BORINGS

TABULATION OF TEST DATA

CONSOLIDATION TEST

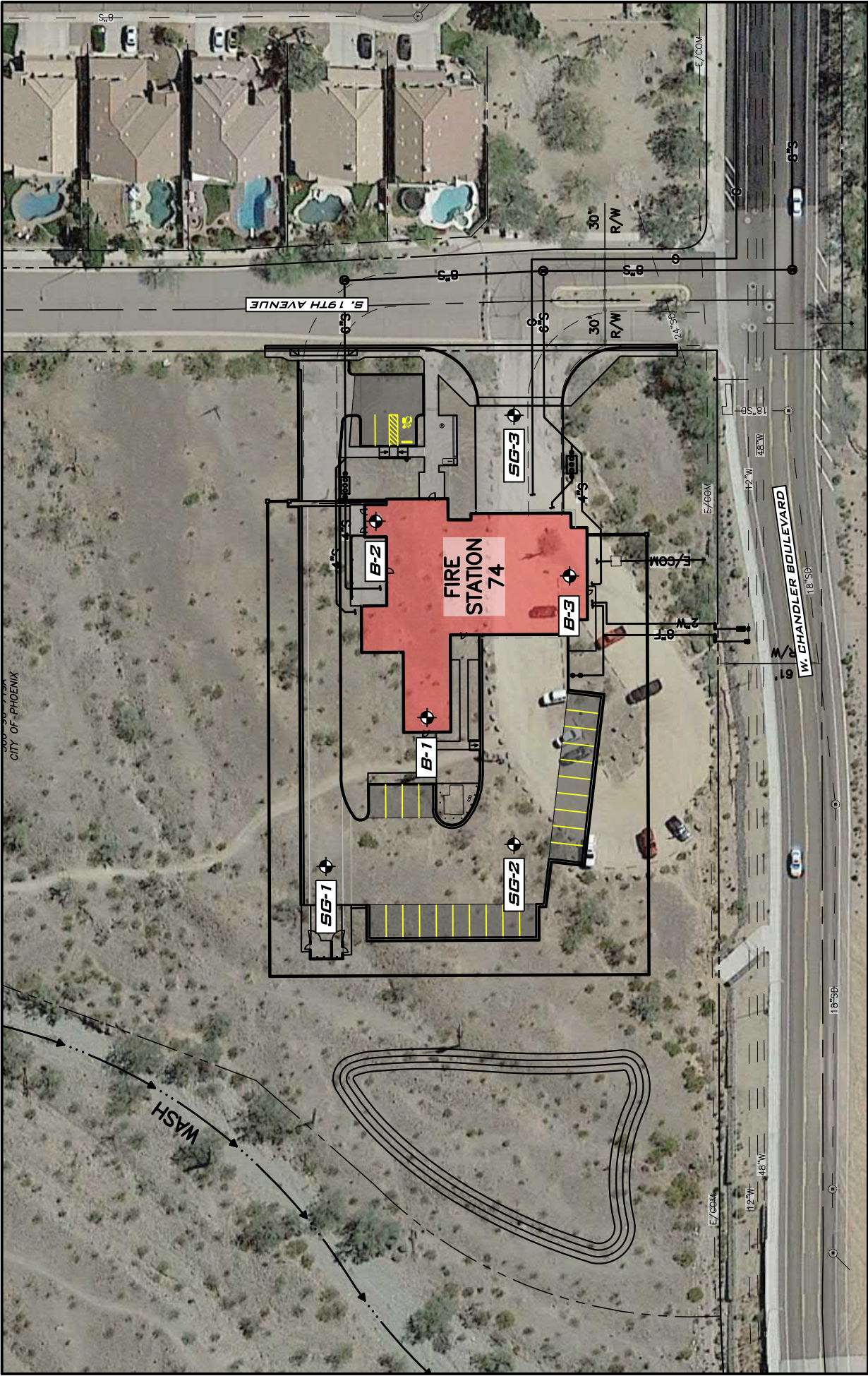
MOISTURE-DENSITY RELATIONS

SWELL TEST DATA

FIELD AND LABORATORY INVESTIGATION

On April 28, 2023, soil test borings were drilled at the approximate locations shown on the attached Soil Boring Location Plan. All exploration work was carried out under the full-time supervision of our field engineer, who recorded subsurface conditions and obtained samples for laboratory testing. The soil borings were advanced with a truck-mounted CME-75 drill rig utilizing 7-inch diameter hollow stem flight augers. Detailed information regarding the borings and samples obtained can be found on an individual Log of Test Boring prepared for each drilling location.

Laboratory testing consisted of moisture content, dry density, grain-size distribution, and plasticity (Atterberg Limits) tests for classification and pavement design parameters. Remolded swell tests were performed on samples compacted to densities and moisture contents expected during construction. Compression tests were performed on a selected ring sample to estimate settlements and determine effects of inundation. All field and laboratory data are presented in this appendix.



◆ - APPROXIMATE SOIL BORING LOCATIONS



SOIL BORING LOGATION PLAN

PHOENIX FIRE STATION NO. 74
 NWC 19TH AVENUE & CHANDLER BOULEVARD
 PHOENIX, ARIZONA

SPEEDIE AND ASSOCIATES
 A UES Company

SHEET: 1 OF 1

DR: NJV

REV: XXX

DATE: 05/24/23

PROJECT NO.: 23066B5A

SOIL LEGEND

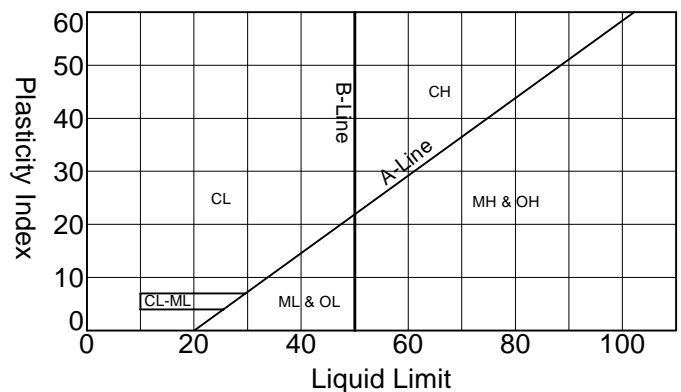
SAMPLE DESIGNATION	DESCRIPTION		
AS	Auger Sample	A grab sample taken directly from auger flights.	
BS	Large Bulk Sample	A grab sample taken from auger spoils or from bucket of backhoe.	
S	Spoon Sample	Standard Penetration Test (ASTM D-1586) Driving a 2.0 inch outside diameter split spoon sampler into undisturbed soil for three successive 6-inch increments by means of a 140 lb. weight free falling through a distance of 30 inches. The cumulative number of blows for the final 12 inches of penetration is the Standard Penetration Resistance.	
RS	Ring Sample	Driving a 3.0 inch outside diameter spoon equipped with a series of 2.42-inch inside diameter, 1-inch long brass rings, into undisturbed soil for one 12-inch increment by the same means of the Spoon Sample. The blows required for the 12 inches of penetration are recorded.	
LS	Liner Sample	Standard Penetration Test driving a 2.0-inch outside diameter split spoon equipped with two 3-inch long, 3/8-inch inside diameter brass liners, separated by a 1-inch long spacer, into undisturbed soil by the same means of the Spoon Sample.	
ST	Shelby Tube	A 3.0-inch outside diameter thin-walled tube continuously pushed into the undisturbed soil by a rapid motion, without impact or twisting (ASTM D-1587).	
--	Continuous Penetration Resistance	Driving a 2.0-inch outside diameter "Bullnose Penetrometer" continuously into undisturbed soil by the same means of the spoon sample. The blows for each successive 12-inch increment are recorded.	

CONSISTENCY			RELATIVE DENSITY	
Clays & Silts	Blows/Foot	Strength (tons/sq ft)	Sands & Gravels	Blows/Foot
Very Soft	0 - 2	0 - 0.25	Very Loose	0 - 4
Soft	2 - 4	0.25 - 0.5	Loose	5 - 10
Firm	5 - 8	0.5 - 1.0	Medium Dense	11 - 30
Stiff	9 - 15	1 - 2	Dense	31 - 50
Very Stiff	16 - 30	2 - 4	Very Dense	> 50
Hard	> 30	> 4		

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS <small>MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE</small>	CLEAN GRAVELS <small>(LITTLE OR NO FINES)</small>		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
	SAND AND SANDY SOILS <small>MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE</small>	CLEAN SANDS <small>(LITTLE OR NO FINES)</small>		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		SM	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES <small>(APPRECIABLE AMOUNT OF FINES)</small>		SC	SILTY SANDS, SAND - SILT MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS <small>LIQUID LIMIT LESS THAN 50</small>		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	SILTS AND CLAYS <small>LIQUID LIMIT GREATER THAN 50</small>		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS	
			CH	INORGANIC CLAYS OF HIGH PLASTICITY	
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

NOTE: DUAL OR MODIFIED SYMBOLS MAY BE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS OR TO PROVIDE A BETTER GRAPHICAL PRESENTATION OF THE SOIL

MATERIAL SIZE	PARTICLE SIZE				
	Lower Limit		Upper Limit		
	mm	Sieve Size ♦	mm	Sieve Size ♦	
SANDS	Fine	0.075	#200	0.42	#40
	Medium	0.420	#40	2.00	#10
	Coarse	2.000	#10	4.75	#4
GRAVELS	Fine	4.75	#4	19	0.75" x
	Coarse	19	0.75" x	75	3" x
COBBLES	75	3" x	300	12" x	
BOULDERS	300	12" x	900	36" x	
♦U.S. Standard		xClear Square Openings			



Depth (feet)	Graphic Log	Rig Type: CME-75		Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
		Boring Type: Hollow Stem Auger						
		Surface Elevation: N/A						
Visual Classification								
0		Gray <u>POORLY GRADED GRAVEL</u> (GP-Dry to Moist) with 1-10% Cobbles						
		Very Dense Light Brown <u>SILTY, CLAYEY SAND</u> with <u>GRAVEL</u> (SC/SM-Dry to Moist)		S-1	2.5	NT	NT	54/12"
5		Very Dense Light Brown <u>WELL-GRADED GRAVEL</u> with <u>SAND</u> and <u>CLAY</u> (GW/GC-Dry to Moist) with 1-10% Cobbles		RS-2	5.9	2.0	130.4	50/5"
		Interbedded Layer of <u>SILTY SAND</u>						
		Very Dense Gray <u>SILTY GRAVEL</u> with <u>SAND</u> (GM-Dry to Moist) with 1-10% Cobbles		S-3	11.3	NT	NT	73/12"
		10-20% Cobbles						
		Auger Refusal on Cobbles						
15								
20								

Boring Date: **4-28-23**
 Field Engineer/Technician: **N Wagner**
 Driller: **O. Mariscal**
 Contractor: **Resilient Drilling**

Water Level		
Depth	Hour	Date
Free Water was Not Encountered		
		∇
		▼

NT = Not Tested

SPEEDIE AND ASSOCIATES

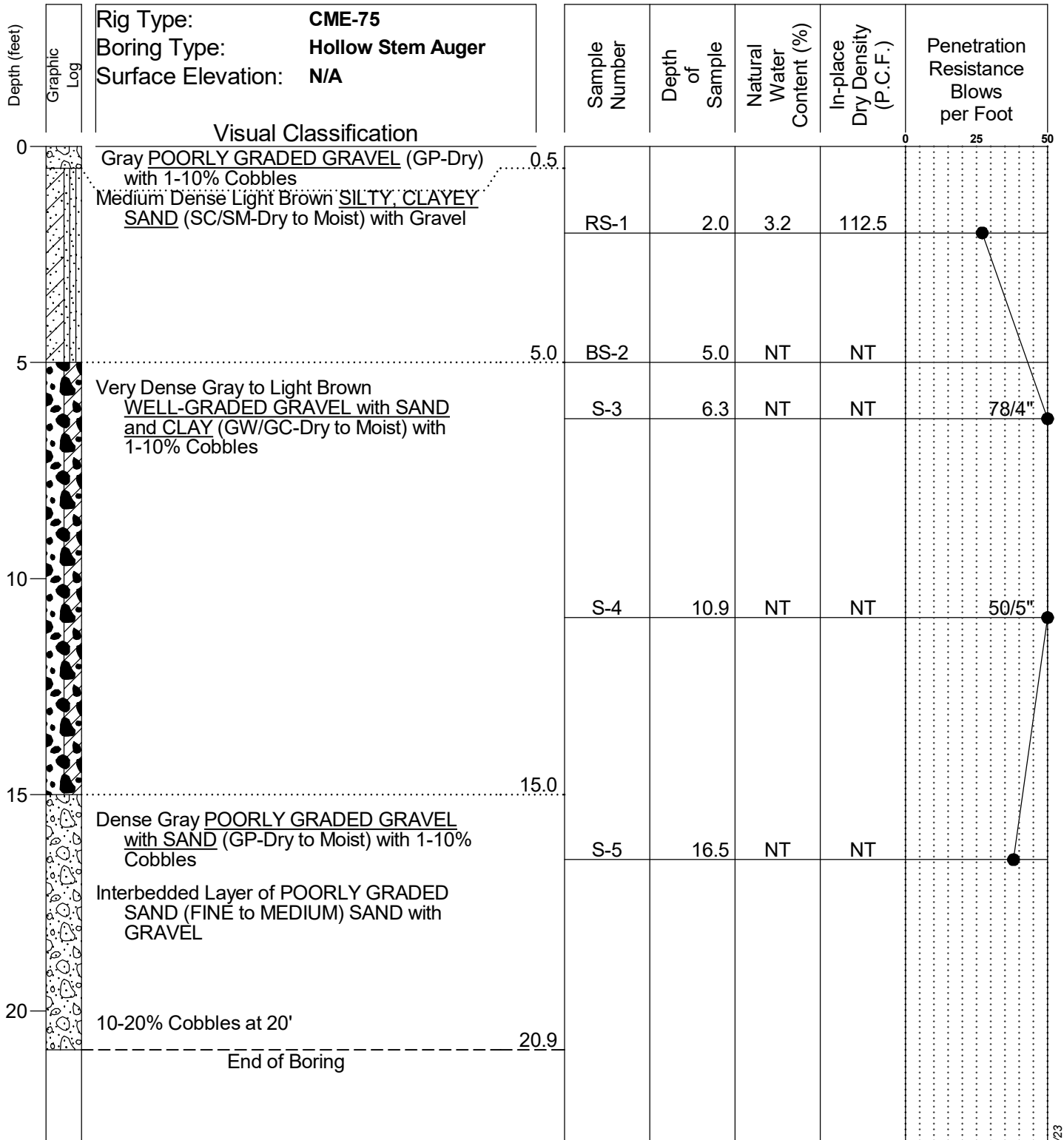
Log of Test Boring Number: **B-1**

Phoenix Fire Station No. 74

NWC 19th Avenue & Chandler Boulevard

Phoenix, Arizona

Project No.: **230668SA**



Boring Date: **4-28-23**
 Field Engineer/Technician: **N Wagner**
 Driller: **O. Mariscal**
 Contractor: **Resilient Drilling**

Water Level		
Depth	Hour	Date
<i>Free Water was Not Encountered</i>		
		∇
		▼

NT = Not Tested

SPEEDIE AND ASSOCIATES

Log of Test Boring Number: **B-2**

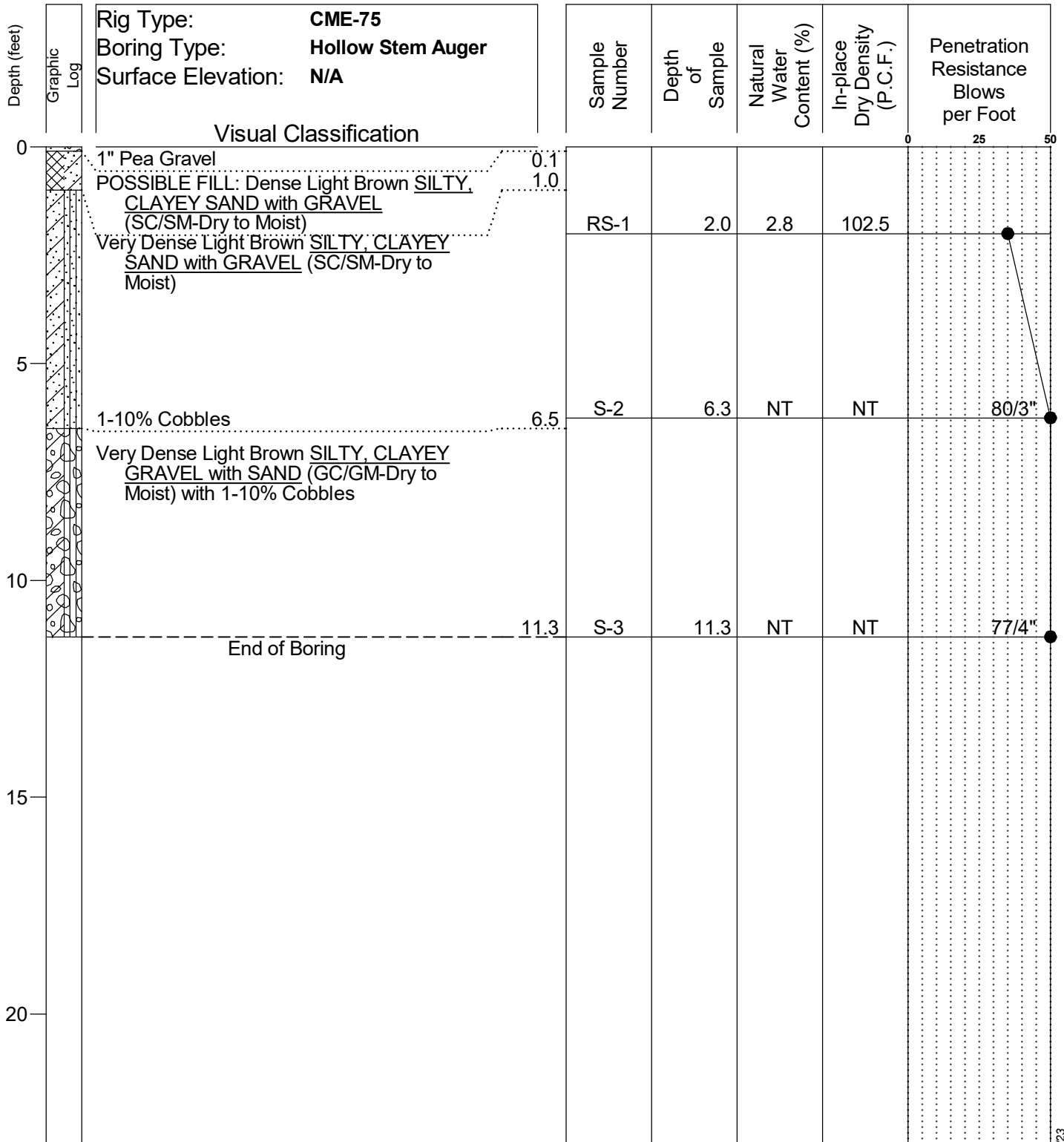
Phoenix Fire Station No. 74

NWC 19th Avenue & Chandler Boulevard

Phoenix, Arizona

Project No.: **230668SA**

SPEEDIE 230668SA.GPJ GEN GEO. GDT 5/31/23



Boring Date: 4-28-23
 Field Engineer/Technician: N Wagner
 Driller: O. Mariscal
 Contractor: Resilient Drilling

Water Level		
Depth	Hour	Date
<i>Free Water was Not Encountered</i>		
		▽ ▼

NT = Not Tested

SPEEDIE AND ASSOCIATES

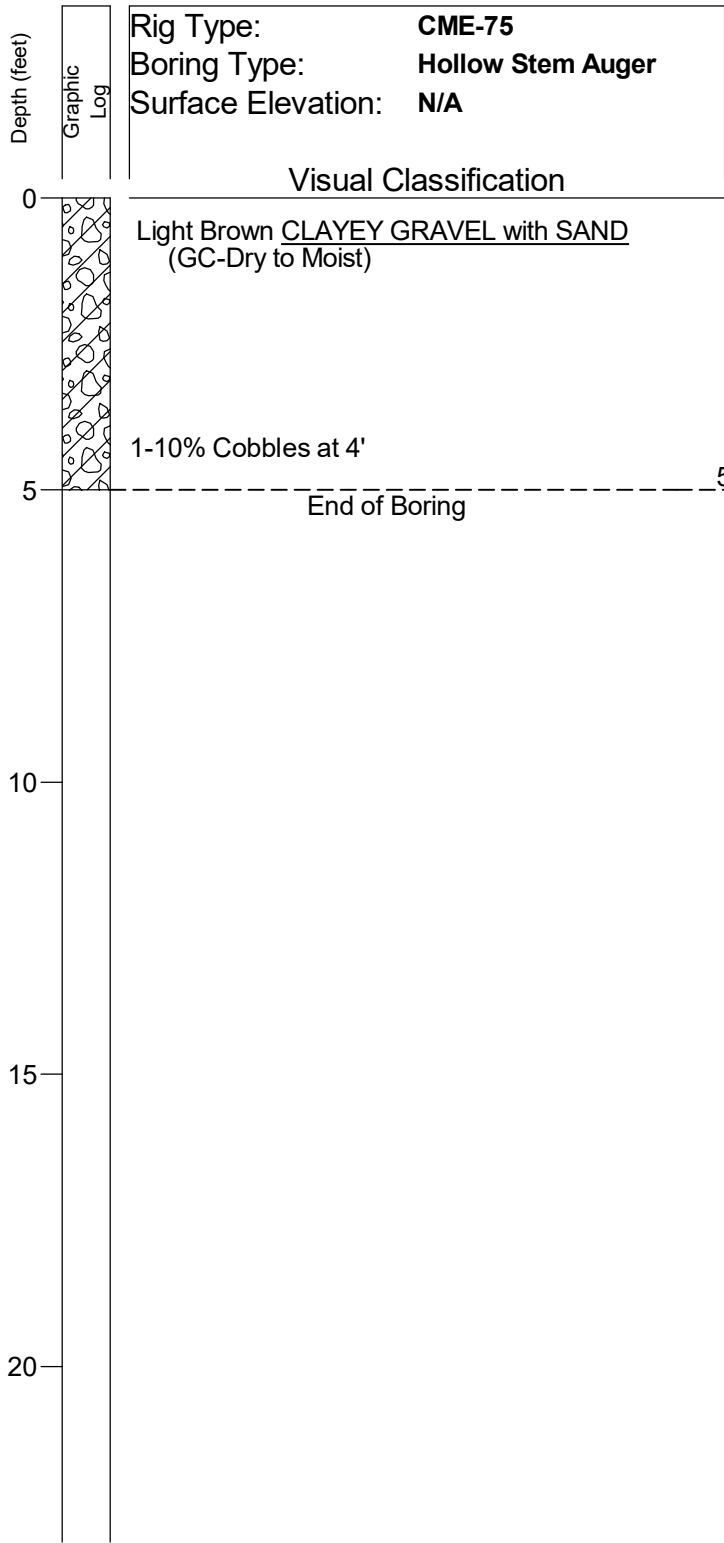
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Phoenix Fire Station No. 74

NWC 19th Avenue & Chandler Boulevard

Phoenix, Arizona

Project No.: 230668SA



Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
AS-1	3.0	NT	NT	

Boring Date: **4-28-23**
 Field Engineer/Technician: **N Wagner**
 Driller: **O. Mariscal**
 Contractor: **Resilient Drilling**

Water Level		
Depth	Hour	Date
<i>Free Water was Not Encountered</i>		

NT = Not Tested

SPEEDIE AND ASSOCIATES

Log of Test Boring Number: **SG- 1**

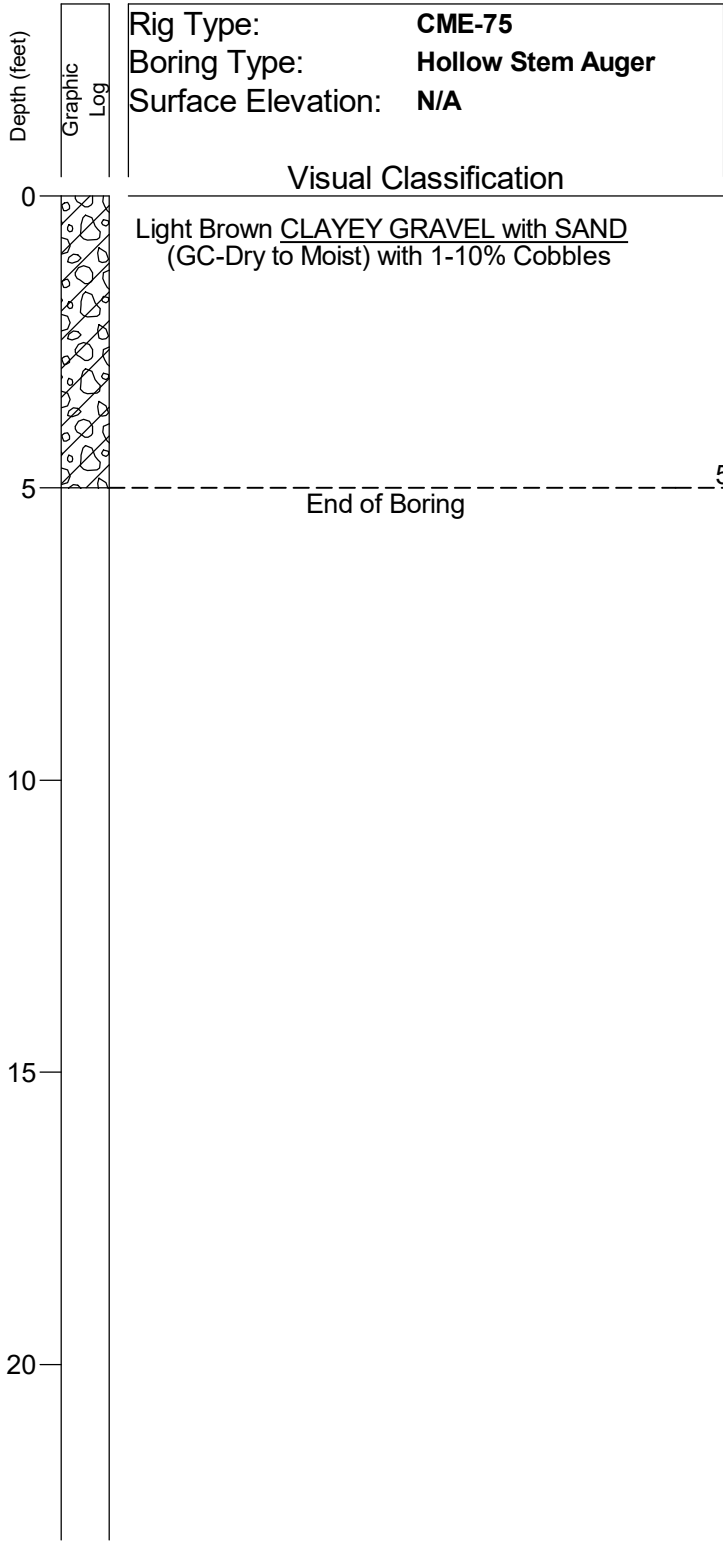
Phoenix Fire Station No. 74

NWC 19th Avenue & Chandler Boulevard

Phoenix, Arizona

Project No.: **230668SA**

SPEEDIE 230668SA.GPJ GEN GEO.GDT 5/31/23



Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
AS-1	3.0	NT	NT	

Boring Date: **4-28-23**
 Field Engineer/Technician: **N Wagner**
 Driller: **O. Mariscal**
 Contractor: **Resilient Drilling**

Water Level		
Depth	Hour	Date
<i>Free Water was Not Encountered</i>		

NT = Not Tested

SPEEDIE AND ASSOCIATES

Log of Test Boring Number: **SG- 2**





Phoenix Fire Station No. 74

NWC 19th Avenue & Chandler Boulevard

Phoenix, Arizona

Project No.: **230668SA**

SPEEDIE 230668SA.GPJ GEN GEO. GDT 5/31/23

Depth (feet)	Graphic Log	Rig Type: CME-75	Sample Number	Depth of Sample	Natural Water Content (%)	In-place Dry Density (P.C.F.)	Penetration Resistance Blows per Foot
		Boring Type: Hollow Stem Auger					
		Surface Elevation: N/A					
		Visual Classification					
0		1" Pea Gravel					0
		POSSIBLE FILL: Light Brown SILTY, CLAYEY SAND (SC/SM-Dry to Moist) with Gravel					25
		Light Brown SILTY, CLAYEY SAND with GRAVEL (SC/SM-Dry to Moist)	AS-1	3.0	NT	NT	50
		Light Brown CLAYEY GRAVEL with SAND (GC-Dry to Moist) with 1-10% Cobbles					
5	----- End of Boring -----						

Boring Date: **4-28-23**
 Field Engineer/Technician: **N Wagner**
 Driller: **O. Mariscal**
 Contractor: **Resilient Drilling**

Water Level		
Depth	Hour	Date
<i>Free Water was Not Encountered</i>		
		∇ ▼

NT = Not Tested

SPEEDIE AND ASSOCIATES	
Log of Test Boring Number:	SG- 3
Phoenix Fire Station No. 74	
NWC 19th Avenue & Chandler Boulevard	
Phoenix, Arizona	
Project No.:	230668SA

TABULATION OF TEST DATA

SOIL BORING or TEST PIT NUMBER	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE INTERVAL (ft)	NATURAL WATER CONTENT (Percent of Dry Weight)	IN-PLACE DRY DENSITY (Pounds Per Cubic Foot)	PARTICLE SIZE DISTRIBUTION (Percent Finer)					ATTERBERG LIMITS			UNIFIED SOIL CLASSIFICATION	SPECIMEN DESCRIPTION
						#200 SIEVE	#40 SIEVE	#10 SIEVE	#4 SIEVE	3" SIEVE	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
B-1	RS-2	RING	5.0 - 5.9	2.0	130.4	11.7	21	39	53	100	26	19	7	GW-GC	WELL-GRADED GRAVEL with SILTY CLAY and SAND
B-2	BS-2	BULK	0.5 - 5.0	NT	NT	19.8	31	49	63	100	22	18	4	SC-SM	SILTY, CLAYEY SAND with GRAVEL
B-2	RS-1	RING	1.0 - 2.0	3.2	112.5	NT	NT	NT	NT	NT	NT	NT	NT		
B-3	RS-1	RING	1.0 - 2.0	2.8	102.5	NT	NT	NT	NT	NT	NT	NT	NT		
SG-1	AS-1	AS	0.0 - 3.0	NT	NT	14.7	24	40	55	100	25	14	11	GC	CLAYEY GRAVEL with SAND

Sieve analysis results do not include material greater than 3". Refer to the actual boring logs for the possibility of cobble and boulder sized materials.

NT=Not Tested
Sheet 1 of 1

Phoenix Fire Station No. 74
NWC 19th Avenue & Chandler Boulevard
Phoenix, Arizona
Project No. 230668SA



CONSOLIDATION TEST

PROJECT: Phoenix Fire Station No. 74

PROJECT NO.: 230668SA

LOCATION: NWC 19th Avenue & Chandler Boulevard

DATE: 5/21/23

BORING NO.: B-1

SAMPLE NO.: RS-2

SAMPLE DEPTH: 5 to 5.9

LABORATORY NO.:

LIQUID LIMIT: 26

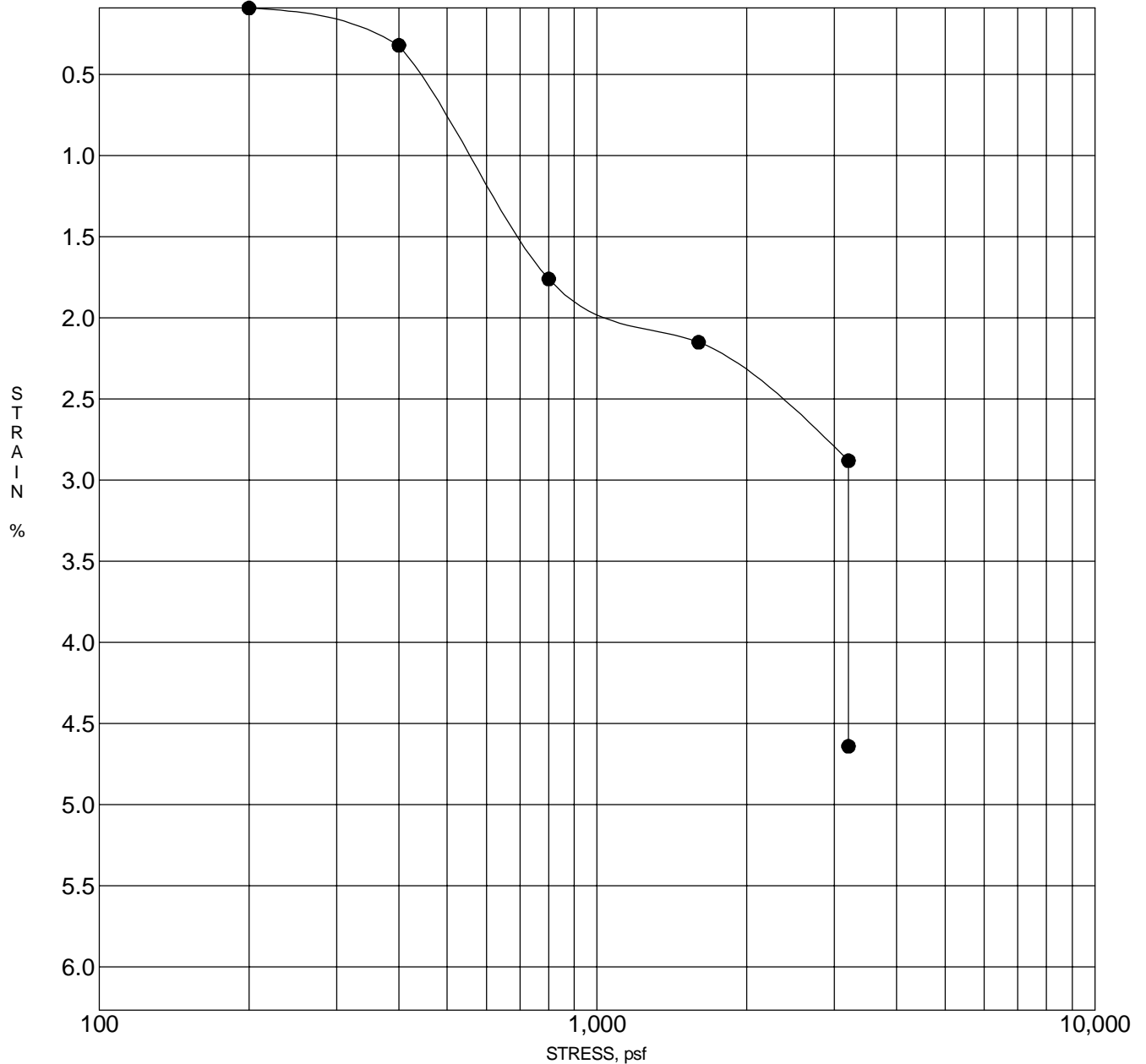
PLASTIC LIMIT: 19

PLASTICITY INDEX: 7

CLASSIFICATION: GW-GC

ASTM SOIL DESCRIPTION:

WELL-GRADED GRAVEL with SILTY CLAY and SAND



Sample inundated at end of test at 3200 psf

**SPEEDIE
AND ASSOCIATES**

CONSOLIDATION TEST

PROJECT: Phoenix Fire Station No. 74

PROJECT NO.: 230668SA

LOCATION: NWC 19th Avenue & Chandler Boulevard

DATE: 5/21/23

BORING NO.: B-2

SAMPLE NO.: RS-1

SAMPLE DEPTH: 1 to 2

LABORATORY NO.:

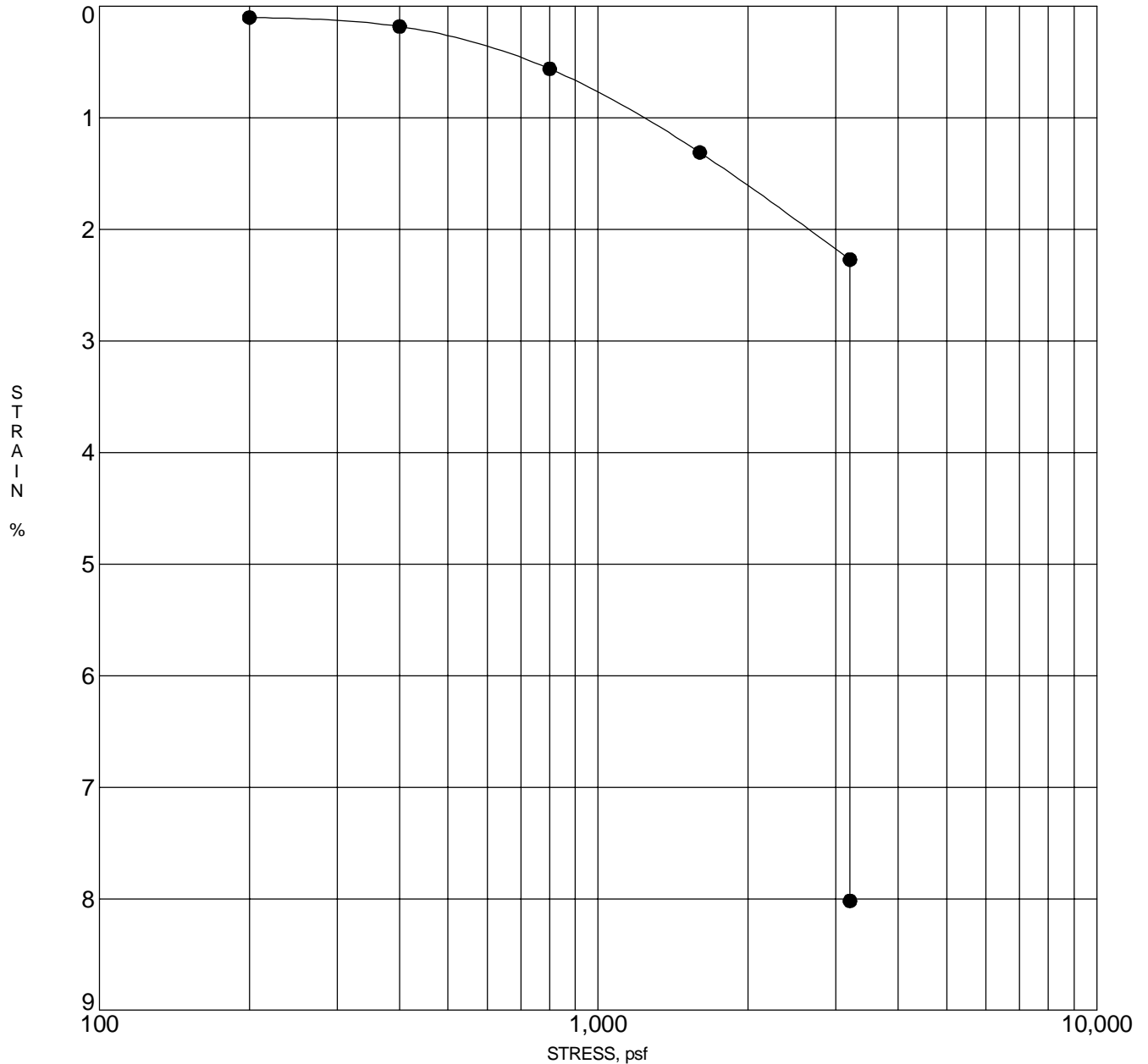
LIQUID LIMIT:

PLASTIC LIMIT:

PLASTICITY INDEX:

CLASSIFICATION:

ASTM SOIL DESCRIPTION:



Sample inundated at end of test at 3200 psf

**SPEEDIE
AND ASSOCIATES**

MOISTURE-DENSITY RELATIONS

PROJECT: Phoenix Fire Station No. 74

PROJECT NO.: 230668SA

LOCATION: NWC 19th Avenue & Chandler Boulevard

DATE: 5/21/23

BORING NO.: B-2

SAMPLE NO.: BS-2

SAMPLE DEPTH: 0.5 to 5

LABORATORY NO.:

METHOD OF COMPACTION: D698A

LIQUID LIMIT: 22

PLASTIC LIMIT: 18

PLASTICITY INDEX: 4

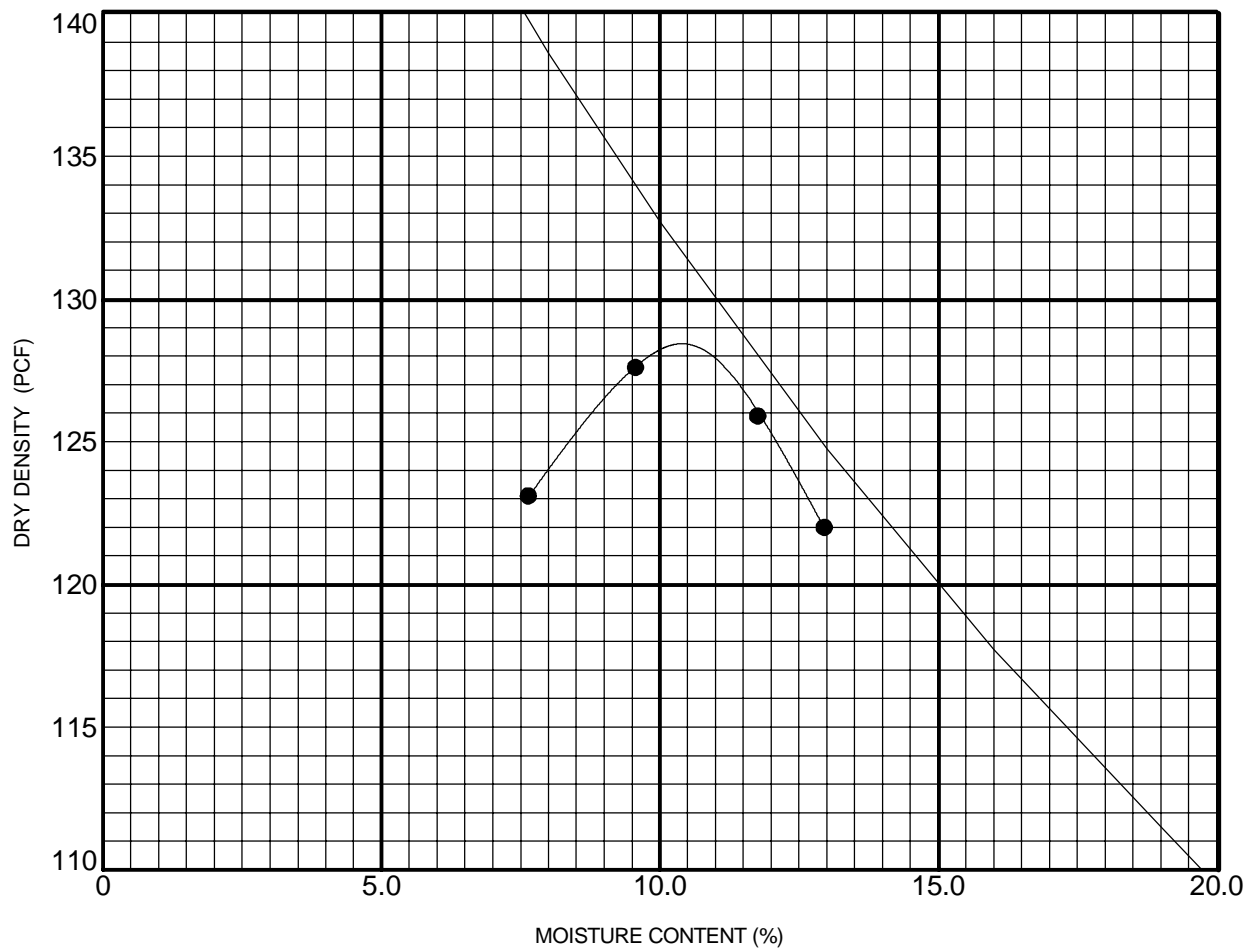
CLASSIFICATION: SC-SM

ASTM SOIL DESCRIPTION:

SILTY, CLAYEY SAND with GRAVEL


MAXIMUM DRY DENSITY: 128.5 PCF

OPTIMUM MOISTURE CONTENT: 10.4%



SWELL TEST DATA

BORING or TEST PIT No.	SAMPLE DEPTH, ft	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)	REMOVED DRY DENSITY (pcf)	INITIAL MOISTURE CONTENT (%)	PERCENT COMPACTION	FINAL MOISTURE CONTENT (%)	CONFINING LOAD (psf)	TOTAL SWELL (%)
B-2, BS-2	5.0	128.5	10.4	121.8	8.9	94.8	13.4	100	0.7

<p style="text-align: center;">Phoenix Fire Station No. 74 NWC 19th Avenue & Chandler Boulevard Phoenix, Arizona Project No. 230668SA</p>	
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------

DOCUMENT 00 63 13

REQUEST FOR INTERPRETATION FORM

Project: Phoenix Fire Station No. 74 R.F.I. Number: _____
From: _____
To: Perlman Architects of Arizona Date: _____
2929 N. Central Ave., Suite 1600
Phoenix, Arizona 85012 A/E Project Number: 323009

Specification Section: Paragraph: Drawing Reference: Detail

Request:

* Requested Date/Time for Response:

Signed by:

Response:

Attachments

Response From: To: * Date Received: * Date Returned:

Signed by:

Copies: Owner Consultants _____ _____ _____ File

* Contractor shall allow up to 5 working days review and response time for RFI'S, unless review is required of multiple consultants, then the review and response period shall be 7 working days. (See Section 01 26 13.

Supporting Data Attached: Drawings Product Data Samples Tests Reports _____

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachments: _____

A/E's REVIEW AND ACTION

- Substitution approved – Make submittals in accordance with Specification Section 01 33 00.
- Substitution approved as noted – Make submittals in accordance with Specification Section 01 33 00.
- Substitution rejected – Use specified materials.
- Substitution Request received too late – Use specified materials.

Signed by: _____ Date: _____

Additional Comments: Contractor Subcontractor Supplier Manufacturer A/E _____

SECTION 01 11 00

SUMMARY OF WORK

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project: Project consists of a new single story, 3 apparatus bay fire station located at 1900 West Chandler Blvd., Phoenix, Arizona.

1.02 DEFINITIONS PERTAINING TO THE CONTRACT DOCUMENTS

- A. Furnish: To purchase and deliver.
- B. Install: To place into final position and connect.
- C. Provide: To furnish and install.
- D. Connect: To make the complete necessary utility connection (water, sewer, gas, electricity, etc.) from the building utility to the piece of equipment to allow that piece of equipment to function as intended (e.g., a gas connection for an oven or cooktop).
- E. "As shown", "as detailed", "as indicated" or words of similar import mean as indicated on the drawings
- F. "As selected", "as approved" or words of similar import mean as selected by, as approved by, or as accepted by the Architect and Owner.
- G. "Approved equal", "or equal" shall mean as approved and accepted by the Architect and Owner.
- H. "Shall" means mandatory.
- I. "As required" means as required by the contract documents.
- J. "As necessary" means essential to the completion of the work.
- K. "Concealed" means not visible in the finished work.
- L. "Exposed" means visible in the finished work.
- M. "Days" means calendar days.
- N. "Working Days" means work days and does not include legal holidays.
- O. Substantial Completion: That stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

1.03 OWNER FURNISHED AND INSTALLED (OWNER PROVIDED) ITEMS

- A. General: The terms "Furnish," "Install," and "Connect" shall be as defined in Article 1.02 of this Section.
- B. Items furnished and installed by Owner, or by Owner's separate Vendor(s): Refer to Drawings for items to be Owner Furnished and Installed.

- C. Contractor's Responsibilities:
 - 1. Contractor shall give Owner written notice, stating date(s) when Owner-Furnished items must be received at the job site to insure Project completion in accordance with established schedule. Such dates shall be shown on the schedule.
 - 2. Contractor is responsible for the coordination and interface of Owner-Furnished and Installed items with Work of this Contract to provide all necessary mechanical and electrical rough-ins, openings, supports, dimensions, etc., as necessary for a complete installation.

1.04 OWNER-FURNISHED, CONTRACTOR INSTALLED ITEMS

- A. General: The terms "Furnish," "Install," and "Connect" shall be as defined in Paragraph 1.02 of this Section.
- B. Items furnished by Owner and installed by Contractor: Refer to Drawings for items to be Owner-Furnished for Installation by Contractor.
- C. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed Shop Drawings, Product Data, and Samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for Manufacturers' warranties, inspections and service.
- D. Contractor's Responsibilities:
 - 1. Contractor shall provide a written schedule to the Owner, indicating when Owner-furnished items must be received at the job site to insure Project completion in accordance with established schedule. Such dates shall be shown on the schedule.
 - 2. Review Owner-reviewed Shop Drawings, Product data, and Samples
 - 3. Receive and unload products at site; inspect for completeness or damage, jointly with Owner.
 - 4. Handle, store, assemble, install, protect, connect and finish such products, including furnishing lubricants and fluids and procedures necessary to render product serviceable and operative.
 - 5. Contractor is responsible for the coordination and interface of Owner-Furnished items to provide all necessary mechanical and electrical rough-ins, openings, supports, dimensions, etc., as necessary for a complete installation.

1.05 CONTRACTOR USE OF SITE

- A. General: Contractor shall have full use of the site within Contract Limit Lines indicated for construction operations during the construction period.
- B. Construction Operations: Limited to areas noted on Drawings including storage of materials and equipment.
- C. Utility Outages and Shutdown: Interruption of utility services to the existing building(s) is not permitted.
- D. Smoking Restrictions: Smoking, including electronic smoking devices, is not permitted on the property during and after construction or within 25 feet of entrances, operable windows, or outdoor air intakes.

1.06 PERMITS, FEES AND NOTICES

- A. Plan check fees have been paid by the Owner.
- B. The Owner will secure and pay for the building permit and for other permits and governmental fees, licenses and inspections necessary for the proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required at the time the bids are received or negotiations concluded. This shall include, but not be limited to:
 - 1. Building Permit from the City of Phoenix, Arizona.
 - 2. Inspections and Certificates from State Fire Marshal.
- C. The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authority bearing on the performance of the Work.
- D. It is not the responsibility of the Contractor to make certain that the Contract Documents are in accordance with applicable laws, statutes, building codes and regulations. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, he shall promptly notify the Architect and Owner in writing, and any necessary changes shall be accomplished by appropriate Modification.
- E. If the Contractor performs Work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Architect and Owner, the Contractor shall assume full responsibility therefor and shall bear attributable costs.

1.07 SPECIAL SITE CONDITIONS

- A. The Contractor shall be completely responsible for protecting existing site and street improvements indicated to remain and adjacent to new construction from damage and/or injury due to this Work and shall repair at his expense all areas damaged as a result of his Work.

1.08 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of the City of Phoenix.
- B. On-Site Work Hours: Limit Work to normal business working hours of 7:00 a.m to 5:00 p.m., Monday through Friday, unless otherwise indicated.

1.09 ARCHITECTURAL BARRIERS

- A. It is the desire of the Owner that the facilities and improvements constructed under this Contract meet or exceed the intent of applicable public law concerning prohibition of discrimination, and that no individual be discriminated against on the basis of disability in the full and equal enjoyment of the goods, services, facilities, privileges, advantages, or accommodations of this completed Project.
- B. The designers and drafters of these Documents have intended to incorporate those Owner's intentions into these Documents.
- C. It is recognized that there may be products not incorporated into these Documents that may more nearly meet the Owner's desires than those included.

- D. The Owner hereby solicits those providing elements of this Project to bid and contract for the Project as required by these Documents, but at the time of submitting Shop Drawings, or sooner when appropriate, and without causing delay in the Project, to also submit proposals for improving the accessibility of the Project to physically or mentally impaired persons.

1.10 REPRODUCTION OF DRAWINGS

- A. Contractor shall not alter the size of Drawings when making or ordering reproductions.
- B. Only full-size, current Drawings shall be maintained at the Project Site.

1.11 COMMUNICATIONS

- A. All communications with the Architect shall be copied to the Owner's Representative.
- B. All communications with the Architect's consultants shall be through the Architect.

END OF SECTION

SECTION 01 21 00

ALLOWANCES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Cash Allowances.
- B. Related Sections:
 - 1. Division 1 Sections.

1.02 DEFINITIONS

- A. Allowances: Cash amounts established in the Contract Documents to be included in the Contract Base Sum to cover the cost of items not specified in detail.
- B. In-Place Costs: When indicated, cost is complete for all materials and installation for indicated work; otherwise, costs are for indicated materials only.

1.03 SUBMITTALS

- A. Change Order Proposals: If not executed prior to the signing of the Contract for the Work, submit proposals for work required by Architect's "Addendum" relative to allowances in form of Change Order proposals. Itemize in detail, quantities and unit prices of materials, products, and assemblies required, in addition to allowable Contractor markups in accordance with the Owner-Contractor Agreement.
- B. Invoices. Submit invoices, delivery slips, or any other Architect acceptable comprehensive data inventorying materials delivered to the site for each approved allowance.
- C. Quality Assurance Submittals: Submit in accordance with "Quality Assurance" paragraphs herein.

1.04 QUALITY ASSURANCE

- A. Allowance Incorporation into Progress Schedule: On progress schedule as required for submittal, indicate when final selections and purchase of each allowance must be accomplished for timely incorporation into Project Schedule. In addition, provide separate written notice to Architect itemizing these requirements.
- B. Product Submittals: Submit product data, shop drawings, and samples as required by Architect to adequately review Work to be provided.
- C. Adjustments to Contract Sum: Cost adjustments to Contract Sum will be made by Change Order process. At Project Closeout, final adjustment is to be made to balance account; including credit to Owner with any unused amounts, if any.

1.05 ADMINISTRATION OF ALLOWANCES

- A. Allowances shall cover the cost to the Contractor for the materials, equipment and installation required by the allowance delivered to the site, and all applicable taxes.

- B. The Contractor's costs for receiving and handling on the site, overhead, profit and other expenses contemplated for the original Allowance shall be included in the Contract Sum and not in the Allowance.
- C. Whenever the cost is more than or less than the Allowance, the Contract Sum shall be adjusted accordingly by Change Order, the amount of which will recognize proportionate changes, if any, in handling costs on the site, overhead, profit, and other expenses.
- D. Use of Allowances must be requested and approved through the Allowance Use Authorization form.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials:
 - 1. Architects Selections: Purchase manufacturer's products in conformance with Architect's selections and in conformance with Contract Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspection: For products purchased for each approved allowance, inventory and inspect such products promptly upon delivery for damages. Return damaged goods and secure new.

3.02 PREPARATION

- A. Coordination: Coordinate incorporation of products in timely manner with all affected Installers of other work.

3.03 INSTALLATION

- A. General: Install primary products and related products in conformance with Primary System Manufacturer's project specific requirements for each assembly and in conformance with the Contract intent.

3.04 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Include lump sum of One Hundred Thousand and no/100 Dollars (\$100,000.00) for Owner directed Work and/or unforeseen conditions.
- B. Allowance No. 2: Appliances:
 - 1. Include the lump sum of Thirty-Five Thousand and No/100 Dollars (\$35,000.00) for purchase of appliances including, but not limited to the following:
 - a. Ice Machine.
 - b. Three (3) Refrigerator Freezers, one with chilled water and ice dispenser.

- c. Type 1 Range Hood with integrated fire suppression system. Light and sidewall exhaust.
- d. Dishwasher.
- e. 48 inch Gas Range with Griddle/Grill and Oven.
- f. Two (2) sets of Washers and Dryers.
- g. Two (2) Microwave Ovens.

END OF SECTION

SECTION 01 26 13

REQUESTS FOR INTERPRETATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Administrative requirements for requests for information / interpretation.

1.02 DEFINITIONS

- A. Request For Information / Interpretation (RFI):
1. A document submitted by the Contractor requesting clarification of a portion of the Contract Documents, hereinafter referred to as RFI.
 2. A properly prepared request for information / interpretation shall include a detailed written statement that indicates the specific Drawings or Specification in need of clarification and the nature of the clarification requested.
 - a. Drawings shall be identified by drawing number and location on the drawing sheet.
 - b. Specifications shall be identified by Section number, page and paragraph.
 3. Requests for Information: Request made by Contractor concerning items not indicated on Drawings or contained in the Project Manual that is necessary to properly perform the Work.
 4. Requests for Interpretation: Request made by Contractor in accordance with Owner's Representative's third party obligations to the contract for construction.
- B. Improper RFI's:
1. RFI's that are not properly prepared.
 2. Improper RFI's will be processed by the Architect at the Architect's standard hourly rate and Architect will charge the Owner, and such costs will be deducted from monies still due the Contractor. The Contractor will be notified by the Architect prior to the processing of improper RFI's.
- C. Frivolous RFI's:
1. RFI's that request information that is clearly shown on the Contract Documents.
 2. Frivolous RFI's may be returned unanswered or may be processed by the Architect at the Architect's standard hourly rate and Architect will charge the Owner, and such costs will be deducted from monies still due the Contractor. The Contractor will be notified by the Architect prior to the processing of frivolous RFI's.

1.03 CONTRACTOR'S REQUESTS FOR INFORMATION

- A. RFI's shall be submitted on Document 00 63 13 included in the Project Manual, or similar form prepared by the Contractor and approved by the Architect prior to use.
1. Forms shall be completely filled in, and if prepared by hand, shall be fully legible.
 2. RFI's shall be submitted in numerical order with no breaks in the consecutive numbering.
 3. Each page of attachments to RFI's shall bear the RFI number and shall be consecutively numbered in chronological order.

4. RFI's shall be submitted by E-Mail or digital file transfer.
 - a. Address for E-Mail will be distributed by the Architect at the Pre-Construction Conference.
 - b. An electronic version of Document 00 63 13 will be provided upon request.

- B. When the Contractor is unable to determine from the Contract Documents, the material, process or system to be installed, the Architect shall be requested to make a clarification of the indeterminate item.
 1. Whenever possible, such clarification shall be requested at the next appropriate Project Meeting, with the response entered into the meeting minutes. When clarification at the meeting is not possible, either because of the urgency of the need, or the complexity of the item, Contractor shall prepare and submit an RFI to the Architect.
 2. RFI's may not be sent directly to the Architect's Consultants. All RFI's shall be sent directly to the Architect.

- C. Contractor shall endeavor to keep the number of RFI's to a minimum. In the event that the process becomes unwieldy, in the opinion of the Architect, because of the number and frequency of RFI's submitted, the Architect may require the Contractor to abandon the process and submit future requests as either submittals, substitutions or requests for change.

- D. RFI's shall be originated by the Contractor.
 1. RFI's from subcontractors or material suppliers shall be submitted through, reviewed by, and signed by the Contractor prior to submittal to the Architect.
 2. RFI's from subcontractors or material suppliers sent directly to the Owner's Representative, Architect or the Architect's consultants shall not be accepted and will be returned unanswered.

- E. Contractor shall carefully study the Contract Documents to assure that the requested information is not available therein. RFI's which request information available in the Contract Documents will be deemed either "improper" or "frivolous" as noted above.

- F. In cases where RFI's are issued to request clarification of coordination issues, for example, pipe and duct routing, clearances, specific locations of work shown diagrammatically, and similar items, the Contractor shall fully lay out a suggested solution using drawings or sketches drawn to scale, and submit same with the RFI. RFI's which fail to include a suggested solution will be returned unanswered with a requirement that the Contractor submit a complete request.

- G. RFI's shall not be used for the following purposes:
 1. To request approval of submittals
 2. To request approval of substitutions,
 3. To request changes which are known to entail additional cost or credit. (A Change Order Request form shall be used.)
 4. To request different methods of performing work than those drawn and specified.

- H. In the event the Contractor believes that an RFI response by the Architect results in additional cost or time, Contractor shall not proceed with the work indicated by the RFI until a Change Order (or Construction Change Directive, if applicable to the Project) is prepared and approved. RFI's shall not automatically justify a cost increase in the work or a change in the Project schedule.
 - 1. Answered RFI's shall not be construed as approval to perform extra work.
 - 2. Unanswered RFI's will be returned with a stamp or notation "Not Reviewed".
- I. Contractor shall prepare and maintain a log of RFI'S, and at any time requested by the Architect, Contractor shall furnish copies of the log showing outstanding RFI'S. Contractor shall note unanswered RFI's in the log.
- J. Contractor shall allow up to 5 working days review and response time for RFI'S, unless review is required of multiple consultants, then the review and response period shall be 7 working days.
 - 1. The Architect will endeavor to respond to RFI's in a timely manner.
 - 2. RFI shall state requested date/time for response, however, this requested date/time for response is not a guarantee that the RFI will be answered by that date/time if that date/time is too expeditious.
 - 3. Architect may request additional time when deemed necessary.

1.04 ARCHITECT'S RESPONSE TO RFI'S

- A. Architect will respond to RFI's on one of the following forms:
 - 1. Answers to properly prepared RFI's will be made directly upon the RFI form and will be returned via E-Mail or digital file transfer.
 - 2. Improper or Frivolous RFI's
 - a. Notification of Processing Fee(s).
 - b. Unanswered RFI's will be returned with a stamp or notation: "Not Reviewed."
- B. Architect may opt to retain RFI's for discussion during regularly scheduled project meetings for inclusion of responses in meeting minutes in lieu of responding on a written form.

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

1.01 SCHEDULE OF VALUES

- A. With first Application for Payment, submit three (3) copies of completed AIA Document G703 Continuation Sheet indicating the scheduled value of major categories and subcontracts for the Work, for approval of the Architect.
- B. For each item, provide a column for listing:
 - 1. Item number
 - 2. Description of Work
 - 3. Scheduled Value
 - 4. Previous Applications
 - 5. Work in Place and Stored Materials under this Application
 - 6. Authorized Change Orders
 - 7. Total Completed and Stored to Date of Application
 - 8. Percentage of Completion
 - 9. Balance to Finish
 - 10. Retainage.

1.02 PAY REQUEST

- A. The form of Application for Payment shall be a notarized AIA Document G702, Application and Certification for Payment, supported by approved AIA Document G703, Continuation Sheet. A minimum of three (3) original copies of these forms shall be submitted for each application. Submit additional copies if requested by the Owner or Architect.
 - 1. Present required information in typewritten form or on electronic media printout.
 - 2. Execute certification by signature of authorized officer.
 - 3. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
 - 4. List each authorized Change Order as an extension on continuation sheet, listing Change Order number and dollar amount as for an original item of Work.
- B. With each Application for Payment submit lien releases for the previous payment, substantiation for stored materials, monthly progress reports and updates, and any other pertinent items required by the Owner or Architect and identified during the Pre-Construction Conference.
 - 1. AIA Documents G706, Contractor's Affidavit of Payment of Debts and Claims, G706-A, Contractor's Affidavit of Release of Liens, Documents G707, Consent of Surety Company to Final Payment shall be used.
 - 2. If appropriate, G707-A, Consent of Surety to Reduction in or Partial Release of Retainage shall be used.
- C. When acceptable to the Owner, the Contractor may submit for payment on properly stored materials not yet incorporated into the work. Materials stored on the site must be in a secured area and be protected from damage, weather, theft or vandalism. The Contractor shall be responsible for replacing any damaged or missing materials.
- D. Materials stored off the job site must be in the supplier's storage area, separated from other materials, and clearly labeled for this particular project. Insurance certificates for the material naming the Owner as an additional insured, loss payee shall be delivered with the pay request.

END OF SECTION

SECTION 01 31 19
PROJECT MEETINGS

PART 1 GENERAL

1.01 PRECONSTRUCTION CONFERENCE

- A. A Preconstruction Conference to discuss the Project work will be held at a time and location designated by the Architect.
- B. Contractor, and representatives of major Subcontractors, shall meet with Owner and Architect. The purpose of this conference is to discuss the Project in detail, including scheduling of Work, and to answer questions. Unless followed up in writing, verbal authorizations or acknowledgement of those present are not binding.
- C. Meeting minutes will be taken by the Contractor for distribution to all attendees within 48 hours of conference.

1.02 PROGRESS MEETINGS

- A. At day and time designated by Architect, weekly Progress Meeting will be held at Project site.
- B. Contractor and representatives of major Subcontractors shall meet with Owner and Architect.
- C. Contractor is responsible for notifying Subcontractors of their required attendance. These meetings will address progress of the Work and problems that may have developed since the previous meeting.
- D. Unless followed up in writing, verbal authorizations or acknowledgements by those present are not binding.
- E. Meeting minutes will be taken by the Contractor for distribution to all attendees within 48 hours of each meeting.

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 CONSTRUCTION SCHEDULE

- A. Submit 3 copies of the Construction Schedule, broken down by Trade or Material, to the Architect for approval prior to the first Pay Request. Schedule shall be by CPM or bar graph type and shall show proposed starting and completion dates for each Trade and activity for the Work. Submit 3 copies of updated schedule at each Pay Request field review to the Architect.
- B. Submit completed construction schedule to Architect no later than 15 calendar days after date of Agreement and update monthly during construction. Submit current schedule with each application for payment.
- C. Submit completed material delivery schedule to the Architect no later than 20 calendar days after the date of the Agreement. Identify material critical to the progress of the Project and those for which long lead time in procurement is anticipated. Indicate projected dates for submittal, order and delivery of such material.

1.02 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- A. Submit the completed schedule of submittals to the Architect no later than 15 calendar days after date of Agreement and update monthly during construction. Submit current schedule with each application for payment.
- B. Shop Drawings:
 - 1. Following Contractor's review and approval, submit to the Architect three black on white prints of each Drawing for review.
 - 2. The Architect will review the Drawings and affix a stamp to the indicating the findings of the review, and will return same to the Contractor.
 - 3. Comments, if any, will be noted directly on the drawing.
 - 4. The Contractor shall then print and distribute the appropriate number of copies to the various Trades and to Contractor's job personnel as required.
 - 5. If a drawing is indicated to be corrected and resubmitted, correct and resubmit as outlined above.
 - 6. Fire Alarm System/Fire Sprinklers System Shop Drawings shall be submitted to the state and local Fire Marshal and obtain approval prior to installation. Fire Marshal inspection, test and approval of completed installations shall be obtained prior to acceptance of the systems and Substantial Completion of the Project.
- C. Product Data:
 - 1. Following Contractor's review and approval, submit to the Architect four (4) copies of Manufacturer's catalogs and brochures, or PDF format electronic copy of Manufacturer's catalogs and brochures as required by the Specifications. If electronic copy product data are furnished, all files shall be full size PDF only. Resubmit corrected copies for approval in accordance with original submittal.
- D. Samples:
 - 1. Following Contractor's review and approval, submit to the Architect samples of materials in quantities and sizes as required by the Specifications. No electronic copy of samples will be considered for review.

2. Submit a minimum of four (4) samples of each required material, one each for Architect, Owner, Contractor and Subcontractor.
 3. Submittals required other than for selection of color, texture, fabric or finish shall be given to the Architect at a time determined by the Contractor, which will allow for resubmittal and which will not cause and delay in the Work.
 4. Corrected samples shall be resubmitted for approval as per the original submittal.
- E. Color Selection: Within 30 days of the date of Agreement, or Owner's approval of final color selections, submit to the Architect for approval, samples and appropriate information required for the selection of colors, textures, fabric and finishes for the entire Project. Physical samples shall be submitted for color or material selections. Electronic samples will not be reviewed. Final selection of color, textures, fabrics or finishes will not be made until all applicable and related submittals have been provided. If the Contractor fails to provide the required samples and related information within the time period, the Architect shall have the option of selecting colors, textures, fabric, finishes or specific materials from those specified or approved and the Contractor shall be obligated to provide the material selected by the Architect.
- F. Submit Shop Drawings, Product Data and Samples for only those items specifically mentioned in the Specifications and or Addenda. Contractor shall be responsible for obtaining Shop Drawings required for the progress of the Work, even though such Shop Drawings may not require the Architect's review.
- G. Partial Submittals: Submittals which are partial or contain only a portion of the data required to describe the item or installation will be rejected, unless such partial submittal is coordinated with the Architect prior to submittal, and final approval of all such items will be withheld pending receipt of all required information.
- H. Deviations: All deviations from the Contract Documents shall be clearly identified in the submittal. Submittal shall include only items included in the specifications or which have been approved in advance by the Architect in accordance with requirements of Section 01600. Submittals containing items which have not been approved in advance by the Architect will be rejected.

1.03 QUALITY CONTROL SUBMITTALS

- A. Equipment Lists: Following Contractor's review and approval, submit to the Architect 6 complete lists of major items of mechanical, plumbing and electrical equipment and materials, within 30 calendar days after date of Agreement. Submit all items at one time. Partial list will not be acceptable. Submittals shall include the Manufacturer's Specifications, weights, space requirements, physical dimensions, rating of equipment and supplemental information requested by the Architect. Submit performance curves for pumps and fans. Where a submittal sheet describes items in addition to that item being submitted, delete such items. Clearly note equipment and materials which deviate from those shown or specified in size, weight, required clearances, and location of access. Modifications to the Work as shown or specified in submittals shall be indicated and shall be provided by the Contractor as a part of the Work.
- B. Manufacturer's Instructions: Where Specifications require Work to be furnished, installed or performed in accordance with a specified product Manufacturer's instructions, distribute copies of such instructions to concerned parties.

1.04 REVIEW PROCESS

- A. All Shop Drawings will be reviewed and returned within 7 working days to the Contractor for distribution to the applicable trades. Shop Drawings for major components of the Work (i.e. Structural Steel) shall be returned within 14 working days.
- B. Shop Drawings are to be submitted to the Architect in a reasonable sequenced manner as not to overburden the reviewing discipline. If the Architect feels as though the review of the Submittal is not on the critical path of the Project, then the review may exceed indicated review times.
- C. If the corrections identified on the Shop Drawings are not corrected and the review of the same Submittal exceeds two (2) reviews, the Contractor will be billed for additional reviews at the current hourly rate charged by the Architect or his Consultants. This process will require that the Contractor be notified of the charges and an additional Service Work Order be signed prior to the review commencing.

END OF SECTION

SECTION 01 35 43

ENVIRONMENTAL PROCEDURES

PART 1 - GENERAL

1.1 REQUIREMENTS

- A. The Environmental Mitigation requirements for this Project are recorded in the contract conditions and this Specification Section. The mitigation measures may include, but are not limited to, procedures and standards to control:
 - 1. Clean Air/Dust Control.
 - 2. Historical/Cultural Resources.
 - 3. Endangered Species.
 - 4. Migratory Bird Treaty Act of 1918.

1.2 CLEAN AIR/DUST CONTROL

- A. As required by the Clean Air Act, the project location shall require the issuance of an Air Quality permit from Maricopa County.
- B. Contractor is responsible for securing and paying for all related permits.

1.3 HISTORICAL & CULTURAL RESOURCES

- A. Governing Regulation: National Historic Preservation Act of 1966, particularly sections 106 and 110; 36 CFR Part 800.
- B. The project site is known to be archeological sensitive.
- C. To maintain compliance with the National Historic Preservation Act (NHPA) 36 CFR Part 800 regulations, the project location shall require historic/cultural resource monitoring mitigation, thru application of the mitigative stipulations in the City/SHPO/ACHP PA.
- D. The City will be responsible for implementing the monitoring activities. The Contractor is responsible for accommodating activities.

1.4 ENDANGERED SPECIES

- A. Governing Regulation: Endangered Species Act of 1973, particularly section 7; 50 CFR Part 402
- B. Burrowing owls are not expected to be present in the park or adjacent vacant lots, based on the quality of habitat present. However, burrowing owl survey by qualified surveyor shall occur at least seven (7) days prior to start of on-site activities. If burrowing owls or potentially active burrows are observed in the project area, work shall cease in the vicinity and the City project manager contacted to make appropriate arrangements.
- C. The City will be responsible for conducting the required Burrowing Owl survey.

1.5 MIGRATORY BIRD TREATY ACT OF 1918

- A. Governing Regulation: 16 U.S.C. §§703 – 712 and Arizona state law ARS Title 17.
- B. As required by the Migratory Bird Treaty Act of 1918 (MBTA) 16 U.S.C. §§703 – 712 and Arizona state law ARS Title 17, the project location shall be assessed for the presence of active nests protected under the MBTA, at least seven (7) days prior to start of on-site activities and, if such habitat is present, will require coordination through the City's Office of Environmental Programs (OEP).

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

3.1 CLEAN AIR/DUST CONTROL

- A. Contractor is responsible for securing and paying for all related permits.

3.2 HISTORICAL & CULTURAL RESOURCES

- A. The City will be responsible for implementing the monitoring activities.
- B. The Contractor is responsible for accommodating activities.

3.3 ENDANGERED SPECIES

- A. The City will be responsible for conducting the required Burrowing Owl survey

3.4 MIGRATORY BIRD TREATY ACT OF 1918

- A. The City will be responsible for conducting the survey. If necessary, the City will coordinate relocation activities
- B. Contractor to accommodate activities.

End of Section 01 35 43

SECTION 01 42 00

REFERENCES

1.01 QUALITY ASSURANCE

- A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes. Such Reference Standards are made part of the Contract Documents by reference.
- B. Conform to reference standard by date of issue current on date of Contract Documents.
- C. Obtain copies of standards when required by Contract Documents.
- D. Should specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- E. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.02 SCHEDULE OF REFERENCES

- A. The following is a partial list of agencies, councils, institutions, associations, and so forth that may be referred to in the Contract Documents. This list is not to be interpreted as being complete.

AA	Aluminum Association	www.aluminum.org
AABC	Associated Air Balance Council	www.aabchq.com
AAMA	American Architectural Manufacturers Association	www.aamanet.org
AASHTO	American Association of State Highway	www.aashto.org
ACI	American Concrete Institute	www.aci-int.org
ADC	Air Diffusion Council	www.flexibleduct.org
AFPA	American Forest and Paper Association	www.afandpa.org
AI	Asphalt Institute	www.asphaltinstitute.org
AIA	American Institute of Architects	www.aia.org
AISC	American Institute of Steel Construction	www.aisc.org
AISI	American Iron and Steel Institute	www.steel.org
AITC	American Institute of Timber Construction	www.aitc-glulam.org
AMCA	Air Movement and Control Association	www.amca.org
AMG	Arizona Masonry Guild	www.masonryforlife.com

ANSI	American National Standards Institute	www.ansi.org
APA	Engineered Wood Association	www.apawood.org
API	American Petroleum Institute	www.api.org
ARI	Air-Conditioning and Refrigeration Institute	www.ari.org
ASHRAE	American Society of Heating, Refrigerating	www.ashrae.org
ASME	American Society of Mechanical Engineers	www.asme.org
ASTM	American Society for Testing and Materials	www.astm.org
AWI	Architectural Woodwork Institute	www.awinet.org
AWPA	American Wood Preservers Association	www.awpa.com
AWS	American Welding Society	www.aws.org
AWWA	American Water Works Association	www.awwa.org
BHMA	Builders Hardware Manufacturer's Association	www.buildershardware.com
BIA	Brick Industry Association	www.brickinfo.org
CDA	Copper Development Association	www.copper.org
CISCA	Ceilings and Interior Systems Construction Association	www.cisca.org
CLFMI	Chain Link Fence Manufacturers Institute	www.chainlinkinfo.org
CRI	The Carpet and Rug Institute	www.carpet-rug.com
CRSI	Concrete Reinforcing Steel Institute	www.crsi.org
CSSB	Cedar Shingle and Shake Bureau	www.cedarbureau.org
DHI	Door and Hardware Institute	www.dhi.org
EJMA	Expansion Joint Manufacturers Association	www.ejma.org
FMG	FM Global	www.allendale.com
GA	Gypsum Association	www.gypsum.org
GANA	Glass Association of North America	www.glasswebsite.com
ICC	International Code Council	http://www.iccsafe.org/
IEEE	Institute of Electrical and Electronics Engineers	www.ieee.org
IGMA	Insulating Glass Manufacturers Alliance	www.igmaonline.org
MAG	Maricopa Association of Governments	www.mag.maricopa.gov

MBMA	Metal Building Manufacturer's Association	www.mbma.com
MIL	Military Specification	http://dodssp.daps.dla.mil/
ML/SFA	Metal Lath/Steel Framing Association	www.naamm.org
NAAMM	National Association of Architectural	www.naamm.org
NCMA	National Concrete Masonry Association	www.ncma.org
NEBB	National Environmental Balancing Bureau	www.nebb.org
NEMA	National Electrical Manufacturers Association	www.nema.org
NFPA	National Fire Protection Association	www.nfpa.org
NRCA	National Roofing Contractors Association	www.nrca.net
NTMA	National Terrazzo and Mosaic Association	www.ntma.com
PCA	Portland Cement Association	www.cement.org
PCI	Precast/Prestressed Concrete Institute	www.pci.org
PDCA	Painting and Decorating Contractors of America	www.pdca.com
PS	Product Standard U. S. Department of Commerce	http://ts.nist.gov/Standards/Conformity/sccg.cfm
RIS	Redwood Inspection Service	www.redwoodinspection.com
RFCI	Resilient Floor Covering Institute	www.rfci.com
SDI	Steel Deck Institute	www.sdi.org
SDI	Steel Door Institute	www.steeldoor.org
SJI	Steel Joist Institute	www.steeljoist.org
SMACNA	Sheet Metal and Air Conditioning	www.smacna.org
SSPC	The Society for Protective Coatings	www.sspc.org
TCA	Tile Council of America, Inc.	www.tileusa.com
UL	Underwriters' Laboratories, Inc.	www.ul.com
WCLIB	West Coast Lumber Inspection Bureau	www.wclib.org
WDMA	Window and Door Manufacturing Association	www.wdma.com
WWPA	Western Wood Products Association	www.wwpa.org

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1 GENERAL

1.01 TESTING LABORATORY SERVICES

- A. Special Inspections and Testing: Owner will employ and pay for the services of an independent testing agency to perform Special Inspections and Testing called for in the Contract Documents and as required by Code or authorities having jurisdiction.
- B. Quality Control Testing and Inspections: Contractor shall retain an independent testing laboratory, acceptable to Architect and Owner, to perform quality control testing Work called for in the Contract Documents, and pay cost of services.
- C. Contractor shall cooperate with Testing Laboratory personnel and provide access to the Work as required to perform testing or inspections called for in the Construction Documents.
- D. Contractor shall furnish samples for such tests and deliver them to the Testing Laboratory in quantities as required by the Contract Documents.
- E. Contractor shall provide Testing Laboratory 24 hours minimum notice in advance of Work being performed that requires testing and/or inspection services.
- F. The Testing Laboratory(s) shall, within 24 hours of performing a test or inspection, distribute digital copies of reports as follows:
 - 1. Architect
 - 2. Structural Engineer or other Engineering Consultant
 - 3. Contractor
 - 4. Owner
 - 5. Code authorities or authorities having jurisdiction as they may require.
- G. All costs for additional inspections and/or retesting required when initial testing indicates Work does not comply with Contract Documents, shall be paid for by the Contractor.
- H. Refer to individual specification Sections and General Notes on Drawings for specific requirements for Testing and/or Inspections. The following lists are intended as a guide to the Contractor to aid in determining testing requirements for the Project, however, the requirements specified in the Technical Sections shall take precedence over these lists and these lists are not to be interpreted as being complete.
 - 1. Special Inspections and Testing:
 - a. Special Inspections and Testing required by the General Structural Notes on the Drawings.
 - a. 03 30 00 - Cast-In-Place Concrete: Test cylinders, slump test(s)
 - b. 04 05 15 - Mortar and Masonry Grout: Test of grout mix
 - c. 04 22 00 - Concrete Unit Masonry: Prism testing
 - d. 05 10 00 - Structural Metal Framing: Welded connection tests, inspection of high strength bolts.
 - e. 31 00 00 - Earthwork: Test imported fill materials if required, observation of earthwork by Geotechnical Engineer, density and moisture testing of trench backfill, field density tests of underslab fill and backfill.

2. Quality Control Testing and Inspections:
 - a. 03 30 00 - Cast-In-Place Concrete: Floor flatness, calcium chloride moisture testing.
 - b. 04 22 00 - Concrete Unit Masonry: Water penetration and leakage
 - c. 07 92 00 - Joint Sealers: Field adhesion testing and stain testing.
 - d. Division 09 Flooring Sections: Moisture content of concrete sub-floors.
 - e. 31 31 00 - Soil treatment: Field test termite treatment
 - r. 32 12 16 - Asphaltic Concrete Paving: Smoothness tests

1.02 CONTRACTOR'S QUALITY CONTROL

- A. Where Contract Documents require that a particular product be installed and/or applied by an applicator approved by the Manufacturer, it is the Contractor's responsibility to ensure that the subcontractor employed for such work is approved in writing by the Manufacturer of the product. Such subcontractor(s) shall provide evidence of being approved to the Owner and Architect prior to being awarded the Subcontract for the Work.
- B. Work shall be executed by persons skilled in the work required and shall conform to the highest methods, standards and accepted practices of the Trade or Trades involved.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 GENERAL

- A. Comply with codes and regulations regarding potable drinking water, sanitation, dust control, fire protection, and other temporary controls.
- B. Remove temporary office facilities, toilets, storage sheds and other construction of temporary nature from the site as soon as, in the opinion of the Architect, the progress of the work will permit. Recondition and restore to a condition acceptable to the Architect, areas of the site occupied by temporary facilities.
- C. Obtain written approval from the Owner a minimum of 72 hours prior to disconnection or shutting off service or utility.

1.02 TEMPORARY ELECTRICITY

- A. Provide and pay for power service required from Utility and make arrangements for such service.
- B. Provide temporary electric feeder from electrical service at location as directed by the Utility Owner or as indicated on Drawings.
- C. Provide power outlets for construction operations, with branch wiring and distribution boxes. Provide flexible power cords as necessary.
- D. Provide main service disconnect and overcurrent protection at convenient location.
- E. Permanent convenience receptacles which are GFI protected may be utilized during construction after appropriate approvals and permits for temporary use. Existing electrical receptacle used during construction shall be left in a new condition without damage at final completion.
- F. Provide adequate distribution equipment, wiring, and outlets to provide branch circuits for power and lighting.

1.03 TEMPORARY LIGHTING

- A. Provide incandescent lighting for construction operations to achieve a minimum lighting level of 2 watts/sq. ft.
- B. Provide adequate floodlights, clusters and spot illumination to work areas after dark.
- C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- D. Maintain lighting and provide routine repairs.
- E. Replace all non-LED lamps of permanent light fixtures used during the construction period immediately prior to issuance of Certificate of Substantial Completion.

1.04 TEMPORARY HEATING/COOLING AND VENTILATING

- A. Provide and pay for heating/cooling devices and heat as required to maintain appropriate and specified conditions for construction operations.
- B. Prior to operation of permanent equipment for temporary heating or cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.
 - 1. All ducts shall be vacuumed and all filters shall be replaced immediately prior to issuance of Certificate of Substantial Completion.
- C. Maintain minimum/maximum ambient temperature and humidity conditions required by individual specification sections for installation of materials and finishes required to have specific environmental conditions.
- D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.05 COMMUNICATIONS

- A. At time of Project mobilization, or before, provide Architect and Owner with Project team directory, including the following:
 - 1. General Contractor's home office.
 - 2. Contractor's superintendent mobile telephone number.
 - 3. Other major subcontractors and Project Team members.
- B. Provide superintendent with mobile telephone throughout construction period.
- C. Computer and Internet Access: Provide computer with internet access in field office.
 - 1. Provide DSL or Cable modem access with 1.5 Mbps minimum.
 - 2. Computer shall be made available to Owner and Architect for use throughout construction.
 - 3. Provide account/address reserved for project use.

1.06 TEMPORARY WATER SERVICE

- A. Provide, maintain and pay for suitable quality water service required for construction operations.
- B. Extend branch piping throughout the site to provide outlets for hoses with threaded connections.

1.07 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures.
- B. At end of construction, return facilities to same or better condition than originally found, if required.

1.08 TEMPORARY FIRE PROTECTION

- A. Provide adequate number of fire extinguishers to protect the Work.
- B. Comply with fire insurance and governing regulations.

- C. Provide UL labeled ABC all-purpose fire extinguishers adequate in size and number.
- D. Provide temporary office and storage areas with fire extinguishers.

1.09 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plant life designated to remain. Replace damaged plant life.
- D. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

1.10 FENCING

- A. Construction: Commercial grade chain link fence with adequate support to remain in place during storm winds.
- B. Provide 6'-0" high fence around construction site, including parking lot, landscape area, and retention areas as necessary to protect Work; equip with vehicular and pedestrian gates with locks.
- C. Locate gates for access to work areas, as required. Close and lock after working hours.

1.11 ENVIRONMENT PROTECTION AND CONTROLS

- A. Exercise controls to keep noise and dust during construction to a minimum. Traffic or construction areas shall be sprinkled with water or chemicals as required and in accordance with applicable regulatory requirements.
- B. Environmental Protection: Conduct construction operations and operate equipment and machinery using methods complying with environmental regulations to avoid or minimize pollution or contamination to air, water, waterways, soil, groundwater, or other natural resources.
 - 1. Air Resources: Prevent creation of dust, air pollution, and odors.
 - 2. Store volatile liquids, including fuels and solvents, in closed containers.
 - 3. Properly maintain equipment to reduce gaseous pollutant emissions.
 - 4. Properly dispose of hazardous or contaminated debris in compliance with environmental regulations.
 - 5. Grade site to drain. Maintain excavations free of water. Provide, operate and maintain pumping equipment as may be necessary.
 - 6. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
 - 7. Comply with local requirements for storm water pollution prevention.

1.12 EXTERIOR ENCLOSURES

- A. Provide temporary weather-tight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification Sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.13 PROTECTION OF INSTALLED WORK

- A. Protect all installed work. Provide the special protection features where specified in individual specification Sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to avoid damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with plywood sheets and waterproof covering.
- E. Prohibit traffic or storage directly on waterproofed or roofed surfaces. If traffic or activity is necessary, provide protection in accordance with material and or system manufacturer's printed instructions.
- F. Prohibit traffic from landscaped areas.

1.14 SECURITY

- A. Provide security and facilities to protect Work and existing facilities, and Owner's operations from unauthorized entry, vandalism or theft.
- B. Provide and pay for watchman service if necessary for adequate protection.

1.15 SITE ACCESS, PARKING AND STAGING

- A. Provide temporary surface parking areas to accommodate construction personnel.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. Provide fenced area with secure locking gates for exterior construction staging that may be necessary throughout the construction period.

1.16 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition on a daily basis.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Regularly remove waste materials, debris, and rubbish from site and dispose off-site. Do not allow to accumulate.

1.17 PROJECT IDENTIFICATION

- A. General Contractor is limited to one (1) sign located on their construction trailer. Additional signage must be approved by Owner's Representative. Subcontractors, suppliers, manufacturers, consultants, etc., shall not furnish company information banners unless approved by Owner's Representative.
- B. Project Information Sign: Provide 8 foot wide x 4 foot high project sign of exterior grade plywood and wood frame construction, painted to Architect's design and colors.
 - 1. List title of Project, Names of Owner, Architect, and General Contractor.
 - 2. Erect on site at location established by Architect and Owner.
 - 3. Allow 7 working days for Architect to provide electronic graphic image.
- C. Contractor shall obtain all required approvals and sign permits and pay all fees required for installation of temporary construction signs.
- D. No other signs are allowed without Owner's permission except those required by law.

1.18 FIELD OFFICES AND SHEDS

- A. Office: Weather-tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture, drawing rack and drawing display table.
- B. Provide space for project meetings, with table and chairs to accommodate the entire Project Team.
- C. Locate offices and sheds as approved by Owner.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 DELIVERY, STORAGE AND HANDLING

- A. Deliver manufactured materials in original packages, containers or bundles, with the seals unbroken, identified by the name and mark of the Manufacturer, the product name, color, number, and so forth.
- B. Deliver fabrications in as large assemblies as practicable. Fabrications specified to be shop-primed or shop-finished shall be packaged or crated as required to preserve such priming or finish intact and free from damage.
- C. The Contractor shall be responsible for protecting all materials and equipment furnished under the Contract including materials and equipment furnished by the Owner for the Contractor to install and for the materials and equipment furnished and installed by the Owner's separate contractors in the completed or partially completed Work.
- D. Store materials in a manner to properly protect them from damage. Materials or equipment damaged by handling, weather, dirt or other cause will not be acceptable and are to be removed from the site. Replace such materials immediately so as not to delay the Work.
- E. Store materials so as to cause no obstructions. Store off sidewalks, roadways, and underground services.
- F. When a room in the Project is used as a shop or store room, the Contractor shall be responsible for all repairs, patching or cleaning necessary due to such use. Location of such storage space shall be subject to approval of the Architect.

1.02 SUBSTITUTIONS AND PRODUCT OPTIONS

- A. Whenever a product is specified by using a proprietary name or the name of a particular Manufacturer or Vendor, the specific item mentioned shall be understood as establishing type, function, dimension, appearance, and quality desired.
- B. Other manufacturers' products will be accepted provided sufficient information is submitted to allow the Architect to determine that products proposed are equivalent to those named.
- C. Prior Approvals:
 - 1. Substitutions will be considered when written request has been submitted to the Architect for approval.
 - 2. Contractor shall request approval of such substitution, in writing, to the Architect using Document 00 43 25 – Substitution Request (During the Bidding Phase) form contained in the Project Manual.
 - 3. Each such request shall include all information requested below for Requests for approval after award of a Contract. If the Owner approves any proposed substitution, such approval shall be set forth in an Addendum.

- D. Requests for approval after award of a Contract:
1. Requests shall be made only under one of the following conditions:
 - a. Specified product or material is not available.
 - b. Extensive revisions to the Contract Documents are not required.
 - c. Proposed changes are consistent with intent of the Contract Documents.
 - d. Request is timely and properly submitted.
 - e. Specified product or material cannot be provided within the Contract Time.
 - f. Request relates to an “or equal” clause.
 - g. Proposed substitution offers Owner a substantial advantage in cost, time, or other considerations.
 - h. Specified product or material cannot receive regulatory approval.
 - i. Specified product or material is incompatible with other materials.
 - j. Specified product or material cannot be coordinated with other materials.
 - k. Specified product or material manufacturer cannot provide the specified warranty.
 2. Requests shall be submitted to the Architect a minimum of 10 working days prior to date Contractor is required to place an order for the product.
 3. Contractor shall request approval of such substitution, in writing, to the Architect using Section 00 63 25 – Substitution Request (After the Bidding Phase) form contained in the Project Manual.
 4. The request shall specifically state the reason that the product is unavailable with evidence to substantiate the reason.
 5. Requests made directly to Architect by suppliers, subcontractors and distributors that are not from the Contractor will not be accepted by the Architect or Owner.
 6. Architect will approve or reject substitution in writing.
 7. Substitutions will not be considered if they are indicated or implied on Shop Drawings.
- E. Contractor shall submit descriptive brochures, drawings, samples and other data as is necessary to provide direct comparison to the specified materials after reviewing and determining that product meets specified requirements. Submittals shall be well marked and identified as to types and kind of the items being submitted for approval. Lack of sufficient information will be cause for rejection. Reference to catalogs will not be acceptable unless catalog is submitted with approval request and the specific product or material and its components are clearly identified.
- F. In submitting a substitution, the Contractor makes the following representations:
1. Proposed substitution has been fully investigated and determined to be equal or superior to specified product or material.
 2. The same warranty will be furnished for proposed substitution as for specified product or material.
 3. The same maintenance service and source of replacement parts, as applicable, is available.
 4. Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
 5. Cost data included on the substitution request is complete. Claims for additional costs related to accepted substitution and its impact on other portions of the Work which may subsequently become apparent are waived.
 6. Proposed substitution does not affect dimensions and functional clearances.

7. Payment for costs for additional services of Architect caused by the substitution shall be paid by Contractor. The Contractor will be billed for additional services at the current hourly rate charged by the Architect. The Architect will charge the Owner, and such costs will be deducted from monies still due the Contractor.
8. Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

END OF SECTION

SECTION 01 71 23
FIELD ENGINEERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specifications, apply to this Section.

1.2 DESCRIPTION

- A. This Section describes requirements for verifying, establishing and maintaining construction grades, lines levels and monuments as indicated within the contract documents.

1.3 GENERAL

- A. The Contractor shall, before commencing Work, verify all grades, lines, levels and dimensions indicated and report any errors or inconsistencies to the Owner or Owner's Representative and Design Professional. The Contractor shall not proceed until such errors or inconsistencies are corrected or meet Owner or Owner's Representative and Design Professional's modified requirements.
- B. Provide construction staking and surveying from base lines, grades, and benchmarks shown on the plans. Under no circumstances will the Contractor be granted a time extension to this contract due to the lack of construction survey information. Any discrepancies in design of base lines and grades revealed in construction operations shall be brought to the Owner or Owner's Representative and Design Professional's attention immediately for correction or clarification.
- C. The Contractor shall establish and maintain all construction grades, lines, levels and bench marks and shall be responsible for the accuracy and protection of the same. This work shall be accomplished by a licensed civil engineer or surveyor. Protect all temporary bench marks and maintain them in place for the duration of the Contract or until such time as their removal does not affect completion of the Project.
- D. Do not remove any property line markers or monuments or data established by the Owner. If such are damaged or removed, the Contractor shall bear cost of replacement.

END OF SECTION

SECTION 01 73 00

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 EXAMINATION AND COORDINATION OF WORK

- A. Verification of Conditions: Examine and verify surfaces, subsurfaces, condition and serviceability of previous work to receive subsequent work and report detrimental conditions in writing to the Architect.
- B. Commencement of work acknowledges acceptance and serviceability of previous work.
- C. Coordination: Coordinate with other work which affects, connects with, or will be concealed by subsequent work.
 - 1. Work within concealed ceiling and plenum spaces shall be coordinated with all other work within these spaces to assure a coordinated assembly.
 - 2. Coordinate location and layout of mechanical, electrical and other systems located within suspended ceilings.
 - 3. Utilize Revit Model to create fully coordinated model and Shop Drawings of Project infrastructure.
 - 4. Notify Architect immediately if conflicts are found.
 - 5. Adjust work in place in concealed ceiling spaces as required to allow installation of other work which cannot be adjusted.
- D. Any remedial work required to be performed on previously placed work after new work has commenced shall be by and at the expense of the Contractor and/or sub-contractor having commenced the new work.

1.02 TOLERANCES

- A. Certain tolerances are listed in the various specification sections and on the Drawings. In addition, other tolerance limits are set forth below. These tolerances are the maximum variation allowed on the Project.
- B. Each of the Contractors shall review the tolerance limits established for their work as they relate to the other work on the Project. Should the tolerance limits established for their work be in conflict with those limits established for other adjoining work, the Architect and Owner shall be notified before proceeding.
- C. It is the intention of the Contract Documents that, assuming work in place is within the tolerance limits established, or has been accepted by following contractor(s), subsequent work shall be adjusted as required.
- D. Tolerances:
 - 1. Concrete: 1/8 inch plus or minus in any 10 feet and 3/4 inch total overall in any direction.
 - 2. Masonry: 1/8 inch plus or minus in any 10 feet and 1/4 inch total overall in any direction.
 - 3. Structural Steel: 1/8 inch plus or minus in 60 feet and 1/2 inch total overall in any direction.
 - 4. Miscellaneous Metal: 1/8 inch plus or minus in 20 feet and 1/4 inch total overall in any direction.
 - 5. Ornamental Metal: 1/8 inch total overall in any direction.

6. Drywall: 1/16 inch plus or minus in any 12 feet and 1/8 inch total overall in any direction.
 7. Acoustic Tile: 1/8 inch maximum variation overall in any direction.
 8. Granite and Marble: 1/16 inch maximum variation overall in any direction.
 9. Millwork: 1/16 inch Maximum overall in any direction.
 10. Ceramic Tile: 1/16 inch maximum overall in any direction.
- E. All materials such as Stone tile and veneers, acoustic tile, lay-in acoustical panel and decorative ceilings, ceramic tile, VCT, wood flooring, and so forth, are to meet flush with adjacent pieces of the same material.

1.03 APPROVED APPLICATORS

- A. Where specific instructions in the Specifications require that a particular product and/or material be applied and/or installed by an "approved applicator" it shall be the Contractor's responsibility to insure that any subcontractor or sub-subcontractor used for such Work is in fact currently certified by the particular Manufacturer for this type of installation or application.

1.04 APPROVED MANUFACTURERS

- A. Each Section includes a list of Manufacturers whose equipment is acceptable as to manufacture, subject to conformance with the Contract Documents. Careful checking must be completed by the Contractor and the manufacturer or equipment supplier to verify that the equipment will meet all capacities, requirements, space allocations and is suitable for the intended purpose specified.

1.05 REFERENCE DATA

- A. Reference data made available to the Contractor is for the Contractor's information only, and neither the Owner nor the Architect assume any responsibility for the Contractor's conclusions.
- B. The Contractor shall establish and maintain all building and construction grades, lines, levels, and benchmarks. This Work shall be performed by a licensed Civil Engineer or Surveyor under the employ of the Contractor, who shall certify to the Owner that he has performed this service.
- C. The Contractor shall not remove any fixed property line markers, monuments or data.

END OF SECTION

SECTION 01 73 29 CUTTING AND PATCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cutting, fitting and patching, including attendant excavation and backfill required to complete Work, and for:
 - 1. Making several parts fit together properly.
 - 2. Uncovering portions of Work to provide for installation of ill-timed Work.
 - 3. Removing and replacing defective and non-conforming Work.
 - 4. Removing samples of installed Work required for testing, as directed by Architect.
 - 5. Providing routine penetrations of non-structural surfaces for installation of piping electrical conduit, and similar items.

1.02 SUBMITTALS

- A. In advance of executing any cutting or alterations, submit written request to Architect requesting consent to proceed with cutting which affects:
 - 1. Work of Owner or other trades.
 - 2. Structural value or integrity of any element of Project.
 - 3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 - 4. Efficiency, operational life, maintenance or safety of operational elements.
 - 5. Visual qualities of sight-exposed elements.
- B. Include in request:
 - 1. Identification of Project.
 - 2. Description of affected Work.
 - 3. Necessity for cutting, alteration or excavation.
 - 4. Effect of Work of Owner or other trades, or structural or weatherproof integrity of Project.
 - 5. Description of proposed Work:
 - a. Scope of cutting, patching, alteration, or excavation.
 - b. Trades which will execute Work.
 - c. Products proposed to be used.
 - d. Extent of refinishing to be done.
 - 6. Alternatives to cutting and patching.
 - 7. Cost proposal, when applicable.
 - 8. Written permission of trades whose Work will be affected.
- C. Submit written notice to Architect designating time work will be uncovered and when work will be performed to provide for observation when necessary.

1.03 PAYMENT FOR COSTS

- A. Payment caused by ill-timed or defective work or work not conforming to Contract Documents, including costs for additional services of Architect and Engineer shall be paid by Contractor. The Contractor will be billed for additional services at the current hourly rate charged by the Architect. The Architect will charge the Owner, and such costs will be deducted from monies still due the Contractor.

- B. Payment of work done on written instructions of Architect, other than defective or nonconforming work, will be paid by Owner on approval of a written Change Order. Provide written cost proposal prior to proceeding with cutting and patching instructed by Architect for other than defective or nonconforming work. All work shall be approved by Architect and Owner prior to commencement.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide for replacement of Work removed. Comply with Contract Documents for type of Work standards and Specification requirements for each specific product involved.

PART 3 EXECUTION

3.01 INSPECTION

- A. Inspect existing conditions of Work, including elements subject to movement or damage during cutting and patching, and excavating and backfilling. After uncovering Work, inspect conditions affecting installation of new products and verify procedures with Architect.
- B. Report unsatisfactory or questionable conditions in writing to Architect/Engineer. Do not proceed with Work until further instructions are received.

3.02 PREPARATION

- A. Provide shoring, bracing and supports as necessary to maintain structural integrity of work. Design of shoring, bracing and supports shall be performed by an Engineer registered in the State of Arizona.
- B. Provide devices and methods to protect other portions of Work from damage, including elements which may be exposed by cutting and patching Work. Maintain excavations free from water.

3.03 ERECTION, INSTALLATION AND APPLICATION

- A. Performance:
 - 1. Execute fitting and adjustment of products to provide finished installation to comply with and match specified tolerances and finishes.
 - 2. Execute cutting and demolition by methods which prevent damage to other Work to provide proper surfaces to receive installation of repairs and new Work.
 - 3. Execute excavating and backfilling by methods which prevent damage to other Work and settlement as specified in Section 31 01 00.
- B. Employ original installer or fabricator to perform cutting and patching for:
 - 1. Weather-exposed surfaces and moisture-resistant elements such as roofing, sheet metal, sealants and waterproofing.
 - 2. Sight-exposed finished surfaces.
- C. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes as shown on Drawings and as specified.

- D. Fit Work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces. Conform to fire code requirements for penetrations and maintain integrity of fire walls and ceilings.
- E. Restore Work which has been cut or removed. Install new products to provide completed Work in accordance with requirements of Contract Documents and as required to match surrounding areas and surfaces.
- F. Refinish entire surfaces as necessary to provide an even, matching finish as follows:
 - 1. Painted Walls or Ceilings: To nearest intersection with another finish or corner.
 - 2. Where applied finishes occur (i.e wallcovering, tile, wood paneling): To nearest intersection of finish without damage to adjacent material. Where match of pattern, grain, texture, or similar finish cannot be made, refinish area to intersection with other finish or internal corner.
 - 3. Manufactured or shop fabricated materials: Replace entire affected surface or entire component.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 FINAL CLEANING

- A. Perform the following special cleaning for trades at completion of Work. Employ experienced workmen or professional cleaners for the final cleaning:
 - 1. Remove marks, stains, fingerprints, soil and dirt from paint, stain and wall covering.
 - 2. Remove spots, soil, paint and mastic from tile work and wash same.
 - 3. Clean fixtures, equipment and piping; remove stains, paint, dirt and dust.
 - 4. Remove temporary floor protections; clean and polish floors.
 - 5. Clean concrete walks and slabs of plaster or cement droppings, paint and other objectionable materials to present a neat, clean appearance.
 - 6. Clean exterior and interior metal surfaces, including doors and windows and their frames.
 - 7. Remove oil, stains, dust, dirt, paint and the like from items required to have a polished finish; polish and leave without fingermarks or other blemishes.
 - 8. Wash interior and exterior glazing, inside and outside.
 - 9. Polish mirrors.
- B. Make building(s) ready for occupancy in every respect. Lay heavy building paper in main circulation areas to protect the floors until final inspection and acceptance.
- C. Existing improvements, inside or outside the property which are disturbed, damaged or destroyed by the Work under the Contract shall be restored to their original condition unless as part of the Work, improvements were required.

1.02 PROJECT RECORD DOCUMENTS

- A. As the work progresses, the Contractor shall maintain a complete and accurate record of changes or deviations from the Contract Documents and Submittals, indicating the Work as actually installed. Document information by daily corrections and/or additions in the appropriate locations on a PDF or other suitable electronic copy of the Construction Documents and Submittals and PDF or other suitable electronic copy of the Specifications which shall be maintained by the Contractor solely for the purpose of this documentation. Contractor shall maintain this electronic set of Construction Documents and Submittals at the Project site for review by the Owner and Architect.
- B. Information contained in the Record Documents shall include, but not be limited to:
 - 1. Modifications made by Addenda, Bulletins, Change Orders, Construction Change Directives and Architect's Supplemental Instructions.
 - 2. Location of site underground pipes, conduits, ducts, cables and similar work, dimensioned horizontally to permanent points of reference and located vertically by indicating depth of burial and invert elevations. Dimensions shall be accurate within 2 inches.
 - 3. Location of building plumbing piping, sprinkler piping, control valves, shut-off valves, heating and air conditioning equipment, mechanical piping, ductwork, major conduit runs, power, control and alarm wiring, etc., dimensioned horizontally to permanent points of reference. Dimensions shall be accurate within 2 inches. By notation, describe the vertical location of the item such as "below slab," "above ceiling," etc.

4. Modifications made to accommodate field conditions.
 5. Location and function of mechanical and electrical control devices and shut-off valves.
 6. Panel schedules showing final circuiting of electrical fixtures and equipment.
- B. The Architect will provide PDF or other suitable electronic copy of the complete original bidding documents, at Contractor's expense. Seals and signatures of Registrants shall be completely removed and/or permanently obscured. Contractor shall provide the following on the Drawings:
1. Changes in the Contract Documents, secured with prior approval of the Architect, recorded on the PDF copy utilizing PDF writing software mark-up features, by a competent drafter. Deletions shall be made by electronic cross-out or other indication clearly indicating information deleted. Record information in adequate size lettering and notations to be legible at half size reproduction.
- C. Upon Substantial Completion of the Work, deliver the complete electronic set of Record Documents including Shop Drawings and annotated Specifications to the Architect for approval.
- D. Permit Record Set, as approved by all governing agencies shall be kept in secure location by the Contractor.

1.03 OWNERS MANUAL

- A. Owner's Manual: Prior to final payment, provide 1 digital copy and Three (3) hard-back, loose-leaf binders, suitably typed, indexed and labeled, containing the following:
1. Subcontractors and major suppliers list with companies names, addresses, email addresses and telephone numbers.
 2. Warranties and certifications.
 3. Affidavit from general and subcontractors on use of asbestos free materials.
 4. Maintenance/operation instructions.
 5. Parts list.
 6. List of Extra Materials delivered to Owner; signed for by Owner's representative.
 7. Other items required by the Specifications.

1.04 OPERATION AND MAINTENANCE DATA

- A. Submittals: Submit two (2) draft copies of Operation and Maintenance Manuals for systems and equipment, including electrical and control items, and parts lists, a minimum of 14 days prior to requesting inspection for Substantial Completion, or scheduled Substantial Completion Date, whichever is earlier. Furnish separate copies for each Division.
1. Architect will review Manuals for general scope and content and return one copy of draft manuals with required action.
- B. Operating instructions shall include complete operating sequence, control diagrams, description of method of operating machinery, machine serial numbers, factory order numbers, parts, tests, instruction books, suppliers phone numbers, addresses, email addresses, and individual equipment guarantees. Parts lists shall be complete in every respect, showing parts and part numbers for ready reference.

- C. Maintenance instructions shall include a written list of required and suggested maintenance for mechanical, plumbing, electrical or other equipment or features in the project. Each item shall contain a brief description of the maintenance required as well as the recommended time frame or period for the maintenance. Include lists of filter sizes for air handling equipment, indicated "washable" or "disposable" and for which unit the filter is for.
- D. Provide operating and maintenance instructions on DVD, memory key or similar electronic media, either prepared by the Contractor or where available, manufacturers prepared operations and maintenance videos and/or instructions for each specific equipment item or system.
- E. Assemble maintenance manual and operating instructions in hard back loose leaf binders. Suitably label and index material for ready reference.
- F. Upon substantial completion of the Project Work, submit one copy of the Operation and Maintenance Manual and Parts Lists to the Architect for approval. Upon receipt of Notice of Approval, deliver the additional copy to the Owner. Include CD and/or DVD disks of materials in electronic format.

1.05 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Deliver spare parts, tools, extra stocks of material and similar physical items required by individual specification sections to the Owner with a copy of the transmittal to the Architect. Obtain signed receipts from the Owner for all items.
- B. Change over construction locks to permanent keying system. Deliver required number of keys to the Owner with a copy of the transmittal to the Architect. Obtain receipts from the Owner for delivered items.

1.06 ELECTRONIC COPIES OF IMAGE DOCUMENTS

- A. Upon completion provide CD, DVD, or memory key containing image copies in JPEG, PDF or other appropriate electronic format of all record and maintenance documents.

1.07 WARRANTIES

- A. Submit warranties required by individual specification Sections in duplicate, assembled in durable binders with a Table of Contents and a digital copy of same on DVD, memory key or other current electronic media.
- B. The date of commencement of warranties shall be the date of Substantial Completion except as may be modified by AIA Document G-704, Certificate of Substantial Completion, or by other written agreement with the Owner.

END OF SECTION

SECTION 02 41 13

SELECTIVE SITE DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Selective demolition of minor above grade site improvements necessary or required so that the new construction and related work can be performed and completed in accordance with the Contract Documents.
 - 2. Protection of existing trees and vegetation indicated to remain.
- B. Related Sections:
 - 1. Section 31 00 00 – Earthwork, for site preparation and grading, including site stripping, and removal of existing fill, vegetation, debris, loose soil, etc., from the building site

1.02 SUBMITTALS

- A. Submit copies of permits and notices authorizing demolition as may be required by law, including permits to transport and dispose of debris.
- B. Submit project record documents which accurately record actual locations of capped utilities, and concealed obstructions in accordance with Section 01 77 00.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements
 - 1. Conform to applicable code(s) for demolition of structures, safety of adjacent structures, dust control, runoff control and disposal.
 - 2. Obtain required permits from authorities necessary for demolition and transport and disposal of debris.
 - 3. Conform to applicable regulatory procedures if hazardous or contaminated materials are discovered.
- B. Provide storm water pollution control and provide a Storm Water Pollution Prevention Plan (SWPPP) as required by the City of Phoenix and the State of Arizona.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Unless specifically scheduled for reuse, demolished materials shall become the possession of the Contractor and shall be immediately removed from the site
- B. Fill materials at excavations: As specified in Section 31 00 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and notify the Architect in writing of discrepancies before proceeding with the work.
- B. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Architect.

3.02 PREPARATION

- A. Identify, disconnect, remove and cap designated utilities within site areas as indicated or required to accommodate new construction. Notify affected utility companies before starting work and comply with their requirements.
 - 1. Notify Blue Stakes and private utility locator companies for all utility locations not covered by Blue Stakes.
 - 2. Mark location of utilities.
- B. Provide, erect, and maintain temporary barriers and security devices where required and as indicated on drawings.
- C. Protect existing site improvements, landscaping materials, utilities, appurtenances, and other work indicated to remain. Where existing materials indicated to remain are disturbed or damaged by selective demolition operations, remove damaged materials and replace with new materials to match existing at no additional expense to the Owner.
- D. Protect bench marks and existing work from damage or displacement.
- E. Prevent movement or settlement of adjacent structures.

3.03 SELECTIVE SITE DEMOLITION

- A. Carry out demolition work to cause as little inconvenience to existing site areas as possible and with minimum interference to public or private accesses. Maintain protected egress and access at all times.
- B. Perform the removal, cutting, drilling, etc., of existing work with extreme care, and using small tools in order not to jeopardize the structural integrity of the building.
- C. Perform cutting of existing concrete and masonry with saws and core drills. Do not use jackhammers.
- D. Provide hoses and water connections for sprinkling of debris as necessary to limit dust to lowest practicable level.
- E. Protection of Trees and Other Vegetation to Remain:
 - 1. Carefully and cleanly cut roots and branches of trees indicated to be left standing, where such roots and branches obstruct demolition work or will be affected by removal of footings, foundations, or utilities to be removed. Provide protection for roots over 1-1/2 inch diameter, which are cut during construction operations. Coat cut faces with emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out. Cover with earth as soon as possible.

2. Protect existing trees and other vegetation against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark/skin, smothering of trees by stockpiling construction materials or excavated materials within drip line, foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.
 3. Water trees and other vegetation to remain within the limits of construction area as indicated on the Drawings as required to maintain their health during course of construction operations.
 4. Repair or replace trees and vegetation which are damaged by construction operations, in a manner acceptable to Architect. Employ arborist to repair damages to trees, saguaros and shrubs.
- F. Backfill areas excavated and open pits and holes caused as a result of demolition in accordance with Section 31 00 00. Rough grade and compact areas affected by demolition to maintain site grades and contours unless noted otherwise on drawings.
1. Trenches and open pits within traffic areas which are left open for demolition or construction purposes shall be covered with properly supported heavy steel traffic bearing plates.
- G. Rebuild existing work/site improvements which must be removed to allow the installation of new work as indicated on the Drawings or where damaged by demolition operations.
- H. Material Disposal:
1. Remove materials from site and dispose of in a legal manner at no additional expense to Owner.
 2. No materials are to be sold on, or adjacent to, the site. Signs advertising the sale of materials shall not be allowed.
 3. Burning of materials on site is not permitted.
 4. Break concrete and masonry into sections less than 3 feet in any dimension.
 5. Remove from site, contaminated, vermin infested, or dangerous materials encountered and dispose of by safe means so as not to endanger health of workers and public.
 6. Debris from the demolition shall not be allowed to accumulate within the building or on the site.

END OF SECTION

SECTION 03 05 05

FLY ASH

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Fly ash admixture for incorporation into concrete mixes specified in the following specification sections:
1. Section 03 30 00 – Cast-In Place Concrete.
 2. Section 04 05 15 – Mortar and Masonry Grout.
 3. Section 32 13 13 – Concrete Paving.
 4. Section 32 16 00 – Concrete Curbs, Gutters, Sidewalks, and Driveways.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Coal Fly Ash and Raw or Calcined Natural Pozzolan
1. Sampled and tested in accordance with the current edition of ASTM C311, Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete.
 2. Conform to the requirements of the current edition of ASTM C618, Standard Specification of Coal Fly Ash and Raw and Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete, as follows:
 - a. Meet the requirements of ASTM C618, Table 1 Chemical Requirements and Table 1A Supplementary Optional Chemical Requirements.
 - b. Meet the requirements of ASTM C618, Table 2 Physical Requirements and Table 2A Supplementary Optional Physical Requirements in the following areas:
 - 1) Effectiveness in Controlling Alkali-Silica Reaction.
 - 2) Effectiveness in Contributing to Sulfate Resistance, Procedure A.
 - 3) Uniformity Requirements when air-entraining concrete is specified:
 3. Source Quality Control:
 - a. Fly ash shall come from sources with an established quality control program to demonstrate that the fly ash consistently conforms to ASTM C618 specification and uniformity requirements. The quality history shall include a minimum of 40 test results representing a minimum of the previous 6 months production of fly ash.
 - b. Per the current edition of ACI 232, Use of Fly Ash in Concrete, section 5.6, the fly ash quality history shall be available that demonstrates at least monthly ASTM C618 certification results from a Cement and Concrete Reference Laboratory (CCRL) accredited laboratory. A minimum of 20 reports representing at least 6 months of fly ash production is required.

2.02 MIXES

- A. Provide fly ash admixture for incorporation into concrete mixes as specified in the following specification sections:
1. Section 03 30 00 - Cast-In Place Concrete.
 2. Section 04 05 15 - Mortar and Masonry Grout.
 3. Section 32 31 13 – Concrete Paving.
 4. Section 32 16 00 - Concrete Curbs, Gutters, Sidewalks, and Driveways.
- B. Proportioning:
1. Per ACI 232, Use of Fly Ash in Concrete, section 4.1, the most effective method for proper proportioning of concrete for a specific application is by use of a trial batch and testing program per ACI 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete. When necessary, a series of mixtures shall be prepared and tested to determine the proper proportions for the specific project requirements.
 2. Fly ash, when used, shall not replace more than 18 percent of cement content by weight.
 3. Fly ash shall not be used in architectural exposed concrete or concrete slabs with a burnished or acid finish, or where it could negatively affect any material in contact with it.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 03 10 00
CONCRETE FORMWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Formwork for cast-in-place concrete, including, but not limited to:
 - 1. Installation of embedded items.
 - 2. Shoring, Bracing and Anchorage, including openings for other Work
 - 3. Form Accessories
 - 4. Form Stripping.

- B. Related Sections:
 - 1. Section 03 11 19 – Insulating Concrete Forms (ICFs), for stay-in-place insulating concrete forms for structural cast-in-place concrete walls.

1.02 DESIGN REQUIREMENTS

- A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.03 SUBMITTALS

- A. Shop Drawings: Show form construction including jointing and other items that affect exposed concrete visually. The Architect's review is for general architectural applications and features only. Designing formwork for structural stability and efficiency is the Contractor's responsibility.

- B. Product Data: Provide data on accessory materials and installation requirements.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 347R - Guide to Formwork for Concrete.

1.05 QUALIFICATIONS

- A. Design formwork under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Arizona.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to site to prevent deterioration and damage.

- B. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.07 COORDINATION

- A. Coordinate this Section with other Sections of Work which require attachment of components to formwork.

- B. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request instructions from Architect's Structural Engineer before proceeding.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Forms for Concealed Concrete: Plywood, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit. For use in below grade concrete or concrete covered by another finish. Not for use where finished concrete is exposed to view.
 - 1. Plywood, Douglas Fir species; APA grade-trademarked; BB Plyform, Class 1, Exterior Grade as per PS1.
 - 2. Lumber: Spruce, Pine or Fir species; construction grade, with grade stamp clearly visible.
 - 3. Plywood shall have mill applied release agent and edge seal.
- B. Forms for Exposed Concrete: Plywood, MDO, tempered concrete-form-grade hardboard, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surface. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system where shown on Drawings. For use in exposed to view concrete that is not covered by another finish.
 - 1. MDO (medium density overlay), class 1 or better, with mill applied release agent and edge seal.
 - 2. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C of B-B High Density Overlaid Concrete Form," Class I.
 - 3. Tempered concrete-form-grade hardboard, with applied release agent and edge seal.
 - 4. MDO, plywood, and hardboard forms shall have mill applied release agent and edge seal.
- C. Forms for Cylindrical Columns and Supports. Metal, glass-fiber-reinforced plastic, or paper or fiber tubes that will produce smooth surfaces without joint indications. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.
- D. PVC Sleeves: ASTM D1758, PVC 1120 compound, Schedule 40.

2.02 FORMWORK ACCESSORIES

- A. Form Ties: Removable or snap-off type, free of defects that could leave holes larger than one inch in concrete surface.
- B. Form Release Agent: 100 percent biodegradable, zero VOC, vegetable base, colorless, which will not stain concrete, or impair natural bonding or color characteristics of coating intended for use on concrete.
 - 1. Do not use petroleum-based agents. Paraffin and waxes shall not be used when a concrete finish is required.
- C. Corners: Chamfered wood strip type or vinyl bead; 3/4 inch x 3/4 inch size; maximum possible lengths.

- D. Flashing Reglets: Galvanized steel 22 gauge thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.
- E. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with Drawings.

3.02 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Arrange formwork for exposed concrete in an orderly and symmetrical manner to produce smooth concrete finish indicated.
- C. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- D. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping.
- E. Align joints and make watertight. Keep form joints to a minimum.
- F. Obtain approval from Architect before framing openings in structural members which are not indicated on Drawings.
- G. Provide chamfer strips on external vertical wall corners where exposed in the finished Work. Chamfer strip is not required on exposed foundation corners where exposed less than 12 inches.
- H. PVC Sleeves: Set PVC sleeves in proper alignment and position. End of sleeves shall be flush with finished concrete surface.

3.03 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with Manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive applied coverings which are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.04 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in or passing through concrete work.

- B. Locate and set in place items which will be cast directly into concrete.
- C. Coordinate Work of other Sections in forming and placing openings, slots, reglets, recesses, chases, sleeves, bolts, anchors, and other inserts.
- D. Install accessories in accordance with Manufacturer's instructions, straight, level and plumb. Ensure items are not disturbed during concrete placement.
- E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.05 FORM CLEANING

- A. Clean and remove foreign matter within forms as erection proceeds.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.06 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301.
- B. Construct formwork as required to produce concrete members of size, shape, configuration, alignment, elevation and position indicated on Drawings within tolerance limits of ACI 301.
- C. Surface Irregularities: Construct and maintain formwork to produce concrete having the following formed finish Class and permitted abrupt or gradual irregularities as designated by ACI 347-04.
 - 1. Vertical and horizontal exterior exposed surfaces: Class B, 1/4 inch.
 - 2. Other surfaces prominently exposed to public view: Class B, 1/4 inch.

3.07 FIELD QUALITY CONTROL

- A. Inspect erected formwork, shoring, and bracing to ensure that Work is in accordance with formwork design, and that support, fastenings, wedges, ties and items are secure.
- B. Do not reuse wood formwork more than 3 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.08 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads. Forms shall be removed in accordance with the requirements of the General Structural Notes.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

- D. Formwork for stem walls and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage.
- E. Cure exposed concrete in accordance with Section 03 30 00 whenever the formwork is removed during the curing period.

3.09 REMOVAL STRENGTH

- A. When formwork removal is based on the concrete reaching its specified 28 day strength (or a specified percentage thereof), the concrete shall be presumed to have strength when either of the following conditions has been met:
 - 1. When test cylinders, field cured under the most unfavorable conditions prevailing for any portion of the concrete represented, have reached the required strength.
 - 2. When the concrete has been cured for the same length of time as the age, at test, of laboratory cured cylinders which reach the required strength. The length of time concrete has been cured in the field shall be determined by the cumulative number of days or fractions thereof, not necessarily consecutive, during which the temperature of the air in contact with the concrete is above 50 degrees F. and the concrete has been damp or thoroughly sealed from evaporation and loss of moisture.

END OF SECTION

SECTION 03 11 19

INSULATING CONCRETE FORMS (ICF's)

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Stay-in-place insulating concrete forms for structural cast-in-place concrete walls. Includes the installation of concrete steel reinforcement and the placement of concrete within the insulating concrete forms.
- B. Cast-in-place concrete walls include the construction of the following:
 - 1. Exterior load bearing, and non-load bearing walls as indicated on Structural Drawings.
- C. Bracing and scaffolding shall be provided to comply with all applicable codes.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions.
- B. Code Compliance Data: Submit relevant code compliance data.
- C. Drawings and Calculations: Submit project drawings, details of construction, and structural calculations as required by the local building department.
- D. Steel Reinforcement and Concrete: Submit the reinforcement schedule and concrete mix design as proposed for use.

1.03 QUALITY ASSURANCE

- A. Comply with applicable governing codes and regulations.
- B. Follow manufacturer's training and installation procedures.
- C. Installer Qualifications: Installation of insulating concrete formwork shall be performed by a company specializing in performing Work of this Section with a minimum of 5 years documents experience and whose installers are trained and certified by the insulating concrete form manufacturer to perform work.
- D. Contractor is responsible for proper construction and placement of forms, steel reinforcement and concrete.
- E. Material in contact with the insulating concrete form must be compatible with expanded polystyrene.
- F. Standards: Comply with the following as applicable.
 - 1. ACI 301 Standard Specifications for Structural Concrete
 - 2. ACI 318 Building Code Requirements for Structural Concrete
 - 3. ACI 332 Guide to Residential Cast-in-Place Concrete Construction
 - 4. ASTM C 94 28-Day Concrete Compressive Strength
 - 5. ASTM C 150 Portland Cement
 - 6. ASTM C 33 Normal Weight Aggregates
 - 7. ASTM C 330 Light Weight Aggregates

8. ASTM C618 Fly Ash
9. ASTM A615 Steel Specifications for Steel Reinforcement
10. ASTM A185 Steel Wire Fabric Specifications
11. ASTM E84 Surface Burning Characteristics of Building Materials

1.04 SYSTEM DESCRIPTION

- A. Insulating concrete form consists of panels of expanded polystyrene nominal density 1.5 lbs/ft³ connected by manufacturer's standard ties.
- B. Provides overall wall section thickness and concrete cross section as indicated on the Drawings.
- C. Provide plastic ties recessed 1/2" behind each face of expanded polystyrene and located 6" o.c. to provide 1-1/4" wide furring strip the full height of wall to fasten exterior and interior finishes.
- D. Interior ICF wall finish shall provide a plumb and straight surface ready to receive direct applied gypsum board without the need for additional framing or furring where indicated on Drawings.
- E. The wall system shall provide a calculated R-22 insulation value.
- F. The wall system provides fire resistance ratings and superior sound attenuation values.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver the product in original factory packaging with product listing label and manufacturing label.
- B. Handle and store the product to prevent damage and deterioration.
- C. Protect from prolonged exposure to the sunlight's UV rays.

1.06 PROJECT CONDITIONS

- A. Follow manufacturers requirements for protection and placement of concrete during construction periods when the weather is below the minimum specified by the building codes to ensure proper curing conditions.

1.07 WARRANTY

- A. Furnish manufacturer's standard product warranty.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Furnish products of one of the following Manufacturers, except as otherwise approved by the Architect, subject to compliance with Specification requirements:
 1. Fox Blocks; Division of Airlite Plastics www.foxblocks.com
 2. Nudura integrated Building Technology www.nudura.com
 3. Equal as prior approved by Architect and Owner.

- B. Basis of Design: Drawings and detailing are based on ICF as manufactured by Nudura. Where other ICF materials are used in the actual Work, the Contractor is responsible for all design and detailing changes that may be affected by differences in the forms or installation of the forms that necessitate changes/modifications in the design and detailing.

2.02 MATERIALS

- A. Provide insulating concrete forms conforming to ACI 332 and as indicated on the Drawings and as required for complete installation as shown.
 - 1. Flame Spread Index: Not to exceed 25 when tested in accordance with ASTM E84.
 - 2. ICF Sizes: 11-1/4 inches thick, unless otherwise indicated on Drawings.
- B. Concrete
 - 1. Concrete supplied under Section 03 30 00 shall meet the compressive strength requirement as specified in the General Structural Notes.
 - 2. Recommended concrete mix shall include a concrete slump and aggregate size as indicated on the Structural Drawings and as recommended by the form system manufacturer.
- C. Steel Reinforcement
 - 1. Steel reinforcement shall be supplied and placed in the formwork as specified by the design engineer or prescriptive reinforcement tables.
- D. Auxiliary Materials
 - 1. Sufficient bracing, wall alignment and scaffolding
 - 2. Waterproofing materials for below grade applications
 - 3. Exterior finishes
 - 4. Interior finish must meet code requirement for 15 minute thermal barrier
 - 5. Door and window opening bucks
 - 6. Penetration and sleeve material
 - 7. Anchors and anchor bolts

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify all items in the Work Included section and verify site conditions.
- B. Verify footings are installed within +/- 1/4" of level and step footings are 16" in height.
- C. Verify steel reinforcement vertical dowels are in place as specified by design.

3.02 PREPARATION

- A. Clean top of footings and organize materials and equipment before starting formwork.

3.03 INSTALLATION

- A. Installation of forms and contractors work must be in accordance to manufacturer's installation manual and training procedures including:
 - 1. Placement of forms.
 - 2. Steel reinforcement placement.
 - 3. Concrete placement.

4. Door and window opening construction.
 5. Bracing, scaffolding and wall alignment.
 6. Anchors, anchor bolts, penetrations.
 7. Final pre-pour checklist.
- B. Place and lap reinforcement in accordance with Structural Drawings.
- C. Mechanically vibrate all concrete when faced.
- D. Place concrete in maximum lifts indicated in General Structural Notes on Structural Drawings.
- E. Interior ICF Wall Finish: Remove fins, stone projecting joint marks and out-of-plane surfaces to produce a straight, plumb wall surface without projections or surface irregularities. Interior ICF wall finish shall provide a plumb, smooth and straight surface ready to receive direct applied gypsum board without the need for additional framing or furring where indicated on Drawings.
1. Tolerances: 1/8 inch maximum from plumb and smooth surface in 8'-0".
- F. Exterior ICF Wall Finish: Remove fins, stone projecting joint marks and out-of-plane surfaces to produce a straight, plumb wall surface without projections or surface irregularities ready to receive direct applied plywood wall sheathing where indicated on Drawings.
1. Tolerances: 1/8 inch maximum from plumb and smooth surface in 8'-0".
- 3.04 FIELD QUALITY CONTROL
- A. Ensure that the cast-in-place concrete walls are level, plumb, square and straight and that all dimensions conform to the drawings.
- 3.05 CLEANUP
- A. Clean up and dispose of all debris on job site related to the installation of the insulating concrete forms.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Concrete reinforcement as shown on the Drawings and as specified.

1.02 QUALITY ASSURANCE

- A. Comply with ACI-301, Chapter 5, except where more exacting requirements are specified.
- B. Comply with requirements in AWS-D12.1, except where more exacting requirements are specified in the Contract Documents.

1.03 SUBMITTALS

- A. Shop Drawings: Submit Drawings showing bending and placing of reinforcing. Include diagrammatic elevations of walls at a scale sufficiently large to show clearly the position and erection marks of marginal bars and their dowels and splices and bar arrangement for more than one layer of reinforcing steel in concrete sections.
- B. Certificates: Submit certified mill test reports for review prior to fabrication.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Shipping: Deliver reinforcement to the Project site bundled, tagged and marked to facilitate sorting and placing. Tags shall indicate bar sizes, lengths, grade and other information corresponding to markings shown on placement diagrams.
- B. Storage and Protection: Store reinforcement at the site off the ground and in a manner to prevent damage to the materials.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Reinforcing Steel: New billet-steel, deformed bars conforming to ASTM A615, Grade 60, with a minimum yield of 60 ksi for all bars #4 and larger and ASTM A615, Grade 40 with a minimum yield of 40 ksi for all #3 bars, unless otherwise indicated on Drawings. Grade 60 bars indicated to be welded shall be ASTM A706.
- B. Welded Wire Fabric: Not allowed.
- C. Fiber Reinforcing: As specified in Section 03 30 00.
- D. Chairs: Galvanized steel or plastic tipped.
- E. Tie Wire: ASTM A82, 16 gauge or heavier, black annealed.

- F. Welding Rods: E-70 Series for A615 Grade 40 (ASTM A615M, Grade 300) reinforcing, and E-90 Series for A706 reinforcing; low hydrogen conforming to AWS A-5.1.

2.02 FABRICATION

- A. Shop fabricate bars as far as is practical. Bend bars cold. Make bends for stirrups and ties around pins having diameters at least 2 times the thickness of the bars; for other bars 1 inch diameter and smaller, 6 times the thickness; for larger bars 8 times the thickness.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Determine weldability of reinforcing steel by laboratory chemical analysis of steel. Only steel conforming to chemical requirements specified in AWS D12.1 may be welded.

3.02 PLACING REINFORCEMENT

- A. General:
 - 1. Place in accordance with ACI 318 and as shown.
 - 2. Accurately place reinforcement and securely tie at intersections with 16 gauge black annealed wire.
 - 3. Maintain reinforcing in proper position by chairs, bar supports or other approved devices.
 - 4. Bars in footings shall be supported on precast concrete blocks.
 - 5. The bending or field cutting of bars around openings or sleeves will not be permitted.
 - 6. Reinforcing steel in beams and slabs shall not be placed until after concrete in walls and columns has been poured.
- B. Splices in concrete beams, columns, walls, slabs, and footings shall be per typical detail on Structural Drawings. Splices shall be Class B tension splices (2'-0" minimum), unless otherwise indicated on Drawings. Stagger a minimum of one lap length. Hook horizontal bars around corners not less than 24 diameters, with a minimum of 12 inches as per typical details.
- C. Concrete protection of reinforcing shall be not less than the following:
 - 1. Concrete is poured against and permanently exposed to ground: 3 inches.
 - 2. Concrete is poured against forms but may be in contact with ground:
 - a. #5 and under: 1-1/2 inches.
 - b. #6 and larger: 2 inches.
 - 3. Exterior face of exterior walls (exposed to weather but not in contact with ground): 1-1/2 inches minimum.
 - 4. Interior walls and interior face of exterior walls: 3/4 inch minimum.
 - 5. Beams, girders and columns: 1-1/2 inches.
 - 6. Interior Slabs: 1 inch.
- D. Clear distance between bars shall be not less than 1-1/2 times the maximum size of coarse aggregate unless noted otherwise.
- E. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits or embedded items. If bars are moved more than one bar diameter or enough to exceed code tolerances, resulting arrangement of bars shall be subject to review of Architect.

- F. Bars with kinks or bends not indicated shall not be used. Reinforcement shall not be bent or be straightened in a manner that will weaken the material, or be bent after being partially embedded in hardened concrete.

3.03 CLEANING

- A. During the course of the Work and on completion, remove excess materials, equipment and debris and dispose of off premises. Leave Work in clean condition.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Cast-in-place concrete including, but not limited to, the following:
 - 1. Building footings, foundations, slabs on grade.
 - 2. Site structures including, but not limited to, footings and foundations for site structures, site walls, gates and gate operators, site lighting supports, electrical and mechanical equipment support pads, and other site furnishing and equipment requiring cast-in-place concrete items.
 - 3. Concrete fill for pipe bollards specified in Section 05 50 00.
 - 4. Abrasive blast (sand blasted) finished concrete.
 - 5. Other items as indicated on Drawings.

- B. Related Sections:
 - 1. Section 03 05 05 – Fly Ash
 - 2. Section 03 10 00 – Concrete Formwork
 - 3. Section 03 11 19 – Insulating Concrete Forms (ICFs)
 - 4. Section 03 20 00 – Concrete Reinforcement
 - 5. Section 03 35 33 – Decorative Concrete Finishes, for ground and polished concrete finish.
 - 6. Section 32 13 13 – Concrete Paving.
 - 7. Section 32 16 00 – Concrete Curbs, Gutters, Sidewalks and Driveways

1.02 SYSTEM DESCRIPTION

- A. Performance Requirements: Interior slabs on grade scheduled to receive applied floor finishes (resilient flooring, etc.) shall be tested as specified herein under Field Quality Control Calcium chloride test requirements. Moisture vapor from the floor must be less than 3 pounds per 1,000 square feet per 24 hours.

1.03 SUBMITTALS

- A. Mix Design: Submit mix design for each class of concrete to the Architect for review. Review of mix designs by Architect and/or Engineer shall in no way relieve the Contractor of responsibility for the performance of the concrete.

- B. Product Data: Submit Manufacturer's Specifications and performance data for accessory products.

- C. Test Reports: Submit copies of test reports for concrete compressive strength, air content, temperature and slump. Submit copies of granular base course test reports.

- D. Shop Drawings: Submit shop drawing showing proposed location of construction joints, expansion/contraction joints and control joints and obtain approval of same from Architect prior to construction.
1. Prior to start of construction, submit a slab on ground “Placing, Curing, and Jointing Procedures Plan”. Indicate detailed procedure and sequence for placing, evaporation control, curing methods, time intervals between placing and jointing, and coordination with City of Phoenix staff for sealing of exposed slabs. The plan shall also include procedures for repair and/or removal and replacement of slabs that crack in excess of specified tolerances.
- E. Samples of materials, including names, sources, and descriptions, of the following:
1. Vapor Barrier.
 3. Sand blast finish concrete.

1.04 QUALITY ASSURANCE

- A. Standards:
1. Standard for measuring, mixing, transporting and placing of concrete shall be ACI-301 and ACI-304.
 2. Standard for measuring, mixing and delivery of ready mixed shall be ASTM C94, except that time in mixer after water has been added at batch plant is limited to 1-1/2 hours.
 3. Job-mixed concrete shall be subject to Architect's review of design, mixing and handling procedures.
- B. Pre-Installation Conference:
1. Contractor shall conduct a meeting at Project site to review proposed mix designs and discuss required methods and procedures to achieve required concrete construction.
 2. Contractor shall distribute meeting agenda to all attendees a minimum of 7 days prior to the scheduled date meeting.
 3. Attendees: Responsible representatives of every party who is concerned with the concrete work to attend the conference, including but not limited to the following:
 - a. Contractor's superintendent.
 - b. Laboratory responsible for concrete design mix.
 - c. Laboratory responsible for field quality control.
 - d. Concrete subcontractor.
 - e. Ready-mix concrete producer.
 - f. Admixture manufacturer(s).
 - g. Concrete placement equipment manufacturer(s).
 4. Meeting minutes will be taken by the Contractor for distribution to all attendees within 5 days of meeting. Contractor shall also distribute copy of meeting minutes to Owner, Structural Engineer, and Architect.
 5. Minutes shall include statement by concrete subcontractor indicating proposed mix design, placement, finishing and curing procedures can produce the concrete quality required by these specifications.
- C. Static Coefficient of Friction: Sealed concrete floors shall have a tested coefficient of friction of 0.71 minimum dry, 0.6 minimum wet for level surfaces and treads of stairs and 0.8 minimum wet or dry for ramp surfaces when tested in accordance with ASTM D2047 / UL410.

1.05 PROJECT CONDITIONS

- A. Rain protection: Do not place concrete during rain unless adequate protection has been provided.
- B. Cold weather protection: Comply with ACI-306R.
- C. Hot weather protection: Comply with ACI-305R and 305.1-06.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C150, Type I or Type II, alkali content not to exceed 0.6 percent. Use one brand and type of cement throughout Project unless otherwise specified.
- B. Aggregate - Structural Concrete: Clean, coarse aggregate and gravel, free from foreign matter, conforming to ASTM C33. Aggregate shall be graded from coarse to fine in accordance with ASTM C33, Size 67.
- C. Admixtures:
 - 1. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures. Provide one of the following:
 - a. AEA-92 and Air 40, Euclid Chemical Co. www.euclidchemical.com
 - b. Sika AER, Sika Corp. www.sikaconstruction.com
 - c. Master Builders MB-VR or MB-AE, BASF Admixtures www.basf-admixtures.com
 - 2. Water-Reducing Admixture: ASTM C494, Type A, and containing not more than 0.05 percent chloride ions. Provide one of the following:
 - a. Eucon NW or Eucon WR 91, Euclid Chemical Co.
 - b. Master Builders Pozzoloth 322N, BASF Admixtures
 - c. Plastocrete 160, Sika Chemical Corp.
 - 3. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C494, Type F or Type G and containing not more than 0.05 percent chloride ions. Provide one of the following:
 - a. Eucon 37/Eucon 1037, or Plastol Series, Euclid Chemical Co.
 - b. Daracem 100 or ADVA Flow, W.R. Grace & Co.
 - c. Master Builders Rheobuild 1000 or Glenium 3030, BASF Admixtures.
 - 4. High-Range, Water-Reducing, and Retarding (Superplasticizer): ASTM C 494, Type G. Provide one of the following:
 - a. Eucon 537, Euclid Chemical Company
 - b. Daracem 100, W.R. Grace & Co.
 - c. Master Builders Rheobuild 916, BASF Admixtures
 - 5. Non-Chloride, Non-Corrosive Accelerating Admixture: The admixture shall conform to ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. The admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory (of at least a year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures. Provide one of the following:
 - a. Accelguard 80, 90 or NCA, Euclid Chemical Co.

6. Water-Reducing, Retarding Admixture: ASTM C494, Type D, and contain not more than 0.05 percent chloride ions. Provide one of the following:
 - a. Eucon NR or Eucon Retarder 100, Euclid Chemical Co.
 - b. Master Builders Pozzolite Retarder, BASF Admixtures.
 - c. Plastiment, Sika Chemical Co.
 7. Fly ash admixture: In accordance with Section 03 05 05 and General Structural Notes on Structural Drawings.
 8. Use set-retarding admixtures during hot weather only when approved by Architect.
 9. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.
- D. Fiber-Reinforced Concrete (FiberMesh):
1. Polypropylene Fiber reinforced concrete shall be provided in accordance with ASTM C1116 Type III, synthetic fiber reinforced concrete, as follows. Synthetic reinforcing fibers shall be 100 percent virgin polypropylene fibrillated fibers containing no reprocessed olefin materials. Fibers shall have a specific gravity of 0.9, a minimum tensile strength of 70 ksi, graded per manufacturer. A minimum of 1.5 pounds of fibers per cubic yard of concrete shall be used. Fibers shall be added at the batch plant. Toughness indices shall meet requirements for performance level I.
 2. 2 inch Xorex Steel Fibers manufactured specifically for concrete reinforcement at an addition rate of 33 pounds per cubic yard of concrete. Material shall be ASTM A820, Type I, low carbon, cold drawn, continuously deformed, circular segment steel wire with minimum ultimate tensile strength of 120,000 psi. Material shall conform to ASTM C1116 and be clean of rust, oil, and deleterious materials.
 3. Provide applicable fibers at the following locations in the project:
 - a. Polypropylene Fibers shall be used at all interior and exterior slabs exposed to view.
 - b. Steel Fibers shall be used at all Apparatus Bays and exterior concrete driveway aprons.
 - c. MAG specs shall be followed for pedestrian sidewalks, curbs and gutters.
- E. Water: Potable.

2.02 ACCESSORIES

- A. Bonding Agents and Repair Products:
1. Interior Only (PVA): L&M Construction Chemicals EVERWELD www.lmcc.com; EucoWeld, Euclid Chemical Company www.euclidchemical.com; US Spec Bondcoat PVA www.usspec.com; or Larsens' Weld Crete www.larsenproducts.com
 2. Interior Only for Bonding Existing Concrete to Fresh Concrete (Epoxy): Sikadur 32, Hi-Mod, Sika www.sikausa.com; Euco 452 Series, Euclid Chemical Company www.euclidchemical.com; Maxi-Bond 2500, US Spec www.usspec.com; or Rezi-Weld, W.R. Meadows www.wrmeadows.com.
 3. Exterior and Interior Bonding Admixture (acrylic latex): SBR Latex or Flexcon Euclid Chemical Company www.euclidchemical.com; Intralok, W.R. Meadows www.wrmeadows.com; Acylcoat, US Spec www.usspec.com; or Dayton Bond J40, Dayton Superior www.daytonsuperior.com.

4. Polymer Repair Compounds: Polymer and microsilica modified cementitious based compounds.
 - a. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - b. Horizontal Locations:
 - 1) Sikatop 121 or 122, Sika Chemical www.sikausa.com
 - 2) Thin Top Supreme, Concrete Top Supreme, Euclid Chemical Company www.euclidchemical.com
 - 3) TP Mortar, US Spec www.usspec.com
 5. Underlayment Topping: Free-flowing, self-leveling, pumpable cementitious base compound.
 - a. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - 1) Ardex K-15, Ardex Inc.
 - 2) Flo-Top or Super Flo-Top, Euclid Chemical Company
 - 3) Self-Leveling Underlayment, US Spec
 - 4) Underlayment 110, BASF
 6. Repair Topping: Latex modified, sandless cementitious mortar topping with bond strength meeting or exceeding requirements of ASTM C1059.
 - a. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - 1) Thin Top Supreme, Euclid Chemical Company
 - 2) TP Mortar, US Spec
 - 3) As approved by Architect.
- B. Non-Shrink Grout:
1. Premixed or prepackaged, non-metallic, non-gaseous, bleed free compound; non-shrink when tested in accordance with ASTM C 1107, Grade B at a fluid (flow cone) consistency of 20 to 30 seconds.
 2. Attain minimum compressive strength of 7,000 psi in 28 days at above fluid consistency.
 3. Fluid grouts: Remain workable, flow through flow cone after 20 minutes with slight agitation, in temperatures from 40 to 70 degrees F.
 - a. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - 1) Suregrip High Performance, Dayton Superior, www.daytonsuperior.com
 - 2) Sikagrout 212, Sika www.sikausa.com
 - 3) Master Builders (Masterflow 713) www.masterbuilders.com
 - 4) W.R. Meadows No. 588 Grout www.wrmeadows.com
 - 5) L&M Construction Chemicals (DURAGROUT) www.lmcc.com
 - 6) US Spec "GP Grout" www.usspec.com
 - 7) Euclid N-S Grout www.euclidchemical.com.
 4. High Flow Fluid Grouts: High flow grout shall achieve 95 percent contact when placed under an 18 inch x 36 inch base plate, remain workable, and flow through cone after 60 minutes in temperature from 70 to 90 degrees F.
 - a. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - 1) Hi-Flo Grout, Euclid Chemical Company www.euclidchemical.com
 - 2) US Spec "MP Grout" www.usspec.com
 - 3) Chemrex Masterflow 928, BASF www.chemrex.com

- C. Epoxy Anchoring Adhesive: 2-component, high modulus, 100 percent solids epoxy gel adhesive complying with ASTM C881.
1. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - a. Hilti HIT-RE 500-SD www.hilti.com
 - b. Simpson Strong-Tie Co. Set-XP www.simpsonanchors.com .
- D. Formed Construction Joint: Standard design plastikey, tongue and groove key joint; 3-1/2 inch vertical dimension for 4 inch slabs. For use only in slabs not exposed to vehicular traffic.
- E. Preformed Expansion Joint Filler: ASTM D1751.
- F. Liquid Curing and Sealing Compound:
1. Verify that specified curing compound is compatible with the floor finish material(s) and adhesive(s) that will be applied to floor surface prior to delivery of curing compound to jobsite. If it is determined that the curing compound is not compatible with the floor finish material(s) and adhesive(s) that will be applied to floor surface, Contractor shall immediately notify Architect.
 2. Dissipating Hydrocarbon Resin Curing Compound: ASTM C309, VOC compliant, 350 g/l, for use on slabs receiving subsequent applied finishes and where noted on Drawings. Subject to compliance with requirements, provide one of the following:
 - a. Kurez DR VOX or Kurez W VOX, Euclid Chemical Company www.euclidchemical.com
 - b. Maxcure Resin Clear HS, US Spec www.usspec.com
 3. Clear Curing and Sealing Compound (Voc Compliant, 350 g/l): Liquid type membrane-forming curing compound, clear styrene acrylate type, complying with ASTM C1315, Type I, Class A, 25% solids content minimum. Moisture loss shall be not more than 0.40 Kg/m² when applied at 300 sq. ft./gal. Manufacturer's certification is required. Subject to project requirements provide one of the following products:
 - a. Chemrex Kure 1315, BASF Construction Chemicals www.chemrex.com.
 - b. Lumiseal WB, L&M Construction Chemicals www.lmcc.com
 - c. Radiance UV-25, US Spec www.usspec.com
 - d. Super Diamond Clear VOX, Euclid Chemical Company www.euclidchemical.com
 - e. VOCCOMP-30, W.R. Meadows www.wrmeadows.com
- G. Sealer: VOC compliant, acrylic copolymer type.
1. Interior: ASTM C1315, Class A. Subject to requirements, Provide one of the following:
 - a. VCOMP-30, W. R. Meadows.
 - b. Euclid Super Aqua Cure VOX, Euclid Chemical Company.
 - c. Dress & Seal WB #30, L&M Construction Chemicals.
 - d. J-19, Dayton Superior.
 3. Liquid Densifier-Sealer for Ground and Polished Concrete: As specified in Section - 03 35 33.
- H. Leveling Agent: Sonneborn Sonoflow, Euclid Flo-Top, Ardex K-15, L&M Construction Chemicals Levelex, US Spec "Self-Leveling Underlayment, or Dayton-Superior Levelayer 1 are acceptable products.

- I. Liquid Sealer Densifier: High performance, deeply penetrating concrete densifier; odorless, colorless, VOC compliant, non-yellowing silicate based solution designed to harden, dustproof and protect concrete floors subjected to heavy vehicular traffic and to resist black rubber tire marks on concrete surfaces. The compound must contain a minimum solids content of 20 percent of which 50 percent is silicate.
 1. Subject to project requirements provide one of the following products:
 - a. Ashford Formula, Curecrete Chemical Company, Inc. www.ashfordformula.com
 - b. Diamond Hard, Euclid Chemical Company www.euclidchemical.com .
 - c. SealHard, L&M Construction Chemicals www.lmcc.com
 - d. Liquihard, W. R. Meadows www.wrmeadows.com
 - e. J-17 Surehard, Dayton-Superior www.daytonsuperior.com
 - f. Industraseal, US Spec www.us-spec.com "
 2. Liquid Densifier-Sealer for Ground and Polished Concrete: As specified in Section 03 35 33.

- J. Vapor Barrier: ASTM E1745, Meets or exceeds Class A, manufactured from prime virgin resins and complying with the following:
 1. Permeance Rating:
 - a. New Material: Less than 0.01 perms (gr/ft²/hr/in-Hg) when tested in accordance to ASTM E96 or ASTM F1249.
 - b. After Mandatory Conditioning: Less than 0.01 perms (gr/ft²/hr/in-Hg) when tested in accordance with ASTM E154, Sections 8, 11, 12 and 13.
 2. Minimum Thickness: 15 mils in accordance with ACI 302.2R-06.
 3. Puncture Resistance: Minimum 2200 grams when tested in accordance with ASTM D1709.
 4. Tensile Strength: Minimum 45.0 lbf/in when tested in accordance with ASTM D882.
 5. Acceptable Products:
 - a. Stego Wrap (15 mil) vapor Barrier, Stego Industries, L.L.C., (877) 464-7834 www.stegoindustries.com
 - b. Vaporguard, Reef Industries www.reefindustries.com
 6. Accessories:
 - a. Seam Tape and Mastic: Provide manufacturer's recommended seam tape and vapor proofing mastic with WVTR of 0.3 perms or lower when tested in accordance with ASTM E96.
 - b. Pipe Boots: Construct boots from vapor barrier material, pressure sensitive tape and/or mastic in accordance with manufacturer's instructions.
 - c. Termination Bars and Tapes: As recommended by manufacturer for terminating vapor barrier on vertical footings and foundation walls.

- K. Concrete Accessories: Gateway Engineering Company, Dayton-Superior Corporation, or Burke Concrete Accessories.

- L. Evaporation Retarder:
 1. Type: Monomolecular film, compatible with subsequent coatings and floor finishes.
 2. Acceptable Manufacturer and Products: L&M Construction Chemicals (E-Con), Master Builders (Confilm), Sika (Sika Film), W.R. Meadows (Evapre), US Spec (Monofilm ER), or Dayton Superior (Surefilm J-74)."

2.03 MIXES

- A. Design of Mixes: All mix designs shall be prepared in accordance with ACI 318-05, “Building Code Requirements for Structural Concrete”, Section 5.3, “Proportioning on the Basis of Field Experience or Trial Mixtures”.
- B. Selection of proportions for normal weight concrete: ACI 301.
- C. Mix and deliver ready-mixed concrete in accordance with requirements of ASTM C94, Option A.
 - 1. Not more than 90 minutes shall elapse from time water is introduced into the concrete mixture until completion of placement.
 - 2. Do not add water to mix that has stiffened to increase its workability.
 - 3. At no time shall concrete mix exceed a bulb thermometer reading of 90 degrees F. or over.
 - 4. Use ice or other method as reviewed by Architect, to keep concrete below 90 degrees F. temperature.
- D. Fiber Reinforcement: Refer to paragraph 2.01, D.
- E. All concrete must contain the specified water-reducing admixture or the specified high-range water-reducing admixture (superplasticizer). All thin concrete slabs, less than 8 inches in thickness placed at air temperatures below 50 degrees F shall contain the specified non-corrosive, non-chloride accelerator. All concrete slabs placed at air temperatures above 90 degrees F may require the use of a water reducing retarding admixtures.
- F. All concrete required to be air entrained shall contain an approved air entraining admixture. All pumped concrete, concrete for industrial slabs, synthetic fiber concrete, architectural concrete, self-consolidating concrete, concrete required to be watertight or concrete with a water/cement ratio below 0.50 shall contain the specified high-range water-reducing admixture (superplasticizer).
- G. Durability Requirements - Water/Cementitious Ratio:
 - 1. All concrete subject to freezing and thawing shall have a maximum water/cementitious ratio of 0.50 (4000 psi at 28 days or more).
 - 2. Water-cement ratio for concrete used for interior slab on grade construction: 0.40 to 0.45.
- H. Air Entraining Admixture: All concrete exposed to freezing and thawing and/or required to be watertight shall have an air content of 4.5 to 7.5 percent in accordance with ACI 212.3R. All interior, slabs subject to vehicular abrasion, shall have a maximum air content of 3 percent.
- I. Compressive strength (28 day): As shown on Structural Drawings.
- J. Slump, for consolidation by vibration: As shown on Drawings.

PART 3 EXECUTION

3.01 PREPARATION

- A. Prior to placing concrete:
 - 1. Clean equipment involved.
 - 2. Remove debris and foreign material from the forms.
 - 3. Remove concrete laitance from reinforcing steel.
 - 4. Wet wood forms and masonry units in contact with concrete.
- B. No wood will be permitted to remain permanently inside the forms.
- C. Coordinate the necessary Trades as required to provide the sleeves, bolts, anchors, holes, etc., to be built in.
- D. At locations indicated on Drawings, place vapor retarder over subbase immediately prior to placing of floor slab.
 - 1. At locations indicated on Drawings, Install vapor retarder in accordance with ASTM E1643-11 and manufacturer's printed instructions.
 - 2. Unroll vapor barrier/retarder with the longest dimension parallel with the direction of the pour.
 - 3. Lap vapor barrier/retarder over footings or seal to foundation walls.
 - 4. Vapor barrier/retarder shall be continuous over entire floor area and turned up a minimum of 2 inches at perimeter walls and penetrations and sealed with termination bar or tape.
 - 5. Overlap joints 6 inches and seal with manufacturer's tape.
 - 6. Seal all penetrations (including pipes) per manufacturer's instructions.
 - 7. No penetration of the vapor barrier/retarder is allowed except for reinforcing steel, structural members and permanent utilities.
 - 8. Repair damaged areas by cutting patches of vapor barrier/retarder, overlapping damaged area 6 inches and taping all four sides with tape.
 - 9. Vapor barrier/retarder installation shall be approved by the vapor barrier manufacturer prior to concrete placement.

3.02 PLACING OF CONCRETE

- A. Concrete Work shall be performed in accordance with ACI-301 except as amended by this Section.
- B. Convey concrete from the mixer to place of final deposit by methods which will prevent segregation of aggregate or loss of material. Place concrete at such a rate that concrete is at all times plastic and to insure a practically continuous flow of concrete. Concrete not in place 1-1/2 hours after water has been added at batch plant may be rejected by Architect.
- C. Place concrete as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Do not deposit concrete that has partially hardened or been retempered.
- D. Do not place concrete during rain unless adequate protection has been provided.

- E. Thoroughly compact concrete by suitable means during the placing, and work around the reinforcement and embedded items into the corners of the forms.
 - 1. Use vibrators to aid in the placement of the concrete, operated by experienced personnel.
 - 2. Keep at least one spare operating vibrator on the job at all times during the concrete operations.
- F. Self-Consolidation concrete does not require vibration.
- G. Set reinforcing dowels connecting new concrete construction to existing with epoxy anchoring adhesive as indicated on Structural Drawings.
- H. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
 - 1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
 - 3. Maintain reinforcing in proper position during concrete placement.
 - 4. Immediately following screeding of slabs, spray over the entire surface of fresh plastic concrete a sprayable solution of evaporation retardant and finish aid prepared and used in strict compliance with manufacturer's directions.

3.03 CONSTRUCTION, EXPANSION, AND CONTRACTION JOINTS

- A. Construction Joints: Provide as required to facilitate construction in accordance with Concrete Jointing Plan on Drawings and reviewed shop drawings.
- B. Expansion and Contraction Joints: Place expansion and contraction joints where required to ensure that undesirable thermal and shrinkage cracking of slabs is minimized.
 - 1. Sawcut Joint. Sawed joints shall be completed within 4 to 8 hours after concrete placement. Sawed joints shall be cut as soon as possible so as not to cause spalling of the slab while sawing. Waiting until the next day to saw cut joints is unacceptable and cause for removal and replacement of slab.
 - 2. If joint patterns are not shown, provide joints not exceeding 10 feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays). 5 foot on center at sidewalks.
 - 3. See Concrete Jointing Plan on Drawings for locations of expansion and contraction joints in slabs-on-grade and in topping pours.
 - 4. If drawings do not indicate locations, verify with Architect prior to placement of slabs-on-grade and topping pours.
 - 5. Utilize early entry saw-cutting techniques using specialized equipment and procedures in accordance with the manufacturer of the saw-cutting equipment to saw-cut all joints in interior and exterior slabs within 2 hours of final finishing of the floor slabs while the concrete is still in its early green state.
 - a. Acceptable Equipment: Soff-Cut International, Inc., Corona, CA 1-800-776-3328 www.soffcut.com
 - 6. At exterior slabs-on-grade provide a 1/2 inch wide expansion joint wherever slabs abut vertical construction elements whether indicated or not.
- C. Additional reinforcing may be required at some construction, expansion/contraction and control joints, and shall be supplied and installed at no additional cost.

- D. Reinforcing shall be continuous through construction joints of reinforced slabs, unless otherwise indicated on Drawings. Placement schedule shall be submitted for approval.
- E. For slabs-on-grade, no concrete pour shall be longer than 100 feet or more than 4,000 square feet in area, unless early entry saw-cutting techniques are utilized for placement of joints in the slab while the concrete is still in a green state and prior to the slab developing expansion/contraction cracking at random location. Provide shear keys as detailed.
- F. Provide support of formed construction joint materials by means that does not puncture or otherwise damage under floor vapor retarder at interior floor slabs on grade.

3.04 FINISHING VERTICAL (FORMED) SURFACES

- A. Formed surface finishes:
 - 1. Pits, tunnels, mechanical rooms and concealed surfaces: Remove fins, patch tie holes.
 - 2. Interior and exterior exposed surfaces: Remove fins, patch tie holes, stone joint marks, out-of-plane surfaces and other projections to produce uniform, smooth, dense concrete having the following formed finish Class and permitted abrupt or gradual irregularities as designated by ACI 347-04:
 - a. Vertical and horizontal exterior exposed surfaces: Class A Smooth Finish, 1/8 inch, except abrupt irregularities shall be removed.
 - b. Other surfaces prominently exposed to public view: Class A Smooth Finish, 1/8 inch, except abrupt irregularities shall be removed.
 - c. Concealed surfaces where covered by another finish: Class C, 1/2 inch, except abrupt irregularities shall be limited to 1/4 inch.

3.05 FINISHING HORIZONTAL SURFACES

- A. Rake concrete into place, screed and compact with a light tamp, except do not tamp topping and slabs not on grade. Screed with sawing motion and float surface to bring fines to the top.
- B. Mix and apply evaporation retarder in accordance with manufacturer's printed instructions immediately after floating. In extreme drying conditions, apply additional material as needed. Apply lightly on hard to trowel floor areas.
- C. Concrete Flatwork (Slab) Finishes:
 - 1. Interior Flatwork Concrete:
 - a. Sealed, smooth steel trowel finish.
 - b. Ground and polished concrete as specified in Section 03 35 33.
 - 2. Exterior Flatwork: As follows, unless otherwise indicated on Drawings:
 - a. Natural color broom finish concrete as indicated on Drawings.
 - b. Natural color ripple finish concrete at ramps as indicated on Drawings.
- D. When concrete has hardened sufficiently so that excess fines will not be brought to the surface, trowel slab with a steel trowel to a smooth surface free of pinholes and other imperfections. A mechanical trowel with rotating steel blades, approved by Architect, shall be used for this operation.
- E. After the surface has hardened sufficiently to ring under a trowel, trowel again with a steel trowel to a hard, burnished surface free of blemishes.

- F. Concrete slabs scheduled to receive ceramic or stone tile, concrete topping or similar finishes shall have a screeded finish but true and even to plane with no sharp projections or ridges.
- G. Use a 1/8 inch radius edger on edges of exposed Work. Use a deep cutting, 1/8 inch radius scoring tool or sawcutting to provide scoring for control joints as indicated unless otherwise noted or directed.
- H. Finish floors shall meet requirements of ACI 302.1R for a Flat (3/16 in 10'-0") Classification. Floors scheduled to receive thin-set tile shall meet Very Flat (1/8 inch in 10'-0") Classification.

3.06 SLABS

- A. Saw cut or score contraction joint pattern indicated on Drawings. Use thick blade or scoring tool. Early entry saw shall be used immediately after final finishing and to a depth of 1-1/4 inches. A conventional saw or scoring tool shall cut 1/4 of the depth of slab thickness.
- B. Slope to drains to drains as indicated on Drawings, but not less than 1/4 inch per foot nominal across entire room or area to be drained.

3.07 SPECIAL FINISHES

- A. General:
 - 1. Obtain cement and aggregates from a single source for specialty concrete finishes to provide uniformity in appearance and color.
 - 2. Place concrete containing the high range water reducing admixture at a maximum slump. Flow or pump concrete into place, screed, strike-off and float. Do not tamp.
- B. Ground and Polished Concrete: As specified in Section 03 35 33 – Decorative Concrete Finishes.
- C. Abrasive Blast (Sand Blasted) Finish Concrete:
 - 1. Blasting Operations and Requirements:
 - a. Apply sand blast finish to exposed exterior concrete surfaces indicated.
 - b. Coordinate with concrete placement schedule to ensure that surfaces to be blast finished are blasted at the same age for uniform results.
 - c. Determine type of nozzle, nozzle pressure, and blasting techniques required to match the Architect's sample or desired finished appearance.
 - d. Abrasive blast corners and edge of patterns carefully, using back-up boards, to maintain uniform corner or edge line.
 - 2. Depths of Cut: Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surface to match Architect's samples as follows:
 - a. Light Sand Blast Finish: Remove surface irregularities and indications of formwork and expose fine aggregates; maximum 1/16 inch reveal, or as otherwise acceptable to Architect.

3. Surface Continuity: Perform sand blast finishing in as continuous an operation as possible, utilizing the same work crew and nozzleman to maintain continuity of finish on each surface or area of work. Maintain patterns of variances in depths of cuts as indicated.
4. Construction Joints: Use technique acceptable to the Architect to achieve uniform treatment of construction joints.

3.08 REPAIR OF SURFACE DEFECTS

- A. Modify or replace concrete not conforming to required lines, detail and elevations. Grind high spots and fill low areas as required to provide finished floor tolerances as required for application of finish floor materials.
- B. Repair or replace concrete not properly placed, resulting in excessive honeycombing and other defects. Do not patch, repair or replace exposed architectural concrete except upon express direction of Architect.
- C. After forms are removed, fill tie rod holes, correct honeycomb spots, remove fins and clean and finish damaged surfaces. Wipe off excess mortar and rub to match adjoining surfaces.
- D. When excessive honeycombing is revealed, remove the defective material immediately after stripping forms to a depth of 3/4 inch to 1 inch. Cut edge of area perpendicular to surface to avoid feathered edges. Repair using the following method or submit method of repair and patching material to Architect and Structural Engineer for approval.
 1. Saturate with water for several inches beyond cutout and brush-in a grout consisting of equal parts Portland cement and sand. Follow immediately with the patching mortar. Leave the patch slightly higher than the surrounding surface. After an hour or two, finish flush with the adjoining surface. Wipe and rub patch to match adjoining surfaces. Keep patches moist for 7 days.
 2. Patching mortar shall consist of the same materials and proportions as the original concrete except that the coarse aggregate shall be omitted. When color match is required, adjust mixture to produce a finished color to match the adjoining concrete surfaces.
- E. Random cracks that have a width in excess of 3/32" and/or an excess of 1/16" vertical displacement, for the length of 25 percent or more of a total crack length shall require sections of the slab on ground to be removed and replaced as directed by the Architect and/or Owner.
- F. Cracks caused by expansion, shrinkage and the like that occur in natural color concrete up through final acceptance of building shall be carefully repaired by epoxy injection or other method approved by the Architect.

3.09 CURING

- A. Protect freshly deposited concrete from premature drying and maintain without drying at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete.
 1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Immediately after screeding slabs, apply liquid evaporation retardant (this is not a curing compound). After finishing, keep continuously moist.

- B. Curing Methods: Cure concrete surfaces receiving finish materials, including, but not limited to; cementitious toppings, paint, and flooring, using one of the following two methods immediately after finishing operations. Consideration shall be given to the construction schedule impact and the compatibility of finish materials with the concrete when selecting a method.
 - 1. Keep concrete continuously moist for at least 7 days using polyethylene film, liquid membrane forming curing compound, or other acceptable covering. Interior floor slabs on grade shall be continuously moist cured for a minimum of 7 days in accordance with ACI standards.
 - 2. Liquid curing compounds shall not be acceptable unless it has been demonstrated that curing compound can satisfactorily serve as a base for finish materials or removed, resulting in a satisfactory base for adhesion of finish materials.
 - 3. Where approved for use, apply liquid curing compound in accordance with the Manufacturer's printed instructions.
 - 4. Refer to Structural Drawings for other acceptable curing procedures.
- C. Prevent rapid drying of the concrete at the end of the curing period.
- D. During the curing period, protect the concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibrations. Protect finished concrete surfaces from damage caused by construction equipment, materials or methods.

3.10 UNDERLAYMENT OR REPAIR TOPPING

- A. Apply underlayment or repair topping to correct unsatisfactory floor surface due to undue settlement or failure to meet tolerance requirements.
- B. Slab surface preparation and placing procedures shall be approved by the underlayment and/or repair topping manufacturer and Architect prior to start of installation.
- C. Installation: Install underlayment and/or repair topping materials in accordance with Manufacturer's published instructions and recommendations.

3.11 FLOOR SEALER

- A. At areas indicated on Drawings, provide 2 coats of sealer.
- B. Surface must be clean, dry and free of loose dirt, oil, wax, curing and parting compounds and other foreign matter.
- C. Apply each coat in accordance with Manufacturer's printed instructions.

3.12 LIQUID SEALER DENSIFIER

- A. Where indicated on Drawings, provide one coat of liquid sealer densifier.
- B. Clean and prepare concrete floors to receive liquid sealer densifier in accordance with manufacturer's printed instructions.
- C. Concrete slabs to receive liquid sealer densifier shall be properly cured in accordance with recommendations of the liquid sealer densifier manufacturer's recommendations.

- D. Application shall be made in strict accordance with manufacturer's printed instructions and just prior to completion of construction.
 - 1. Spray, squeegee or roll-on liquid sealer densifier to clean, dry concrete surface.
 - 2. Scrub liquid into concrete surface with a mechanical scrubber.
 - 3. Keep surface wet with sealer densifier during the application process.
 - 4. When product thickens, but not more than 60 minutes after initial application, squeegee or vacuum surface to remove all excess liquid.
- E. Apply each coat in strict accordance with Manufacturer's instructions.

3.13 FIELD QUALITY CONTROL

- A. Tests: Inspection and testing of concrete mix will be performed by a testing laboratory in accordance with Section 01 45 00.
 - 1. Provide free access to Work and cooperate with appointed firm.
 - 2. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.
 - 3. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
 - 4. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
 - 5. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
 - 6. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
 - 7. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
 - 8. Take one additional test cylinder during cold weather concreting, and cure on job site under same conditions as concrete it represents.
 - 9. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed. .
 - 10. Concrete which does not meet the compressive strength requirement at 28 days will be rejected and removed from the Project, and disposed of in a legal manner.
- B. Calcium chloride test requirements:
 - 1. Two weeks before installation of the ceramic tile, VCT, vinyl, wood, carpet, epoxy flooring and/or other finish flooring systems over the interior concrete slabs, provide calcium chloride test to determine the level of water vapor transmission in the slab.
 - 2. Conduct testing in accordance with ASTM F1869 or ASTM E1907 (quantitative anhydrous calcium chloride test).
 - 3. Conduct calcium chloride tests after HVAC system has been in continuous use for 36 hours with a minimum ambient temperature of 72 degrees F. Water vapor transmission levels are directly affected by ambient room temperature and readings conducted without a sustained ambient temperature is NOT acceptable.

4. Document test results and provide copy to Architect with a marked up floor finish plan showing test results.
5. Provide a written clarification on status of HVAC system before and during the test and the length of time the ambient air temperature was maintained before the tests.

3.14 PROTECTION

- A. Protect finished surfaces from stains or abrasions. Protect surfaces or edges by leaving forms in place or by providing temporary covers. Protect concrete from rain, flowing water or mechanical injury.
- B. Protect floor slabs from the droppings of plaster, paint, dirt, and other marring by covering with polyethylene plastic sheet, or other acceptable floor protection covering, well lapped and sealed.
 1. Where concrete slabs are scheduled to be the finished floor surface, or where slab is treated with a special concrete finish serving as the finished floor surface, provide a continuous covering of 1/2 inch particle board, joints tightly butted and cut to sizes tight to wall construction, over entire floor area over polyethylene plastic sheet, or other acceptable floor protection sheeting. Maintain covering (polyethylene and particleboard) in good condition until danger of damage is past.

3.15 CLEANING

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises.

END OF SECTION

SECTION 03 35 33

DECORATIVE CONCRETE FINISHES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Honed and bonded abrasive polished (ground and polished) concrete for interior floors using multi-step wet/dry mechanical process, and accessories indicated, specified, or required to complete polishing.
- B. Related Sections:
 - 1. Section 03 30 00 – Cast-in-Place Concrete and related section for forming, reinforcing and concrete materials.

1.02 DEFINITIONS

- A. Terminology: As defined by the Concrete Polishing Council (CPC).
- B. Polished Concrete: The act of changing a concrete floor surface, with or without aggregate exposure, to achieve a specified level of gloss.
- C. Bonded Abrasive Polished Concrete: The multi-step operation of mechanically grinding, honing, polishing of a concrete floor surface with bonded abrasives to cut a concrete floor surface and to refine each cut to the maximum potential to achieve a specified level of finished gloss as defined by the CPC.

1.03 SUBMITTALS

- A. In accordance with Section 03 30 00 - Cast-In-Place Concrete, and the following:
- B. Product Data: Manufacturer's technical literature for each product indicated, specified, or required. Include manufacturer's technical data, application instructions, and recommendations.
- C. Installer Qualifications: Data for company, principal personnel, experience, and training specified in "Quality Assurance" Article.
- D. Field Quality Control: Reports of testing specified in "Field Quality Control" Article.
- E. Maintenance Data: For inclusion in maintenance manual required by Division 01. Include the following:
 - 1. Instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
 - 2. Precautions against cleaning products and methods which may be detrimental to finishes and performance.

1.04 QUALITY ASSURANCE

- A. Polisher Qualifications:
 - 1. Experience: Company experienced in performing specified work similar in design, products, and extent to scope of this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce specified work.
 - 2. Supervision: Maintain competent supervisor who is at Project during times specified work is in progress, and is currently certified as Craftsman - Level I or higher by CPC.
 - 3. Manufacturer Qualification: Approved by manufacturer to apply liquid applied products.
- B. Walkway Auditor: Certified by CPC or NFSI to test bonded abrasive polished concrete floors for dynamic and static coefficient of friction according to ANSI B101.1 and B101.3.
- C. Coefficient of Friction: Achieve following coefficient of friction by field quality control testing in accordance to the following standards:
 - 1. ANSI B101.1 Static Coefficient of Friction - Achieve a minimum of .42 for level floor surfaces.
 - 2. ANSI B101.3 Dynamic Coefficient of Friction - Achieve a minimum of .35 for level floor surfaces.
- D. Field Mock-up: Before performing work of this Section, provide following field mock-up to verify selections made under submittals and to demonstrate aesthetic effects of polishing. Approval does not constitute approval of deviations from Contract Documents, unless Architect specifically approves deviations in writing.
 - 1. Form, reinforce, and cast concrete slab for 10 foot square field mock-up.
 - 2. Concrete shall be same mix design as scheduled for Project.
 - 3. Placement and finishing work shall be performed by same personnel as will place and finish concrete for Project.
 - 4. Mock-up shall be representative of work to be expected.
 - 5. Perform grinding, honing, and polishing work as scheduled for Project using same personnel as will perform work for Project.
 - 6. Approval is for following aesthetic qualities:
 - a. Compliance with approved submittals.
 - b. Compliance with specified aggregate exposure.
 - c. Compliance with specified finished gloss level.
 - 7. Obtain Architect's approval before starting work on Project.
 - 8. Protect and maintain approved field mock-ups during construction in an undisturbed condition as a standard for judging completed work.
- E. Pre-Installation of Concrete Conference: Prior to placing concrete for areas scheduled for polishing, conduct conference at Project to comply with requirements of applicable Division 01 Sections.
 - 1. Required Attendees:
 - a. Owner.
 - b. Architect.
 - c. Contractor, including supervisor.
 - d. Concrete producer.
 - e. Concrete finisher, including supervisor.
 - f. Concrete polisher, including supervisor.
 - g. Technical representative of liquid applied product manufacturers.
 - h. Walkway auditor.

2. Minimum Agenda: Polisher shall demonstrate understanding of work required by reviewing and discussing procedures for, but not limited to, following:
 - a. Tour field mock-up and representative areas of required work, discuss and evaluate for compliance with Contract Documents, including substrate conditions, surface preparations, sequence of procedures, and other preparatory work performed by other installers.
 - b. Review Contract Document requirements.
 - c. Review approved submittals and field mock-up.
 - d. Review procedures, including, but not limited to:
 - 1) Applicable Division 03 Section on cast-in-place concrete.
 - a) Specific mix design.
 - b) Specified curing methods/procedures.
 - c) Projected 3, 10, and 28 day compression strength test related to specified aggregates exposure for finished floor and project phasing.
 - d) Protection of concrete substrate during construction and prior to polishing process.
 - e) Project phasing and scheduling for each step of grinding, honing and polishing operations including, but not limited to:
 - i. Quality of qualified personnel committed to project.
 - ii. Quality and size of grinders committed to project.
 - iii. Proper disposal of concrete slurry and/or concrete dust.
 - f) Details of each step of grinding, honing, and polishing operations.
 - i. Application of liquid applied products.
 - ii. Protecting polished concrete floors after polishing work is complete.
3. Reports: Record discussions, including decisions and agreements reached, and furnish copy of record to each party attending.

1.05 FIELD CONDITIONS

- A. Concrete Work: In accordance with Section 03 30 00 - Cast-In-Place Concrete.
- B. Damage and Stain Prevention: Take precautions to prevent damage and staining of concrete surfaces to be polished.
 1. Prohibit use of markers, spray paint, and soapstone.
 2. Prohibit improper application of liquid membrane film forming curing compounds.
 3. Prohibit vehicle parking over concrete surfaces.
 4. Prohibit pipe-cutting operations over concrete surfaces.
 5. Prohibit storage of any items over concrete surfaces for not less than 28 days after concrete placement.
 6. Prohibit ferrous metals storage over concrete surfaces.
 7. Protect from petroleum, oil, hydraulic fluid, or other liquid dripping from equipment working over concrete surfaces.
 8. Protect from acids and acidic detergents contacting concrete surfaces.
 9. Protect from painting activities over concrete surfaces.
- C. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting liquid applied product application.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS AND ACCESSORIES

- A. Concrete Materials and Accessories: In accordance with Section 03 30 00 - Cast-In-Place Concrete.
- B. Reinforcement: As specified in Section 03 20 00.

2.02 DECORATIVE CONCRETE FINISH MATERIALS AND ACCESSORIES

- A. Liquid Densifier: An Aqueous solution of Silicon Dioxide dissolved in one of the following Hydroxides that penetrates into the concrete surface and reacts with the Calcium Hydroxide to provide a permanent chemical reaction that hardens and densifies the wear surface of the cementitious portion of the concrete.
 - 1. Subject to project requirements provide one of the following products:
 - a. Ashford Formula, Curecrete Chemical Company, Inc. www.ashfordformula.com
 - b. Diamond Hard, Euclid Chemical Company www.euclidchemical.com .
 - c. SealHard, L&M Construction Chemicals www.lmcc.com
 - d. Liquihard, W. R. Meadows www.wrmeadows.com
 - e. J-17 Surehard, Dayton-Superior www.daytonsuperior.com
 - f. Industraseal, US Spec www.usspec.com
 - g. Scofield Lithium Silicate Concrete Densifier, L.M. Scofield Company www.scofield.com
- B. Repair Material: A product that is designed to repair cracks and surface imperfections. The specified material must have sufficient bonding capabilities to adhere after the polishing to the concrete surface and provide abrasion resistance equal to or greater than the surrounding concrete substrate.
- C. Grout Material: A thin mortar used for filling spaces. Acceptable products shall be:
 - a. Epoxy, urethane, polyurea, or polyaspartic resins.
 - b. Latex or acrylic binders mixed with cement dust from previous grinding steps.
 - c. Silicate binders mixed with cement dust from previous grinding steps.
- D. Protective Cover: Non-woven, puncture and tear resistant, polypropylene fibers laminated with a multi-ply, textured membrane, not less than 18 mils in thickness.

2.03 POLISHING EQUIPMENT

- A. Field Grinding and Polishing Equipment:
 - 1. A multiple head, counter rotating, walk behind or ride on machine, of various size and weights, with diamond tooling affixed to the head for the purpose of grinding concrete. Excludes janitorial maintenance equipment.
 - 2. If dry grinding, honing, or polishing, use dust extraction equipment with flow rate suitable for dust generated, with squeegee attachments.
 - 3. If wet grinding, honing, or polishing, use slurry extraction equipment suitable for slurry removal and containment prior to proper disposal.
- B. Edge Grinding and Polishing Equipment: Hand-held or walk-behind machines which produces same results, without noticeable differences, as field grinding and polishing equipment.

- C. Burnishing Equipment: High speed walk-behind or ride-on machines capable of generating 1000 to 2000 revolutions per minute and with sufficient head pressure of not less than 20 pounds to raise floor temperature by 20 degrees F.
- D. Diamond Tooling: Abrasive tools that contain industrial grade diamonds within a bonded matrix (such as metallic, resinous, ceramic, etc) that are attached to rotating heads to refine the concrete substrate.
 - 1. Bonded Abrasive: Abrasive medium that is held within a bonding that erodes away to expose new abrasive medium as it is used.
 - 2. Metal Bond Tooling: Diamond tooling that contains industrial grade diamonds with a metallic bonded matrix that is attached to rotating heads to refine the concrete substrate. These tools are available in levels of soft, medium, and hard metallic matrices that are matched with contrasting concrete substrates (i.e. hard matrix/soft concrete, medium matrix/medium concrete, soft matrix/hard concrete) and are typically used in the grinding and early honing stages of the polishing process.
 - 3. Resin Bond Tooling: Diamond tooling that contains industrial grade diamonds within a resinous bonded matrix (poly-phenolic, ester-phenolic, thermoplastic-phenolic) that is attached to rotating heads to refine the concrete substrate. Resin bond tooling does not have the soft/medium/hard characteristics of metal bond tooling and are typically used for the later honing and polishing stages of the polishing process.
 - 4. Hybrid Tooling: Diamond tooling that combines metal bond and resin bond that has the characteristics of both types of tooling. These types of tools are typically used as either transitional tooling from metal bond tools to resin bond tools or as a first cut tool on smooth concrete surfaces.
 - 5. Transitional Tooling: Diamond tooling that is used to refine the scratch pattern of metal bond tooling prior to the application of resin bond tooling in an effort to extend the life of resin bond tooling and to create a better foundation for the polishing process.
 - 6. Abrasive Pad: An abrasive pad, resembling a typical floor maintenance burnishing pad, that has the capability of refining the concrete surface on a microscopic level that may or may not contain industrial grade diamonds. These pads are typically used for the maintenance and/or restoration of previously installed polished concrete flooring.

2.04 CONCRETE MIX DESIGN

- A. Concrete Mix Design: As specified in Section 03 30 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Acceptance of Surfaces and Conditions:
 - 1. Examine substrates to be polished for compliance with requirements and other conditions affecting performance.
 - a. Concrete Finished Floor Flatness in accordance with Section 03 30 00 - Cast-In-Place Concrete.
 - b. Concrete curing methods in accordance with Section 03 30 00 - Cast-In-Place Concrete.
 - c. Concrete Compression strength in accordance with Section 03 30 00 - Cast-In-Place Concrete and General Structural Notes on Drawings.

- B. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
- C. Starting work within a particular area will be construed as acceptance of surface conditions.

3.02 PREPARATION

- A. Concrete Work: In accordance with Section 03 30 00 - Cast-In-Place Concrete and related Sections.
- B. Cleaning New Concrete Surfaces:
 - 1. Prepare and clean concrete surfaces.
 - 2. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, paint splatter, and other contaminants incompatible with liquid applied products and polishing.

3.03 DECORATIVE CONCRETE FINISHES - GENERAL

- A. Concrete placement, construction joints, expansion joints, contraction joints, and Initial slab finishing shall be in accordance with Section 03 30 00 prior to Work of this Section.

3.04 BONDED ABRASIVE POLISHED (GROUND AND POLISHED) CONCRETE

- A. Perform all polishing procedures to ensure a consistent appearance from wall to wall.
- B. Initial Grinding:
 - 1. Use grinding equipment with metal or semi-metal bonded tooling.
 - 2. Begin grinding in one direction using sufficient size equipment and diamond tooling to meet specified aggregate exposure class.
 - 3. Make sequential passes with each pass perpendicular to previous pass using finer grit tool with each pass, up to 100 grit metal bonded tooling.
 - 4. Achieve maximum refinement with each pass before proceeding to finer grit tools.
 - 5. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.
 - 6. Continue grinding until aggregate exposure matches approved field mock-ups.
- C. Treating Surface Imperfections:
 - 1. Mix patching compound or grout material with dust created by grinding operations, manufacturer's tint, or sand to match color of adjacent concrete surfaces.
 - 2. Fill surface imperfections including, but not limited to, holes, surface damage, small and micro cracks, air holes, pop-outs, and voids with grout to eliminate micro pitting in finished work.
 - 3. Work compound and treatment until color differences between concrete surface and filled surface imperfections are not reasonably noticeable when viewed from 10 feet away under lighting conditions that will be present after construction.
- D. Liquid Densifier Application: Apply undiluted to point of rejection, remove excess liquid, and allow curing according to manufacturers instructions.
- E. Grout Grinding:
 - 1. Use grinding equipment and appropriate grit and bond diamond tooling.

2. Apply grout, forced into the pore structure of the concrete substrate, to fill surface imperfections.
 3. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.
- F. Honing:
1. Use grinding equipment with hybrid or resin bonded tooling.
 2. Hone concrete in one direction starting with a 100 grit tooling and make as many sequential passes as required to remove scratches, each pass perpendicular to previous pass, up to 400 grit tooling reaching maximum refinement with each pass before proceeding to finer grit tooling.
 3. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.
- G. Polishing:
1. Use polishing equipment with resin-bonded tooling.
 2. Begin polishing in one direction starting with 800 grit tooling.
 3. Make sequential passes with each pass perpendicular to previous pass using finer grit tooling with each pass until the specified level of gloss has been achieved.
 4. Achieve maximum refinement with each pass before proceeding to finer grit pads.
 5. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.
 6. Stain Protection: Uniformly apply and remove excessive liquid according to manufacturer's instructions. Final film thickness should be less than .05 mils after cure.
 7. Final Polish: Using burnishing equipment and finest grit abrasive pads, burnish to uniform reflective sheen matching approved field mock-up.
- H. Final Polished Concrete Floor Finish: Comply with the following, unless otherwise indicated on Drawings or selected by Architect. Final aggregate exposure and finished gloss level shall be in accordance with approved Field Sample. Provide the following levels of finish as scheduled on Drawings:
1. Main Living Areas:
 - a. Exposure: Class C, Coarse Aggregate, 80-90% Coarse Aggregate, 10-20% Blend of Cement Fines and Fine Aggregate.
 - b. Gloss: Level 3, Polished 40-69% image clarity, haze index <10.
 2. Apparatus Bays and Support:
 - a. Exposure: Class A, Cement Fines, 85-95% Cement Fines, 5-15% Fine Aggregate.
 - b. Gloss: Level 2, Satin (Honed) 10-39% image clarity, haze index <10

3.05 FIELD QUALITY CONTROL

- A. In accordance with Section 03 30 00 - Cast-In-Place Concrete, and the following.
- B. Field Testing: Engage a qualified walkway auditor to perform field testing to determine if polished concrete floor finish complies with specified coefficient of friction;
 1. ANSI B101.1 for static coefficient of friction.
 2. ANSI B101.3 for dynamic coefficient of friction

3.06 MAINTENANCE AND PROTECTION

- A. Maintenance Training: CPC Craftsman shall train Owner's designated personnel in proper procedures for maintaining polished concrete floor.
- B. Covering: After completion of polishing, protect polished floors from subsequent construction activities with protective covering.

END OF SECTION

SECTION 04 01 20.52

UNIT MASONRY CLEANING

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

- A. Performance Requirements: The application of chemical cleaner shall leave the finished surfaces uniform in color and shall not alter the natural texture of the masonry units.

1.02 QUALITY ASSURANCE

- A. Qualifications:
1. Manufacturer: Engaged in producing materials with a satisfactory performance record for at least 5 years.
 2. Applicator: Trained, approved and accepted by the cleaning compound manufacturer. Application personnel shall have at least 2 years experience with the particular materials being applied.
- B. Field Samples:
1. A test area of wall surface from 10 to 20 square feet in size shall be cleaned with the chemical cleaner recommended by the cleaning compound manufacturer for acceptance by the Architect.
 2. Test samples of adjacent non-masonry materials for possible reaction with the diluted cleaning materials. Samples to be available for review by the Architect.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Delivery shall be made to the job site in manufacturer's original containers with seals unbroken and labeled with manufacturer's batch number.
- B. Storage and Protection:
1. Store materials in original, unopened containers in compliance with manufacturer's printed instructions.
 2. Do not store in areas where temperature will fall below 20 degrees F. or rise above 100 degrees F..

1.04 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Temperature and relative humidity conditions for a period before, during and after application shall be as recommended by the manufacturer.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Chemical Cleaner:
1. Cleaner shall be a solution of blended liquid acids, heavily inhibited and emulsified and in combination with special wetting systems.
 2. Specific product selection shall be dependent upon substrate as recommended by the chemical cleaner manufacturer.
 3. Cleaner shall be acceptable to the masonry unit manufacturer.
 4. Muriatic acid shall not be acceptable as a chemical cleaner for new masonry.

5. Subject to compliance with specification requirements, Sure-Klean Vana Trol, Sure-Klean No. 600 Detergent and Sure-Klean 101 Lime Solvent as manufactured by ProSoCo, Inc., www.prosoco.com or 202V Vana-Stop , 202 New Masonry Detergent and 200 Lime Solve as manufactured by Diedrich Technologies www.diedrichtechnologies.com are acceptable products.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 1. Prior to start of work, carefully inspect the installed work of other trades, and verify that such work is complete to the point where this work may commence.
 2. The chemical cleaner manufacturer's representative shall verify that the chemical cleaner may be applied in accordance with the manufacturer's recommended methods.
 3. In the event of discrepancy, immediately notify the Architect.
 4. Commencement of system application constitutes acceptance of surfaces by applicator.

3.02 PREPARATION

- A. Protection:
 1. Use all means necessary to protect the installed work of other trades.
 2. Concrete sidewalks shall be protected from runoff by soaking with water immediately prior to application on adjacent walls.
 3. Adjoining glass, metal and painted surfaces shall be protected from overspray and splash of chemical cleaner. Inadvertent splashes shall be removed in an approved manner before the solution has damaged the surface.
 4. In the event of damage, immediately make all repairs and replacements necessary to the approval of Architect and at no additional cost to Owner.
- B. Surface Preparation for Chemical Cleaner:
 1. In strict accordance with manufacturer's printed instructions.
 - a. Masonry walls shall be cleaned within 14 to 28 days after installation.
 - b. Walls shall be free of excess mortar.
 - c. Cracks, other than hairline cracks, shall be pointed up.
 - d. Defective mortar joints shall be routed out, pointed with mortar and tooled.
 2. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
- C. Presoaking Hoses:
 1. Adequate water supply shall be made available to assure thorough pre-soaking and thorough rinsing of the wall before undertaking general cleaning.
 2. Two water hoses shall be used by the cleaning crew.
 3. One hose shall be attached to a length of lawn soaker hose placed along the top of the wall to provide a uniform and complete saturation of the entire wall area.
 4. The second hose shall provide a copious flow of water for thorough flushing of excess mortar and dirt from the scrubbed areas.
 5. The lawn soaker hose is later to be placed at the face of the scaffold or stage to provide a continuous spray of wall areas below the working area.

3.03 APPLICATION

- A. Chemical Cleaner: Application to be in strict accordance with manufacturer's printed instructions and as follows:
1. Surfaces shall be thoroughly pre-soaked with clean water to prevent the absorption of the cleaning solution within the pores of the masonry.
 2. Cleaning solution shall be diluted with clear water and applied to pre-soaked wall areas with a long handled stiff fibered masonry wall washing brush, or other brush as recommended by the cleaning compound manufacturer. The cleaning solution may also be applied with a garden-type low pressure sprayer having a maximum nozzle pressure of 50 psi (3.5kg/cm²). Allow the solution to remain on the wall 5 to 10 minutes, or as recommended by the cleaning solution manufacturer. Wooden paddles or other non-metallic tools may be used to remove stubborn particles. Cleaning shall be restricted to small areas of up to 20 square feet at a time.
 3. After washing a given area, the wall shall be flushed with a copious amount of clear water, working from top to bottom, before the solution dries on the wall surface. All of the cleaning solution shall be completely rinsed off of the wall.
 4. Rinsing water may be applied with a high-pressure hose system with a maximum nozzle pressure of 700 psi . The high-pressure nozzle tips shall have a fan spray angle of from 15 to 45 degrees. The high-pressure system shall have a water flow rate of 3 to 8 gallons per minute. Care shall be taken to avoid damaging the brick unit or the mortar joints with the high-pressure water spray.
 5. Repeat the procedure on spots which require additional cleaning.
 6. Clean roof side and top of parapet walls.

END OF SECTION

SECTION 04 05 15

MORTAR AND MASONRY GROUT

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Mortar and masonry grout used in concrete unit masonry construction as shown on Drawings and as specified.

1.02 SUBMITTALS

- A. Mix Designs:
 - 1. Submit mix designs and samples to the Architect for review prior to delivering materials to the site or commencing the Work.
 - a. Mortar Mix Design: Furnish in accordance with ASTM C270.
 - b. Grout Mix Design: Furnished by either the grout supplier or an independent testing laboratory. Submit comprehensive strength data with mix design submittals when pozzolans are used.
 - 2. Submit written colored mortar proportions for each color of mortar to be supplied for review by the Architect.
- B. Samples: Submit mortar channels for color selection.
- C. Product Data: If alternative mortar materials are to be provided, submit current instructions stating the actual quantities and mixing instructions for alternative mortar materials to conform to specified requirements.
 - 1. Submit test report data substantiating compliance with specified performance requirements.
 - 2. Submit current ICC Evaluation Report.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Protection: Cementitious materials shall be stored off the ground, under cover and shall be kept dry.
- B. Preblended Mortar Mix Delivery System: The use of dry preblended mortar silos and bulk bags shall be acceptable. Bulk bags and silos shall be sealed to prohibit contamination of the ingredients and to keep the materials dry until mixed.

1.04 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Hot Weather Requirements: Wet mortar board before loading and cover mortar to retard drying when not being used.
 - 2. Cold Weather Requirements: In accordance with "Recommended Practices and Guide Specifications for Cold Weather Masonry Construction" by IMIAC; provide adequate equipment for heating the mortar and grout materials, when air temperature is below 40 degrees F.. Temperatures of the separate materials, including water, shall not exceed 140 degrees F. when placed in the mixer. When air temperature is below 32 degrees F., maintain mortar temperature on boards above freezing.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Mortar:
1. Cement: Type II Portland cement conforming to ASTM C150.
 2. Aggregate: Clean, sharp and well graded and free from injurious amounts of dust, lumps, shale, alkali, surface coatings and organic matter, conforming to ASTM C144, except that no less than 3 percent nor more than 10 percent shall pass a No. 100 sieve.
 3. Hydrated Lime: ASTM C207, Type S.
 4. Water: Clean and potable.
 5. Admixtures:
 - a. Chemical: The use of accelerator admixtures, water reducing plasticizers and other chemical admixtures shall not be allowed.
 - b. Mineral: In accordance with Section 03 05 05.
 - c. Water-Repellent Admixture: In accordance with Section 04 05 26.
 - d. Alternative Plasticizer: Pozzolanic formulation consisting of a combination of hydroxy aluminum silicates and diatomite:
 - 1) Alternative Plasticizer Manufacturer: Engaged in producing materials with a satisfactory performance record for at least 5 years.
 - 2) Mortar mix design shall be in accordance with ICC Evaluation Report, in accordance with the mortar type specified elsewhere in this specification.
 - 3) Provide alternative plasticizer in accordance with manufacturer's printed instructions, including specific mixing instruction.
 - 4) No other admixtures shall be used in conjunction with the alternative plasticizer unless approved in writing by the alternative plasticizer manufacturer.
 - 5) Packing and Shipping: Mortar admixture(s) shall be delivered to the job site in manufacturer's original containers with seals unbroken and labeled with manufacturer's batch number.
 6. Mortar Color:
 - a. Color: Matching integral colored masonry units as approved by Architect.
 - b. Provide limeproof, inorganic compounds which shall not exceed 15 percent by weight of the cement, unless otherwise directed by Manufacturer.
 - c. Carbon black shall not exceed 3% by weight of the cement.
 - d. Factory blend color for full color saturation of mortar joint and factory package for unitized jobsite mixing at a ratio of one unit of color per sack of cementitious material, (portland cement, lime, or masonry cement).
- B. Grout:
1. Cement: Type II Portland cement conforming to ASTM C150.
 2. Aggregate: ASTM C404 and as follows:
 - a. Sand: Size No. 1 for fine aggregate.
 - b. Pea Gravel: Size No. 8 for coarse aggregate.
 3. Water: Clean and potable.

2.02 MIXES

- A. Mortar: ASTM C 270, Type S.
1. Measurement: Accurately measure materials by ASTM C270 by the Property Method per Table 2.

2. Mix cementitious materials and aggregates 3 to 5 minutes in a mechanical mixer. Small amounts of mortar may be mixed by hand. Adjust consistency of the mortar depending on the absorptive quality of the units being laid, and to the satisfaction of the mason.
 3. If mortar begins to stiffen, it may be retempered by adding water within a basin formed by the mortar, and remixing.
 4. Use within 2-1/2 hours of initial mixing and no mortar shall be used after it has begun to set or after it has become harsh or non-plastic.
 5. Mix color in a specific and exacting ratio in accordance with the Architect's reviewed submittals.
 6. Water-Repellent Admixture: In accordance with Section 04 05 26.
 7. Preblended Mortar Mix: Provide mortar as specified herein, except that dry ingredients may be preblended and bulk packaged for delivery to a jobsite silo (which loads into batch mixer) or bagged for hand loading into mixer. Moisture shall be extracted from sands. Digital printouts displaying the proportions of each batch shall be submitted to the Architect upon request. Mixing shall be accomplished by mechanical mixer in accordance with instructions provided by Preblended Mortar Mix Distributor.
- B. Grout:
1. Job-Site Mixed: In accordance with ASTM C476.
 2. Transit-Mixed:
 - a. Designed by the supplier or an independent testing laboratory with a minimum compressive strength of 2000 psi (140mPa) in 28 days, unless higher strength is required by the Structural Drawings and Notes.
 - b. Slump: Not to exceed 8 inches, unless otherwise noted on Drawings.
 - c. Use within 1-1/2 hours of initial mixing and use no grout after it has begun to set or after it has become harsh or non-plastic.
 - d. Course grout may be used in cavity walls with a horizontal dimension of 2 inches or more, and in hollow cell construction 4 inches or more in both horizontal directions.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installation of mortar and grout shall be as specified under each of the following Sections and in accordance with AMG Standard 108:
 1. Section 04 22 00 – Concrete Unit Masonry.
- B. Colored Mortar: Consistency of appearance shall be maintained throughout the Project.
- C. Temperature: Mortar and grout shall have a temperature between 50 degrees F. and 90 degrees F. while being used.
- D. Grout may be poured by hand bucket, concrete hopper or through a grout pump. Grout spaces shall not be wet down prior to pouring grout.

3.02 FIELD QUALITY CONTROL

- A. General: Tests and inspections as necessary to verify quality and strength of mortar and grout. Laboratory tests shall conform to applicable ASTM standards and tests.

- B. Tests:
1. Frequency: As determined by the Architect based upon total time for construction of masonry with not less than two tests per each level of masonry construction, foundation to roof or floors.
 2. Testing Laboratory: Inspection and testing of mortar and grout will be performed by a testing laboratory in accordance with Section 01 45 00. The testing laboratory, in addition to meeting requirements of ASTM E329, must be an approved laboratory competent to perform cement physical testing.
 3. Distribution of Results of Tests: Within 24 hours of results of tests, copies of the results shall be submitted to the Architect, Contractor, masonry contractor, and the grout supplier if applicable.
- C. Mortar:
1. Property Specification (ASTM C270): Testing in accordance with ASTM C 780.
 2. For determining hardened mortar properties, prepare 3 test specimens for each test age and property. A strength test shall be the average of the strengths of the specimens tested at the age specified. Specimens shall be tested at 7 and 28 days.
- D. Grout:
1. Testing per ASTM C1019.
 2. Three test specimens shall constitute one sample. A strength test shall be the average of the strengths of the specimen tested at the age specified.
 3. Specimens shall be tested at 7 and 28 days.
 4. The compression strength will be considered satisfactory if the average of three consecutive tests of the grout is equal to or greater than the specified strength and no individual strength test falls below the specified strength by more than 500 psi.

3.03 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

END OF SECTION

SECTION 04 05 23
MASONRY ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Furnishing the following items for installation under Section 04 22 00:
 - 1. Veneer ties and anchors.
 - 2. Control joints.
 - 3. Through wall flashings.
 - 4. Mortar deflection material.
 - 5. Weep holes.
- B. Related Sections:
 - 1. Section 04 22 00 – Concrete Unit Masonry.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's brochures depicting each of the masonry accessories which will be used prior to delivering materials to the site or commencing the Work in this Section.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Storage and Protection: Store metal items at the site off the ground and in a manner to prevent damage to the materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, subject to compliance with Specification requirements.
 - 1. Dur-O-Wall Inc. www.dur-o-wal.com
 - 2. Heckmann Building Products, Inc. www.heckmannbuildingprods.com
 - 3. Hohmann and Barnard, Inc. www.h-b.com

2.02 MATERIALS

- A. Carbon Steel Sheet: To ASTM A366, hot-dip galvanized after fabrication to ASTM A153, Class B.
- B. Carbon Steel Wire: To ASTM A82, with zinc coating hot-dip galvanized after fabrication to ASTM A153.
 - 1. Tensile Strength: Not less than 80,000 psi.
 - 2. Yield Point: Not less than 70,000 psi.
- C. Reinforcing Steel: As specified in Section 03 20 00.

2.03 ACCESSORIES

- A. General: Anchors and ties shall be steel with zinc coated finish or shall be of other non-corrosive metal.
- B. Adjustable Veneer Anchors:
1. Facing over CMU and/or ICF: (Veneer over Air and Vapor Barrier Underlayment over Concrete Unit Masonry Wall Construction and/or ICF): Hohmann & Barnard HB-5213 adjustable veneer anchor with No. 523 Brass Expansion Bolt, or equivalent as approved by the Architect and Structural Engineer from one of the specified Manufacturers.
 - a. Description: Adjustable veneer anchor consisting of an L-shaped 14 gauge ribbed plate section with 7/16 inch hole for connecting 7/16 inch diameter brass expansion bolt, eyelets for hook (pintle) insertion, and 3/16 inch diameter pintle of appropriate length to extend into veneer unit mortar bed a minimum of 1-1/2 inches, with a minimum of 5/8 inch mortar cover at outside face of veneer unit.
 2. Facing over Framing: (Veneer over Air and Vapor Barrier Underlayment over Stud Framing): Hohmann & Barnard HB-213 adjustable veneer anchor, Heckman 315-D with 316, or equivalent as approved by the Architect and Structural Engineer from one of the specified Manufacturers.
 - a. Description: Adjustable veneer anchor consisting of an L-shaped 14 gauge ribbed plate section with 9/32 inch holes for connecting screws, eyelets for hook (pintle) insertion, and 3/16 inch diameter pintle of appropriate length to extend into veneer unit mortar bed a minimum of 1-1/2 inches, with a minimum of 5/8 inch mortar cover at outside face of veneer unit.
- C. Control Joints:
1. Rubber: Extruded, solid section, ASTM D2000 2AA-805 with a durometer hardness of 70 or 80 when tested per ASTM D2240.
 2. Polyvinyl Chloride (PVC): ASTM D2287, Type PVC 654-4 with a durometer hardness of 85 (+5) when tested per ASTM D2240, minimum tensile strength of 1750 psi with minimum 300 percent elongation per ASTM D638, and cold crack brittleness of 50 degrees F per ASTM D746.
 3. Sizes and Profiles: As indicated on Drawings.
- D. Joint Filler: Closed cell neoprene rubber conforming to ASTM D1056, Grade 2A1, oversized 50 percent, self expanding, 2-3/4 or 3 inch width by maximum length.
- E. Self-adhering Composite Flashing: Self-adhering composite flashing product composed of a high-density, cross-laminated polyethylene film coated on one side with a layer of pliable, adhesive rubberized-asphalt compound.
1. Overall Thickness: Not less than 0.040 inch.
 2. Acceptable Manufacturers and Products:
 - a. CCW-705-TWF Thru-Wall Flashing, Carlisle Coating and Waterproofing www.carlisle-ccw.com
 - b. Perm-A-Barrier Wall Flashing, W.R. Grace & Co. www.graceconstruction.com
 - c. Polyguard 300 Thru Wall Flashing Membrane, Polyguard Products, Inc. www.polyguardproducts.com
 - d. Blueskin TWF, Henry Company www.henry.com
 - e. Equivalent as approved by Architect.
 3. Primer: Provided by the flashing manufacturer. Must be applied to all glass-matt faced exterior gypsum sheathing unless specifically allowed otherwise by manufacturer in writing specific to this project.

- F. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard. Acceptable products include the following:
 - 1. Mortar Net USA, Ltd.; Mortar Net Weep Vents.

- G. Mortar Deflection Material: Polymer based geomaterial made of high-density polyethylene strands woven into a 90 percent open mesh weave design. Acceptable products include the following:
 - 1. Mortar Web, Sandell Construction Solutions www.sandellmfg.com
 - 2. Mortar Maze, Advanced Building Products, Inc. www.advancedbuildingproducts.com
 - 3. Mortar Net, Mortar Net USA, Ltd. www.mortarnet.com

PART 3 EXECUTION

3.01 INSTALLATION

- A. General: Installation of masonry accessories shall be as specified under the following Section and in accordance with AMG Standard 108.
 - 1. Section 04 22 00 – Concrete Unit Masonry.

- B. Control Joints: Provide control joints as indicated on Drawings and in accordance with the requirements of Specification Section for the masonry units.

- C. Through Wall Flashing:
 - 1. Provide through-wall flashings as indicated on Drawings and in accordance with the requirements of Specification Section for the masonry units.
 - 2. Specified flashing and accessories are not designed for use as a finished surface or for use in areas where they will be exposed to sunlight. Prevent contact with products containing fresh coal tar or coal tar pitch. Prevent contact with sealant products containing polysulfide polymers due to incompatibility.
 - 3. Remove deleterious materials from surfaces to be flashed.
 - 4. Apply surface conditioner by spray, brush or roller at the rate recommended by manufacturer to dirty or dusty surfaces or surfaces having an irregular or rough texture before installing flashing membrane.
 - 5. Remove silicone-coated release paper and position flashing carefully before placing it against the surface. When properly positioned, place against surface by pressing firmly into place by hand roller or blunt object, such as the backside of a utility knife. Fully adhere flashing to substrate to prevent water from migrating under flashing.
 - 6. Overlap adjacent pieces 2 inches and roll overlaps with a steel hand roller or a blunt object. Fully seal overlaps to prevent water leakage through laps. Trim bottom edge 1/2 inch back from exposed face of the building.
 - 7. At heads and sill where flashing is indicated to be placed, turn up ends a minimum of 2 inches and make careful folds to form a pan, with the pan seams sealed with compatible mastic acceptable to flashing manufacturer.
 - 8. Apply a bead or trowel coat of compatible mastic acceptable to flashing manufacturer along top edge, seams, cuts and penetrations. Seal penetrations through flashing with compatible mastic acceptable to flashing manufacturer.

- D. Weep Holes: Provide weep holes as indicated on Drawings and in accordance with the requirements of Specification Section for the masonry units.

- E. Mortar Deflection Material: After the first one or two courses of brick have been set, clean cavity of any miscellaneous mortar or debris and place mortar deflection material in the cavity of the wall on top of installed flashing.

3.02 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

END OF SECTION

SECTION 04 05 26

CMU INTEGRAL WATER REPELLENT

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

- A. Performance Requirements: Water repellent admixture shall be provided in both the masonry units and mortar used in all exterior exposed CMU wall construction, and shall constitute a complete integral water repellent system for exterior above grade walls meeting the following requirements:
1. Admixture shall leave the finished surfaces water repellent and shall not alter the natural texture or color of the masonry units.
 2. Admixture shall provide wind driven rain resistance equivalent to Class E Rating as measured by ASTM E514-74.
 3. Bond strength as determined by ASTM E72 shall not be reduced by use of the water repellent admixture.

1.02 QUALITY ASSURANCE

- A. Qualifications:
1. Water Repellent Manufacturer: Engaged in producing materials with a satisfactory performance record for at least 5 years.
 2. Masonry Unit Fabricator/Manufacturer: Trained, approved and accepted by the manufacturer.
- B. Regulatory Requirements: Use of water repellent admixtures shall be in strict accordance with applicable Federal, State and local requirements, including, but not limited to, environmental regulations.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Mortar admixture shall be delivered to the job site in manufacturer's original unopened containers and packaging, with labels clearly identifying product name, manufacturer, and batch number.
- B. Store admixture in clean, dry area indoors in accordance with manufacturer's instructions; keep containers sealed until ready for use, keep from freezing, do not use admixture once frozen.
- C. Protect admixture during handling to prevent damage or contamination.

1.04 WARRANTY

- A. Water Repellent Manufacturer: Water-repellent shall be warranted by Admixture manufacturer to be free of defects and to meet manufacturer's published physical and chemical properties.
- B. CMU producer shall warrant that Integral Polymeric CMU Water-repellent has been provided at appropriate dosage rate in all units shipped to this project for use in exterior walls.

- C. Masonry Installer shall warrant that only CMUs and mortar containing Integral Polymeric CMU Water-repellent have been placed in exterior walls and that admixture was included in the mortar mix in accordance with water repellent manufacturer's printed instructions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Water-Repellent Admixture: The following shall be included in exterior masonry units.
 - 1. Liquid polymeric admixture(s) formulated for mixing with mortar mix and formulated for mixing with concrete during production of concrete masonry units to cross link and provide resistance to water penetration to achieve a Class E Rating when tested in accordance with ASTM E514.
 - 2. Admixture shall not reduce flexural and compressive strength of mortar when tested in accordance with ASTM C1072 and C780.
 - 3. Concrete Masonry Unit Manufacturer: Acceptable to integral water repellent manufacturer and qualified by integral water repellent manufacturer to comply with ASTM E514 for water permeance testing.
 - 4. Acceptable Products include the following:
 - a. Dry Block Mortar Admixture as manufactured by GCP Applied Technologies Inc. <https://gcpat.com>
 - b. Eucon Blocktite Mortar Admixture as manufactured by The Euclid Chemical Company www.euclidchemical.com
 - c. RainBloc admixture as manufactured by ACM Chemistries, Inc. www.acmchem.com

PART 3 EXECUTION

3.01 ERECTION, INSTALLATION, APPLICATION

- A. In accordance with Sections 04 05 15 and 04 22 00 and manufacturers recommendations.

END OF SECTION

SECTION 04 22 00

CONCRETE UNIT MASONRY

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes concrete masonry units including setting materials and accessories.
- B. Related Sections:
 - 1. Section 04 05 23 – Masonry Accessories, for control joints, wall ties, through-wall flashings, weep holes, mortar deflection material, and cavity vents.

1.02 SUBMITTALS

- A. Samples: Submit samples to Architect for review prior to delivering materials to Site or commencing Work in this Section.
 - 1. Provide 2 samples of each type and weight classification of concrete masonry units, (stretcher units), to be used on Project showing range of texture and/or color variations of exposed surfaces for units.
 - 2. Units provided to Project shall match these samples.
- B. Shop Drawings: Submit Shop Drawings showing proposed location of control joints and obtain approval of same from Architect and Structural Engineer prior to construction.
- C. Test Reports:
 - 1. Submit test results for concrete masonry units for exterior building wall construction to be used to Architect in accordance with Section 01 45 00.
 - 2. Test results shall clearly indicate:
 - a. Types of materials and composition, including integral water repellent.
 - b. Classification of concrete masonry unit in accordance with ASTM C90 requirements.
 - c. Water penetration and leakage in accordance with testing specified under Source Quality Control specified in this section.
 - 3. Testing laboratory shall notify Architect of non-conforming material submittals.
- D. Certificates: Submit certification to the Architect prior to delivery of concrete masonry units to jobsite, signed by Concrete Masonry Unit Manufacturer, stating that the concrete masonry units to be supplied: 1) shall meet the specified requirements for concrete masonry units for exterior building wall construction, and; 2) are suitable for proposed usage.

1.03 QUALITY ASSURANCE

- A. Standards:
 - 1. The "Levels of Quality", Standard 107 of Arizona Masonry Guild (AMG) shall apply and by reference is hereby made a part of this Specification. Reference to Custom, Standard or Economy in this Specification shall be as defined in latest edition of AMG Standard 107.
 - 2. Comply with the requirements of ACI 530.1/ASCE 6 "Specifications for Masonry Structures", except as otherwise indicated.
- B. Regulatory Requirements: Masonry materials and workmanship shall meet requirements of building codes which are applicable to jurisdiction in which Project is located.

- C. Certifications: Concrete masonry units shall be supplied by a manufacturer participating in the Certified Block Program of the Arizona Masonry Guild.
- D. Installer Qualifications: The Masonry Subcontractor shall have a supervisor on the jobsite, whenever masonry work is being performed, who is Certified by the Arizona Masonry Contractors Association. Proof of certification shall be submitted to the Architect prior to start of masonry work.
- E. Mock-Ups: Prior to start of Work, construct a sample panel from approved materials, containing each different kind or color of concrete masonry units, approximately 4 feet high x 6 feet long or as required to illustrate wall design under direction of Architect.
 - 1. Sample wall shall provide a standard of workmanship, bond, thickness and tooling of joints.
 - 2. Construct successive sample panels until standard is approved.
 - 3. When accepted, sample wall shall be standard of comparison for remainder of masonry Work.
 - 4. This sample, when accepted by the Architect, will function as a reference base for acceptance or rejection of final work.
 - 5. Sample wall shall be reviewed by the specification writer or Architect's contract administrator for acceptance.
 - 6. Sample wall shall receive water repellent as specified in Section 07 19 00.
 - 7. Upon completion of Project, remove sample wall from site and dispose of in a legal manner.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Transport and handle masonry units in such a manner as to prevent chipping and breakage.
- B. Deliver and store materials in dry, protected areas.
- C. Keep free of stain or other damage.
- D. Locate storage piles, pallets, stacks or bins to avoid or protect material from heavy or unnecessary traffic.
- E. Segregate storage piles, pallets, stacks or bins of fire-rated units from non-rated units and maintain clear identification of the rating of the units.
- F. Replace damaged material at no cost to Owner.

1.05 PROJECT/SITE CONDITIONS

- A. Hot Weather Requirements:
 - 1. When ambient air temperature exceeds 100 degrees F., or when ambient air temperature exceeds 90 degrees F. and wind velocity is greater than 8 mph, Masonry Contractor shall implement hot weather protection procedures as submitted to Architect.
 - 2. Do not spread mortar beds more than 4 feet ahead of placing block units.
 - 3. Place block units within one minute of spreading mortar.

- B. Cold Weather Requirements:
1. Fully protect concrete masonry units against freezing by a weather-tight covering which shall also prevent accumulation of ice.
 2. Do not lay concrete masonry units when temperature of surrounding atmosphere is below 40 degrees F. or is likely to fall below 40 degrees F. in the 24 hour period after laying, unless adequate protection is provided.

1.06 SCHEDULING AND SEQUENCING

- A. Coordination: Coordinate with other Trades whose Work relates to concrete masonry unit installation for placing required blocking, backing, furring, conduits and other items.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General Requirements for Concrete Masonry Units:
1. Concrete masonry units shall meet ASTM C90 requirements except that when CMU will be exposed in final construction, ASTM C90-00, paragraph 7.2.1 shall be modified to read: "Three percent of a shipment containing chips not larger than 1/2 inch in any dimension, or cracks not wider than 0.02 in. and not longer than 10 percent of the nominal height of the unit is permitted." Linear shrinkage of units of units shall not exceed 0.065 percent.
 2. Units shall be in the same condition in wall as they were upon delivery.
 3. Unit sizes shall be 8 by 4 by 16 inches, 4 by 4 by 8 inches, 8 by 4 by 4 inches, 4 by 4 by 16 inches, and other sizes as may be indicated on Drawings.
 4. Texture and color shall be consistent for all units provided for exposed walls. Range of texture and color shall be within that shown by samples reviewed by Architect.
 5. Surface of units shall be clean and free from dirt when laid in walls.
 6. Units not complying with the appropriate ASTM Standards and AMG Standard 107 shall not be laid in the wall where exposed to view. Any unit that is chipped in excess of the requirements of AMG Standard 107 will be rejected and shall be removed and replaced.
 7. Provide special block sizes and shapes required or as shown on Drawings.
 8. CMU may be used for construction of building walls exposed to the exterior if they comply with requirements specified under Source Quality Control.
 9. Water-Repellent Admixture: In accordance with Section 04 05 26. Concrete masonry units used to construct exterior building walls shall contain the recommended amount of integral water repellent admixture, as per manufacturer's certification program.
- C. Hollow CMU Classifications: The following requirements shall apply to all shapes, colors, textures and sizes of CMU provided.
1. Medium weight units: Weighing 105 lbs. per cubic foot to less than 125 lbs. per cubic foot and manufactured from a combination of volcanic scoria aggregate conforming to ASTM C331 and sand conforming to ASTM C33.
 2. Normal weight units: Weighing 125 lbs. per cubic foot or more and manufactured with sand conforming to ASTM C33.
 3. Fire-resistant Rated Lightweight Units: Provide units manufactured and certified to comply with UL 618 – Standards of Concrete Masonry Units for the fire-resistance rating required.
 - a. Weighing less than 105 lbs per cubic foot and manufactured with sand and gravel, cinders, blast furnace slag, expanded clay or shale, pumice, or other proprietary aggregates complying with ASTM C331

- D. Standard Smooth Faced CMU: Manufacturer's standard smooth faced units.
 - 1. Standard grey units at non-exposed-to-view areas.
 - 2. Unit sizes shall be as shown on Drawings.
 - 3. Integral Color Units: As scheduled on Drawings.
- E. Decorative Faced CMU: "Mesastone" textured face masonry units as manufactured by Superlite Block (an Oldcastle company), Phoenix, AZ, or equivalent:
 - 1. Manufactured from special colored aggregates and integrally colored masonry with uniform sandblasted textured face.
 - 2. Fittings and Specialty units, including solid wall caps, shall also have uniform textured (sandblasted) face as required to fit design scheme. Units shall be textured on 1, 2 or 3 faces as required by design and placement of units in wall.
 - 3. Units shall be manufactured with manufacturer's standard integral water-repellent admixture.
 - 4. Unit sizes shall be as shown on Drawings.
 - 5. Integral Color: As scheduled on Drawings.
- F. Interlocking Fence Block Units: Medium weight, interlocking fence block units (4 inches x 8 inches x 16 inches) and open-ended pilaster units (8 inches x 8 inches x 16 inches), including half interlocking fence block units, corner pilaster units and end pilaster units as required.
 - 1. Integral Color: As scheduled on Drawings.
 - 2. Provide "drainage block" solid units with slotted holes to allow water drainage for site wall locations where indicated.
- G. Other Decorative Faced CMU: As scheduled on Drawings.
- H. Accessory Units: Provide units as required for window sills and jambs, doors, control joints, bond beams, lintels, pilaster, caps and other locations as indicated on Drawings with a minimum of block cutting. Accessory units shall match adjacent unit color and texture unless noted otherwise.

2.02 ACCESSORIES

- A. Joint Reinforcing: Joint reinforcing in accordance with requirements of IBC 2018, Chapter 21.
- B. Reinforcing Steel: As specified under Section 03 20 00.
- C. Control Joints: As specified under Section 04 05 23.
- D. Wall Ties, Through-Wall Flashings, Weep Holes, Cavity Vents: As specified in Section 04 05 23.
- E. Mortar and Grout: As specified under Section 04 05 15. Provide water-repellent admixture in accordance with Section 04 05 26.
- F. Sheet Metal Flashings: See Section 07 60 00. Furnish shapes in accordance with project requirements and NCMA TEK 19-2A, 19-4A and 19-5A.
- G. Steel Lintels: As indicated or scheduled on Structural Drawings.

2.03 SOURCE QUALITY CONTROL

- A. Concrete masonry units to be provided for exterior exposed building wall construction shall be tested by manufacturer using a spray bar test as follows:
1. Testing shall be performed at no additional cost to Owner.
 2. Individual concrete masonry units shall be placed on a rack where water is sprayed at a rate of 140 gallons per hour for a minimum of 4 hours.
 3. Testing shall be made upon concrete masonry units prior to application of post-applied water repellent.
 4. Test results for units regularly manufactured using a standard mix design within the previous 6 months shall be acceptable.
 5. Test results shall meet or exceed the following:

Location	Results
Inside front face shell	<20% damp (no running water or sheen)
Center web	Dry
Inside outer web	<10% damp
Inside of back face shell	Dry
Outside of back face shell	Dry

6. Submit test reports as specified herein under "Submittals."

PART 3 EXECUTION

3.01 EXAMINATION

- A. Installer shall examine supporting structure and conditions under which unit masonry is to be installed, and notify Contractor, in writing, conditions detrimental to proper and timely completion of Work. Do not proceed with the installation of unit masonry Work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- B. Do not use units with chips, cracks, or other defects which might be visible in the finished Work unless otherwise acceptable to the Architect.
- C. Do not build on frozen Work; remove and replace unit masonry Work damaged by frost or freezing.
- D. Do not use frozen materials or materials mixed or coated with ice or frost. Do not lower freezing point of mortar by use of admixtures or anti-freeze agents, and do not use calcium chloride in mortar or grout.

3.02 PREPARATION

- A. Protection: Protect sills, ledges, offsets and other projections from dropping of mortar and grout.

3.03 ERECTION, INSTALLATION, APPLICATION

- A. General Requirements for Concrete Masonry Walls:
1. Workmanship:
 - a. Provide Standard Level workmanship as defined by AMG Standard 107.
 - b. Concrete masonry units which will be exposed in the finished work shall be treated as an architectural finish and shall be handled carefully to ensure that chippages do not occur during handling and laying. Handling shall be minimized on the jobsite to eliminate chances for chippage.

2. Lay units in uniform and true courses, level and plumb to height indicated on Drawings.
 3. Lay concrete unit masonry in such a way that cracks are not formed at time unit is placed in wall.
 4. Units shall not be wetted before being used and shall be laid dry.
 5. Adjusting Units:
 - a. Units shall be adjusted to be level, plumb and straightened into final position in wall while mortar is still soft and plastic enough to ensure a good bond.
 - b. Avoid over-plumbing and pounding of corners and jambs to fit stretcher units after they are set in position.
 - c. If position of unit is shifted after mortar has stiffened, or bond is broken or cracks are formed, re-lay unit in new mortar.
 6. Bearings on Walls: Provide 3 courses of solid units or grouted hollow masonry units below steel bearing plates or beams bearing on walls. Extend bearings each side of contact with load as required to properly transfer loads into wall.
 7. Openings: Provide openings in masonry walls where required or indicated. Steel lintels shall be provided unless otherwise noted.
 8. Flashings: Surface of masonry shall be smooth and free from projections which will puncture flashing materials. All sheet metal flashings shall have hemmed edges.
 9. Weep Holes: If required, shall be provided in the head joints of the first course and be at a maximum of 24 inches on center.
 10. Cutting of masonry: When required, exposed block units shall be cut with a power driven Carborundum or diamond disc blade saw. When using "wet" cutting methods, clean water shall be used on exposed units.
 11. Where fresh masonry joins masonry that is partially or totally set, the exposed surface of the set masonry shall be cleaned and lightly wetted so as to obtain the best possible bond with the new Work. Loose brick and mortar shall be removed.
 12. If it becomes necessary for construction purposes to "stop-off" a horizontal run of masonry, this shall be done by racking back on half a CMU veneer unit length in each course and , if grout is used, stopping the grout 4 inches back of the rack. Tothing will not be permitted, except upon written approval of the Architect.
- B. Anchorage of CMU Veneer to:
1. Masonry and ICF:
 - a. Provide ties anchored into masonry backup construction.
 - b. Anchors shall be spaced so as to support not more than 2 square feet of wall area, but not more than 24 inches o.c. horizontally, unless noted otherwise on drawings.
 - c. Maintain a space not less than one inch in width between masonry walls, keeping space free of mortar or other rigid materials.
 2. Framed Walls:
 - a. Anchor veneer with adjustable ties or anchors spaced so as to support not less than 2 square feet of wall area, but not more than 16 inches vertically and 24 inches horizontally with additional ties within 12 inches of openings and spaced not more than 12 inches around perimeter of openings.
 - 1) Locate anchor section relative to course where tie section is embedded to allow maximum vertical differential movement of tie up and down.
 - b. Fasten ties through sheathing to wall framing with two corrosion resistant coated screws.

- C. Bonding:
1. Bond pattern shall be regular running bond unless indicated otherwise on the drawings.
 2. Bond shall be plumb throughout face of wall.
 3. No pieces shorter than 4 inches shall be used at corners or jambs.
- D. Bearing Wall Intersections:
1. Intersecting block bearing walls shall not be tied together in a masonry bond, except at corners.
 2. One wall shall terminate at face of other wall with a control joint at intersection.
 3. Tie intersecting wall together with a metal tie bar, 1/4 inch x 1-1/4 inches x 2'-4" long with a 2 inch right angle bend at each end of bar, spaced vertically at 2 feet on center.
 4. Bends at ends of tie bars shall be embedded in grouted cells.
 5. Rake out vertical joint between intersecting walls to a depth of 3/4 inch after mortar has stiffened.
 6. Provide sealing of control joint as specified in Section 07 92 00.
- E. Interlocking Fence Unit Fence Construction:
1. Construct pilasters simultaneously with panels and maintain vertical alignment of cells. Lay-up interlocking panel units in running bond with full mortar bedding the depth of face shells. Head joints are not mortared at interlocking panel units. Concave tool all joints.
 2. Pilaster grouting: Reinforcing steel is to be in place before grouting starts. Fill masonry cells solidly with grout.
- F. Non-Bearing Wall Intersections:
1. Tie non-bearing wall together with strips of metal lath or galvanized 1/4 inch mesh hardware cloth placed across joint between 2 walls placed in alternate horizontal block courses.
 2. Rake out vertical joint between intersecting walls to a depth of 3/4 inch after mortar has stiffened.
 3. Provide sealing of control joint as specified in Section 07 92 00.
- G. Joining of Work:
1. Where fresh masonry joins partially set masonry the exposed surface of the set masonry shall be cleaned and lightly wetted so as to obtain the best possible bond.
 2. Remove loose concrete block and mortar.
 3. Stop-off a horizontal run of masonry by racking back 1/2 brick length in each course and, if grout is used, stopping the grout 4 inches back of the rack.
 4. Tothing will not be permitted, except upon written approval of the Architect.
- H. Mortar Joints:
1. Joints shall be straight, clean and a uniform 3/8 inch thickness on exposed wall face and in accordance with NCMA TEK 19-2A.
 2. Exposed vertical and horizontal joints shall be tooled when mortar is "thumbprint" hard with round or other approved jointer, slightly larger than the width of the joints to produce a dense, slightly concave tooled surface which is well bonded to block at edges.
 3. Joints shall be tooled flush at:
 - a. Below grade and planter surfaces to receive waterproofing.
 - b. Interior or exterior surfaces to receive furred wall construction, or other finishes requiring flush joints that are to be concealed.
 4. Solidly fill joints from face of unit to depth of face shell, except where specified otherwise.

5. Full bedding to be provided for first course on foundation and wherever maximum strength is required.
 6. Butter vertical head joints well and shove these joints tight so that mortar bonds well to both units.
 7. Full coverage to be provided on bed of face shells and webs surrounding cells to be filled.
 8. Bee-holes or other open joints shall be filled and tooled with mortar while mortar is still fresh.
- I. Control Joints:
1. Provide control joints, as detailed, at vertical masonry walls where such walls exceed 40 feet in length. In long length of walls, provide joints at approximately 24 feet on center or as detailed.
 2. Control joints shall be continuous full height of walls.
 3. At bond beams, control joints shall separate both block and grout; however, steel reinforcing shall be continuous.
 4. Horizontal wire reinforcing shall not run through control joint.
 5. Control joints shall not occur at wall corners, intersections, ends, within 24 inches of concentrated points of bearing or jambs or over openings unless specifically indicated on Structural Drawings.
 6. Control joint materials shall be held back from finished surface as required to allow for sealant and back-up materials.
- J. Horizontal Joint Reinforcing:
1. Place horizontal joint reinforcing every 16 inches vertically throughout wall construction.
 2. Continuously reinforce first bed joint immediately above and below openings. Provide reinforcing in second bed joint above and below openings which extends 2 feet beyond each side of opening.
 3. Lap splices in reinforcing in accordance with Structural Drawings.
 4. Cut and bend reinforcing at corners.
- K. Vertical Reinforcing and Bond Beam Reinforcing:
1. Place in accordance with requirements of Drawings.
 2. Vertical Reinforcement: Provide continuous reinforcing full height of wall at wall ends, corners, intersections, jambs of openings and each side of control joints. Vertical reinforcing shall match and lap dowels which are at top of foundation walls and precast concrete beams.
 3. Bond Beams: Provide horizontal reinforcing of 2 bars in minimum 8 inch deep grouted continuous bond beam at roof and elevated floor lines.
 4. Parapets: Provide horizontal reinforcing of 1 bar in minimum 8 inch deep grouted continuous bond beam at top of parapets.
 5. Bond Beam and Parapet Reinforcing at Vertical Control Joints: Place bars continuous through control joint and wrap mastic tape around bars for 18 inches each side of control joint.
 6. Bond Beam and Parapet Reinforcing at Corners and Wall Intersections: Provide bent bars to match reinforcing at corners and wall intersections.
 7. Lap splices in reinforcing in accordance with Structural Drawings.
 8. Use spacers to position reinforcing steel in center of grout at center of wall as required by code.
- L. Grouting:
1. Reinforcing steel is to be in place and inspected before grouting starts.
 2. Vertical cells to be filled shall have vertical alignment to maintain a continuous cell area.
 3. Keep cell to be grouted free from mortar.

4. Fill cells solidly with grout in lifts not to exceed 5 feet.
 5. Grout may be poured by hand bucket, concrete hopper or through a grout pump.
 6. Do not wet down grout space prior to pouring of grout.
 7. Stop pours 1-1/2 inches below top of cell to form a key at pour points.
 8. Grout shall be consolidated by mechanical vibration during placing before loss of plasticity in a manner to fill grout space. Grout pours greater than 12 inches shall be reconsolidated by mechanical vibration to minimize voids due to water loss. Grout pours 12 inches or less in height shall be mechanically vibrated, or rodded.
 9. Grout barrier below bond beams shall be continuous wire lath or other approved material.
 10. Grout beams over openings and bond beams in a continuous operation.
 11. Solidly grout in place bolts, anchors and other items within wall construction.
 12. Fully grout jambs and head of metal door frames connected to masonry. Filling of frames shall be done as each 2 feet of masonry is laid.
 13. Use extreme care to prevent grout or mortar from staining face of the masonry.
 14. Immediately remove grout or mortar which is visible on face of masonry.
- M. Provisions for Other Trades and Built-in Items:
1. Build in items required and indicated, including; but not limited to, reinforcing steel, anchors, flashings, sleeves, frames, structural steel, loose lintels, anchor bolts, nailing blocks, door and window frames and miscellaneous iron.
 2. Enclosures for pipes, stacks, ducts and conduits:
 - a. Construct slots, chases, cavities, and similar spaces as required.
 - b. Where masonry is to enclose conduit or piping, bring it to proper level indicated and as directed.
 - c. Cover no pipe, conduit chases or enclosures until advised that Work has been inspected and approved.
- N. Tolerances; Standard Level of Quality: In accordance with AMG Standard 107.
- O. Joint and Crack Control: In accordance with NCMA TEK 10-1.
- P. Flashing: In accordance with NCMA TEK 19-2A, 19-4A and 19-5A and 19-4, and as detailed on Drawings.
- Q. Weep holes shall be provided above lintels and vertical obstructions as per manufacturer's flashing and weep hole diagrams, and as detailed on Drawings.
1. Provide weep vents at bottom course of veneer units and course immediately above all vertical obstructions such as lintels, door heads, etc., at 32 inches on center horizontally.

3.04 FIELD QUALITY CONTROL

- A. Masonry Tests: Inspection and testing of masonry will be performed by a testing laboratory in accordance with Section 01 45 00.
1. Provide free access to Work and cooperate with appointed firm.
 2. Water testing of CMU exterior building walls shall be provided as specified in Section 07 19 00.

3.05 ADJUSTING

- A. Pointing of Mortar Joints:
1. Point and fill holes and cracks in exposed mortar joints.
 2. Cut out defective mortar joints to a depth of at least 1/4 inch.
 3. When cutting is complete, remove dust and loose material by brushing or vacuuming.

4. Prehydrate mortar for pointing by mixing dry ingredients with only sufficient water to produce a damp mass of such consistency that it will retain its form when it is pressed into a ball with hands, but will not flow under trowel.
 5. Allow mortar to stand for a period of not less than one hour nor more than 2 hours, after which remix with addition of sufficient water to produce satisfactory workability.
 6. Pointing mortars shall be identical to adjacent mortar in similar joints and finish results shall match and be indistinguishable from original mortar used.
 7. Premoisten joint and apply mortar tightly.
 8. Tool to match adjacent joints.
 9. Moist cure for 72 hours.
- B. Patching: If approved by Architect, patching of exposed masonry walls shall be done at conclusion of general Work and shall conform as closely as possible to similar surrounding or adjoining Work.

3.06 CLEANING

- A. Daily Cleaning: Keep walls clean. Soiled masonry from mortar and grout spills which will be exposed to view at completion of Project shall be cleaned immediately with stiff fiber brushes until wall is free of dropped or spattered mortar.
- B. Walls indicated to be painted shall be cleaned with stiff fiber brushes until wall is free of all surface free of all dropped and splattered mortar and irregular surfaces that would telegraph through the painted finish or interfere with paint adhesion.
- C. Clean walls to be exposed in the finished work in accordance with Section 04 01 20.52. Do not clean walls by sand blasting.
- D. Remove scaffolding and equipment used in Work.
- E. Clean up debris, refuse and surplus material and remove from premises.

3.07 PROTECTION

- A. Furnish temporary protection for exposed masonry corners subject to injury.
- B. Carefully cover tops of walls left incomplete at conclusion of day's Work with tarpaulins or other approved covering.
- C. In hot and dry weather, protect masonry against too rapid drying.
- D. Protect finished Work against freezing for a period of not less than 48 hours by means of enclosures, artificial heat, or such other protective methods as may be required.

END OF SECTION

SECTION 05 10 00
STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Structural steel framing including, but not limited to:
 - 1. Columns
 - 2. Beams, including Roof Ridge Lookouts.
 - 3. Ledgers, Headers, and Lintels
 - 4. Anchor Bolts
 - 5. Bearing Plates
 - 6. Other Miscellaneous Structural Steel Items.
- B. Related Sections:
 - 1. Section 05 50 00 – Metal Fabrications, for miscellaneous metal fabrications and other non-structural steel fabrications.

1.02 SUBMITTALS

- A. Shop Drawings: Submit shop and erection Drawings clearly showing each piece required for fabrication and erection. Drawings shall include material grade, camber, holes and other pertinent data. Indicate welds by standard AWS symbols showing size, length, and type of each weld.
- B. Test Reports: Submit reports for welded connection tests.
- C. Submit anchor setting drawings clearly showing location of all anchor bolts and embedded plates to be anchored in concrete and masonry construction. Provide templates for anchor bolts.

1.03 QUALITY ASSURANCE

- A. Welding:
 - 1. Performed by certified welders in compliance with AWS D.1 Structural Welding Code.
 - 2. Welders shall be duly qualified within the last 12 months in the position in which they are to weld and the qualifications and Specifications for workmanship shall comply with the AWS requirements "AWS Structural Welding Code - Steel."
- B. Certifications:
 - 1. Prior to fabrication or shipment of material to the job site, furnish certification of the Manufacturer of the structural steel that material furnished meets or exceeds requirements of ASTM standards specified or noted on Drawings, for each type of material.
 - 2. Prior to site welding operation, submit welders' written certifications and qualifications, including date of each welder's certification performing work on the Project.
- C. Tolerances: All steel exposed to view shall be architectural steel, and tolerances as a minimum shall comply with section 10 of AISC code of standard practice.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Exercise care during unloading, storage and erection to avoid damage. Dumping on the ground is not permitted.
- B. Support material stored at the site completely free of the ground, and cover to avoid damage from the elements.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: Materials shall be new, of uniform quality, suitable and without defects affecting the strength or service of the structure.
- B. Structural Steel:
 - 1. Wide Flange: ASTM A992 (Fy = 50 ksi), unless otherwise indicated.
 - 2. Other Rolled Shapes Including Channels, Angles, Plates, Bars and Rods: ASTM A36 (Fy = 36ksi), unless otherwise indicated.
 - 3. All structural rolled members with Fy greater than 36 ksi shall be identified with an ASTM specification mark or tag in accordance with IBC Section 2203.1 over shop prime paint.
- C. Round HSS or Pipe: ASTM A500, Grade C (Fy = 42 ksi).
- D. Square or Rectangular HSS: ASTM A500, Grade C (Fy = 46 ksi).
- E. Structural Tube: ASTM A500 Grade C (FY = 50 ksi).
- F. Bolts and Anchor Bolts: ASTM F1554 Grade 36 (ASTM A307).
- G. High Strength Bolts: ASTM A325N, unless noted otherwise.
- H. Welded Anchors and Shear Connectors: ICC approved, as manufactured by KSM or Nelson. Substitutions must have ICC approval and be of equivalent capacity for the intended use.
- I. Welding Rods: AWS A5.0, E70 series, low hydrogen type.
- J. Metal Primer: VOC compliant.
 - 1. Interior Steel (where indicated to be painted): Tnemec 88HS-0559 Gray www.tnemec.com, modified short oil alkyd; or Tnemec 10-99 modified alkyd, chemically active, rust-inhibitive primer, or equivalent as standard with fabricator.
 - 2. Exterior Steel: Provide primer specified in Section 09 91 00 – Painting, for exposed structural steel indicated to receive High Performance Paint System.
- K. Grouts: As specified in Section 03 30 00.

2.02 FABRICATION

- A. Workmanship and details of construction (except as otherwise indicated or specified) shall be in conformity with applicable articles of the latest AISC Manual, Parts 1 through 4; AISC Specifications; except Section A7 (Design Documents) and Chapter N (Plastic Design); and the applicable building codes. Sections 3.1, 3.4 and 4.2 of AISC code of Standard Practice are specifically excluded from this work.
 - 1. Sections shall be of dimensions, weight and design as indicated, assembled complete at the shop, with base plates and other detailed materials attached.
 - 2. Furnish shims at columns where base plates are shop fabricated to columns.
 - 3. Make connections as indicated or detailed, on the Drawings and the reviewed shop and erection Drawings.
 - 4. Exposed steel shall have smooth, clean surfaces with no identifying trade marks, names etc., exposed to view.
 - 5. Leave in condition for finish painting.
- B. Bolted connections shall be as detailed or shall conform to AISC standard bolted connections with maximum number of 3/4-inch diameter bolts. See Framed Beam Connections Tables II, III, or IV of AISC Manual of Steel Construction.
- C. Where bolt holes in steel members are enlarged to more than 1/16 inch diameter oversize, provide 3/16 inch x 2-1/2 inch x 2-1/2 inch plate washers to steel members with 3/16 inch fillet weld all around.
- D. Loose Steel Lintels: Provide loose structural steel shape lintels for openings and recesses in masonry walls and partitions, as shown. Weld adjoining members together to form a single unit. Provide not less than 4 inch bearing at each side of openings, unless otherwise shown.
- E. Shelf Angles: Provide structural steel shelf angles of sizes shown for attachment to concrete framing. Provide slotted holes to receive 3/4 inch bolts, spaced not more than 6 inches from ends and not more than 24 inches o.c., unless otherwise shown.
- F. Loose Bearing Plates: Provide loose bearing plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required.

2.03 SHOP FABRICATION FOR USE OF HIGH STRENGTH BOLTS

- A. Joint surfaces, including those adjacent to the bolt heads, nuts or washers, shall be free of loose mill scale, burrs, or any foreign material (including paint). Field paint these areas with the specific shop paint after erection and completion.
- B. Joints using high strength bolts shall be inspected by a representative of an independent testing laboratory acceptable to the Owner's Representative.
 - 1. Inspection shall be accomplished by the use of a properly calibrated torque wrench.
 - 2. Calibration shall be by the procedure specified in the Specifications for structural joints using ASTM A325 or A490 bolts, under Section 9, inspections (pp. 6.2-53) Thirteenth Edition, AISC Manual of Steel Construction.
 - 3. Check a minimum of 20 percent of the bolts in each connection.
 - 4. If one or more of the bolts checked in any connection is below the minimum tension, check all of the bolts in that connection.
 - 5. Bolts which cannot be properly tensioned will be rejected.

- C. Check calibrated wrenches individually for accuracy at least once daily for actual conditions of application.
- D. All high strength bolts shall be installed as bearing type connections with threads included in the shear plane, unless noted otherwise on the Structural Drawings. Submit copies of the torque reading for each connection directly to the Architect in the form of a report, along with the minimum torque values required to reach the specified tensions and the calibration procedures.
- E. The use of load indicator washers or twist-off spline type of fastener requires specific prior approval of the Architect.

2.04 SHOP WELDING

- A. Make welds by the electric-arc process.
- B. Grind exposed welds smooth.
- C. Where weld size is not indicated, it shall develop full strength of member and connection.

2.05 PAINTING - SHOP COAT

- A. Shop prime all structural steel, except as follows:
 - 1. Steel that is not exposed to weather shall not be painted.
 - 2. Items of steel and iron Work indicated or specified to be encased in concrete. Partially embedded steel shall have primer applied to area embedded in concrete to a depth of 2 inches.
 - 3. Surfaces to be welded.
 - 4. Surfaces to be high-strength bolted with slip-critical connections.
- B. Clean steel Work by wire brushing, or by other means selected by the fabricator, of loose mill scale, loose rust, accessible weld slag, or flux deposit, dirt and other matter before shop coat of paint is applied. Clean in accordance with SSPC SP-6 as required. Remove oil, grease and similar contaminants in accordance with SSPC SP-1.
- C. After cleaning, give steel Work one coat of metal primer. Apply primer thoroughly and evenly to dry surfaces by brush, spray, roller coating, flow coating or dipping at the selection of the fabricator.
- D. Apply primer to provide a wet film of 2.0 mils.
- E. Paint erection marks on painted surfaces. Touch-up surfaces where welding, grinding of welds, joints, etc. are done in the field.
- F. The paint shall be thoroughly dry before the members are handled or loaded.
- G. Comply with Section 09 91 00 for application of high performance paint system primer applied to exposed exterior steel indicated to receive high performance paint system.

2.06 SOURCE QUALITY CONTROL

- A. Tests: Where a welded splice is fabricated in beams or columns other than those detailed, fabricator shall have splice connection tested using one of the following methods: magnetic particle, radiographic, or ultrasonic. Testing shall be conducted by an independent testing laboratory and a report submitted to the Architect. The costs of this testing shall be borne by the fabricator.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Verify anchor bolt locations, grouting and elevation of base and setting plates, and other material set by other Trades before commencing Work.
 - 2. Notify Architect of Work set by others which does not comply with specified tolerances. Do not erect material upon such Work until it has been satisfactorily corrected.
 - 3. Start of Work implies acceptance of Work of other Trades affecting structural frame erection.

3.02 ERECTION

- A. Erect Work to the proper lines and levels, plumb and true, and in correct relation to other Work maintain this condition to completion.
- B. Connections:
 - 1. Machine Bolting:
 - a. Fair-up holes with pins to align holes before bolting.
 - b. Ream unfair holes to obtain alignment or drill new holes.
 - c. Enlargement of holes with drift pins or burning of new holes is not permitted.
 - d. Draw bolts up tight after members are aligned and leveled, and set or deform threads to prevent loosening.
 - e. All high strength bolts shall be installed as bearing type connections with threads included in the shear plane.
 - 2. Welding:
 - a. Welds shall be per AWS standards and procedures.
 - b. Submit certification that welders have passed AWS code qualification tests.
 - c. Refer to Shop Drawings for weld size and dimensions.
 - d. Close joints exposed to weathering with continuous 1/8 inch weather welds.
 - e. Grind smooth exposed welds, but grinding shall not reduce weld strength or required cross section.
 - f. Protect finish material from damage due to welding.
 - g. Remove unsatisfactory welds by chipping or arc air method.
 - 3. Connect members temporarily and align completely before making permanent connections.
 - a. Temporary conditions shall consist of bolts in no less than 1/3 of the holes and in no case less than 3 bolts in any single connection.
 - b. Surfaces in contact shall be thoroughly clean when assembled.
 - c. Provide necessary temporary bracing and guying to align the structure properly for permanent connections, and safely resist erection, dead load and wind stress.
 - d. Take particular care to have the Work plumb and level (maximum slope ratio tolerance 1 to 500 for interior members, 0 to 1000 for exterior members) before making permanent connections.
 - e. Remove bracing and guys only after permanent alignment and assembly and structure is capable of completely sustaining design and temporary construction loads.

- C. Exposed Steel:
 - 1. Verify the condition of exposed steel after erection.
 - 2. Exert particular care to provide a neat, accurate installation with members straight and true, corners and edges square, sharp and free from burrs and irregularities, adjacent members perfectly matched and no bolts or rivets exposed.
 - 3. Remove erection bolts and seats and plug weld and grind holes smooth.
- D. Touch-up Primer Painting:
 - 1. Remove temporary guys, bracing and bracing clips, and grind flush remaining burrs, before painting. Remove welding slag, spatter, rust and burnt paint and wire brush clean welds before touch-up.
 - 2. Touch-up Primer Painting: Touch-up welds, abrasions, bolted connections, and other areas where shop prime paint has been removed or is damaged with specified prime paint.
- E. Grout Placement: Comply with the manufacturer's instructions.
- F. Tighten anchor bolts after supported members have been positioned and plumbed.

3.03 FIELD QUALITY CONTROL

- A. Field inspections and testing shall be performed by an independent testing and inspection agency in accordance with Section 01 45 00. Refer to general Structural Notes on Drawings for detailed testing requirements.

3.04 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises.

END OF SECTION

SECTION 05 31 00

STEEL DECK

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Increase S and I properties for simple or two span continuous to achieve equivalent load capacity. Minimum allowable diaphragm shear capacity furnished, per ICC report, shall be as indicated on Structural Drawings.
 - 2. Sections and properties shall meet AISC Specifications.

1.02 SUBMITTALS

- A. Shop Drawings: Submit shop and erection Drawings showing layout, material and fastening methods and each piece to be erected, and conditions requiring closure panels, supplementary framing, sump pans, cant strips, cut openings, special jointing or other accessories. Note deck welding pattern and physical properties of decking. Shop drawings shall not be made by reproduction of the Contract Drawings.
- B. Report: Submit ICC report showing diaphragm shear test.
- C. Submit welders' written certifications and qualifications.

1.03 QUALITY ASSURANCE

- A. Welding: Performed by certified welders in compliance with AWS D.1.3 requirements and procedures for manual shielded metal arc welding.
- B. Certifications:
 - 1. Prior to fabrication or shipment of material to the job site, furnish certification of the manufacturer of the steel decking that material furnished meets or exceeds requirements of ASTM standards specified or noted on Drawings, for each type of material.
 - 2. Prior to site welding operation, submit welders' written certifications and qualifications.
- C. Maintain on file ICBO report showing diaphragm shear test during the course of construction.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle metal decking in manner which will prevent damage or deformation.
- B. Stack decking stored at the site before erection on platforms or pallets, and suitably protect from the weather.
- C. Exercise special care so as not to damage or overload the decking during the construction period.
- D. Do not use metal decking for storage or as a working platform until the sheets have been welded in position.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved otherwise by Architect or Structural Engineer, subject to conformance with Specification requirements:
1. Consolidated Systems, Inc. www.csisteel.com
 2. Metal Deck, Inc.
 3. United Steel Deck, Inc. www.njb-united.com/usd.htm
 4. Vercor Manufacturing, Inc. www.vercodeck.com
 5. Vulcraft Division, Nucor Corp. www.vulcraft.com/sc
 6. Wheeling Corrugating Division www.wheelingcorrugating.com

2.02 RIBBED DECK

- A. Steel: ASTM A653 or ASTM A1008, with Grade and minimum yield strength indicated on General Structural Notes on Drawings.
- B. Roof Deck: Provide steel roof deck of type indicated on Structural Drawings.
1. Fabricate panels, without top-flange stiffening grooves, to comply with “SDI Specifications and Commentary for Steel Roof Deck,” in SDI Publication 29.
 2. Metal deck used in fire rated assemblies shall meet the requirements of UL. The UL mark on the product shall be acceptable as evidence of compliance.
- C. Finishes:
1. Painted Deck: ASTM A1008, Grade 33.
 2. Galvanized (where indicated) to conform with ASTM A924, Grade 60.

2.03 ACCESSORIES

- A. Provide ridge and valley plates, closures, cant strips, roof sump pans and other accessories where necessary or as shown on Drawings and of same material and finish as steel deck.
- B. Furnish miscellaneous supporting members at openings and edges, as shown on Drawings and as necessary.
- C. Touch-Up Paint Materials:
1. Galvanizing Repair Paint: High zinc-dust content paint complying with SSPC Paint 20 (94 percent minimum zinc dust content, dry film, by weight).
 2. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Erector shall examine subsurfaces to receive Work and report detrimental conditions, in writing, with a copy to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Before proceeding, verify that required inspections of existing conditions have been completed.

3.02 ERECTION - RIBBED DECK

- A. Place deck sheets in accordance with approved erection layout Drawings.
- B. Deck units shall be fabricated to span three or more support spacings, with end laps of at least two inches which shall occur over supports. Male joint of side laps shall engage female joint by at least 5/8 inch.
- C. Openings shown on the erection layout Drawings shall be cut by the deck erector. Openings not shown on the erection diagram, such as those required for stacks, conduits, plumbing vents, etc. shall be cut and reinforced if necessary, by the Trade requiring the openings.
- D. Attach deck to supporting members by fusion welding. Care shall be exercised by the welder in the selection of electrodes and amperage to provide positive welds and prevent high amperage blow holes. Welds shall be made from the top side of the deck with the welder following close behind the placement crew.
- E. Ridge and valley plates, closures, cant strips, roof sump pans and other accessories shall be attached directly to the deck to provide a suitable surface for the application of insulation and/or roofing.
- F. Welding washers are not necessary for ribbed deck of 22 gauge or heavier, or when the bottom rib width equals or exceeds 5/8 inch.
- G. Where washers are required, weld deck to steel framing through 16 gauge welding washers with 1 inch x 3/8 inch puddle welds. Maximum weld spacing shall be as follows unless noted otherwise on the Structural Drawings:
 - 1. End and end laps: 6 inches o.c.
 - 2. Intermediate supports: 6 inches o.c.
 - 3. Edges, perimeter beams and angles parallel to deck flutes: 12 inches on center
 - 4. Opening edges: 6 inches on center
- H. Weld sheets to each other with side seam welds at 12 inches on center.
- I. Touch-up Painting: Immediately after securing deck and other metal components in position, thoroughly clean and touch-up welds and damaged surfaces with specified touch-up repair paint as applicable.

3.03 FIELD QUALITY CONTROL

- A. Tests: When required by the Architect, installation of metal decking and welding shall be subject to inspection by a qualified Testing Agency acceptable to Architect, the cost of which will be paid out of the Testing Allowance.
- B. The Testing Agency shall:
 - 1. Test and inspect metal decking and workmanship to verify compliance with Contract Documents.
 - 2. Check material, equipment, procedures, welds, ability of welders.
 - 3. Furnish Architect with a verified report that completed Work conforms with Contract Documents.

3.04 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 05 41 00

STRUCTURAL METAL STUD FRAMING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes cold-formed structural steel stud framing and supplementary items necessary for complete work required for their installation, including, but not limited to the following:
 - 1. Exterior structural metal stud wall framing as noted including accessories such as clips, stiffeners, bridging, bracing, and fasteners, and necessary steel reinforcing members, stiffeners, bracing including anchorage to building structure.

1.02 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As follows:
 - a. Dead Loads: Weights of materials and construction.
 - b. Wind Loads: As shown in General Structural Notes.
 - c. Earthquake Loads: As shown in General Structural Notes.
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Walls receiving gypsum wallboard finishes: L/240.
 - b. Walls receiving masonry veneer: L/600.
 - 3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 - 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1 inch, typical unless noted otherwise.
- B. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Increase sheet metal gauge and decrease stud spacing as required to withstand the design loads within prescribed deflection limits. Do not increase stud depth without prior approval of the Architect.
- D. Coordinate stud locations with locations of metal panel fasteners and clips. Design studs for the additional concentrated loads due to the metal panel fasteners and clips as required.

1.03 SUBMITTALS

- A. Mill Certificates: Submit Manufacturer's certification that products furnished meet or exceed the specified design requirements. Mill certificates to include uncoated steel thickness, yield strength, tensile strength, total elongation, and galvanized coating thickness
 - 1. Mill Certificates are to be signed by an official representative of the Manufacturer stating that the production materials comply with the component specifications and the published engineering properties.
 - 2. In the absence of the Manufacturers Mill Certificates the contractor may submit test reports from a qualified independent testing agency evidencing compliance with specified requirements.
- B. Research reports or evaluation reports from the model code organization considered acceptable to the building officials having jurisdiction over this project that evidence cold formed metal framing is in compliance with building code in effect for project.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed cold formed metal framing similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."
 - 1. Welding: Performed by certified welders in compliance with AWS D1.3 Structural Welding Code Sheet Steel.
- C. Maintain Mill Certification on file with shipment to verify chemical composition, yield strength, tensile strength, elongation and coating thickness. Include listing of applicable ASTM standards specified in this section and comparison of ASTM requirements to actual materials provided to jobsite.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Exercise care during unloading, storage and erection to avoid damage. Dumping on the ground is not permitted.
- B. Support material stored at the site completely free of the ground, and cover to avoid damage from the elements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products as Manufactured by a Manufacturing member of the Steel Stud Manufacturers Association (SSMA) www.ssma.com, subject to compliance with Specification requirements.

2.02 MATERIALS

- A. All studs, track, bracing and bridging shall conform to ASTM C955 – “Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases”. All cold formed products to be fabricated from ASTM A1003 Structural Grade, Type H, metallic coated steel sheet with hot-dip galvanized coating complying with ASTM A653, of grade and coating weight as follows:
 - 1. Grade: ST33H, 33 ksi for 33 and 43 mil studs and joists and ST50H, 50 ksi for 54 mil studs, unless otherwise indicated on General Structural Notes on Drawings.
 - 2. Coating Designation: G60 hot dip galvanized.
 - 3. Elongation: Limit elongation to 12 percent.
- B. Studs: All stud framing members shall be cold formed members of the type, size, gauge, and spacing indicated on Drawings. Manufacturer's standard C-shaped steel studs of web depths indicated and with lipped flanges.
- C. Track: Channel shaped; same width as studs, for tight fit; gauge matching supporting studs minimum, solid web, galvanized at exterior wall locations.
 - 1. Flange Width: Manufacturers deep flange where indicated, standard flange elsewhere.
- D. Framing Accessories: Manufactured from galvanized sheet steel, thickness to be determined for actual project conditions, provide Manufacturer's standard shapes for:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Gusset plates.
 - 5. Deflection track and vertical slide clips.
 - 6. Stud kickers and girts.
 - 7. Joist hangers and end closures.
 - 8. Reinforcement plates.

2.03 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36, zinc coated by the hot-dip process according to ASTM A123.
- B. Cast-in-Place Anchor Bolts and Studs: ASTM A307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel hex-head bolts and studs; carbon-steel nuts; and flat, unhardened-steel washers. Zinc coated by the hot-dip process according to ASTM A153.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 x the design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
- D. Powder-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times the design load, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.

- E. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws, type appropriate for attachment detail requirements with penetration through joined materials not less than 3 exposed threads.
 - 1. Fastener Head Type:
 - a. Low-profile fastener heads required beneath sheathing, Manufacturer's standard fasteners elsewhere.
 - b. Hex Washer Head for dynamic framing connections.
- F. Welding Electrodes: Comply with AWS standards and as indicated on General Structural Notes on Drawings.

2.04 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, non-corrosive, non-staining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and a 30-minute working time.

2.05 FABRICATION

- A. Fabricate cold-formed steel stud framing and accessories plumb, square, true to line, and with connections securely fastened, according to AISI Design Specifications and Code of Standard Practice for Cold-Formed Steel Structural Framing, ASTM C1007 as applicable to fabrication, Structural Drawings, Manufacturer's recommendations, and the requirements of this Section.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel stud framing members by welding or screw fastening. Shop welding of 0.0747 inch (14 gauge) or thicker components is acceptable. Wire tying of framing members is not permitted.
 - a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to cold-framed steel stud framing Manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
 - 3. Fasten other materials to cold-formed steel stud framing by welding, bolting, or screw fastening, according to Manufacturer's recommendations.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or distortion.
- C. Fabrication Tolerances: Fabricate assemblies to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Square: Fabricate each cold-formed steel stud framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

- A. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete construction.

3.03 INSTALLATION - GENERAL

- A. Cold-formed steel stud framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel stud framing according to ASTM C1007, unless more stringent requirements are indicated or required by conditions.
- C. Install cold-formed steel stud framing and accessories plumb, square, true to line, and with connections securely fastened, according to Manufacturer's recommendations and the requirements of this Section.
 - 1. Space studs at 16 inches on center maximum unless otherwise indicated. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel stud framing members by screw fastening. Wire tying of framing members is not permitted.
 - a. Locate mechanical fasteners and install according to cold-framed steel stud framing Manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
- D. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.
- E. Provide temporary bracing and leave in place until framing is permanently stabilized.
- F. Do not bridge building expansion and control joints with cold-formed steel stud framing. Independently frame both sides of joints.
- G. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and double studs, inaccessible upon completion of framing work.
- H. Fasten reinforcement plate over web penetrations that exceed size of Manufacturer's standard punched openings.
- I. Erection Tolerances: Install cold-formed steel stud framing to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.04 NONLOAD-BEARING CURTAINWALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as required by Structural Drawings.
- B. Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and bottom track, unless otherwise indicated in the shop drawings.
- C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- D. Isolate steel framing from building structure at locations indicated to prevent transfer of vertical loads while providing lateral support.
 - 1. Install deflection track with deep or slotted flanges and anchor to building structure.
 - 2. Connect studs with vertical slide expansion/contraction joint and supplementary framing anchored to building structure.
- E. Install horizontal bridging in curtain wall studs, spaced in rows not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Install additional row of horizontal bridging in curtain wall stud beneath deflection track when curtain wall studs are not fastened to an additional top track.
 - 2. Bridging: Cold-rolled steel channel, clip angle fastened to webs of punched studs or flat, steel-sheet straps of width and thickness indicated, fastened to stud flanges.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain wall-framing system.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Qualified independent testing agency employed and paid by Owner will perform field quality-control testing.
- B. Shop and field welds will be subject to inspection and testing.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace Work that does not comply with specified requirements.
- E. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.06 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel stud framing with galvanizing repair paint according to ASTM A780 and Manufacturer's instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to Manufacturer and Installer to ensure that cold-formed steel stud framing is without damage or deterioration at time of Substantial Completion.

3.07 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Metal fabrications, including items fabricated from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems in other Sections of these Specifications. Types of metal items include, but are not limited to, the following:
1. Steel pipe and tube bollards.
 2. Roof access ladders.
 3. Miscellaneous framing and supports including, but not limited to the following:
 - a. Supports for suspended ceiling suspended finishes, fixtures and other items as necessary, including flat screen monitors, equipment, pot racks, fans, fixtures and similar items.
 - b. Steel tube countertop supports.
 - c. Free-standing steel tube wall structure to support turn-out gear storage lockers specified in Section 10 51 56.
 - d. Applications where framing and supports are not specified in other sections.
 - e. Other items as indicated.
 4. Miscellaneous steel trim.
 5. Dual neck steel support pedestal for lock box, card readers, and opti-com device.
 6. Sliding/rolling steel gates, frames, and hardware.
 7. Trash enclosure gates including man gates, support posts, and hardware.
 8. Backboard rack.
 9. Bottle tank anchors.
 10. Steel tube fabricated bicycle racks.
 11. Aluminum plate door and housing for door controller.
 12. Steel plate headers and door opening frames.
 13. Patio screen walls.
 14. Sign box and support pipe.
 15. Other items as indicated or required.
- B. Related Sections:
1. Division 03 Concrete Sections for gate footings and concrete fill for bollards.
 2. Division 04 Masonry Sections for CMU pier gate supports and adjacent site walls.
 3. Section 32 31 40 – Gate Operator, for self-contained gate operators for sliding yard gates.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings for the fabrication and erection of sliding/rolling yard gates, trash enclosure gates and man gates, bollards, ladders, countertop supports, pedestal supports, bicycle racks, backboard racks, and other items as may be requested by Architect.
1. Include plans and elevations at not less than 1 inch to 1'-0" scale and include details of sections and connections at not less than 3 inches to 1'-0" scale.
 2. Show anchorage and accessory items.

1.03 QUALITY ASSURANCE

- A. Standards: Comply with the following, except as otherwise shown and specified:
 - 1. AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings."
 - 2. AISI "Specifications for the Design of Cold-Formed Steel Structural Members."
 - 3. AWS "Structural Welding Code-Steel."
 - 4. ASTM A6 "General Requirements for Rolled Steel Plates Shapes, Sheet Piping and Bars for Structural Use."
- B. Qualifications: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

1.04 DELIVERY, STORAGE AND HANDLING

- A. Exercise care during unloading, storage and erection to avoid damage. Dumping on the ground is not permitted.
- B. Support material stored at the site completely free of the ground, and cover to avoid damage from the elements.

1.05 PROJECT/SITE CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of Shop Drawings and fabrication, where possible, to ensure proper fitting of the Work. Allow for trimming and fitting wherever the taking of field measurements before fabrication might delay the Work.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Steel Shapes, Plates, Rod, Bars and Bar-size Shapes: ASTM A36.
- B. Steel Pipe: ASTM A501 (Fy = 36 ksi), or ASTM A53, Type E or S, Grade B (Fy = 35 ksi).
- C. Steel Tube: ASTM A500 (Fy = 46 ksi).
- D. Stainless Steel:
 - 1. Plate: ASTM A167 and unless indicated otherwise on Drawings, required by design, or directed by Architect, provide Type 304.
 - 2. Tubing and pipe: ASTM A269 and ASTM A312, seamless, and unless indicated otherwise on Drawings, required by design, or directed by Architect, provide Type 304 with minimum wall thickness equivalent to Schedule 40.
 - 3. Finishes: No. 4 brushed, unless otherwise indicated on Drawings.
- E. Aluminum:
 - 1. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.
 - 2. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
 - 3. Fasteners: Type 316 stainless-steel.
- F. Cold-Finished Carbon Steel Bars: ASTM A108, Grade as selected by fabricator.
- G. Hot-rolled Carbon Steel Sheets and Strips: ASTM A568 and ASTM A1011, pickled and oiled.

- H. Cold-rolled Carbon Steel Sheets: ASTM A1008.
- I. Hot-dip Galvanized Steel Sheets: ASTM A653, with G90 zinc coating.
- J. Cold-drawn Steel Tubing: ASTM A512, sunk drawn, butt welded, cold-finished and stress-relieved.
- K. Slotted Channel Framing (Unistrut): 1-5/8 inch by 1-5/8 inch slotted channel framing system as manufactured by Unistrut, or as approved. Galvanized G90, cold-formed metal channels with flange edges returned toward web with 9/16 inch wide slotted holes in webs at 2 inches o.c.
 - 1. Provide Manufacture's standard connectors, fasteners and other miscellaneous accessories as required for a complete installation and connection to supporting structure and as necessary for support of ceiling elements and other items supported.
- L. Ribbed Steel Deck: ASTM A653 steel, 16 gauge, 1-1/2 inch ribbed B-deck comparable to Vulcraft Type B16, with G90 zinc coating, or as otherwise indicated on Drawings or approved by Architect.
- M. Perforated Steel Sheet:
 - 1. Material: Uncoated steel sheet, 18 gauge.
 - 2. Type: Round perforated hole pattern as indicated on Drawings.
 - 3. Provide panels with unperforated edge for welding to supporting frame as detailed on Drawings.
 - 4. Approved Manufacturers: Provide perforated steel sheet manufactured by one of the following:
 - a. Diamond Perforated Metals www.diamondperf.com
 - b. McNichols Co. www.mcnichols.com.
 - c. McMaster Carr www.mcmaster.com.
 - d. Perforated Metals Plus www.perf-plus.com .
- N. Gray Iron Castings: ASTM A 48, Class 30.
- O. Malleable Iron Castings: ASTM A 47, Grade 32510.
- P. Anchors:
 - 1. Masonry Anchorage Devices: Expansion shield, FS FF-S-325.
 - 2. Toggle bolts: Tumble-wing type, FS FF-B-588; type, class and style as required.
 - 3. Chemical Type Anchors: 2-component chemically curing anchors for concrete or masonry construction, capsule or injection type, designed to accept Manufacturer's galvanized anchor rod.
 - 4. Threaded-type concrete inserts: Galvanized ferrous castings, internally threaded to receive 3/4 inch diameter machine bolts; either malleable iron complying with ASTM A47 or cast steel complying with ASTM A27; hot-dip galvanized in compliance with ASTM A153.
 - 5. Wedge-type concrete inserts: Galvanized box-type ferrous castings, designed to accept 3/4 inch diameter bolts having special wedge-shaped heads, either malleable iron complying with ASTM A47 or cast steel complying with ASTM A27; hot-dip galvanized in compliance with ASTM A153.
 - 6. Provide carbon steel bolts having special wedge-shaped heads, nuts washers and shims; all galvanized in compliance with ASTM A153.

- Q. Fasteners: Provide zinc-coated fasteners with galvanizing complying with ASTM A153 for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required for the installation of miscellaneous metal items.
1. Bolts and nuts: ASTM F1554, Grade 36 (ASTM A307), regular hexagon head.
 2. Bolts, hexagon and square: ANSI B-18.2.1.
 3. Bolts, round head: ANSI B-18.5.
 4. Lag bolts: Square head type.
 5. Wood screws: ANSI B-18.6.1, flat head carbon steel.
 6. Plain washers: ASTM F844 helical spring type carbon steel.
- R. Metal Primer: VOC compliant.
1. Interior Steel: Tnemec 88HS-0559 Gray www.tnemec.com, modified short oil alkyd; or Tnemec 10-99 modified alkyd, chemically active, rust-inhibitive primer, or equivalent as standard with fabricator.
 2. Exterior Steel (exposed, where indicated to be painted):
 - a. Exterior Steel: Tnemec Tneme-Zinc 90-97 aromatic urethane, two-component, moisture-cured, zinc-rich primer.
 3. Comply with Section 09 91 00 for primer used as part of high-performance paint system applied to exposed exterior bollards, enclosure gates, trash enclosure gates, and similar items indicated to receive high performance paint system.

2.02 ACCESSORIES

- A. Inserts and Anchorages: Furnish inserts and anchoring devices to be set in concrete or built into masonry for installation of Miscellaneous Metal Work. Provide setting Drawings, templates, instructions and directions for installation of anchorage devices.
- B. Concrete Fill (for concrete filled pipe bollards): Comply with requirements of Section 03 30 00 for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi.
- C. Rolling Gate Hardware:
1. Guide Angle: 1-1/4 inch x 1-1/4 inch x 3/16 inch galvanized steel inverted guide angle or tube designed to fit contour of gate wheel welded to 1/4 inch thick minimum steel plate with studs for casting and anchorage into concrete.
 2. Tire-V-wheel assembly: 6 inch pneumatic rubber wheel in tandem with a 6 inch diameter in-line ball bearing "V" wheel or truncated "V" wheel designed to operate over inverted guide angle or tube track.
- D. Swing Gate Hardware:
1. Hinges for Trash Enclosure Gates: Provide heavy duty steel pipe sleeve or rolled steel plate hinges, or heavy-duty barrel hinges, of size to sleeve over pipe gate support as detailed and as required by size and weight of gate.
 - a. Fabricate sleeve hinge with grease fittings as detailed.
 - b. Fabricate sleeve hinge with extended end to weld to gate frame.
 2. Double Gates: Provide plunger style cane-bolts with pipe receiver set into paving, size as indicated.
 3. Pedestrian (Man) Gates:
 - a. Hinges: Exterior grade, heavy-duty stainless steel self-closing spring hinges complying with Section 08 71 00 and as approved by Architect. Minimum 3 hinges per gate leaf.
 - b. Latching Device: Exterior grade, heavy-duty stainless steel exterior grade panic exit hardware and electronic catch complying with Section 08 71 00 and as approved by Architect.
- E. Reflective Traffic Tape for Bollards: As specified in Section 10 14 00.

2.03 FABRICATION

- A. General: For fabrication of Miscellaneous Metal Work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding or by welding and grinding, prior to cleaning, treating and application of surface finishes, including zinc coatings.
- B. Shop Assembly: Preassemble items in shop, when possible, to minimize field splicing and assembly of units at the site. Disassemble units only to the extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Workmanship:
1. Use materials of the size and thickness shown, or if not shown, of the required size and thickness to produce adequate strength and durability of the finished product for the intended use. Work to the dimensions of fabrication and support. Use type of materials shown or specified for various components of Work.
 2. Form exposed Work true to line and level with accurate angles, surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32 inch unless otherwise shown. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing the Work.
 3. Weld corners and seam continuously and in accordance with the recommendations of AWS. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.
 4. Form exposed connections with hairline joints which are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type shown, or if not shown, use Phillips flat-head (countersunk) screws or bolts.
 5. Provide for anchorage of type shown, coordinated with supporting structure and the progress schedule. Fabricate as required to provide adequate support for the intended use of the Work.
 6. Cut, reinforce, drill and tap Miscellaneous Metal Work as may be required to receive finish hardware and similar items of Work.
 7. Use hot-rolled steel bars for Work fabricated from bar stock, unless Work is indicated to be fabricated from cold-rolled, or cold-finished stock.
- D. Fabricate steel bollards from steel pipe or tube of size indicated on Drawings. Fabricate square steel tube bollards with removable steel cap as detailed on Drawings. Where indicated to be anchored to concrete pad footings, fabricate units with steel base plates for anchor bolt attachment to footings as indicated on Drawings.
1. Coordinate fabrication of bollards with electrical conduit, controls, and similar items with Division 26.
- E. Miscellaneous Framing and Supports:
1. Provide miscellaneous steel framing and supports which are not a part of the structural steel framework, or other metal systems in other Sections of these Specifications, whether indicated or not as necessary to complete Work.
 2. Fabricate miscellaneous units to sizes, shapes and profiles shown, or if not shown, of the dimensions required to receive adjacent grating, plates, doors or other Work to be retained by the framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars of all welded construction using mitered corners, welded brackets and splice plates, and a minimum number of joints for field connection. Cut, drill and tap units to receive hardware and similar items to be anchored to the Work.

3. Equip units with integrally welded anchor straps for casting into concrete or building into masonry wherever possible. Furnish inserts if units must be installed after concrete is poured. Except as otherwise shown, space anchors 24 inches o.c., and provide minimum anchor units of 1-1/4 inch x 1/3 inch x 8 inch steel straps.
 4. Countertop Supports: Fabricate countertop supports from steel tube and shapes as detailed on Drawings. Continuously weld all joints and grind smooth where exposed.
 5. Turn-Out Gear Locker Supports: Fabricated free-standing steel tube wall structure to support turn-out gear storage lockers specified in Section 10 51 56 from steel tube frames with flanged anchor base plates for securing units to floor and as detailed to support to overhead structure.
- F. Ladders:
1. Fabricate ladders for the locations shown, with dimensions, spacings, details and anchorages as required. Comply with requirements of ANSI A14.3, except as otherwise shown.
 2. Fit rungs into punched holes in centerline of side rails, plug weld and grind smooth on outer rail faces.
 3. Support each ladder at top and bottom and at intermediate points spaced not more than 5 feet o.c. Use welded or bolted steel brackets, designed for adequate support and anchorage, and to hold the ladder 7 inches clear of the wall surface and other obstructing construction. Extend rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, gooseneck the extended rails back to the structure to provide secure ladder access.
 4. Provide non-slip surfaces on the top of each rung, either by coating the rung with aluminum oxide granules set in epoxy resin adhesive, or by using a type of manufactured rung which is filled with aluminum oxide grout.
 5. Exterior ladders shall have hot-dipped galvanized finish.
- G. Trash Enclosure Gates: Fabricate to sizes and shapes indicated using steel tubing, corrugated steel deck, shapes, plate, and other steel items as indicated on Drawings.
1. Fabricate with continuously welded joints, and smooth exposed edges.
 2. Miter corners and use concealed field splices wherever possible.
 3. Weld hinges to frame.
 4. Weld cane bolt holder to gate leaves.
- H. Pedestrian Gates: Fabricate to sizes and shapes indicated using steel tubing, corrugated steel deck as detailed, shapes, plate, and other steel items as indicated on Drawings.
1. Fabricate with continuously gas-arc welded joints, and smooth exposed edges.
 2. Miter corners and use concealed field splices wherever possible.
 3. Hinges for Swing Gates: Weld heavy duty galvanized steel butt hinges directly to gate frame and support posts.
 4. Coordinate fabrication with panic exit device and electronic catch specified in Section 08 71 00.
- I. Horizontal Sliding Yard Gates: Fabricate to sizes and shapes indicated using steel tubing, shapes, plate, steel tube or bar pickets, perforated or solid steel sheet infill, and Phoenix Fire Department Logo/Seal as detailed, and other steel items as indicated on Drawings.
1. Fabricate with continuously gas-arc welded joints, and smooth exposed edges.
 2. Miter corners and use concealed field splices wherever possible.

3. Hardware:
 - a. Provide roller guides, inverted V-tracks, rails, guides, support angles, etc., as required for smooth operation as indicated.
 - b. Inverted-V Guide Track: Fabricate inverted-V guide angle or tube of shape to fit contour of roller wheel and base plate with anchor studs of length required for full opening width plus gate wheel travel for full open position.
 - c. Fabricate tire-V-wheel assembly from 2-inch square tube with ball bearing “V” wheel in alignment with inverted angle guide and in-line with tandem 6 inch pneumatic rubber wheels spaced at approximately 20 inches center to center (10 inches each side of guide wheel).
 - d. Coordinate fabrication with gate operator specified in Section 32 31 40.
 4. Finish: Powder Coated.
- J. Patio Screen Wall: Fabricate to sizes and shapes indicated using steel tubing, steel flat bar, perforated uncoated steel sheet, and bent plate cap as detailed on Drawings.
1. Fabricate with continuously welded joints, and smooth exposed edges.
 2. Miter corners and use concealed field splices wherever possible.
 3. Tack weld perforated steel sheet to support posts and rails as detailed.
- K. Support Pedestals and Frames: Provide square steel tube dual neck pedestal as indicated on Drawings as manufactured by Chase Security Systems <http://www.chasesec.com/>
1. Finish: Powder Coated in color selected by Architect.
- L. Backboard Rack: Fabricate backboard rack as detailed on Drawings with steel and stainless steel shapes and welded wire mesh as indicated. Fabricate with continuously welded joints, and smooth exposed edges.
1. Steel Finish: Powder Coated.
 2. Stainless Steel Finish: Brushed No. 4 finish, unless otherwise indicated on Drawings.
- M. Bottle Tank Anchors: Fabricate bottle anchors as detailed from steel plate with eye-hooks with pre-drilled holes for anchorage to supporting wall construction.
- N. Miscellaneous Steel Trim: Provide shapes and sizes as required for the profiles shown. Except as otherwise noted, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other Work.
- O. Bicycle Racks: Fabricated from steel tube as indicated with fully welded joints ground smooth.
1. Finish: Powder Coated.
- P. Steel Plate Opening Frames, Head Plates, and Steel Plate Signage for Apparatus Bay Doors: Fabricate from 1/4 inch steel plate as detailed with fully welded joints ground smooth.
1. Fabricate with pre-drilled holes for anchorage of units to masonry door jambs or bolting to steel stud wall construction as detailed.
- Q. Aluminum Plate Door and Housing for Door Controller:
1. Fabricate housing from aluminum plate, sheet, and extrusions to configuration and size indicated.
 2. Fabricate doors from die-cut aluminum plate. Coordinate openings with door controller activation devices.

3. Hinges: Continuous aluminum or stainless steel piano type hinge.
 4. Latching and Locking: Provide latch and door lock as indicated on Drawings.
 5. Finish: Powder coated finish in color selected by Architect.
- R. Prevent galvanic action and other forms of corrosion by insulating contact points between metals and incompatible metals or materials. Provide separation of resilient gasket or other appropriate material to separate aluminum bar gratings and angles where units are attached to steel.

2.04 FINISHING

- A. Galvanizing: All metal fabrications which will be exposed to the exterior in the finished Work, including steel indicated to be painted, shall be hot-dip galvanized after fabrication, including bolts and nuts. Galvanizing shall comply with ASTM A123 and A153 for the hot-dip process after fabrication. Do not galvanize steel specifically indicated to be left as raw unfinished steel.
- B. Shop Painting:
1. Shop paint Miscellaneous Metal Work, except those members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces, unless otherwise indicated.
 2. Remove scale, rust and other deleterious materials before shop coat of paint is applied. Clean in accordance with SSPC SP-2, SP-3, or SP-7, as required. Remove oil, grease and similar contaminants in accordance with SSPC SP-1.
 3. Apply one shop coat of metal primer paint to fabricated metal items, except apply 2 coats of paint to surfaces which are inaccessible after assembly or erection.
 4. Immediately after surface preparation, brush or spray on metal primer paint in accordance with Manufacturer's instructions, and to provide a uniform dry film thickness of 2 mils for each coat.
 5. Comply with Section 09 91 00 for application of high performance paint system primer applied to exposed exterior bollards, enclosure and pedestrian gates, trash enclosure gates, and similar items indicated to receive high performance paint system.
- C. Powder Coated Finish: Multi-step oven cured TGIC powder coated finish consisting of thorough cleaning, pretreatment, powder coat primer and Ultra polyester finish (TGIC) at 2-4 mils.
1. Color: Custom color as selected by Architect.
 2. Provide powder coated finish to the following items and other items as may be indicated on Drawings:
 - a. Bicycle racks.
 - b. Sliding yard gates.
 - c. Steel components of backboard racks (not stainless steel).
 - d. Support pedestals and frames.
 - e. Aluminum plate door and housing for door controller.
 - f. Turn-out gear locker supports.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.

- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates to appropriate Trades.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on Shop Drawings.
- D. Perform field welding in accordance with AWS D1.1.
- E. Install pipe bollards in concrete footings plumb and level, accurately fitted, free from distortion or defects. Provide adequate bracing as required to hold bollard in position until concrete has been placed and cured.
 - 1. Where indicated to be concrete filled, fill bollards solidly with concrete and mound top surface to shed water.
- F. Gates:
 - 1. Securely anchor gates and erect plumb, level, and true, with smooth operating hardware.
 - 2. Secure for full opening without interference.
 - 3. Attach hardware by means which will prevent unauthorized removal.
- G. Turn-Out Gear Locker Supports: Anchor units firmly in place with anchor bolts to floor and anchorage to overhead structure as detailed on Drawings as necessary to firmly support turn-out gear lockers.
- H. Obtain Architect approval prior to site cutting or making adjustments not scheduled.
- I. Prevent galvanic action and other forms of corrosion by insulating contact points between metals and incompatible metals or materials. Provide separation of resilient gasket or other appropriate material to separate aluminum bar gratings and angles where units are attached to steel.
- J. Touch-up Painting:
 - 1. Touch-up welds, abrasions, and other areas where shop prime paint has been removed or is damaged with specified prime paint or galvanizing repair paint.
 - 2. Touch up factory applied powder coat finish surfaces damaged by installation to perfectly match powder coated finish using compatible touch-up paint recommended by powder coat manufacturer.

3.04 ERECTION TOLERANCES

- A. Maximum Variation from Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset from True Alignment: 1/4 inch

3.05 ADJUSTMENT

- A. Lubricate hinges and adjust gates to operate freely. Adjust hardware for smooth operation.

3.06 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Rough carpentry including, but not limited to:
 - 1. Dimensional lumber framing.
 - 2. Wall and roof sheathing, including cricket framing and sheathing at flat roofs.
 - 3. Wall ledgers.
 - 4. Interior wall plywood wall panels.
 - 5. Utility and equipment backer panels.
 - 6. Miscellaneous backing, blocking, nailers, sleepers and curbs.
 - 7. Other items as shown on the Drawings and as specified herein.

- B. Related Sections:
 - 1. Section 06 17 00 – Manufactured Structural Wood, for engineered lumber (LVL, LSL, PSL) and I-Joists.

1.02 SUBMITTALS

- A. Product Data: Submit technical data for wood preservative and fire-retardant products.

1.03 QUALITY ASSURANCE

- A. Identify each piece of lumber or plywood used for structural framing with grade and trademark of a lumber grading organization. Trademark of manufacturer shall also appear on each piece.

- B. Grading Rules: Conform with applicable requirements of American Lumber Standards "Simplified Practice Recommendation R-16" and to grading rules of manufacturer's association under whose rules the lumber is produced.

- C. Standards: Conform with requirements of The Engineered Wood Association, U. S. Dept. of Commerce Commercial Standards and American Wood Preservers Institute Standards (www.preservedwood.com), as they apply.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.

- B. Storage: Store off ground to assure adequate ventilation and protect against damage while stored at the site.

- C. Handling: Comply with manufacturer's instructions.

1.05 PROJECT CONDITIONS

- A. Environmental Requirements: Store materials for which a maximum moisture is specified in areas where humidity can be controlled.

PART 2 PRODUCTS

2.01 LUMBER MATERIALS

- A. Species: Douglas Fir – Larch, Hem Fir graded in accordance with Standard Grading and Dressing Rules of WCLIB. Framing lumber shall be stress grade. All sides shall be surfaced, except where indicated to be rough sawn. Provide Redwood for use at exposed curbing and supports for roof mounted equipment.
- B. Lumber Grades: Provide dimensional lumber framing of grades indicated on General Structural Notes on Drawings, and the following:
 - 1. One inch boards: Construction.
 - 2. Misc. blocking, bridging, etc: Utility.
 - 3. Grounds and furring: Construction Grade Douglas Fire or No. 2 White Pine.
 - 4. Use edge grain or vertical grain boards as preferred cut for fascia and trim boards to help prevent cup and bow.
- C. Finger jointed studs may be used if grade stamped to meet Grade(s) indicated on Structural Drawings and in accordance with Standard Grading Rules specified herein.
- D. Moisture Content:
 - 1. Lumber shall be air-dried or kiln-dried.
 - 2. At time of installation, moisture content, expressed as a percentage of the weight of the oven-dry wood, shall not exceed 19 percent for lumber of up to two inches nominal thickness and 15 percent for exterior trim and siding.
 - 3. Moisture content of lumber over two inches nominal thickness shall conform to the rules of the association under which it is graded.
- E. Engineered Lumber (LVL and PSL): As specified in Section 06 17 00.
- F. Wood I-Joists: As specified in Section 06 17 00.

2.02 SHEATHING MATERIALS

- A. General:
 - 1. Panel thickness and identification index shall be as shown on the Drawings and as specified and shall also be stamped on each piece of sheathing.
 - 2. Design of project is based upon plywood sheathing, however, OSB Board may be substituted for plywood if it conforms to all requirements for plywood installed in like locations.
 - 3. Plywood (or OSB Board where allowed) which has an edge or surface permanently exposed to the weather shall be exterior type.
- B. Plywood: Each panel of softwood plywood shall be identified with the APA grade-trademark and shall meet the requirements of PS-1 for softwood plywood.
- C. Plywood Backing Panels: For mounting of telephone and electrical equipment, provide Grade C-D Exposure 1 plywood panels, 15/16 inch thick, unless otherwise indicated.
- D. OSB Board: Manufactured in conformance with U.S. Department of Commerce Voluntary Product Standard PS 2.
 - 1. Each piece shall be stamped in accordance with American Plywood Associations (APA) grade rules and shall meet requirements of latest edition of U.S. Product standard PS 2.

2. Provide APA-trademarked panels with Exterior or Exposure 1 Classification.
 - a. Provide Exterior bond classification for panels exposed to repeated wetting and redrying or long-term exposure to weather.
 - 1) Provide Exterior Classification OSB used in Fascia board applications.
 - b. Provide Exposure 1 panels for all uses not involving long-term exposure to weather.

2.03 FACTORY WOOD TREATMENT

- A. Preservative Treatment:
 1. Materials:
 - a. Chromated copper arsenate (CCA) shall not be allowed.
 - b. Provide ammoniacal copper quaternary (ACQ) or copper boron azole (CBA) as produced by the following manufacturers:
 - 1) Lonza Wood Protection www.wolmanizedwood.com or www.naturalselect.com.
 - 2) Viance Treated Wood Solutions; Viance, LLC www.treatedwood.com
 - 3) Osmose, Inc., Wood Preserving Division, www.osmosewood.com.
 2. Locations Required:
 - a. Wood sillplates and ledgers bolted in direct contact with concrete foundations and slabs-on-grade or masonry located at or below grade only shall be pressure treated lumber.
 - b. Blocking occurring on top of or above the roof deck, including the nailer beneath the flashing at parapet caps, shall be treated lumber.
 - c. Other locations as required by Code.
- B. Fire-Retardant Treatment: Lonza Wood Protection www.wolmanizedwood.com Dricon FRTW, or Hoover Treated Wood Products www.frtw.com, Pyro-Guard; in accordance with UL label.
 1. Where required by code or indicated on Drawings, wood utility backer panels, plywood wall panels, blocking, etc., shall be fire-retardant treated.
 2. Dimensioned lumber shall be kiln dried to a maximum moisture content of 18 percent before and after milling and fire protective treatment.

2.04 ACCESSORIES

- A. Nails: Common wire, galvanized for exterior Work, meeting ASTM F1667 of the sizes indicated on the Drawings.
- B. Screws: Standard domestic manufacture, bright steel, except galvanized for exterior use and of brass, bronze, aluminum, or stainless steel when used to attach items made of those materials. Screws used for attaching interior trim and finish to drywall partitions shall be Type S self-drilling, self-tapping corrosion resistant coated steel drywall screws of required lengths as specified in Section 09 29 00.
 1. Screws used for attaching preservative treated wood shall be Type S self-drilling, self-tapping corrosion resistant coated steel screws. Acceptable products include the following:
 - a. DEC-KING Exterior Wood Screw with Climacoat.
 - b. Tapcon Concrete Anchor with Blue Climaseal or White UltraShield.
 - c. Wood-To-Metal TEKS with Grey Spex.
 - d. Roofgrip with Spex or Blue Climaseal.
 - e. GY-FAST Nail with Climacoat.
 - f. Maxi-Set Tapcon White UltraShield.

- C. Bolts: Standard mild steel, square head machine bolts with square nuts and malleable iron or steel plate washers or carriage bolts with square nuts and cut washers as indicated. Bolts, nuts and washers, wholly or partially exposed on exterior shall be galvanized.
- D. Structural Bolts: Machine bolts, or carriage bolts, of structural grade steel with square nuts, conforming to ASTM A307.
- E. Steel plates and angles: ASTM A36, galvanized after fabrication.
- F. Lag screws, shear plates and split ring connectors: Conform to requirements of the "National Design Specifications for Stress Grade Lumber and its Fastenings" of National Forest Products Association.
- G. Framing anchors and joist hangers: Simpson Company products or similar devices as approved by Structural Engineer through Architect and noted on Drawings.
- H. Power driven inserts: Ramset, or as approved by Structural Engineer through Architect meeting FS GGG-D-777a. Install as per manufacturer's printed directions. Charge shall be powerful enough to prevent spalling of concrete.
- I. Galvanizing: ASTM A653.
- J. Toggle Bolts: FS FF-B-588.
- K. Fabricated Connections:
 - 1. Sheet metal galvanized of size and type shown on Drawings.
 - 2. Structural Steel: ASTM A36. Welding by qualified welders in conformance with AWS D1. One shop coat of paint per Federal Specification TT-P-86, Type II to parts not embedded.
- L. Sill Sealer Gasket: Owners Corning "FoamSealR" or GreenGuard Sill Sealer; 1/4 inch foam sill plate gasket, or equivalent as approved by Architect.
- M. Joint Sealant: Silicone sealant complying with Section 07 92 00.

PART 3 EXECUTION

3.01 FRAMING

- A. Coordination: Install wood framing making proper provisions for Work of other trades. Cut wood required to accommodate plumbing, heating and ventilating, electrical and other trades. Fit neatly around exposed items, as outlet boxes, conduit, pipes and ducts. Protect adjacent Work. Before proceeding with rigid sheathing, make certain required inspections have been made by Building Official.
- B. Structural Members: No cutting, notching or drilling without prior approval of the Structural Engineer through the Architect.
 - 1. Fabricate and install wood framing and sheathing which is exposed in the finished work with grade stamps concealed from view or removed.
- C. Wood Backing: Provide wood backing, furring, stripping or blocking indicated or required for installation and attachment of work of other trades. Provide fire-proofed wood backing approved by Building Official where required by Code in noncombustible or fire-rated construction.

- D. Connections: Subdrill where necessary to avoid splitting.
- E. Bolts: Drill bolt holes 1/32 inch larger than bolt diameter. Use square plate or malleable iron washers under heads and nut where they bear against wood. Re-tighten bolts immediately prior to concealing with finish materials. Re-tighten exposed bolts immediately prior to final inspection by Building Official.
- F. Lag Screws and Screws: Subdrill, use square plate or malleable iron washer under lag screw heads when they bear on wood.
- G. Exterior base plates or sills resting on concrete: Set sill plates on sill sealer gasket. Size plates or sills and set level and true to line. Bolt down with bolts of size, length and spacing indicated with a bolt not more than 9 inches from the end of any piece.
- H. Apply a continuous bead of joint sealant at interior side of top of sill plate and exterior wall sheathing. Clean sill plate and wall cavity area of all dirt and debris before applying joint sealant.
- I. Studs: Wall and partitions shall be nominal 2x4 and 2x6 studs 16 inches on center unless otherwise noted or unless they are required to be larger to accommodate mechanical or electrical equipment, piping and fixtures or fixtures or equipment of any other Trade. Unless otherwise detailed, panels, valve covers, cleanouts, devices, access doors, recessed cabinet boxes, etc., shall be mounted flush with the adjacent wall surface. When any such item is of a depth where it is not practical to use solid studding to the full thickness of the wall, then the wall shall be furred. When furring is required, it shall extend the full width and from floor to roof or ceiling joists. The studs comprising interior partitions and the wall material affixed thereto shall extend from floor to roof or ceiling joist framing except as shown. Staggered stud walls shall be constructed where shown on plans and as detailed.
- J. Rough Framing: Fit closely, set accurately to required lines and levels, and secure rigidly in place. Set horizontal and inclined members with crown edge up. Reinforce cut members as directed by Structural Engineer through Architect. Bolt, nail and spike in a thorough manner with not less than the sizes and quantities indicated or specified. Structural members shall provide full contact at bearing surfaces.
- K. Top plates in bearing partitions: Shall be doubled and lapped at each intersection with walls or partitions. Stagger joints in upper and lower members of top plate not less than 4 feet.
- L. Provide blocking not less than 2 inches in thickness of same width as stud as follows:
 - 1. Stud partitions or walls more than 8 feet , but not more than 14 feet in height: One row of blocking fitted snugly and nailed into mid-height of stud.
 - 2. Walls or partitions over 14 feet in height: 2 or more rows of blocking. Locate rows of blocking so that in no case will the distance between sole or top plates and blocking or between lines of blocking exceed 8 feet.
 - 3. Provide solid fire blocking at ceiling line at dropped ceilings and at other locations indicated on Drawings or required by Code.
- M. Frame corners solid where stud walls or partitions meet or as shown on the Structural Drawing.
- N. Provide double joists under partitions parallel to joists, and for headers and side members at openings larger than 4 feet in dimension.
- O. Joist framing into headers and header joists shall be supported on joist hangers.

3.02 SHEATHING

- A. General: Comply with applicable recommendations contained in APA Form No.E30, “APA Engineered Wood Construction Guide,” for types of structural use panels and applications indicated.
 - 1. Comply with “Code Plus” of the above-referenced guide.
- B. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. ICC NER-272 for power-driven fasteners.
 - 2. IBC Table 2304.9.1, Fastening Schedule.”
- C. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- D. Sheathing and subflooring shall have edges blocked and nailed for diaphragm or shear wall stresses as shown on the Drawings.
- E. Subflooring shall be glued and nailed.
- F. At non-tongue and groove sheathing, provide plywood clips at 24 inches O.C. maximum at unsupported or unblocked edges.

3.03 PLYWOOD BACKING PANELS

- A. Plywood Backing Panels: Install with the “C” or best face on exposed side.

3.04 CLEANING

- A. During the course of the Work and on completion, remove excess materials, equipment and debris and dispose of away from premises.

END OF SECTION

SECTION 06 16 43

EXTERIOR GYPSUM SHEATHING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Glass-mat faced water-resistant exterior gypsum sheathing as shown on Drawings and as specified herein.

1.02 DEFINITIONS

- A. Gypsum Board Construction Terminology Standard: Refer to ASTM C1177 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this Section or other referenced standards.

1.03 SUBMITTALS

- A. Product Data: Submit Manufacturer's descriptive literature including product specifications, material composition, thickness, sizing, fire resistant properties, design data and installation instructions.
- B. Certificates: Submit Manufacturers' written certificate that products furnished under this section meet the specified requirements.
- C. Contract Closeout Submittals: Submit the following in accordance with Section 01 77 00 - Contract Closeout.
 - 1. Copy of Warranty.

1.04 QUALITY ASSURANCE

- A. Installers Qualifications: Employ installers with sufficient skills and who are thoroughly familiar with the type of construction involved and the materials and techniques specified for this work.
- B. Comply with applicable specification recommendations of GA-216 and GA-600 as published by the Gypsum Association.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging, containers, and bundles with Manufacturer's brand, product identification markings and brand intact.
- B. Storage: Store panels flat and level in an enclosed shelter providing protection from damage and exposure to the elements. Insure adequate air circulation is allowed around material stacks.
- C. Handling: When loading, unloading, and moving materials use care not to cause breakage or edge damage.

1.06 SEQUENCING AND SCHEDULING

- A. Sequence installation of exterior gypsum sheathing so sheathing will not be left exposed longer than recommended by manufacturer or 180 days, whichever is less, prior to installation of exterior cladding.

1.07 WARRANTY

- A. Furnish Manufacturer's standard 10 year limited warranty covering defects in manufacturing and materials and maximum 1 year exposure warranty stating that product will remain free of defects and suitable for its intended use after installation, but before the exterior weather-resistive barrier or cladding is installed on the building, regardless of exposure to normal weather conditions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved otherwise by the Architect, subject to compliance with Specification requirements:
 1. CertainTeed Corp., Saint Gobain www.certainteedcorp.com
 2. Georgia-Pacific Gypsum (GP) www.buildgp.com
 3. National Gypsum Company www.nationalgypsum.com
 4. Pabco Gypsum www.pabco gypsum.com
 5. USG www.usg.com

2.02 MATERIALS

- A. Glass Mat Faced Exterior Sheathing Board: Glass-mat faced exterior gypsum sheathing complying with ASTM C1177.
 1. Thickness: 5/8 inch at non-rated assemblies, 5/8 inch fire rated product at fire rated assemblies.
 2. Acceptable Products: Subject to compliance with requirements, provide one of the following:
 - a. DensGlass Sheathing, G-P Gypsum Corporation.
 - b. GlasRoc Sheathing, CertainTeed Corp.
 - c. Gold Bond BRAND eXP Sheathing, National Gypsum Company
 - d. PABCO GLASS Sheathing, Pabco Gypsum
 - e. Securock Brand Glass-Mat Sheathing, USG

2.03 ACCESSORIES

- A. Fasteners: Type S-12, bugle head, self-tapping, with organic-polymer or other protective coating having a salt-spray resistance of more than 800 hours as tested in accordance with ASTM B117, and as follows:
 1. Provide steel drill screws complying with ASTM C1002 to attach sheathing to steel framing less than 0.03 inch thick.
 2. Provide steel drill screws complying with ASTM C954 to attach sheathing to steel framing from 0.03 inch to 0.112 inch thick.
 3. Length: As recommended to penetrate metal framing minimum depth as recommended by sheathing Manufacturer.

- B. Joint Treatment Materials:
 - 1. Joint Sealant: Silicone emulsion sealant complying with ASTM C834 and compatible with sheathing and sheathing tape as recommended by the sheathing Manufacturer. Provide one of the following:
 - a. Dow Corning 795 Building Sealant.
 - b. Pecora 895.
 - 2. Glass Fiber Sheathing Tape: Provide self-adhering glass-fiber tape, 2 inch minimum width, 10 x 10 or 10 x 20 threads/inch mesh, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board with a history of successful in-service use.
- C. Edge Trim: GA216; Type L bead; electro-galvanized steel and Type LC rolled-formed zinc.
- D. Butyl Rubber Flashing Membrane: Grace Vycor Butyl, Grace Construction Products, self-adhering, butyl rubber based adhesive and polyethylene flashing, 6 inch or 9 inch widths as appropriate for flashing condition.
 - 1. Primer: Perm-A-Barrier WB Primer, Grace Construction Products.
- E. Soffit Vents: Continuous linear soffit vent, width as indicated on Drawings by depth to suite soffit sheathing and indicated finish; 6063 T5 extruded aluminum or electro-galvanized steel, baked-on primer finish. Provide product(s) indicated on Drawings as manufactured by Fry Reglet, Superior, or equivalent as approved by Architect.
 - 1. Provide manufacturers standard end/termination caps at all ends.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Verify that surface of framing members do not vary more than 1/4 inch from the plane of faces of adjacent members.
- C. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Glass Mat Exterior Sheathing Board:
 - 1. Install in accordance with GA-253, ASTM C1280, IBC requirements and manufacturer's printed instructions.
 - 2. Verify that surface of framing members do not vary from more than 1/4 inch from the plane of faces of adjacent members.
 - 3. Install glass mat gypsum sheathing with logo side out.
 - 4. End joints shall be offset. Joints should fit snugly and flashing installed around openings.
 - 5. Panels of the maximum length possible shall be used to minimize the number of joints. Edge joints must be located parallel to and with vertical orientations on framing. End joints of adjacent lengths of sheathing must be staggered.

6. Cut boards at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
 - a. Install boards with 3/8 inch setback where non-load-bearing construction abuts structural elements.
 - b. Install boards with 1/4 inch setback where they abut masonry or similar materials that might retain moisture, to prevent wicking.
 - c. Allow no joints greater than 3/8 inch.
 7. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevents exterior moisture from passing through completed exterior wall assembly.
 8. Attach sheathing to metal framing with screws spaced 8 inches o.c. at perimeter and 8 inches o.c. in field.
 9. Install fasteners so screw heads bear tightly against and flush with surface of sheathing but do not cut into facing. Fasteners must not be countersunk.
 10. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.
- B. Horizontal Installation: Install 2-foot-wide gypsum sheathing boards horizontally with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of stud flanges and stagger end joints of adjacent boards not less than one stud spacing, two where possible. Screw-attach boards at perimeter and within field of board to each steel stud as follows:
1. Fasteners spaced maximum 8 inches o.c. and set back 3/8-inch minimum, 1 inch maximum from edges and ends of boards.
- C. Vertical Installation: Install 4-foot-wide gypsum sheathing boards vertically with vertical edges centered over flanges of steel studs. Abut ends and edges of each board with those of adjoining boards. Screw-attach boards at perimeter and within field of board to each steel stud as follows:
1. Fasteners spaced maximum 8 inches o.c. along perimeter and in the field of the board, and set back 3/8-inch minimum, 1 inch maximum from edges and ends of boards.
- D. Joint Treatment: If weather seal is required before application of the water-resistive barrier, treat joints of installed glass matt gypsum sheathing in accordance with sheathing manufacturer's written recommendations or one of the following:
1. Apply 3/8 inch bead of sealant to all joints and trowel in firmly until flat. Use backer rod for joints larger than 1/8 inch. Apply enough of the same material to each fastener to cover completely when troweled flat.
 2. Apply glass mesh joint tape to all joints, overlapping at intersections by the width of the tape. Apply approximately 3/8 inch bead of sealant over the applied tape over the joint and embed the sealant into the entire surface of the tape with a trowel. Use backer rod for joints larger than 1/8 inch. Apply enough of the same material to each fastener to cover completely when troweled flat.
- E. Ceiling/Soffit Applications: Install with long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of stud flanges and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each stud.
1. Space fasteners a maximum of 8 inches o.c., or tighter where recommended by the sheathing Manufacturer, and a minimum of 3/8 inch from edges and ends of boards.
 2. Place edge trim where gypsum sheathing abuts dissimilar materials and as indicated on Drawings.

3. Place soffit vents at locations and in continuous lengths consistent with lines of buildings and as detailed on Drawings. Provide end caps at all end conditions.
 4. Apply joint tape over joints and embed in setting type joint compound. Skim coat entire surface with setting type joint compound for smooth finish equivalent to Level 3 finish in accordance with the Gypsum Association "Recommended Specification: Levels of Gypsum Board Finish", except where ceiling of soffit board serves as a base to another applied finish.
 5. Finished surface to be coated with Drywall Primer prior to application of paint system specified in Section 09 91 00.
- F. Flashing Membrane: Apply flashing membrane in accordance with Manufacturer's instructions around all openings in exterior gypsum sheathing. Apply flashing membrane primer on all concrete, masonry and glass-matt faced gypsum sheathing surfaces prior to adhering flashing membrane.

3.03 CLEANING

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 06 17 00

MANUFACTURED STRUCTURAL WOOD

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Laminated Strand Lumber (LSL), Parallel Strand Lumber (PSL), and/or Laminated Veneer Lumber (LVL) beams, headers, rim joists and similar members indicated on Drawings or used at contractors option to sawn lumber indicated.
 2. Wood I-Joists.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings for review before fabrication begins, conforming to the design load criteria shown on the Drawings.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Members shall be stored in a vertical position, in a dry place, completely protected from the weather. Members shall be handled with care to prevent damage.

1.04 PROJECT CONDITIONS

- A. Verify dimensions shown on Drawings by taking field measurements; proper fit and attachment of members is required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Furnish products of one of the following manufacturers, except as approved by the Architect, subject to compliance with specifications requirements:
1. Georgia-Pacific Wood Products; www.buildgp.com
 2. Louisiana-Pacific Corporation; www.lpcorp.com
 3. RedBuilt Engineered Wood Products; www.redbuilt.com
 4. Roseburg Forest Products www.roseburg.com
 4. Web Joist Corporation; www.webjoist.com (Wood I-Joists only)
 6. Weyerhaeuser – TrussJoist Engineered Wood Products; www.woodbywy.com

2.02 MATERIALS

- A. Engineered LSL, PSL, and LVL Lumber: Factory manufactured beams, headers and similar members composed of wood strand elements arranged with grain generally parallel to member length, Laminated Strand Lumber (LSL), Parallel Strand Lumber (PSL), and/or Laminated Veneer Lumber (LVL), pressure laminated with adhesive to form composite beam members.
1. Adhesive: Exterior type complying with ASTM D2559. 1. Adhesive: Exterior type complying with ASTM D2559.

2. Design: Beams and Engineered Lumber shall be sized and detailed to fit the dimensions and loads indicated on the plans. Designs shall be in accordance with allowable values and section properties assigned and approved by the building code. Verification of design of the beams by complete calculations is to be available upon request.
- B. Wood I-Joists:
1. Materials: Plywood web joists shall be factory manufactured with structural grade plywood, microlam or machine stress rated lumber flanges, utilizing waterproof type glues. Plywood webs shall be APA structural I grade with face veneers installed with grain running in the vertical direction of the joist and butt jointed to form a continuous web member. The web shall be pressure formed and fit into a groove in the center of the wide face of the flange members so as to form a pressured glue-joint at that junction.
 2. Design: Joists shall be sized and detailed to fit the dimensions and loads indicated on the plans. Designs shall be in accordance with allowable values and section properties assigned and approved by the building code. Verification of design of the joist by complete calculations is to be available upon request.
 3. Fabrication: Joists shall be manufactured in a plant approved by the building code for fabrication.

PART 3 EXECUTION

3.01 ERECTION

- A. Where shown on Drawings, wood I-joists and engineered lumber beams, headers, rim joists, and similar members shall be erected in accordance with the drawings and fabricators installation suggestions. Temporary construction loads which cause member stresses beyond design limits are not permitted.
- B. Erection bracing and blocking in addition to that specified bridging is to be provided to keep the joists straight and plumb as required to assure adequate lateral support for the individual joists and the entire system until the sheathing material has been applied.
- C. Contractor shall notify the Architect prior to enclosing joists to provide the opportunity for inspection of the installation.
- D. Temporarily removing web members, drilling or cutting chords or webs will not be permitted without written permission from Architect.
- E. Coordinate with other trades whose Work relates to beam or joist member installation.

3.02 CLEANING

- A. After erection, remove unused materials, tools, scaffolding and debris and leave broom clean.

END OF SECTION

SECTION 06 40 00

ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Architectural woodwork as shown on Drawings and as specified herein, including, but not limited to, the following:
1. Wood veneer and plastic laminate faced casework, including, but not limited to the following:
 - a. Dorm room casework.
 - b. Kitchen, pantry, breakroom, and laundry room casework.
 - c. Office casework.
 - d. Workshop casework.
 2. Sub-tops for solid surfacing countertops specified in Section 12 36 61.
 3. Stainless steel countertops, backsplashes, and sinks.
 4. Storage shelving, including closet rods and shelves.
 5. Plastic laminate faced wood trim for server rack opening.
 6. Other items as may be indicated on Drawings.
 7. Installation of Owner Furnished Dorm Platform Beds.
- B. Related Sections:
1. Section 12 31 00 – Manufactured Metal Casework, for custom fabricated stainless steel casework and countertops
 2. Section 12 36 61 - Solid Surface Countertops, for solid surfacing material countertops and backsplashes, including windowsills.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings showing layout, dimensioned plans and elevations, adjacent conditions, large-scale details, hardware, attachment devices, and schedule of finishes. Field verify critical dimensions.
1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 2. Show locations and cutouts and holes for plumbing fixtures, faucets, and other items.
- B. Samples:
1. Submit four 12 inch x 12 inch samples of each wood species to receive shop applied finish showing stain color and finish.
 2. Submit four Samples of each specified or scheduled plastic laminate for verification purposes.
 3. Submit samples of galvanized steel and stainless steel sheet to be used for countertops, sinks and wall cladding.
 4. Submit four Samples of each type of hardware specified or required.
- C. Woodwork Quality Standard Compliance Certificates: AWS Quality Certification Program Certificates.
- D. Qualification Data: For fabricator.

1.03 REFERENCES

- A. Reference Standards: Comply with the following:
 - 1. Architectural Woodwork Standards (AWS), Edition 2.
 - 2. ANSI/NEMA LD3 for laminates.

1.04 QUALITY ASSURANCES

- A. Qualifications: Manufacturer shall be company specializing in manufacturing the products specified in this Section with minimum 5 years documented experience. Shop shall be a certified participant in AWS's Quality Certification Program.
- B. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork.
- C. Quality Standard: Unless otherwise indicated, comply with AWS's "Architectural Woodwork Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. Provide AWI Quality Certification Program certificates indicating that woodwork, including installation, complies with requirements of grades specified.
 - 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with such selections and requirements in addition to the quality standard.
 - 3. Standard of Quality: Comply with the following, unless otherwise indicated on Drawings:
 - a. Premium Grade, unless otherwise indicated.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.
- B. Storage: Adequately protect against damage and moisture while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.07 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS - PLASTIC LAMINATE

- A. Furnish high pressure decorative laminate products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
 - 1. Formica www.formica.com
 - 2. Wilsonart www.wilsonart.com
 - 3. Nevamar www.nevamar.com
 - 4. Laminart www.laminart.com
 - 5. Pionite www.pionite.com
 - 6. As approved by Architect.

2.02 MATERIALS -GENERAL

- A. Provide materials that comply with requirements of AWS's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

2.03 WOOD MATERIALS

- A. Softwood Lumber (Concealed Locations): Graded in accordance with applicable standard specified herein under "Quality Assurance," for grade of work specified, Douglas Fir species, plain sawn, moisture content of 6-8 percent, with flat grain, of quality suitable for transparent finish. Thicknesses as indicated on Drawings.
- B. Hardwood Lumber: Select hardwood lumber to meet the AWS QSI requirements for Premium or Custom Grade as specified, average moisture content of 6 percent; and as follows:
 - 1. Species and Cut: As scheduled on Finish Schedule on Drawings.

2.04 SHEET MATERIALS

- A. Softwood Plywood: DOC PS 1, MDO (Medium Density Overlay), or other overlay plywood product suitable for application of plastic laminate as approved by the Architect.
- B. Hardwood Faced Panel Products: Core materials of particleboard, lumber, or MDF, type of glue recommended for application.
 - 1. Face Veneer(s) Species and Cut(s): As scheduled on Finish Schedule on Drawings.
 - 2. Face Veneer Grade: "AA" face, well matched for grain and color between veneer and lumber, unbacked. Paper backed veneer adhered with contact adhesive is not allowed.
 - a. Veneer thickness: .040 inch minimum.
- C. Thermofused Decorative Overlay (Melamine): Roseburg Thermally Fused Melamine Panels as manufactured by Roseburg Forest Products (800) 245-1115 www.rfpco.com.
 - 1. Substrate: Roseburg Ultrablend, Roseburg Pine Particleboard or Medium Density Fiberboard (MDF).
 - a. Color: As scheduled on Drawings.

- D. Prefinished Particleboard: Thermofused Roseburg Melamine on core material of 45 lb. particleboard as manufactured by Roseburg Forest Products (800) 245-1115.
- E. Wood Particleboard: Standard in accordance with applicable standard specified herein under "Quality Assurance," for grade of work specified, composed of wood chips, 45 lb. density, made with water resistant adhesive; of grade to suit application; sanded faces for drawer construction and shelving.
- F. Baltic Birch Plywood: Manufactured in accordance with Russian Export GOST 3916.1-96 Standards, Type II Glue; Grade B where visible on the exterior of the cabinet, Grade BB at cabinet interior locations.
- G. Medium Density Fiberboard (MDF): Medite II (or Medite FR as applicable) as manufactured by SierraPine, Roseville, CA, 800-676-3339 www.sierrapine.com, or equal as manufactured by Roseburg Forest Products www.rfpco.com, complying with the following:
 - 1. Water-Resistant MDF: Provide Medex in lieu of Medite II at all wet areas or within 2 feet of any sink or source of water.
- H. Marine Grade Plywood: APA 3/4 inch B-B Marine Grade pressure preservative treated plywood.
- I. Hardboard: Pressed wood fiber with resin binder, tempered grade, 1/4 inch thick, smooth one side, for drawer bottoms, gables and backs.
 - 1. Provide perforated hardboard (Pegboard) where indicated.

2.05 LAMINATE MATERIALS

- A. Plastic Laminate: High pressure decorative type.
 - 1. Horizontal Grade: NEMA LD-3, Grade GP50, .050 inch thickness.
 - 2. Vertical Grade: NEMA LD-3, Grade GP28, (.028 inch thickness).
 - 3. Cabinet Liner Grade: NEMA LD-3, Grade CL-20, (.020 inch thickness). This grade of laminate shall be counterbalanced.
 - 4. Backer: NEMA LD-3, Grade BK-20 (.020 inch thickness).
 - 5. Finishes, Colors and Patterns: As scheduled on Finish Schedule on Drawings or as selected by Architect.
- B. Stainless Steel Sheet: ASTM A666, Type 304, stretcher-leveled standard flatness.
 - 1. Minimum Nominal Stainless Steel Thickness for Stainless Steel Casework: .0625 inch (16 gauge), except 18 gauge may be used for backed countertops.
 - 2. Finish: ANSI No. 4 Brushed Finish, unless otherwise indicated on Drawings.

2.06 ACCESSORIES

- A. Adhesives:
 - 1. Laminate Adhesive: 3M Fastbond 30, or equivalent to suit application.
 - 2. Wall Panel Adhesive: Cartridge type compatible with paneling and wall substrate.
 - 3. Wood Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
 - 4. Multipurpose Construction Adhesive: Formulation complying with ASTM D3498 that is recommended for indicated use by adhesive manufacturer.

- B. Edge Trim for Plastic Laminate Casework: Moisture-curing reactive polyurethane hot melt adhesive (PUR) applied 3mm PVC banding with eased corner.
 - 1. Color shall be as selected by Architect from manufacturer's full range colors and finishes.
 - 2. Where indicated at Dorm Units, provide solid hardwood edge trim of thickness and profile as indicated on Drawings or as selected.
- C. Edge Trim for Wood Veneer Faced Casework: Matching solid hardwood edge of same species as face veneer. Thickness and profile as indicated on Drawings or as selected, 1/8 inch minimum.
- D. Glass: As specified in Section 08 80 00.
- E. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application. Threaded steel for concealed joints.

2.07 HARDWARE

- A. Shelf Standards and Supports for Cabinet Mounted Shelving: K&V 255 standards and 256 supports.
- B. Shelf Standard and Brackets for Wall Mounted Shelving: K&V 87 Single-Slot Wall Standard and No. 187 Single-Flange Wall Brackets, unless otherwise indicated on Drawings.
- C. Shelf Pin Supports for Cabinet Mounted Shelving: 32mm stainless steel shelf pins, or as otherwise indicated on Drawings or as approved by Architect.
- D. Clothes Rod and Brackets:
 - 1. Standard diameter or oval clothes rod with brushed aluminum or matte black finish as selected by Architect.
 - 2. Clothes Rod Flange: Provide clothes rod flange with 32mm integral pin to allow adjustment of clothes rod height in drilled 32mm holes in cabinet sides.
- E. Drawer and Door Pulls: Stainless steel Trimco 562-4 or Stanley 4485, or as otherwise scheduled on Drawings or as approved by Architect.
- F. Drawer Slides: All drawer glides shall be Accuride 3135EC Eclipse Easy-Close, full extension, 100 lb. capacity minimum for all applications.
 - 1. Finish: Clear zinc.
- G. Overlay Cabinet Hinges (5-knuckle): Meeting or exceeding ANSI/BHMA 156.9 Grade 1, hospital tips, 2-3/4 inch height, 270 deg. opening angle, drilled knuckle ID with Teflon coated pins. All mounting holes are countersunk for #8 flat head screws.
 - 1. Acceptable Products:
 - a. "Rockford Hinge;" Five Knuckle Overlay Hinges, Rockford Process Control, LLC www.rockfordprocesshingessandhardware.com
 - b. Stanley 1592.
 - c. Hafele Five-Knuckle Institutional Hinge, Advantage 5 K.
 - 2. Other function hinges may be submitted for approval for special circumstances.
- H. Sliding Door Track Assemblies: Johnson Hardware 1160 track and hanger set complete with track, hangers, track stops, bypass door guides, door stops, recessed pulls, and installation hardware.
- I. Sliding Door Pulls: Johnson Hardware 15US3.

- J. Locks: CompX National C8183 and C8188 Advantage Plus pin tumbler cam door and drawer cabinet locks. C8183 assembled for door function; C8188 assembled for drawer function.
- K. Catches: Stanley 41 or K&V 43.
- L. Grommets: Doug Mockett & Company, Inc. www.mockett.com, size as indicated on Drawings.
 - 1. Color: As selected by Architect.
- M. Provide all other hardware as necessary to fulfill function of architectural woodwork and cabinets as shown on Drawings, subject to approval by Architect.
- N. Finish: Brushed aluminum and/or stainless steel, or matte black (door and drawer pulls only) as scheduled on Drawings, or as otherwise selected by Architect.

2.08 FABRICATION

- A. Fabricate architectural woodwork and cabinets in conformance with AWS Grade specified herein under "Quality Assurance."
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges of solid wood lumber to 1/16 inch radius, unless otherwise indicated on Drawings.
- D. Exposed fasteners are not allowed in the finish Work on exposed and semi-exposed surfaces.
- E. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- F. Exposed Edges:
 - 1. Cap exposed edges of plastic laminate casework with moisture-curing reactive polyurethane hot melt adhesive (PUR) applied 3mm PVC banding with eased corners. Use one piece for full length only.
 - 2. Cap exposed and semi-exposed edges of wood casework with wood edge banding to match veneer, 1/8 inch minimum thickness.
- G. Shelves: Fabricate shelves with 3/4 inch thick MDF, unless otherwise indicated.
 - 1. Laminate, Shelves within Casework: Melamine, thermally fused, at all shelf edges, unless otherwise indicated.
- H. Drill holes for shelf pin supports at 1-inch cent to center spacing. Locate shelf pin holes 3 inches from front and back of shelves.
- I. Drawer Boxes:
 - 1. Fabricate sides and back from minimum 1/2 inch (9-ply) plywood or melamine.
 - 2. Fabricate bottoms from minimum 3/8 inch (7-ply) plywood.
 - 3. Fabricate with dovetail joinery only and reinforce corners as necessary to prevent racking.
- J. Door and Drawer Fronts: 3/4 inch, or as shown on Drawings.

- K. Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and drawers, unless located directly under tops.
- L. Semi-exposed Surfaces (Interior surfaces of plastic laminate casework): Melamine, thermally fused, unless otherwise indicated on Drawings.
- M. When necessary to cut and fit on site, provide materials with ample allowance for cutting and scribing to walls.
- N. Plastic Laminate Faced Countertops: Plastic laminate faced with separate back and side splashes with integral scribe for fitting to wall.
- O. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arrises. Locate counter butt joints minimum 2 feet from sink cut-outs.
- P. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces regardless of thickness or location.
- Q. Provide cutouts, rough openings, and recesses for appliances, outlet boxes, lighting fixtures, plumbing components, fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges. Extend J-boxes as required by NEC.
- R. Fabricate countertops and sub-tops for countertops at wet areas from marine grade plywood.
- S. Fabricate pegboard panels with solid hardwood frames with 1 x 2 sleepers as detailed on Drawings.
- T. Fabricate removable panels where shown for access to plumbing as detailed on Drawings with flush socket cap screws and threaded inserts set into casework base.

2.09 STAINLESS STEEL COUNTERTOPS AND SINKS

- A. Fabricate counters with integral sinks, sizes as indicated. Provide with square edges and marine edges as detailed on Drawings. Connections shall be shielded arc welded and ground smooth to match adjacent surfaces. Fabricate in largest sections practicable, with integral back and end splashes as indicated.
- B. Fabricate counters with backing material of plywood or MDF as specified. Provide Marine Grade plywood at countertops with sinks or within 24 inches of sink.
- C. Coat back of stainless steel assemblies with sound deadening material. Provide with mounting hardware as appropriate to the installation and as necessary.

2.10 SHOP FINISHING

- A. Shop finish Architectural Woodwork indicated to receive transparent or stain finish to the greatest extent possible, unless otherwise indicated in Drawings.
 - 1. Sand Work smooth at field applied mouldings.
 - 2. Apply wood filler in exposed nail and fastener indentations at field applied mouldings. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and types recommended for applied finishes.
 - 3. Finish work in the factory in accordance with AWS Manual, Section 5, System 2 - Lacquer, Precatalyzed or System 12 - Polyurethane, Water-Based, unless otherwise indicated on Interior Drawings.

4. Seal surfaces in contact with cementitious materials.
5. Seal internal surfaces of cabinets with two coats of sealer, except where cabinets are finished internally with cabinet liner.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.03 INSTALLATION

- A. Set and secure cabinetry and other woodwork in place; rigid, plumb and level, and in accordance with applicable standard specified herein under "Quality Assurance" for grade of work specified.
- B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Secure and align adjoining cabinet units and counter tops with concealed joint fasteners.
- E. Scribe casework abutting walls and other components, including walls with variable decorative finishes, with maximum gaps of 1/32 inch (0.80 inch). Do not use trim or additional overlay trim for this purpose.
- F. Secure cabinet and bases to floor using appropriate angles and anchorages.
- G. Exposed fasteners are not allowed in the finish Work except at field applied moldings and trim. When exposed fastening is required to complete installation, exposed fasteners shall be set in quirks, reveals, and reliefs (to be least visible when installation is complete). Fasteners in concealed locations shall be countersink and concealed with plugs to match surrounding materials; finish flush with surrounding surfaces.

3.04 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 07 19 00
WATER REPELLENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Water repellent coating for all exposed exterior CMU wall surfaces.

1.02 DEFINITIONS

- A. Water Repellent: Resistant to penetration of water from rainfall.

1.03 SYSTEM DESCRIPTION

- A. Water repellent shall penetrate into and chemically bond with substrate. Treated surface shall resist penetration by water and water-borne salts, ions, and other contaminants for the warranty period specified herein.
- B. Water repellent shall not change surface texture, appearance, or vapor permeability. Slight changes (darkening) of substrates after application are subject to approval by Architect prior to acceptance and general application.
- C. Masonry walls treated with water repellent shall show no evidence of moisture penetration when field quality control tested after application.

1.04 SUBMITTALS

- A. Submit sample of manufacturer's warranty and any special procedures required to obtain warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall be able to show evidence that the firm has been engaged in producing such material for at least 5 years and that the product has maintained water repellency for over 5 years of continuous field exposure.
- B. Applicator Qualifications: Applicators shall be trained, approved and accepted by the Manufacturer and have a minimum of 2 years experience in successful application of water repellent products.
- C. Regulatory Requirements: Comply with volatile organic compound (VOC) regulations in effect within the jurisdiction of the Project site.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Delivery shall be made to the job site in Manufacturer's original containers with seals unbroken and labeled with Manufacturer's batch number.
- B. Storage and Protection: Store materials in original, unopened containers in compliance with Manufacturer's printed instructions and protect from damage.

1.07 PROJECT CONDITIONS

- A. Environmental Requirements: Temperature and relative humidity conditions for a period before, during, and after application shall be as recommended by the Manufacturer. If rain occurs, allow surfaces to dry a minimum of 5 days.

1.08 WARRANTY

- A. Manufacturer shall provide a written warranty for a period of 5 years from date of project completion.
1. Written warranty shall include the following provisions:
 - a. Walls where water repellent has been applied shall show no evidence of moisture penetration on the interior surface of the wall for the full warranty period.
 - b. Coating will not cause changes in surface texture and color for the full warranty period, regardless of number of applications required to comply with performance requirements.
 2. Upon satisfactory completion of the installation, and as a condition of its acceptance, the warranty shall be delivered to the Owner.
 3. If at any time during the warranty period, any such failure occurs resulting from ordinary weather conditions in any area to which the coating has been properly applied, the manufacturer shall agree to supply all material needed to repair such affected areas at no additional cost.
- B. The applicator shall guarantee the installation against poor workmanship for a period of 2 years from the date of Substantial Completion. Applicator shall make necessary repairs without charge to Owner during that period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, subject to compliance with Specification requirements:
1. BASF Corporation Construction Chemicals www.master-builders-solutions.basf.us
 2. Euclid Chemical Company www.euclidchemical.com
 3. ProSoCo., Inc. www.prosoco.com
 4. Protectosil; Div. of Evonik Industries www.protectosil.com

2.02 MATERIALS

- A. Water Repellent Sealer:
1. Protectosil Aqua-Trete Concentrate, Protectosil.
 2. Baracade M.E or Weather-Guard, Euclid Chemical Company.
 3. Siloxane WB Concentrate, ProSoCo., Inc.
 4. MasterProtect H 400 (formerly Enviroseal 40), BASF.
 5. Equivalent penetrating siloxane, silene, or siloxane/silene blend for use on CMU masonry as approved by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
1. Carefully inspect the installed Work of other Trades, and verify that such Work is complete to the point where water repellent application may commence.
 2. The Manufacturer's representative shall verify that the water repellent can be applied in accordance with the Manufacturer's recommendations.
 3. Verify that cracks which exceed 1/64 inch (0.40mm) wide have been filled with pointing mortar or caulking material. Defective mortar joints shall be routed out, pointed with mortar and tooled.
 4. Verify that flashing and caulking materials have been installed properly.
 5. Verify that masonry has been cleaned as specified in Section 04 01 20.52.
 6. Verify sealants have been installed and are properly cured.
 7. Advise Architect in writing of unsatisfactory conditions. Do not apply water repellent until conditions have been corrected.

3.02 PREPARATION

- A. Protection:
1. Use all means necessary to protect clear water repellent before, during, and after installation and to protect the installed Work of other Trades.
 2. Metal, glass and other such items shall be protected by suitable masking materials to protect against overspray.
 3. In the event of damage, immediately make repairs and replacements necessary as acceptable to the Architect.
 4. Protect concrete sidewalks from runoff by soaking with water immediately prior to application on adjacent walls.
- B. Surface Preparation:
1. Allow walls to cure at least 30 days before clear water repellent is applied.
 2. Walls shall be free of excess mortar.
 3. Follow Manufacturer's instructions regarding allowable moisture level.
 4. Clean surface in accordance with water repellent manufacturer's recommendations to remove all loose and foreign matter that could interfere with application and performance of water repellent.

3.03 APPLICATION

- A. Water Repellent Application - General: Follow Manufacturer's instructions for application and coverage, and procedures established during pre-installation conference.
- B. Mixing:
1. Concentrates: Concentrated products shall be mixed as recommended by the manufacturer for type of substrate where applied.
 2. Strictly observe all mix ratios and consistently measure field mixes with containers calibrated in standard volume units.
- C. Surfaces to be coated:
1. All exposed exterior surfaces of concrete masonry unit walls, including surfaces not exposed to view but left exposed in the finished work such as backs of parapet walls, horizontal projections, etc.

2. Masonry surfaces indicated above which will be covered by another finish material such as metal wall panels, paint, etc., do not require application of water repellent.
 3. Other locations as indicated on Drawings.
- D. Application:
1. Apply water repellent to dry surfaces using airless spray equipment as recommended by the manufacturer at consistent minimum rate.
 2. Apply product in saturating one or two coat application allowing time between coats as recommended by the manufacturer.
 3. Apply product from bottom of the vertical surface to the top, saturating the surface until “run-down” is achieved, but avoiding excessive rundown in accordance with manufacturer’s printed instructions.
 4. At no time shall rate of coverage be less than required by Manufacturer's written instructions and additional procedures established in the pre-installation conference.
- E. Protect surfaces where water repellent has been applied from rain, dirt, dust, traffic, wind-blown debris and other materials that could harm performance of material for a period of not less than 4 hours after application, but not less than protective time recommended by the manufacturer.

3.04 FIELD QUALITY CONTROL

- A. Water Penetration Tests:
1. Twenty days after completion of this portion of the Work, and as a condition of its acceptance, demonstrate by running water test that the Work of this Section will successfully repel water.
 2. Notify the Architect and Manufacturer at least 72 hours in advance and conduct the test in the presence of Architect and manufacturer's representative.
 3. By means of an outrigger or similar acceptable equipment, place 3/4 inch garden hose with garden type spray nozzle, at a point designated by the Architect, 8 feet to 10 feet away from the wall, aiming the nozzle so that water will strike the wall at a 45 degree downward angle.
 4. Run the water onto the wall at full available force for not less than 4 hours. Provisions shall be made to collect the run off water into a container, and if possible to reuse it in the test
 5. Upon completion of the four hour period, inspect the interior surface of the wall for evidence of moisture penetration.
 6. If evidence of moisture penetration is discovered, perform corrective procedures recommended by the manufacturer and as established during the pre-installation conference to the areas where leakage occurred.
 7. Successful application of water repellent will show no evidence of moisture penetration on the interior surface of the wall after four hour period.
 8. An additional area or areas designated by the Architect shall be tested and corrected if leakage occurs, at no additional cost to Owner.
 9. Application of water repellent is subject to rejection upon failing field quality control testing after corrective procedures have been performed at areas failing initial field quality control testing.

3.05 CLEANING

- A. Clean spillage and overspray as recommended by the Manufacturer.
- B. During the course of the Work and on completion, remove excess materials, equipment and debris and dispose of away from premises.

END OF SECTION

SECTION 07 21 00
BUILDING INSULATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Batt/Blanket thermal building insulation.
 - 2. Rigid exterior graphite polystyrene board continuous wall insulation and accessories.
 - 3. Fire-safing insulation.
 - 4. Seamless spray-applied polyurethane foam insulation.
- B. Related Sections:
 - 1. Section 07 57 13 – Coated Foamed Roofing, for rigid polyisocyanurate roof installation board installed as part of foam roofing assembly.
 - 2. Section 07 84 00 – Firestopping.
 - 3. Section 09 81 00 – Acoustical Insulation, for sound attenuation insulation.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's data, installation instructions, limitations and recommendations. Include certification and test data substantiating R-Values and combustibility of each type of insulation.
- B. Evaluation Report: Evidence of compliance of foam-plastic insulations with International Building Code (IBC).

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements: Conform to applicable code for fire resistance ratings and surface burning characteristics.
- B. Provide certificate of compliance acceptable to authorities having jurisdiction indicating conformance to fire-resistance requirements.
- C. Fire safing insulation and assemblies for closure of various voids with fire safing insulation shall comply with IBC Chapter 7 requirements.
- D. Polyurethane Foam Insulation Installer Qualifications: Applicator of spray polyurethane foam shall be a Manufacturer Licensed Dealer (applicator) who has been trained and certified by the Polyurethane Foam Insulation Manufacturer.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Storage: Deliver materials to job in Manufacturer's original unopened packaging. Adequately protect against damage while stored at the site. Deliver so that stocks of materials on the site will permit uninterrupted progress of the Work.
- B. Materials shall be properly identified on each package with the Manufacturer's name and R value.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved otherwise by the Architect, subject to compliance with Specification requirements:
1. Batt and Semi-Rigid Batt Insulation:
 - a. Johns-Manville www.jm.com
 - b. Owens-Corning Fiberglas Corp. www.owenscorning.com
 - c. CertainTeed Corp., Saint Gobain www.certainteed.com
 - d. Knauf Insulation www.knaufinsulation.com
 2. Graphite Polystyrene (GPS) Board Insulation:
 - a. Neopor www.neopor.basf.us
 3. Fire Safing Insulation:
 - a. Thermafiber, Inc. www.thermafiber.com
 - b. Roxul Inc. www.roxul.com
 4. Spray-Applied Polyurethane Foam Insulation:
 - a. CertainTeed Corp., Saint Gobain www.certainteed.com
 - b. Icynene Inc. www.icynene.com
 - c. Lapolla Industries, Inc. www.lapolla.com
- B. Materials designated for a specific application shall be the products of one Manufacturer.

2.02 MATERIALS

- A. Batt Insulation:
1. Unfaced Glass Fiber Batts: ASTM C665, Type I, unfaced glass fiber batts.
 2. Provide batts manufactured from mineral fiber where used within walls with cement backer board applied to one or both sides.
 3. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively when tested in accordance with ASTM E84.
 4. Thickness: Provide minimum thickness as indicated on Drawings for various locations, or minimum thickness to provide the resistance values indicated on Drawings, for various locations. Batts shall be a single thickness to meet the required R value, multiple layers of batts will not be accepted.
- B. Graphite Polystyrene (GPS) Board Insulation:
1. Thickness - Exterior Walls: As indicated on Drawings.
 2. Acceptable Products:
 3. Adhesive: Dow Insta-Stic, single component, moisture cured, polyurethane insulation adhesive as manufactured by Dow Chemical Company.
 4. Z- Furring Members: As specified in Section 09 22 16.
- C. HFC-Blown Type Closed Cell Foam Insulation:
1. Basis of Design: CertainTeed CertaSpray Closed Cell Foam.
 2. Medium-density, MDI-based polyurethane thermoset rigid foam.
 3. When CertaSpray A-side closed cell is mixed with CertaSpray B-side closed cell under pressure in a 1:1 volumetric ratio, they react and expand into a medium-density closed cell foam with an in-place core density of 1.9- 2.2 pcf:
 4. Physical and Mechanical Properties:
 - a. Core Density: 1.9-2.4 pcf when tested in accordance with ASTM D1622.
 - b. Thermal Resistance (aged): 5.8 less than or equal to 2-1/2 inches / 6.4 when greater than 2-1/2 inches when tested in accordance with ASTM C518 at 75 degrees F, (h-ft²- degrees F)/Btu.
 - c. Thermal Resistance (initial): 6.4 when tested in accordance with ASTM C518 at 75 degrees F, (h-ft²- degrees F)/Btu.

- d. Closed Cell Content: 88-95 percent when tested in accordance with ASTM D2842.
 - e. Compressive Strength: Greater than 25 psi when tested in accordance with ASTM D1621.
 - f. Tensile Strength: 23 psi when tested in accordance with ASTM D1623.
 - g. Water Absorption: Less than 2 percent by volume when tested in accordance with ASTM D2842.
 - h. Dimensional Stability: Less than 9 percent by volume when tested in accordance with ASTM D2126 at 75 degrees F/95 percent RH, 28 Day.
 - i. Water Vapor Transmission: 1.3 perm/inch when tested in accordance with ASTM E96.
 - j. Air Permeability: 0.013 when tested in accordance with ASTM E283 at 1 inch thickness, L/s/m².
 - k. Fungi Resistance: Pass, with no growth when tested in accordance with ASTM C 1338.
5. Fire performance:
- 1. Flame Spread: Less than 25 when tested in accordance with ASTM E84.
 - 2. Smoke: Less than 450 when tested in accordance with ASTM E84.
6. Thermal Performance (aged): Tested in accordance with ASTM C518 and/or ASTM C177 at 75 degrees F (24 degrees C) mean temperature.
- a. Thickness per 1 inch: R-Value 5.8 (h-ft²-degreesF)/Btu (1.0 (m²-degreesC)/W).
- D. Fire Safing Insulation: ASTM C24, E119 and E136, with 4 pcf density. Thickness shall be as required by the Manufacturer to provide a fire rating equal to that of the assembly of which it is a part.
- E. Acoustical Batt Insulation: Sound attenuation batt insulation as specified in Section 09 81 00.
- F. Spindle Anchors, Washers and Shields: Provide copper coated low carbon steel spindles, angled type where required for attachment, with steel insulation retainer plates, washers and shields that are listed and labeled for use. Protect ends of spindles with capped self-locking washers where exposed to contact.
- 1. Acceptable Products:
 - a. Stic-Klip Mfg. Co., Type A or B as necessary, with Type S adhesive
 - b. Miracle Adhesive Corp. "Miracle StukUps" with Type HT994 adhesive.
 - c. Goodloe E. Moore Gemco Gemco or Tuff-Weld with G-P Improved or Tuff-Bond Quik-Set Type Adhesive as applicable.
- G. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- H. Safing Clips: Galvanized steel safing clips approved by Manufacturer of safing insulation for holding safing insulation in place.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.

- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

- A. Sprayed Polyurethane Foam Areas: The substrates to which the insulation is applied must be clean, dry, and free of frost, ice, loose debris, or contaminants that will interfere with adhesion of the spray foam insulation. The insulation must not be applied in electrical boxes.
 - 1. Plywood shall contain no more than 18 percent water, as measured in accordance with ASTM D4449 and 4444-84.
- B. Batt and Fire Safing Insulation Areas: The substrates to which the insulation is applied must be clean, dry, and free of frost, ice, loose debris, or contaminants.

3.03 INSTALLATION

- A. Batt Insulation:
 - 1. Delay installation until Construction has progressed to the point that inclement weather will not damage or wet the insulation material.
 - 2. Friction-fit blanket insulation in place. Install batts to fill entire stud cavity, with no gaps, voids, or areas of compression. If stud cavity is less than 8 feet in height, cut lengths to friction fit against floor and ceiling tracks. Walls with penetrations require that insulation be carefully cut to fit around outlets, junction boxes, and other irregularities.
 - 3. Do not install insulation on top of or within 3 inches of recessed light fixtures unless the fixtures are approved for such use.
 - 4. Fully insulate small areas between closely spaced framing members, pipes, conduits or other obstruction by cutting and fitting insulation material as required to maintain the integrity of the insulation. Within exterior wall framing, install insulation between pipes and backside of sheathing. Cut or split insulation material as required to fit around wiring and plumbing.
 - 5. Installation of insulation of scheduled thickness / R-value is required at all exterior walls, soffits, underside of roofs where indicated, projections, etc., whether indicated on Drawings or not.
 - 6. At metal framing, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs or framing members.
 - a. Secure batt insulation to underside of roof sheathing with wire.
 - 7. Fluff insulation to full thickness for specified R-value before installation. Do not compress insulation in the cavity during installation, creating gaps or voids that could diminish thermal value.
 - 8. Trim insulation neatly to fit spaces. Fill miscellaneous gaps and voids with insulation. End match neatly with ends fitting snugly.
 - 9. Place insulation tight to exterior wall or roof substrate without airspace between insulation and exterior sheathing or roof substrate.
 - 10. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.

- B. Rigid Exterior Graphite Polystyrene Board Continuous Insulation: Install insulation in accordance with manufacturer's recommendations, as detailed on Drawings, and the following:
 - 1. Coordinate installation of rigid exterior wall insulation with installation of framing/furring and indicated sheathing.
 - 2. Install insulation between Z-furring members as detailed on Drawings and as specified in Section 09 22 16.
 - a. Install insulation and hold in place with Z-furring members spaced at 24 inches o.c., unless otherwise detailed on Drawings.
 - 3. Butter all edges of insulation board with adhesive to provide continuous vapor barrier or seal board joints with sealing tape.
 - 4. Fit insulation around obstructions with joints staggered and edges butted tightly.
 - 5. Insulate small areas between closely spaced framing members, pipe, conduit, or other obstructions by cutting and fitting insulation board and fitting insulation materials as required to maintain the integrity of the insulation.
 - 6. Press units firmly to substrate.

- C. Fire Safing Insulation: Install in proper sizes on safing clips as needed but not to exceed 24 inches O.C. Leave no voids between walls and edges of slabs.
 - 1. Install safing clips where required to support insulation as required by Code.
 - 2. Cut safing insulation 1/2-inch wider than gap to be filled to ensure compression fit. Leave no voids in completed installation.

- D. Spray-Applied Polyurethane Foam Insulation: Two-component spray-applied polyurethane foam shall be processed and spray applied in Accordance with manufacturer's instructions by approved applicator using manufacturer's recommended spray equipment.
 - 1. Apply insulation to substrates in compliance with manufacturer's written instructions.
 - 2. Apply insulation to produce thickness required for R-Value indicated on Drawings.
 - 3. Extend insulation in thickness indicated to envelop entire area to be insulated.

3.03 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

- B. Protection: Take precautions to protect insulation, both during and after installation, from damage of any kind until covered.

END OF SECTION

SECTION 07 27 26

FLUID-APPLIED VAPOR PERMEABLE AIR BARRIER MEMBRANE

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Fluid-applied, vapor permeable air barrier membrane system, including materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, veneer attachments and ties, piping and other penetrations through the wall assembly.
- B. Related Sections:
 - 1. Section 04 22 00 – Concrete Unit Masonry, for CMU walls to receive fluid-applied membrane air and vapor barrier membrane.

1.02 DEFINITIONS

- A. Vapor Permeable Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.03 PERFORMANCE REQUIREMENTS

- A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration.
- B. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- C. Building envelope shall be designed and constructed with a continuous air barrier to control air leakage into, or out of the conditioned space. The air barrier shall have the following characteristics:
 - 1. It shall be continuous, with all joints made airtight.
 - 2. It shall have an air permeability not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf), when tested in accordance with ASTM E2178.
 - 3. It shall have an air permeability not to exceed 0.04 cfm/sq. ft. under a pressure differential of 0.3 in. water, when tested in accordance with ASTM E2357.
 - 4. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
 - 5. It shall be durable or maintainable.

6. Air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
 - a. Foundation and walls
 - b. Walls and windows or doors
 - c. Different wall systems
 - d. Wall and roof
 - e. Wall and roof over unconditioned space
 - f. Walls, floor and roof across construction, control and expansion joints
 - g. Walls, floors and roof to utility, pipe and duct penetrations
7. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

1.04 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.
- B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 1. Include details of interfaces with other materials that form part of air barrier.
 2. Include details of mockups.
- C. Samples: Submit representative samples of the following for approval:
 1. Fluid-applied membrane.
 2. Transition membrane and other components of membrane system.
- D. Certificates: Submit product certificates for air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.
- F. Qualification Data: For applicator.
- G. Product Test Reports:
 1. Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Air barrier systems shall be manufactured and marketed by a firm with a minimum of 10 years experience in the production and sales of waterproofing and air barriers. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.
- B. Source Limitations: Components used shall be sourced from one manufacturer, including sheet membrane, air barrier sealants, primers, mastics, and adhesives.

- C. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, to a minimum of 5 projects, whose work has resulted in applications with minimum of 10 years history of successful in-service performance.
- D. Single-Source Responsibility: Obtain air barrier materials from a single manufacturer regularly engaged in manufacturing the product.
- E. Provide products which comply with all federal, state and local regulations controlling use of volatile organic compounds (VOCs).
- F. Preinstallation Conference: Conduct conference at Project site.
 - 1. Include installers of other construction connecting to air barrier, including roofing, waterproofing, architectural precast concrete, masonry, sealants, windows, glazed aluminum window wall and storefront systems, and door frames.
 - 2. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.06 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.
- B. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency. Coordinate mockups with exterior finish materials.
 - 1. Adhesion Testing: Mockups will be tested for minimum air-barrier adhesion of 30 lbf/sq. in. according to ASTM D4541.
 - 2. Test mock-up for air and water infiltration to conform with Section 01 45 00 - Quality Control, in accordance with ASTM E 783 and ASTM E 1105.
 - 3. Notify Architect 7 days in advance of the dates and times when mockups will be tested.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.
- B. Storage and Handling: Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets.
 - 1. Protect from damage from sunlight, weather, excessive temperatures and construction operations.
 - 2. Store roll materials on end in original packaging. Protect rolls from direct sunlight until ready for use.
 - 3. Store air barrier membranes, adhesives and primers at temperatures of 40 degrees F and rising.
 - 4. Keep solvent away from open flame or excessive heat.
 - 5. Remove damaged material from the site and dispose of in accordance with applicable regulations.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

1.08 PROJECT/SITE CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.09 COORDINATION

- A. Ensure continuity of the air barrier throughout the scope of this section.

1.10 WARRANTY

- A. Material Warranty: Manufacturer's standard form in which manufacturer agrees to replace fluid-applied air barrier membrane materials that fail within specified warranty period when installed and used in strict conformance with written manufacturer's instructions.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to maintain specified air permeance rating.
 - b. Failure to maintain specified vapor permeance rating.
 - 2. Warranty Period: 5 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following manufacturers, except as otherwise approved by the Architect, subject to compliance with specifications requirements:
 - 1. Henry Company www.henry.com
 - 2. GCP Applied Technologies www.gcpat.com
- B. Basis of Design: Air-Bloc 31MR as manufactured by Henry Company

2.02 MATERIALS

- A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier:
 - 1. Physical and Performance Properties:
 - a. Membrane Air Permeance: Not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf); when tested per ASTM E2178.
 - b. Assembly Air Permeance: Provide a continuous air barrier assembly that has an air leakage not to exceed 0.04 cfm/sq. ft. of surface area under pressure differential of 0.3 in. water (1.57 psf) when tested in accordance with ASTM E2357.
 - c. Water Vapor Permeance: Greater than 10 perms; when tested in accordance with ASTM E96, Method B.
 - d. Pull Adhesion: Minimum 20 psi or substrate failure to glass faced wall board, minimum 100 psi to concrete/CMU; when tested in accordance with ASTM D4541.
 - e. Low temperature flexibility: Pass at minus 20 degrees F. per ASTM D1970.
 - f. Water resistance of in-place membrane: Pass. No water penetration after 90 minutes @ 6.24 psf tested over OSB and gypsum sheathing in accordance with ASTM E331.

- g. Nail sealability: Pass UV Exposure Limit: Equal to or greater than 180 calendar days when tested in accordance with ASTM D1970.
- h. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly
- 2. Acceptable Products: Subject to compliance with requirements, provide products as manufactured by one of the following:
 - a. Air-Bloc 31MR; Henry Company (Basis of Design)
 - b. Perm-A-Barrier VPL, GCP Applied Technologies.

2.03 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Joint Reinforcing Strip: Air barrier manufacturer's approved tape.
- C. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- D. Adhesive and Tape: Air barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.
- E. Wall Primer: Liquid waterborne primer recommended for substrate by manufacturer of air barrier material.
 - 1. Flash Point: No flash to boiling point.
 - 2. Solvent type: Water.
 - 3. VOC Content: Not to exceed 10 g/l.
 - 4. Application Temperature: 25 deg. F and above.
 - 5. Freezing Point (as packaged): 21 deg. F.
- F. Flexible Membrane Flashing/transition Membrane: Membrane: 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
- G. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- H. Joint Sealant: As specified in Section 07 92 00 – Joint Sealers. Verify compatibility of sealants with membrane prior to commencing work.
- I. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft density; flame spread index of 25 or less according to ASTM E162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
- J. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.
- K. Adhesive: Manufacturer's standard synthetic, trowel applied, rubber-based adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
 - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - 2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
 - 3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
 - 4. Verify that masonry joints are flush and completely filled with mortar.
 - 5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid-applied air barrier system.
- B. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Pre-treat board joints with manufacturer's recommended 50-75mm (2-3 in.) wide self-adhesive tape. Gaps greater than 1/4 inch should be filled with mastic or caulk, allowing sufficient time to fully cure before application of the tape and fluid applied air barrier system.
- C. Masonry Substrates: Apply air and vapor barrier over concrete block and brick with smooth trowel-cut mortar joints, struck full and flush. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.
- D. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.
- E. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.
- F. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- G. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- H. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.
- I. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- J. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

- K. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.03 JOINT TREATMENT

- A. Joint Treatment: Seal joints up to 1/2 inch and less between panels of exterior grade gypsum sheathing, plywood, OSB or cementitious panels with joint treatment sealant.
 - 1. Fill joint between sheathing with approved joint treatment sealant ensuring contact with all edges of sheathing board. Strike flush any excess sealant over joint layer to form a continuous layer over the joint.
 - 2. Alternatively, seal gaps and voids or irregular joints greater than 1/4 inch between panels of exterior grade gypsum, exterior gypsum sheathing, plywood, OSB or cementitious panels with a strip of self-adhering air/vapor barrier transition membrane lapped a minimum of 1-1/2 inches on both sides of the joint.
 - a. Prime surfaces as per manufacturers' instructions and allow to dry.
 - b. Align and position self-adhering air/vapor barrier transition membrane, remove protective film and press firmly into place. Ensure minimum 2 inches overlap at all end and side laps of membrane.
 - c. Roll all laps and membrane with a counter top roller to ensure seal.
 - 3. Alternately, joints not exceeding 1/8 inch can be sealed with yellow open weave glass fabric.
 - a. Apply yellow open weave glass fabric centered over joint followed by a 1/8 inch thick trowel application of air/vapor barrier membrane.
 - b. Allow to dry prior to application of primary vapor permeable air barrier membrane.
- B. Inside and Outside Corners:
 - 1. Seal inside and outside corners of sheathing boards with a strip of self-adhering transition membrane extending a minimum of 3 inches on either side of the corner detail.
 - a. Prime surfaces as per manufacturers' instructions and allow to dry.
 - b. Align and position self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 2 inches overlap at all end and side laps of membrane.
 - c. Roll all laps and membrane with a counter top roller to ensure seal.
- C. Crack treatment – Masonry and Concrete:
 - 1. Seal cracks over 1/16 inches in masonry and concrete with a strip of self-adhering transition membrane lapped a minimum of 1 1/2 inches on both sides of the crack.
 - a. Prime surfaces as per manufacturers' instructions and allow to dry.
 - b. Align and position self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 2 inches overlap at all end and side laps of membrane.
 - c. Roll all laps and membrane with a counter top roller to ensure seal.
 - 2. Alternately, static cracks 1/16 inch to 1/8 inch can be sealed with primary air barrier membrane.
 - a. Fill crack with primary air barrier membrane.
 - b. Allow to dry prior to application of primary vapor permeable air barrier membrane.

3.04 TRANSITION STRIP INSTALLATION

- A. General: Install strips, transition strips, and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
 - 1. Coordinate installation of air with installation of adjacent construction to ensure continuity of air barrier assembly.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - 1. Prime with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- C. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier (where applicable), concrete below-grade structures, floor-to-floor construction, exterior glazing and window wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- E. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Wall Openings: Prime concealed, perimeter frame surfaces of windows, aluminum framed window wall and storefront assemblies, and doors. Apply modified bituminous transition strip, elastomeric flashing sheet or preformed silicone-sealant extrusion so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.
 - 1. Transition Strips and Membranes: Roll firmly to enhance adhesion.
 - 2. Elastomeric Flashing Sheet: Apply adhesive to wall, frame, and flashing sheet. Install flashing sheet and termination bars, fastened at 6 inches o.c. Apply lap sealant over exposed edges and on cavity side of flashing sheet.
- G. Fill gaps in perimeter frame surfaces of windows, aluminum framed window wall and storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- H. Seal strips and transition strips around masonry reinforcing or ties and similar penetrations with termination mastic.
- I. Seal top of through-wall flashings to air barrier with an additional 6-inch-wide, modified bituminous or counterflashing strip.
- J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.05 FLUID AIR AND WATER BARRIER INSTALLATION

- A. Apply air barrier membrane within manufacturer's recommended application temperature ranges.
- B. General: Apply fluid air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.
 - 1. Apply primer to substrates at required rate and allow it to dry.
 - 2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - 3. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- C. Membrane Air Barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.
 - 1. Vapor-Retarding Membrane Air Barrier: Minimum thickness as required by manufacturer to achieve minimum performance, but not less than 90 mil wet film thickness, 45 mil dry film thickness.
- D. Apply strip and transition strip over cured air-barrier material overlapping as recommended by membrane manufacturer onto each surface according to air-barrier manufacturer's written instructions.
- E. Do not cover air barrier until it has been tested and inspected by Owner's testing agency, if required.
- F. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.06 FIELD QUALITY CONTROL

- A. Test Agency: Owner may engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 - 1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
 - 2. Continuous structural support of air barrier system has been provided.
 - 3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
 - 4. Site conditions for application temperature and dryness of substrates have been maintained.
 - 5. Maximum exposure time of materials to UV deterioration has not been exceeded.
 - 6. Surfaces have been primed, if applicable.
 - 7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
 - 8. Termination mastic has been applied on cut edges.
 - 9. Strips and transition strips have been firmly adhered to substrate.
 - 10. Compatible materials have been used.

11. Transitions at changes in direction and structural support at gaps have been provided.
 12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
 13. All penetrations have been sealed.
- C. Remove and replace deficient air barrier components and retest as specified above.

3.07 CLEANING AND PROTECTION

- A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer.
 2. Protect air barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, flexible PVC membranes, and sealants not approved by air barrier manufacturer.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- C. Remove masking materials after installation.
- D. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 07 32 16
CONCRETE ROOFING TILES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Concrete roofing tiles and installation materials, including roof underlayment, cover board, and rigid insulation.

1.02 DESIGN REQUIREMENTS

- A. Performance: Concrete roofing tile materials and installation shall comply with requirements of the 2018 IBC.
- B. Roofing tile materials and installation shall conform to the requirements of ICC ESR 1900 and LA RR 25021, and the latest edition of the Concrete and Clay Roof Tile Installation Manual.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each material and product used, including the following:
 - 1. Preparation instructions and recommendations.
 - 2. Installation instructions and recommendations.
 - 3. List of accessories.
 - 4. Current ICC Report.
 - 5. Storage and handling requirements and recommendations.
- B. Shop Drawings: Submit shop drawings showing details on hip, ridge, valley and gable configurations, methods of fastening and attachment, and collaborated details with related work. Include a calculation of the total weight of materials to be installed as a roofing system.
- C. Samples: Submit samples showing color, surface finish and texture, and configuration.
- D. Certificates of Compliance showing compliance with referenced standards.

1.04 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer shall be a member of the Tile Roofing Institute.
 - 2. Work shall be performed by a licensed roof tile contractor approved by the manufacturer.
- B. Perform work in conformance with the following:
 - 1. Concrete and Clay Roof Tile Installation Manual (TRI Installation Manual) published July 2015, Uniform ES ER-2015, by the Tile Roofing Institute & Western States Roofing Contractors Association www.tilerroofing.org
 - 2. Latest edition of the National Roofing Contractors Association (NRCA), Steep Roofing Manual.

- C. Regulatory Requirements: Provide extruded concrete roof tile approved for use by ICC as described in current ICC Research Committee Report.
- D. Mock-ups: Provide mock-up as follows if requested by Architect:
 - 1. Construct sample roof panel, minimum 8 feet square, matching roof pitch of Project showing proposed color blend, random stacking and mud setting to be used on the Project using the identical materials and installation which will be used on the remainder of the Project.
 - 2. The purpose of this sample will be to observe color blend and aesthetic effect, the method of installation, including workmanship.
 - 3. The sample, when approved by the Architect, will function as a reference base for acceptance or rejection of color, random stacking, and mud setting.
 - 4. Approved Mock-up may remain as part of finished construction.

1.05 DELIVERY, HANDLING AND STORAGE

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.
- B. Handling:
 - 1. Comply with manufacturer's instructions.
 - 2. To avoid the occurrence of color patterning on the roof, tiles shall be loaded from different pallets to ensure that shades are either segregated or blended uniformly over the entire roof elevation.
 - 3. Refer to roof loading guide of the Concrete and Clay Roof Tile Installation Manual (TRI Guide) published July 2015, Uniform ES ER-2015.
- C. Storage:
 - 1. Adequately protect against damage while stored at the site and protect from mud, dust, dirt or other materials likely to stain or render tile unsatisfactory for installation.
 - 2. Do not stack loaded pallets on top of one another.
 - 3. Do not stack tiles on roof in a manner which would endanger structure.
 - 4. Distribute stacks of tile uniformly in accordance with manufacturer's printed instructions.

1.06 PROJECT CONDITIONS

- A. Anticipate environmental conditions (temperature, humidity, and ventilation) to schedule work within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Do not install underlayment on wet or frozen sheathing.
- C. Do not begin installation until related work in areas to receive tiles is complete.

1.07 WARRANTY

- A. Manufacturer shall warrant the products against manufacturing defects and shall include material and labor to repair or replace defective materials as specified in manufacturer's warranty.
 - 1. Warranty Period - Concrete Roof Tile: Lifetime Transferable Limited Product Warranty for concrete roof tile.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the specified Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements.
 - 1. Eagle Roofing Products www.eagleroofting.com
 - 2. Westlake Royal Roofing Solutions (former Boral North America) <https://westlakeroyalroofing.com>
- B. Basis of Design: Drawings and Specifications are based on products manufactured by Eagle Roofing Products.

2.02 TILE MATERIALS

- A. Concrete Tile:
 - 1. Profile: Eagle Ponderosa as scheduled on Drawings.
 - 2. Color/Finish: As scheduled on Drawings.
 - 3. Trim Tile and Hip Starters: Barrel type.
 - 4. Design:
 - a. Interlocking, with anchor lugs located on the underside.
 - b. Interlocking ridges shall be provided on the longitudinal edges to restrict lateral movement and provide waterstop.
 - c. Transverse bars on underside to serve as weather checks.
 - d. One or two nail holes depending on profile.
 - 5. Composition: Extruded cured concrete composed of Portland Cement and selected sand aggregate being colored by integral color addition or surface coating of specially formulated Portland Cement based products and coloring agents.

2.03 INSULATION ANDD COVER BOARD

- A. Roof Insulation: Polyisocyanurate insulation with glass fiber facers conforming to ASTM C1289, Type II, Class 1.
 - 1. Compressive Strength (ASTM D1621): 20 psi.
 - 2. Nominal Overall Density (ASTM D1622): 2 pcf.
 - 3. Dimensional Stability (ASTM D2126): Less than 2 percent.
 - 4. Moisture Vapor Transmission (ASTM E96): Less than 1 perm.
 - 5. Maximum Flame Spread (E84): 75.
- B. Insulation Cover Board: Dens-Deck Prime, glass-mat faced, water-resistant gypsum substrate board complying with ASTM C1177 as manufactured by Georgia Pacific Corporation.
 - 1. Thickness: 1/2 inch.
 - 2. Cover Board Fasteners: Size and type as recommended by manufacturer for type of substrate and as required to comply with wind uplift requirements.

2.04 SHEET MATERIALS

- A. Underlayment: ASTM D226, No. 30 unperforated asphalt saturated felts.

- B. Self-Adhering, High-Temperature, Butyl-Based Flashing Membrane: 30 to 40 mils thick minimum, consisting of slip-resisting polyethylene film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing, cold applied. Provide primer and protection sheet when recommended by underlayment manufacturer.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Grace Ultra, GCP Applied Technologies www.gcpat.com.
 - b. CCW WIP 250HT, Carlisle Coatings & Waterproofing, Inc. www.carlislewipproducts.com
 - c. Henry Blueskin PE200HT www.henry.com
Perma-Seal PE, Henry Company
 2. Underlayment Primer: As recommended by the manufacturer of the underlayment material.

2.05 ACCESSORIES

- A. Tile Fasteners:
1. Nails: Corrosive resistant fastener meeting ASTM A641 Class I or approved equal. Number 11 gauge diameter and of sufficient length to penetrate 3/4 inch into or through the thickness of the deck or the batten. Comply with the TRI Installation Manual.
 2. Screw Fasteners: Corrosion resistant meeting ASTM A641 Class 1 and/or corrosion resistance equal (according to ASTM B 117).
 - a. Screws shall be 2-1/2 inches in length or penetrate a minimum 3/4 inch into the deck or batten.
 - b. ASTM A641 Class 1 is a nail specification that can be converted to screw fasteners through performance testing (ASTM B 117).
 - c. Each fastener manufacturer is responsible for supplying this support this data. Minimum #8 course thread.
- B. Plastic Cement: ASTM D4586; Type 2, asphalt type with mineral fiber components, free of toxic solvents, capable of setting within 24 hours at temperatures of 75 degrees F. and 50 percent RH.
- C. Deck Tape: 2 inch wide aluminum coated cloth duct tape with adhesive backing.
- D. Plastic Battens: 1/2 inch x 1-5/8 inch x 48" lengths corrugated 100% polypropylene battens as manufactured by Battens Plus, Inc. www.battensplus.com
1. Comply with TRI Guide - Concrete and Clay Roof Tile Installation Manual Fourth Edition.
- E. Eave Closure/Riser/Bird Stop:
1. Comply with TRI Guide Fourth Edition installation Guide and Drawings.
 2. Eagle Roofing Products Bird Stop Capistrano/High Profile - Terracotta, Color as selected by Architect.
- F. Ridge Weather Block for High Profile Tiles: Terracotta, Black color.
- G. Mortar:
1. One part ASTM C150 Type 1 Portland Cement, 2 parts uniformly graded, clean sand conforming to ASTM C144, and potable water as required to provide workable mix.
 2. Plasticizer may be added if required, to assist workability.
 3. Color: Integral colored synthetic mineral oxide color as selected by Architect and/or Owner.

- H. Tile Adhesive (For use at Apparatus Bays): Tile adhesive formulated for use with concrete roofing tile as recommended by roof tile manufacturer.
 - 1. Dow “Insta Stik” or equivalent www.dupont.com

2.06 FLASHING MATERIALS

- A. Sheet Flashing:
 - 1. Galvanized Steel: ASTM A653, 24 gauge minimum and as indicated, with G-90 coating.
 - 2. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14.
 - 3. Finish: Full strength Kynar 500/Hylar 5000 Fluorocarbon coating, applied by the Manufacturer on a continuous coil coating line, with top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to provide a total dry film thickness of 0.95 to 1.25 mil.
 - a. Bottom side: Coated with primer with a dry film thickness of 0.25 mil.
 - b. Finish: Conform to all tests for adhesion flexibility, and longevity as specified by the Kynar 500 finish supplier.
 - c. Color: Color as selected by Architect.
- B. Bituminous Paint: Acid and alkali resistant type; black color.
- C. Flashing Nails: Aluminum, standard round wire roofing type, with prefinished heads matching color of flashing; of sufficient length to penetrate through roof sheathing.

2.07 MORTAR MIXES

- A. Mortar: One part ASTM C150 Type 1 Portland Cement, 2 parts uniformly graded, clean sand conforming to ASTM C144, and potable water as required to provide workable mix.
 - 1. Plasticizer may be added if required, to assist workability.

2.08 FLASHING FABRICATION

- A. Form flashings to profiles required and as may be indicated on Drawings, and to protect materials from physical damage and shed water.
- B. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
- C. Hem exposed edges of flashings minimum 1/4 inch on underside.
- D. Apply bituminous paint on concealed surfaces of flashings.
- E. Rake and Ridge Flashing: Raised Metal Rake Trim for All Profiles, 1-1/2 inches.
- F. Valley Flashings:
 - 1. No. 26 Gauge (G90) Galvanized 24 inches Flashing.
 - 2. Comply with the TRI Installation Manual, Appendix A for valley flashings.
- G. Wall Trays (Pans) Flashing:
 - 1. No. 26 Gauge (G90) Galvanized minimum 6 inches trough.
 - 2. Comply with the TRI Installation Manual, Appendix A for wall/pan flashings.
- H. Pipe Flashing: No. 26 Gauge (G90) Galvanized deck flashing installed with underlayment.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive tile to verify:
 - 1. Surfaces are uniform, smooth, sound, clean and free of irregularities.
 - 2. Related work penetrating the plane of the roof is completed.
 - a. Roof openings are correctly framed.
 - b. Roof penetrations are in place and flashed to deck surface.
 - 3. Verify that deck is of sufficient thickness to accept fasteners
- B. Do not commence tile installation until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Seal roof deck joints wider than 1/16 inch with deck tape.
- B. Fill knot holes and surface cracks with latex filler at areas of bonded eave protection.
- C. Broom clean deck surfaces.

3.03 INSULATION AND COVER BOARD INSTALLATION

- A. General: Install rigid roof insulation and cover board at metal roof deck areas indicated on Drawings to be installed with rigid insulation above the deck.
- B. Insulation: Install insulation complete and ready for roofing. Verify that insulation will span metal deck flutes.
 - 1. Install insulation in full thickness indicated in a minimum of two layers and to provide a level base for application of insulation cover board. Stagger end joints between rows of each layer. Stagger joints of second layer from joints of previous layer a minimum of 6 inches in each direction. Lay in 48 inches wide courses and in largest pieces possible in order to reduce the number of joints in the finished application.
 - 2. Cut and fit insulation for tight fit between members and penetrations without gaps or voids.
 - 3. Do not install more insulation than can be made water-tight with roofing the same day or start of inclement weather.
 - 4. Insulation shall not be installed so as to bridge across expansion joints or other similar devices.
 - 5. Roofing shall not be applied over wet insulation. Insulation which has become wet after installation shall be removed and replaced with dry material before applying built-up roofing.
 - 6. Secure insulation in place with mechanical fasteners in accordance with the concrete roof tile manufacturer requirements, but not less than minimum fastening to comply with specified Performance Requirements.
- B. Cover Board: Install cover boards over insulation with long joints in continuous straight lines and end joints staggered between rows.
 - 1. Stagger cover board joints from joints of insulation below a minimum of 6 inches in each direction.
 - 2. Loosely butt cover board edges together and fasten to roof deck with pre-applied primer side facing up.

3. Secure cover boards in place with mechanical fasteners or adhesive in accordance with the concrete roof tile manufacturer requirements, but not less than minimum fastening to comply with specified Performance Requirements.
 - a. Install fasteners with plates through the roof board, flush with surface.
 - b. Install roof board parallel to or perpendicular to deck ribs.
 - c. Provide fasteners in quantity and spacing as required for specified wind uplift indicated on General Structural Notes on Structural Drawings.
 - d. Increase fastener density by 50 percent at roof corners and roof perimeter.

3.04 INSTALLATION - UNDERLAYMENT

- A. Install metal drip edges at eaves and rakes prior to installation of underlayment materials
- B. Sweep roof deck clean of loose particles.
- C. Underlayment: Install one (1) layer in shingle fashion placed at right angles to roof pitch according to 2018 IBC requirements for roof pitch and TRI Guide MC 01A, MC 01B and manufacturer's instructions.

3.05 INSTALLATION

- A. Installation – General: Install according to TRI Installation Manual, and manufacturer's written application instructions.
- B. Battens: Install plastic battens in strict accordance with Manufacturer's Instructions with recommended fasteners placed at recommended spacing and located on nail markings.
- C. Roof Layout: Layout according to the TRI Installation Manual, and as indicated on Drawings.
 1. Install field tile in courses beginning at eave working up incline of roof deck.
 2. Install tiles in vertical rows at spacing and exposure in accordance with referenced standards and manufacturer's instructions.
 3. All tiles in contact with cement mortar shall be immersed in water for two minutes before installation.
- D. Fastening:
 1. Apparatus Bays: Install roofing tile with adhesive. No exposed fasteners.
 2. All other Locations as Noted on Drawings: Standard mechanical fasteners.
- E. Vent Pipes: Install according to the TRI Installation Manual, Appendix A for vent pipe flashing.
- F. Eave/Gable: Install according to the TRI Installation Manual, Appendix A for eave/gable flashing installation.
 1. Underlayment Wrapped Gable:
 - a. Extend underlayment beyond rake/gable end. Fold down onto fascia or barge board, minimum of 1 inch. Secure with nails and tin tags, round cap nails or other fasteners 6 inches on center.
 - b. Trim underlayment at fascia or barge board. Install a peel and stick underlayment extending underlayment beyond rake/gable end. Fold down and seal onto fascia or barge board.
- G. Bird stops and starters:
 1. Install birdstops along entire length of all eaves.
 2. Install first course of pan tile leaving a 2 to 3 inch overhang at eave.

- H. Hip and Ridge: Install according to the TRI Installation Manual, Appendix A for hips and ridges, unless otherwise indicated on Drawings.
 - 1. Provide cement mortar or other approved materials at all hips and ridges to completely fill voids and to weatherproof the roof.
 - 2. All hip, ridge and first row of cover tiles after gable roll shall be set in cement mortar and fastened by non-corrosive nails.
- I. Rake: Install according to the TRI Installation Manual, Appendix A for rake installation.
 - 1. Rake Gable Tile:
 - a. Install first rake tile the exposed length of first course of field tile with factory finish of rake tile towards the eave.
 - b. Fasten rake tile with a minimum two 10D nails and /or of sufficient length to penetrate the framing a minimum of 3/4 inch.
 - c. About each succeeding rake tile to the nose of the field tile above and maintain a constant head lap.
- J. Valleys: Install according to the TRI Installation Manual, Appendix A for valley installation.
- K. Side Wall Flashing: Install according to the TRI Installation Manual, Appendix A for side wall flashings.
- L. Strip in metal flashings with self-Adhering, high-temperature, butyl-based flashing membrane.
- M. Head and Apron Flashing: Install according to the TRI Installation Manual, Appendix A for head and apron flashing.
- N. Adhesive Fastening: Refer to the TRI Installation Manual, Appendix B for adhesive fastening.
- O. Visually inspect application from ground level after installing 100 tiles to verify roof tile color is uniform and even, and verify that tile courses are straight and true.
 - 1. Correct and color or installation problems before proceeding with installation.
 - 2. Complete installation to provide weather tight service.

3.06 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

3.07 PROTECTION

- A. Construction Traffic: Protect materials and take precautions to prevent other trades from damaging roof during and after construction. Repair torn or punctured materials before roofing over. Use runways over materials in place.
- B. Waterstopping: At the end of each day's work, the work performed during that day shall be sealed at the edges and well covered to prevent moisture from entering under the material. Contractor shall take necessary precautions during installation to insure that moisture from inclement weather shall be prevented from entering the building where interior finishes are in place and/or building is occupied.

END OF SECTION

SECTION 07 57 13

COATED FOAMED ROOFING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes coated foamed roofing system consisting of rigid insulation board, sprayed-in-place polyurethane foam insulation, acrylic coating, aggregate and cementitious traffic topping roof walkways installed over steel framing and steel roof deck construction.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's literature and technical data (specifications, installation instructions and evidence of UL, ICC, CCRC, "Energy Star" and FMG ratings, as applicable) on foam, protective coating, primer and complete system, including manufacturer's Letter of Certification that their products meet and comply with the materials and intent of the Specification, and manufacturer's application or installation instructions.
- B. Certificates:
 - 1. Submit notarized Contractor/Applicator certification from polyurethane foam supplier and/or protective coatings manufacturers as evidence of Contractor/applicator qualification and experience.
 - 2. Provide manufacturer's certification that products approved are products installed on the Project.
- C. Shop Drawings: Submit shop drawings indicating drainage pattern, slopes, and depth of foam at drain, cants, crickets and other critical locations.
- D. Submit ICC Evaluation Service Report showing compliance with specified requirements, equal to ICC ER-3182.
- E. Submit sample of completed roof system showing surface texture and finished thickness of polyurethane foam, color and thickness of composite roof system products.

1.03 PERFORMANCE REQUIREMENTS

- A. Provide watertight roofing system capable of resisting specified uplift pressures, thermally induced movement and exposure to weather without failing during the specified warranty period.
- B. Factory Mutual: Design roofing system to comply with requirements for Class 1 Fire and minimum Class I-90 windstorm classification or as required by Design Wind Pressures indicated on General Structural Notes on Drawings, whichever is more stringent.
- C. Underwriters Laboratories: Roofing system shall be UL 790 Class A over noncombustible deck and shall conform to ASTM Test Standards, ICC, and FMG requirements.
- D. Insulation and foam shall have Class A flame spread in accordance with ASTM E108.
- E. Constituent material containers shall be UL labeled in accordance with the system UL follow-up service agreement.

1.04 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Foam and Coating Manufacturer Qualifications: 5 years of successful installations on which its products have been used in conjunction with sprayed polyurethane foam roofs.
 - 2. Foam/Coating Contractor Qualifications:
 - a. Prior experience in handling and spraying polyurethane foam of the type specified and possessing a thorough knowledge in the use of the required spray equipment.
 - b. Approved by the protective coating manufacturer for single component systems and shall qualify for manufacturer's 10 year no leak system warranty.
 - 3. Applicator Qualifications: Trained by the polyurethane foam manufacturer with minimum of 5 years experience in spray application of polyurethane foam roofing with at least 500,000 square feet of applied roof coating in satisfactory condition.
 - a. Individual mechanics shall be workers experienced and regularly engaged in the spray application of polyurethane foam in roofing systems.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with manufacturer's instructions.

1.06 PROJECT/SITE CONDITIONS

- A. Neither the acrylic roof coating nor the polyurethane foam shall be applied during periods of inclement weather (rain, snow, fog, mist or high humidity).
- B. Do not apply the polyurethane foam when substrate or ambient air temperatures are below 50°F unless specifically approved in writing by the polyurethane foam manufacturer.
- C. Do not apply the polyurethane foam when the substrate surface is less than 5°F above the dew point.
- D. Do not apply acrylic roof coating when weather conditions will not permit complete cure before rain, dew, fog or freezing temperatures occur. Do not apply in late afternoon if heavy moisture condensation may appear during the night.
- E. When wind speeds exceed 10 miles per hour at the job site, windscreens shall be used during the application of the surface primer, polyurethane foam and acrylic roof coating to prevent overspray onto surfaces not intended to receive foam and coating. Under no circumstances shall the surface primer, polyurethane foam or acrylic roof coating be applied when wind speeds exceed 25 miles per hour.

1.07 WARRANTY

- A. Provide manufacturer's 10 year full system warranty. Written warranty shall include materials and labor required to repair water leaks in the protective coatings system, including auxiliary materials, caused by deterioration resulting from ordinary weather conditions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Rigid Insulation Board:
1. Polyisocyanurate Insulation: Conforming to ASTM C1289. Insulation to have compressive strength greater than 16 psi (ASTM D1621), moisture vapor transmission less than 1 perm (ASTM E96), nominal overall density of 2.0 lbs./cu. ft. (ASTM D1622) and core flame spread of 25 or less (ASTM E84).
 2. Thickness: As indicated on Drawings, or minimum thickness as required to provide R-value indicated on Drawings. Provide additional tapered insulation board formed to provide slope to drains as indicated on Drawings.
 3. Insulation Adhesive: Insulation adhesive shall be a two-part component foam adhesive designed to adhere products using the manufacturers recommended application rates to achieve required wind uplift ratings.
- B. Primer/Sealer: Per manufacturer's specific recommendations. Primer shall be formulated to be airless sprayed and designed expressly to enhance adhesion of urethane foams to the substrates applicable to this project.

- C. Polyurethane Foam Insulation:
1. Basis of Design: BASF Elastospray 81285
 2. The polyurethane foam system must be a two component, Zero-ODP (Ozone Depleting Potential), product.
 3. Physical Property Requirements:

Property	Value	Test Method
Density, sprayed-in-place, pcf, min.	2.8	ASTM D-1622
Compressive Strength, psi, min.	50	ASTM D-1621
Closed-cell Content, percent, min.	>90%	ASTM D-2856
K-Factor, aged, max.	.15(R=6.3/in)	ASTM -518
Dimensional Stability, 28 days, 158°F, 100% R.R., percent volume change, max.	+2.5%	ASTM D-2126
Flame Spread, max.	75	ASTM E-84

4. Approved Manufacturers: Provide sprayed foam insulation products by one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
 - a. BaySystems www.baysystemsspray.com
 - b. BASF www.basf.com
 - c. Gaco Western www.gaco.com
 - d. Pro-Tech Products www.pro-techproducts.com
 - e. SWD Urethane Company www.swdurethane.com

- D. Acrylic Roof Coating:
1. Basis of Design: United Coatings – Diathon.
 2. The acrylic roof coating shall be Energy Star listed, have a Solar Reflective Index value of 107 and meet ASTM D-6083 standards, along with the physical property requirements listed herein.
 3. Typical physical properties per ASTM D-6083:

Property	Method	Result
Initial Tensile Strength (psi)	ASTM D-2370	222
Initial Elongation (%)	ASTM D-2370	135
Wet Adhesion (pli)*	ASTM C-749, D-903	5.7
Tear Resistance (lbf/in)	ASTM D-624	87
1000-hr Accelerated Weathering	ASTM D-4798	No Cracking or Checking
Elongation After Accelerated Weathering (%)	ASTM D-2370	161
Low Temperature Flexibility After Accelerated Weathering	ASTM D-522	Pass
Permeance (perms)	ASTM D-1653	13.98
Water Swelling (%)	ASTM D-471	17.05
Fungi Resistance (zero=No Growth)	ASTM G-21	Zero Rating
Volume Solids (%)	ASTM D-2697	52
Weight Solids (%)	ASTM D-1644	65
Viscosity (KU)	ASTM D-562	101
*Measured Over Sprayed Polyurethane Foam		

4. Color: White, unless otherwise indicated on Drawings or selected by Architect.
 5. Approved Manufacturers: Provide sprayed foam insulation products by one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
 - a. BaySystems www.baysystemsspray.com
 - b. BASF www.basf.com
 - c. Gaco Western www.gaco.com
 - d. Pro-Tech Products www.pro-techproducts.com
 - e. SWD Urethane Company www.swdurethane.com
 - f. United Coatings; Quest Construction Products www.quest-cp.com
- E. Cementitious Traffic Topping and Aggregate (For roof walkways):
1. Basis of Design: United Coatings Traffic Guard with a SRI of 98 minimum. Traffic Topping shall be Energy Star Rated.
 2. Aggregate shall be clean and No. 6 in size.
 3. Color: White, to match acrylic coating, unless otherwise selected by Architect.
- F. Sealant - Basis of Design: United Coatings Roof Mate Buttergrade in a color to best match the topcoat color.
- G. Deck Tape: 4 inch minimum width clear polyester tape as approved by the coated foam roofing manufacturer.
- H. Sheet Metal Flashings: In accordance with Section 07 60 00.

2.02 EQUIPMENT

- A. Polyurethane foam shall be applied using proportioning equipment which provides thermostatically controlled material temperatures as recommended by the foam manufacturer.
 - 1. Hoses between the proportioner and spray gun shall be temperature controlled.
 - 2. Contractor shall not change the formulation ratio of the spray equipment.
 - 3. Contractor shall not be allowed to use a refrigerant injection system.
 - 4. When cleaning or servicing spray gun, exercise extreme care so as not to contaminate roof surface with solvents.
- B. Other Equipment: Contractor shall have at all times in close proximity to the spraying operation sufficient buckets to counteract equipment problems without depositing defective material on the deck or on the site.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect.
 - 1. Prior to the application of roofing materials, the Contractor shall examine the roof deck, flashings, and other surfaces that are to receive roofing materials to ensure that surfaces are true, even, clean, dry, and free of dust, dirt, debris, oil, solvents and all material that may adversely affect the adhesion of the surface primer, polyurethane foam or acrylic coating.
 - 2. All penetrations through roofing including drains, scuppers, miscellaneous pipe and vent penetrations, and electrical conduits shall be completed prior to the starting of work.
 - 3. The Contractor shall report in writing to the Owner anything or condition not to the Contractor's satisfaction prior to proceeding with the work of this section.
 - 4. Application of roofing material shall constitute the roofing Contractor's acceptance of surfaces and flashings to receive the materials.
- B. Commencement of Work will be construed as acceptance of subsurfaces.
- C. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 SURFACE PREPARATION

- A. General Area:
 - 1. Notify construction personnel on site and visitors and protect adjacent construction of fugitive overspray.
 - 2. Cars, etc., shall be moved or covered to prevent inadvertent spraying. Contractor shall coordinate subcontractor traffic during roof operations.
 - 3. Provide barricades as required and place them in a way to be in an adequate and sufficient number so that there is no doubt that the area is completely barricaded off.
 - 4. Use appropriate barricading methods to shelter walking traffic from the work area's equipment and overspray.
 - 5. Any damage caused during this construction process shall be restored to pre-project condition or replaced at the Contractor's expense.

6. Provide protective covering as needed to protect building walls, adjacent structures and vegetation, etc., from the effects of the spraying process.
7. When work is finished, no evidence of re-roofing work shall be visible from the ground level, other than the work on the roofing plane.

B. Roof Deck Surface Preparation:

1. General:
 - a. Free from dust, loose and foreign materials. Provide a clean and smooth surface ready for installation.
 - b. Surface shall be dry before commencement of roofing application.
 - c. Deck shall be kept clean and free of loose and foreign material other than tools and equipment of the roofer.
 - d. Metal surfaces shall be free of moisture, rust, dirt and other foreign materials.
 - e. Oils or other foreign materials, attached to the roof decking that prevent satisfactory adhesion, shall be cleaned for the deck.
2. Wood Surfaces:
 - a. Plywood substrates shall be exterior grade not less than 15/32 inches thick, exterior grade or Exposure 1 plywood. All plywood edges must be supported by blocking or have tongue and groove joints as required by IBC Section 2603.4.1.5. Attachment must meet building code requirements for resistance to wind uplift. Deflections should not exceed 1/240 of the span.
 - b. The plywood shall contain no more the 18 percent moisture by weight, as measured in accordance with ASTM D2016.
 - c. All untreated and unpainted surfaces shall be primed with an appropriate, approved primer to minimize moisture absorption and aid in the polyurethane foam adhesion.
 - d. Any joints greater than 1/4 inch shall be caulked or taped prior to the polyurethane foam application.
 - e. Remove all loose dirt, dust and debris using air pressure, a hand or power broom and/ or a vacuum. Power washing is not recommended as it may introduce water into the substrate. Oil, grease and other contaminants must be removed using appropriate cleaning solution.
 - f. Make sure all surfaces are clean and dry prior to polyurethane foam application.
3. Other Surfaces: Contact manufacturer's technical service department for recommendations of surface preparations on other surfaces to receive the acrylic/polyurethane foam roof system.

3.03 INSTALLATION — SURFACE PRIMER

- A. Application: Where required by spray foam manufacturer, apply surface primer to substrate.
1. Apply the surface primer in strict accordance with the manufacturer's application instructions.
 2. Confirm primer is cured before installing polyurethane foam insulation.

3.04 RIGID BOARD INSULATION

- A. Insulation:
1. Install rigid insulation to minimum thickness indicated on Drawings or minimum thickness as required to achieve the R-value scheduled on Drawings, and as required to provide positive drainage to roof drains (where this option is selected to form crickets).

2. Insulation is to be fastened to the substrate with 2 part component foam adhesive to meet Factory Mutual wind uplift criteria or the appropriate local building code criteria.
3. Boards shall be firmly butted together along edges without gaps or openings. Joints exceeding 1/8 inch shall be caulked with a sealant material acceptable to foam manufacturer.
4. Fire/Windstorm Classification: Class 1A-90 for the field of the roof. The perimeters and corners are to have increased wind uplift resistance as required by FM Global Data Sheet 1-28.

3.05 POLYURETHANE FOAM APPLICATION

A. Application:

1. Apply the polyurethane foam in accordance with the polyurethane foam manufacturer's specifications and application instructions, using spray equipment recommended by the foam manufacturer.
2. Thickness: Total thickness of the polyurethane foam shall be not less than 2 inches, with total thickness, including rigid insulation board, to achieve R-values scheduled on Drawings for various locations. Provide additional thickness as required to achieve slope to drains and where tapering is required to facilitate drainage as indicated on Drawings.
3. Apply the full thickness of polyurethane foam in any area on the same day. Phasing of the polyurethane foam is not acceptable.
4. Polyurethane foam shall be applied to ensure proper drainage resulting in no ponding water. Ponding water is defined as "an area of 100 square feet or more which holds in excess of 1/2 inch of water as measured 24 hours after rainfall."
5. The polyurethane foam shall be terminated neatly a minimum of four inches above the finished roof surface at roof penetrations. Foamed-in-place cants shall be applied to allow a smooth transition from the horizontal to vertical surface. Crickets shall be constructed of spray applied polyurethane insulation. The finished polyurethane foam surface texture shall be smooth to orange-peel, free of voids, pinholes and depressions. Verge of popcorn texture is acceptable if it can be thoroughly and completely coated. Popcorn and tree bark textures are not acceptable. Unacceptable foam textures shall be removed and refoamed prior to coating application.

B. Cants and Crickets

1. The required drainage slope gradients shall be as are required to meet the various drainage sources.
2. Cants shall be formed with the spray polyurethane foam, as it transitions from the deck surface up the parapet wall.
3. Crickets may be constructed as follows, at Contractors option:
 - a. With the spray polyurethane foam (within certain sloping requirements). If it is required that the crickets are to be constructed out of polyurethane foam, the details shall be indicated on the Drawings or approved shop drawings to indicate the depth of foam required at the high points and the required drainage slope gradients to the various drainage sources.
 - b. Using tapered insulation board secured to the substrate with an adhesive recommended by the tapered board manufacturer or mechanically fastened. The crickets shall be covered with 2 inches of sprayed polyurethane and the specified coating.

C. Parapets

1. The polyurethane foam shall extend up parapets to the coping cap as indicated on the Drawings.

2. If it is required that the polyurethane extend up to the top of the parapet wall, then the vertical substrate must be fastened in an acceptable manner for wind shear resistance. Foam is to be terminated, via straight line and tapered foam or optional sheet metal flashing that is acceptable to Architect.

3.05 ACRYLIC ROOF COATING, AGGREGATE & TRAFFIC WALKWAY TOPPING APPLICATION

A. Inspection:

1. The polyurethane foam surface shall be free of dust, dirt, debris and other contaminants that would impair the adhesion of the acrylic coating.
2. The polyurethane foam surface must be dry prior to the acrylic coating application.
3. If more than 24 hours elapse between the polyurethane foam application and the start of the acrylic coating application, the coating manufacturer shall thoroughly inspect the polyurethane foam surface for UV degradation and oxidation. If this condition is detected, the polyurethane foam surface shall be mechanically scarified, cleaned, primed and refoamed with 1/2 inch minimum thickness prior to the acrylic basecoat application.
4. Make sure all environmental conditions of Section 1.06 are met prior to acrylic coating application.

B. Application:

1. The acrylic roof coating basecoat shall be applied on the same day as the polyurethane foam application, after the polyurethane foam has been allowed to cure a minimum of one hour and in no case more than 24 hours after the installation of the polyurethane insulation.
2. Apply acrylic roof coating basecoat in a uniform application at 1.5 gallons per 100 square feet or as is required to achieve a dry film thickness of 12 mils.
3. The basecoat shall not be subjected to foot traffic or be disturbed until it is cured.
4. After the basecoat has cured, inspect the coating for pinholes, cracks, thin areas or other deviations. All deviations observed shall be caulked with buttergrade sealant and/or roller coated with additional acrylic roof coating prior to applying subsequent coats.
5. The basecoat must be cured, clean and free of all moisture prior to application of the topcoat. The topcoat shall be installed at 1.5 gallons per 100 square feet or as is required to achieve a 12 dry mil thickness. Total coating system thickness on horizontal surfaces shall be 24 dry mils.
6. Topcoat shall be Energy Star approved color as selected by Architect to comply with required Solar Reflective Index. Install a third coat minimum on all vertical surfaces to receive foam and/or coating at 12 dry mils. The total coating thickness on vertical surfaces shall be 36.
7. The acrylic roof coating shall be applied a minimum of two inches beyond all the terminated edges of the polyurethane foam. These terminations should be masked to provide a neat finished appearance.
8. It is the contractor's responsibility to ensure the minimum total dry film thickness specified is achieved throughout the entire roof area.
9. Broadcast No. 6 aggregate into the wet acrylic roof coating topcoat on horizontal roof surfaces at the application rate of 65 lbs. per 100 square feet. Hold back aggregate application one foot from perimeter roof edges, drains and scuppers.

- C. Cementitious Walkway Traffic Topping and Aggregate: Once the acrylic topcoat has fully cured, install walkway cementitious traffic topping into the No. 6 aggregate at an average rate of 1/4 inch to provide a tough reflective final surface. Hold back cementitious application one foot from perimeter roof edged, drains and scuppers. Do not install cementitious material on vertical surfaces.

3.06 FIELD QUALITY CONTROL

- A. Inspections by Roofing Manufacturer's Representative:
 - 1. The manufacturer's representative for the materials used on this project shall make inspections as outlined by the manufacturer as required to provide the specified warranty.
 - 2. In addition to the inspections required for the warranty, the following inspections shall be required:
 - a. Preliminary deck inspection.
 - b. One unannounced spot inspection.
 - c. Final inspection.

- B. Core Sampling:
 - 1. The Owner reserves the right to take core samples to determine if the polyurethane foam meets the minimum density as specified and is properly bonded to the substrate.
 - 2. Location of core samples shall be as directed by the Owner.
 - 3. Core samples, if required, shall be cut by the Contractor prior to application of the protective coating and after exothermic heat is gone.
 - 4. Costs associated with the cutting of core samples, and repairs of cut-out sections shall be borne by the Contractor.
 - 5. Costs associated with testing the in-place density shall be paid for by the Owner. Tests shall be performed by an independent laboratory in accordance with ASTM D1622.

3.07 CLEANING

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 07 60 00
FLASHING AND SHEET METAL

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Flashings, sheet metal work and related items including, but not limited to:
 - 1. Counterflashing at vertical surfaces.
 - 2. Flashing at roof penetrations.
 - 3. Edge flashing.
 - 4. Sheet metal gutters and downspouts.
 - 5. Factory fabricated and finished coping system.
 - 6. Prefinished aluminum eave, rake and fascia covering and trim.
 - 7. Installation of self-adhering waterproofing underlayment under copings, wall caps and sills.

- B. Related Sections:
 - 1. Section 07 32 16 – Concrete Roofing Tiles, for flashing and trim associated with concrete roof tile.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings indicating type of material, gauge, dimensions, profiles, locations where used, fastening and anchoring methods, joints, and provisions of expansion and contraction.

- B. Samples: Submit samples of each type of prefinished metal in selected color.

- C. Submit manufacturer's Product Data for factory fabricated coping system. Include information for materials, finishes and written installation guide and recommendations.

1.03 QUALITY ASSURANCE

- A. Standards:
 - 1. Comply with design and installation methods of SMACNA Architectural Sheet Metal Manual.
 - 2. Comply with The NRCA Roofing and Waterproofing Manual installation details.
 - 3. Comply with current issue of ANSI/SPRI, ES I.
 - 4. 2018 IBC.

- B. Factory fabricated coping system work shall be performed by the roofing contractor as an integral part of roofing system assembly and warranty.

- C. Performance Requirements:
 - 1. Sheet metal flashing and trim shall be designed and installed in accordance to Referenced Standards and to withstand Wind Zone 2 wind pressures in compliance with FMG Loss Prevention Data Sheet 1-49.
 - 2. Designed and installed to withstand wind pressures in compliance with ANSI/SPRI, ES I-98, or FMG Loss Prevention Data Sheet 1-49 for Class 1-90 wind rated design, or wind load design criteria indicated on General Structural notes on Drawings, whichever is greater.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site. Do not store materials on ground.
- C. Handling: Comply with Manufacturer's instructions. Handle with care so as not to buckle or warp metal, or damage solder joints.

1.05 PROJECT CONDITIONS

- A. Factory Fabricated Coping System:
 - 1. Verify that other trades with related work are complete before mounting coping covers.
 - 2. Mounting surfaces shall be straight and secure; substrates shall be of proper width.
 - 3. Refer to the construction documents, shop drawings and manufacturer's installation instructions.
 - 4. Coordinate installation with roof membrane manufacturer's installation instructions before starting.

1.06 WARRANTY

- A. Sheet Metal Flashing and Trim: Furnish 5 year warranty against flashing and sheet metal failure, in which contractor agrees to repair or replace flashing and sheet metal as necessary to maintain work in watertight condition during the warranty period. Warranty to cover workmanship, materials and repair or replacement of same, at no cost to Owner.
- B. Factory Fabricated Coping System: The system shall be warranted to perform over the term of the specified roofing system warranty and shall be warranted to not blow off or cause membrane failure, even in wind conditions up to 110 mph or the manufacturer shall replace or repair their materials. A 20 year standard Kynar/Hylar finish warranty shall also be included. Supplied and installed by roofing contractor as part of overall roofing system warranty.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Prefinished Metal:
 - 1. Hot-dipped galvanized, ASTM A653 Structural Quality, Grade 40, G90 coating 24 gauge core steel, or prefinished Galvalume - ASTM A792.
 - 2. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14.
 - 3. Finish: Full strength Kynar 500/Hylar 5000 Fluorocarbon coating, applied by the Manufacturer on a continuous coil coating line, with top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to provide a total dry film thickness of 0.95 to 1.25 mil.
 - a. Bottom side: Coated with primer with a dry film thickness of 0.25 mil.
 - b. Finish: Conform to all tests for adhesion flexibility, and longevity as specified by the Kynar 500 finish supplier.
 - c. Color: Custom color as selected by Architect.

4. Strippable film: Liquid applied to top side of painted coil to protect finish during fabrication, shipping and field handling.
- B. Galvanized Steel: ASTM A653, 24 gauge minimum and as indicated, with G-60 coating. Used for sheet metal flashing and trim at concealed from view locations and concealed clips and reinforcements only.

2.02 ACCESSORIES

- A. Reglets and Counterflashings: Fry Reglet Corporation, Type SM at masonry and Concrete, or fabricated as indicated on Drawings. Provide prefabricated inside and outside reglet and counterflashing corners.
- B. Solder: ASTM B32, 50/50 type.
- C. Flux: FS O-F-506.
- D. Sealant: As specified in Section 07 92 00.
- E. Plastic Cement: ASTM D4586.
- F. Bituminous Coating: FS TT-C-494 or SSPC paint - 12, dry film 15 mils per coat.
- G. Sheet Metal Fasteners: Galvanized steel with soft neoprene washers at exposed fasteners.
- H. Self-Adhering Waterproofing Underlayment:
 1. High-temp resistant, flexible, self-adhering rubberized asphalt sheet membrane underlayment with polymer film and removable treated release film on adhesive side; TAMKO TW Underlayment www.tamko.com
 2. High-temperature resistant, flexible, self-adhering butyl-based sheet membrane underlayment with high density cross laminated polyethylene backed and removable plastic release film on adhesive side, self-adhering flashing membrane, Grace Ultra or equivalent www.grace.com/construction/en-us.
- I. Prefinished Metal Seam Sealers and Adhesives: As recommended by prefinished metal manufacturer for waterproof and weather-resistant seaming and adhesive applications of flashing and sheet metal work.
 1. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, nonstaining tape.
 2. Butyl Sealant: ASTM C1311, single-compound, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

2.03 FACTORY FABRICATED COPING SYSTEM

- A. Acceptable Manufacturers: Provide factory fabricated coping system from one of the following Manufacturers, except as approved otherwise by the Architect, subject to compliance with specifications requirements:
 1. ATAS Aluminum Corp., Allentown, PA. www.atas.com
 2. Carlisle Syn Tec www.carlisle-syntec.com
 3. Metal-Era Inc. www.metalera.com
 4. W.P. Hickman www.wph.com

- B. Parapet Coping System:
1. Coping: Metal coping cap with anchor/support cleats for capping any parapet wall. The system shall be maintenance free and does not require exposed fasteners. Joints shall be a butt type with concealed splice plates.
 2. Performance Characteristics:
 - a. Coping sections shall expand and contract freely while locked in place on anchor cleats.
 - b. Coping sections shall lock to anchor cleats by mechanical pressure from hardened stainless steel springs factory attached to anchor cleats.
 - c. Splice plates include factory applied dual non-curing sealant strips capable of providing a watertight seal.
 3. Metal Type and Gauge:
 - a. Prefinished metal as specified.
 - b. 24 gauge, but not less than gauge that will perform per local wind zone conditions and recommended for use by the manufacturer for this project.
 4. Coping Cap: Max. Length of 12'-0", widths to 24 inches manufactured to job requirements.
 5. Coping vertical face and back leg: 2-1/2 inches to 12-1/2 inches manufactured to job requirements.
 6. Concealed splice plates: Finished to match finish of coping cap with factory applied dual noncuring sealant strips.
 7. Anchor/Support Cleat: Cleat with stainless steel spring mechanically locked to cleat normally 12 inches wide at 6'-0" on center; mechanically fastened as indicated and detailed.
 8. Fasteners: Shall provide a minimum pull out resistance of 240# per substrate application. No exposed fasteners shall be permitted. Fasteners shall be electrolytically compatible.
 9. Accessories:
 - a. Corners, end caps, pier caps, etc. shall be fabricated by the coping manufacturer.
 - b. Welded or quicklock assembly shall be used to maintain watertight integrity.

2.04 FABRICATION

- A. Fabricate Flashing and sheet metal from the following:
1. Fabricate flashing and sheet metal exposed to view in the finished work, including wall caps/coping), fascia, drip edges, etc., from prefinished metal sheet.
 2. Fabricate flashing and sheet metal concealed from view in the finished work from galvanized steel.
- B. Fabricate gutters and downspouts in accordance with the following Figure(s) and Table(s) from the SMACNA Architectural Sheet Metal Manual and as indicated on drawings. Fabricate gutters by extrusion roll-forming from prefinished metal sheet to profile indicated on Drawings or as otherwise approved by Architect.
1. Gutters: Figures 1-1 through 1-24D and Tables 1-5, 1-7 and 1-8, as applicable to design indicated.
 2. Downspouts: Figures 1-31 through 1-36 and Table 1-9, as applicable to design indicated.
- C. Fabricate sheet metal flashing, fascia, and trim with lines, arris, and angles sharp and true, and plane surfaces free from objectionable wave, warp or buckle. Form accurate to details.
1. Fabricate flashings as indicated on Drawings. Return and brake edges.

2. Hem exposed edges to form a 1/2 inch wide hem on the side concealed from view.
 3. Provide concealed stiffeners and reinforcements as necessary to provide surfaces free of objectionable wave, warp or buckle.
 4. Profiles, bends, and intersections shall be even and true to line.
 5. Provide hold-down clips for large cap flashings as necessary to comply with performance requirements.
- D. Forming, anchoring, expansion and contraction details shall conform to referenced quality standards.
- E. Provide for thermal expansion of running trim, flashing, expansion joints, and other items exposed for more than 15 feet continuous length.
- F. Fabricate cleats and starter strips of same material as sheet.
- G. Form pieces in longest practical lengths, except form flashing and fascia in 8 to 10 foot units.
- H. Solder and seal metal joints or use seam sealer/adhesive as recommended by prefinished metal manufacturer. After soldering, remove flux. Wipe and wash solder joints clean.
- I. Fabricate corners from one piece with minimum 18 inch long legs, with mitered corners; solder for rigidity, seal with sealant.
- J. Where prefabricated counterflashing and reglet system is used, form upper edge of counterflashing with an approved snap lock flange to engage reglet receiver and to provide a spring action at bottom edge against built-up flashing.

2.04 FINISH

- A. Shop prepare and prime exposed ferrous metal surfaces of unfinished galvanized steel sheet.
- B. Backpaint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 1.5 mil.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
 1. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.
 2. Verify membrane termination and base flashings are in place, sealed, and secure.
 3. Verify substrate is dry, clean and free of foreign matter.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.
- C. Correct defects prior to installation.

3.02 INSTALLATION

- A. Installation shall conform to NRCA and SMACNA manuals.
 - 1. Slope to provide positive drainage.
 - 2. Provide sufficient hold-down clips to insure true alignment and security against wind.
 - 3. Install with 4 inch minimum overlap.
 - 4. Bed overlap joints in appropriate sealant as specified in Section 07 92 00.
 - 5. Form and lap step flashings.
 - 6. Allow sufficient tolerances for expansion and contraction.
 - 7. Insulate work to prevent electrolytic action.

- B. Self-Adhering Waterproofing Underlayment: Install self-adhering waterproofing underlayment under copings, wall caps, and similar horizontal locations.
 - 1. Install waterproofing underlayment in widths to cover top of wall or horizontal surface being installed. Extend underlayment down each side of wall as detailed on Drawings.
 - 2. Waterproofing membrane shall be completely concealed by metal coping.
 - 3. Make end laps 4 inches minimum. Where width of wall requires multiples widths of waterproofing underlayment, make side laps 4 inches minimum.
 - 4. Install coping and wall caps over installed waterproofing underlayment.

- C. Expansion Seams: Maintain a watertight installation at expansion seams. Locate expansion seams as shown or if not shown, at the following maximum spacing for each general flashing use:
 - 1. Flashing, expansion joints, gravel stops, and trim: At 10 foot intervals, 24 inches on each side of corners and intersections.
 - 2. Sealant-type expansion joints: Where sealant-filled expansion joints are used, embed the hooked flanges of the joint members not less than 1 inch into the sealant. Form joints to completely conceal the sealant. When ambient temperature is moderate at the time of installation (40 to 70 degrees F.), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant type joints at temperatures below 40 degrees F. Installation of sealant is specified in Section 07 92 00.

- D. Where dissimilar materials abut, provide proper separation or protection to minimize the possibility of galvanic action.

- E. Soldering:
 - 1. Solder joints at corner fabrications.
 - 2. Except where other methods of joining are indicated or specified, solder joints and connections of Sheet Metal Work.
 - 3. Remove grease and dirt from metal surfaces to be joined.
 - 4. Remove flux residue by scrubbing, neutralizing with ammonia or a 5 to 10 percent solution of washing soda, followed by a clear water rinse.
 - 5. Assemble parts and solder using regular non-corrosive resin flux. Heat metal thoroughly to completely sweat solder through full contact area.

- F. Sealed Joints: Form nonexpansion, but movable joints in metal with flat lapped seams to accommodate elastomeric sealant to comply with SMACNA Standards. Fill joint with sealant and form metal to completely conceal sealant.
 - 1. Seal joints at copings and at other movable, non-expansion type joints.

- G. Reglets: Install reglets in masonry, concrete or stucco to receive flashings.

- H. Counterflashing:
 - 1. Provide metal counterflashing at top edges of built-up base flashings and at other locations indicated.
 - 2. Lap end joints a minimum of 3 inches. Do not solder or weld joints. Make flashing continuous at angles. Counterflashing shall overlap base flashing a minimum of 4 inches, unless otherwise indicated.
 - 3. Where counterflashing terminates in reglets, fasten flashing with lead wedges every 12 inches. Fill reglets continuously with synthetic rubber type sealant.

- I. Factory Fabricated Coping System: Cover top of parapet walls with prefinished metal coping formed to design shown.
 - 1. Verify as-built conditions the manufacturer's coping and edge details for accuracy to fit the wall assembly prior to fabrication. Comply with the coping manufacturer's installation guide when setting copings.
 - 2. Coordinate installation of sheet metal coping with installation of self-adhering waterproofing underlayment placed over wall caps and copings. Waterproofing membrane shall be completely concealed by metal coping.
 - 3. Use mechanical fasteners with minimum 240# pull out resistance for parapet substrates.
 - 4. Where flashing is indicated at back of wall or parapet where coping/wall cap is installed, join rear edge of coping covering to adjacent flashings as indicated.

3.03 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 07 72 00

ROOF ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Roof hatches.
 - 2. Pop-up safety posts for roof hatches.
 - 3. Roof curbs and equipment supports.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's Specifications, design data and installation instructions.
- B. Shop Drawings: Submit Drawings showing layout, dimensions and construction details.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.04 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions shown on Drawings by taking field measurements; proper fit and attachment of parts is required.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as otherwise approved by the Architect, subject to compliance with Specifications requirements:
 - 1. Roof Hatches and Ladder Safety Posts:
 - a. Bilco Co. www.bilco.com
 - b. Bristolite www.bristolite.com
 - c. Babcock-Davis www.babcockdavis.com
 - d. Activar Inc. Construction Products Group, J.L. Industries Products www.activarcp.com
 - e. Nystrom Building Products www.nystrom.com
 - 2. Roof Curbs and Equipment Supports:
 - a. AES Inc., Yerington, NV www.aescurb.com
 - b. Pate Co., Lombard, IL www.patecurbs.com
 - c. Roof Products, Inc., Phoenix, AZ www.rpicurbs.com
 - d. Roof Products & Systems, Bensenville, IL www.rpscurs.com

2.02 MANUFACTURED UNITS

- A. Roof Hatch: Galvanized steel, 14 gauge cover and curb, 22 gauge cover liner. 1 inch thick rigid insulation in curb and cover, 12 inch high curb.
 - 1. Size(s): Provide roof access hatch of size indicated on Drawings, based on the following products as manufactured by Bilco www.bilco.com:
 - a. 36 x 30 inches for ladder access: Bilco Type S-20.
 - 2. Provide heavy-duty slam-type latching mechanism with heavy-duty padlock hasp.
 - 3. Provide vandal resistant features as available.
 - 4. Finish: Powder coat; standard color as selected.
- B. Curbs: Pate Style pc-1b, or equivalent from one of the specified manufacturers, box section design, heavy gauge galvanized steel construction, continuous mitered and welded corner seams, integral base plate, factory installed wood nailer, and insulated with 1-1/2 inch thick rigid fiberglass board insulation.
- C. Equipment Supports: Pate Style es-1, or equivalent from one of the specified manufacturers, monolithic construction, heavy gauge galvanized steel, continuous mitered and welded corner seams, integral base plate, factory installed 2 inch x 4 inch wood nailer, and heavy gauge galvanized steel counterflashing.
- D. Pipe Curb Assemblies: Pate Style pca-1, or equivalent from one of the specified manufacturers, with curb constructed of heavy gauge galvanized steel with continuous welded corner seams, factory installed wood nailer insulated with 1-1/2 inch thick rigid fiberglass board insulation, cover of acrylic clad ABS thermoplastic, including graduated step PVC, boots, adjustable stainless steel clamps and cap fastening screws. Each assembly shall include curb, cap, boots and clamps. See Drawings for size and quantity of pipe penetrations.
- E. Ladder extension (for roof hatches): Bilco Model 1 LadderUP safety post, or Bristolite Grab Bar.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Install roof specialties at locations shown or required in accordance with Manufacturer's instructions and as detailed on Drawings.
- B. Install roof hatches, equipment supports and bases, curbs and curb assemblies, at locations indicated, fastening securely to deck through curb flange.

3.03 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes firestopping as shown on Drawings and as specified herein.
- B. Related Sections:
 - 1. Section 07 21 00 – Building Insulation, for fire safing insulation.

1.02 SYSTEM DESCRIPTION

- A. Provide UL Classified or Warnock Hersey Listed firestopping system to prevent the spread of fire, smoke and gasses through penetrations in fire resistive walls, including; but not limited to; the following areas:
 - 1. Unprotected openings and openings accommodating penetrating items such as cables, cable trays, pipes, ducts, boxes and conduits through fire rated walls.
 - 2. Head of wall openings between wall and connecting floor or roof deck assemblies.
 - a. Meet requirements for exposure to hose stream test.
 - b. Applicable for use with steel fluted deck floor assemblies.
 - b. Allow deflection of floor or roof above.
- B. Firestop systems shall not be intended to support live loads and traffic unless specifically approved by Testing Agency.
- C. Firestop systems shall be approved by Code Authority.
- D. Firestop products shall remain flexible where subject to movement without affecting the integrity of the product.

1.03 SUBMITTALS

- A. Product Data: Submit Manufacturer's Specifications, performance criteria, Drawings and instructions.
- B. Shop Drawings: Submit Manufacturer's complete Shop Drawings showing proposed material, reinforcement, anchorage, fastenings method of installation and UL or Warnock Hersey listing number.
- C. Test Reports: Submit UL or Warnock Hersey test report description for firestopping system.
- D. Provide certificate of compliance from authority having jurisdiction indicating approval of firestop systems.

1.04 QUALITY ASSURANCE

- A. Qualifications: Applicator with minimum of 5 years experience and approved by the materials manufacturer.

- B. Regulatory Requirements: Conform to applicable code for fire resistance ratings and surface burning characteristics:
 - 1. ASTM E 136, ASTM E 119 and ASTM E 814, as applicable.
 - 2. UL 1479 fire test to achieve required fire-rating as noted on Drawings.
 - 3. Listing:
 - a. UL Fire Resistance Directory (current edition).
 - b. WH International Listings
 - 4. UL 2079, "Test for Fire Resistance of Building Joint Systems."
- C. Pre-Installation Conference:
 - 1. Convene a pre-installation conference to review specifications and procedures with the Architect, Contractor, installer, manufacturer's representative, Owner and other trades relevant to the work, prior to ordering materials.
 - 2. Notify Architect at least 48 hours prior to starting Work.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish firestop systems acceptable to governing Code Authority from one of the following Manufacturers, subject to compliance with Specification requirements:
 - 1. U.S. Gypsum Co. www.usg.com
 - 2. Johns-Manville www.jm.com or www.jmfirestopping.com
 - 3. Tremco, Inc. www.tremcosealants.com or www.tremcofirestop.com
 - 4. RectorSeal Corporation www.rectorseal.com
 - 5. 3M Fire Protection Products www.3m.com
 - 6. Specified Technologies, Inc. www.stifirestop.com
 - 7. HILTI Firestop Systems www.hilti.com
 - 8. Nelson Firestop Products www.nelsonfirestop.com
 - 9. Grace Construction Products – Flamesafe www.grace.com

2.02 MATERIALS

- A. Firestop System Materials - General:
 - 1. Appropriate for penetration.
 - 2. Include every component required for code approved installation, including; but not limited to:
 - a. Firestopping putties or compound.
 - b. Backing material.
 - c. Wrap strips.
 - d. Primers, clips and collars.
 - e. Forming and damming materials.
 - f. Cleaners.
 - g. Sealant and fireblock
 - h. Firestop devices.

- B. Properties:
1. Free of asbestos, halogens and volatile components after curing and shall not slump or sag, (except for self-leveling products).
 2. Capable of maintaining an effective barrier against flames, heat and smoke in compliance with IBC requirements and the requirements of ASTM E814 and UL 1479 using the “F” or “T” rating to maintain the same rating and integrity as the fire barrier being sealed.
 3. Non-combustible per ASTM E 136.
 4. UV resistant where exposed to sunlight.
 5. Water resistant where exposed to moisture.
 6. Firestop system shall accommodate movement without adversely affecting fire rating of wall/floor assembly.
 7. Shrink resistant.
 8. Paintable or capable of receiving finish materials in those areas which are exposed to view and which are scheduled to receive finishes.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.
- B. Remove incompatible materials which affect bond.
- C. Install backing materials to arrest liquid material leakage, if required.

3.03 INSTALLATION

- A. Installation shall conform to requirements of qualified designs or manufacturer approved modifications as supported by engineering reports, and shall be approved and accepted by the authority having jurisdiction.
1. Apply primer and firestop materials in accordance with Manufacturer's instructions and in accordance with the appropriate UL Fire Resistance Directory or with the appropriate Warnock Hersey International Listing.
 2. Apply firestopping material in sufficient thickness to achieve rating, to ensure against the passage of flames, smoke and toxic gases, and to a uniform density and texture.
 3. Protect materials from damage on surface subjected to traffic and install cover plates as required on firestop system that will or may be subject to traffic.
 4. Tool surfaces of firestop products to provide a smooth and clean appearance.
- B. Provide firestopping for conditions specified whether or not firestopping is indicated, and, if indicated, whether such material is designated as insulation, safing or otherwise. Insulation types specified in other sections shall not be installed in lieu of firestopping materials.

- C. Interior Walls and Partitions:
 - 1. Construction joints between top of fire rated walls and underside of floors or roof above shall be firestopped.
 - 2. Firestop systems installed shall have been tested by either UL or Warnock Hersey, including exposure to hose stream test and including test for use with steel fluted deck floor assemblies.
 - 3. Firestop system used shall allow for deflection of floor or roof above.

- D. Penetrations:
 - 1. Penetrations include conduit, cable, wire, pipe, duct or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.
 - 2. Provide firestopping to fill spaces in accordance with ASTM E 814 (UL 1479) where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, except at floors on grade.
 - 3. Requirements for penetrations shall apply whether or not sleeves have been provided. Firestop the annular space between sleeve and surrounding surfaces.

3.04 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 07 92 00

JOINT SEALERS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Joints sealants and installation accessories.
- B. Related Sections:
 - 1. Section 07 84 00 – Firestopping, for sealants at fire penetrations.

1.02 SUBMITTALS

- A. Product Data:
 - 1. Submit Manufacturer's current specifications and recommended installation procedures.
 - 2. Submit sample warranty to be signed jointly by applicator and Manufacturer.
 - 3. Submit Manufacturer's standard color chart.
 - 4. Certification in the form of standard data sheet or letter that each type of compound and sealant to be furnished complies with these specifications.
 - 5. Statement that each product to be furnished is recommended for the application shown for this project.
 - 6. Complete instructions for handling, storage, mixing, priming, installation, curing and protection of each type of sealant.
- B. Shop Drawings: Illustrations in sufficient detail to show installation and interface of the work of this Section with the work of adjacent trades.
- C. Field Adhesion Test and Stain Reports: Submit copies of logs and test reports showing results of field adhesion testing and stain testing.
- D. Submit three (3) samples of each specified product, 12-inch minimum lengths, and installed between representative samples of materials to be sealed for each product. Architect's acceptance will be for color only.
- E. Certifications: Submit certification signed jointly by Contractor and Sealant Manufacturer, certifying that products comply with specification requirements, are proper and adequate for the condition of installation and use, have been properly selected and designed for applications where they are to be installed, and that sealants and accessory materials have been installed in accordance with Manufacturer's printed instructions and recommendations of Manufacturer's field representative.
- F. Provide a procedure detailing the cleaning, priming, taping, tooling and other steps recommended to ensure satisfactory function and appearance.
- G. Contract Closeout: Submit Manufacturer's Warranty.

1.03 QUALITY ASSURANCE

- A. Qualifications: Installers shall be thoroughly trained and experienced in the necessary skills and shall be thoroughly familiar with the specified requirements.

- B. Field Adhesion Testing: Perform preconstruction adhesion testing for each type of sealant and substrate as follows:
1. Arrange for Manufacturer's field technical representative to be present during testing.
 2. Install sealant in test joints in minimum 60-inch lengths.
 3. Test joints by standard field adhesion hand pull test.
 4. For joints with dissimilar substrates, test adhesion to each substrate separately as recommended by sealant Manufacturer.
 5. Conduct number of field adhesion tests for each type of sealant and each type of substrate as follows:
 - a. Not less than 10 tests for the first 1,000 feet of installed sealant and 1 test for each additional 1,000 feet of sealant installed, or 1 test per floor per elevation.
 6. Document results of field adhesion tests and record results in field adhesion test log.
 7. Include in log data on pull distance used to test each joint sealant.
 8. Include data on joints where material connected with pull portion of sealant failed to adhere to joint substrate or tore cohesively.
 9. Inspect joints and record data for the following:
 - a. Complete fill.
 - b. No voids.
 - c. Joint dimensions matching those of Manufacturer's recommended details.
 10. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 11. Do not install joint sealants that fail to adhere to joint substrates during testing.
 12. Repair sealant test areas by removing damaged materials and applying sealant to test area using same procedure used to originally install the sealant.
- C. Stain Testing: Perform Stain testing of natural stone, masonry and other porous substrates proposed for use in the Work. Obtain actual samples of materials proposed for use and test to determine if permanent discoloration of porous surfaces will occur from direct contact with sealants. Perform stain testing in conformance with ASTM C1248 and as follows:
1. Arrange for Manufacturer's field technical representative to be present during examination of test results.
 2. Cut substrate to provide flat surface for application of sealant.
 3. Separate substrate materials by removable shims to create 1/2 x 1/2 x 3-inch joint.
 4. Fill joint with scheduled sealant, tool, and allow to cure for 21 days at room temperature.
 5. After 21-day curing, remove shims, compress joint to 50 percent of original joint width to 1/4 inch, and place in an oven at 158 degrees F. for 14 days.
 6. After 14 days in oven, remove and allow sample to cool to room temperature.
 7. Examine sample to determine presence of discoloration or change in appearance in any way to exposed surfaces.
 8. After visual inspection, cut sample in half to determine presence of discoloration or change in appearance in any way into the sample itself at the adhesive bond line and presence of bleeding into the area around the adhesive bond line.
 9. Document results of stain tests and record results in stain test log.
 10. Do not install sealants that show evidence of staining substrates.
- D. Field Color and Workmanship Samples: Seal a section of joint as directed, under job conditions, at least 7 days prior to start of work for review by Architect. When approved, sample shall be used as a standard of comparison for remainder of work.

- E. Manufacturer and sealants Subcontractor to submit log of testing, on company letterhead for each test performed indicating, but not limited to the following:
 - 1. Date
 - 2. Project identification
 - 3. Sealant identification including name, type and batch number
 - 4. Test performance, i.e., acceptable, marginal, not acceptable
 - 5. Storage conditions
 - 6. Signature of person conducting test
- F. Location where the test was conducted.
- G. If tests indicate sealant material is marginal or not acceptable, sealant is not to be used. Tester is to immediately notify Architect and Contractor of the deficient materials. The sealant Subcontractor is to immediately remove deficient materials from site.
- H. Inspections
 - 1. Coordinate sealant selection and application as necessary for the full and satisfactory compatibility and performance between all sealants used under this section with all other applicable and related sections using sealants that may be in direct contact with work of this section.
 - 2. Take all required steps and precautions to properly isolate and prevent any degree of incompatibility between sealants, all in strict accordance with Manufacturer's specifications, recommendations, and instructions.
 - 3. Contractor is to periodically test sealants in place in addition to the Manufacturer's field testing, for adhesion, using methods recommended by sealant Manufacturer. Promptly replace all sealant that does not adhere or fails to cure.
 - 4. Contractor shall arrange to meet the sealant Manufacturer at the jobsite and witness initial installation of sealant on the project with the Contractor, Architect and other Consultants.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site. Maintain product in accordance with Manufacturer's recommendations with proper precautions to ensure fitness of material when installed.
- C. Handling: Comply with Manufacturer's instructions.

1.06 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Observe Manufacturer's temperature service range. Do not apply sealant when weather conditions will inhibit bonding and curing.

1.07 WARRANTY

- A. Provide warranty, in writing and signed jointly by the installer and sealant Manufacturer, to replace sealants which fail at no additional cost to the Owner because of loss of cohesion or adhesion, or do not cure, and which fail to achieve air-tight and water-tight seal as follows:
 - 1. Sealant Types "A" and "B": 5 years.
 - 2. Sealant Types "C1" and "C2": 20 years.
 - 3. Sealant Types "D," "E" and "F": 2 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following manufacturers, except as approved otherwise by the Architect, subject to compliance with specifications requirements:
1. Pecora www.pecora.com
 2. Dow Corning Corp. www.dowcorning.com
 3. GE Construction Sealants, Division of Momentive Performance Materials Inc. www.siliconeforbuilding.com
 4. Sonneborn / Chemrex www.chemrex.com
- B. Single Source Responsibility for Joint Sealer Materials:
1. Obtain joint sealer materials from a single Manufacturer for each different product required.
 2. If sealants from separate Manufacturers must be used and could come in contact with each other, provide written certification from every Manufacturer involved that the sealants are compatible and will adhere to each other.

2.02 MATERIALS

- A. General: Sealants, primers, back-up materials, preformed joint fillers, bond breakers and related materials shall be compatible with adjoining materials.
- B. Sealant:
1. General: The selection of proper sealant for a particular joint shall be in accordance with current published recommendations of the Manufacturer.
 2. Types: See Schedule in Part 3 for the location where each type of sealant is to be provided.
 - a. Type "A": Ultra-low modulus, self-leveling, one-component, silicone sealant conforming to ASTM C920, Type S, Grade SL, Class 100/25, Use T, A, M, and O; Dow Corning SL Parking Structure Sealant (Self Leveling), Pecora 300/310 SL, or Tremco Spectrem 900 SL; OR Low-modulus, non-sag, one-component silicone sealant conforming to ASTM C920, Type S, Grade NS, Class 100/25, Use T, A, M, and O. Dow Corning NS Parking Structure Sealant (Non-Sag), Pecora 301/311 NS, or Tremco Spectrem 800; OR Ultra-low modulus, fast-cure, two-component, neutral-cure silicone sealant conforming to ASTM C920, Type S, Grade FC, Class 100/25, Use T, A, M, and O; Dow Corning FC Parking Structure Sealant (Fast Cure). Pavement joint sealants shall comply with Section 729 of MAG
 - b. Type "B": Silicone sealant conforming to ASTM C920, Type M, Grade NS, Class 25, Use NT, M, A, O, and capable of withstanding movement of 50% in extension and compression, and sustained temperatures of 250 degrees F in service. Dow Corning 790, 795, CCS and CWS.
 - c. Type "C-1": One-part low modulus moisture cure silicone rubber sealant conforming to FS TT-S-001543A, Class A, FS TT-S-00230C, Type II, Class A and ASTM C 920, Type S, Grade NS, Class 25, Use NT, M, G, A, and O, and capable of withstanding movement of 100% in extension and 50% in compression in service. Dow Corning 790 Silicone Glazing Sealant or Pecora 890.

- d. Type "C-2": One-part medium modulus neutral cure silicone rubber sealant conforming to FS TT-S-001543A, Class A, FS TT-S-00230C, Type II, Class A and ASTM C 920, Type S, Grade NS, Class 25, Use NT, M, G, A, and O, and capable of withstanding movement of 50% in extension and 50% in compression in service. Pecora 895, Dow Corning 795 or Dow Corning 791 or 756 SMS (non-staining). Provide Dow Corning 756 SMS where sealant with reduced soiling is indicated.
 - e. Type "D": Medium-modulus, single-component, pre-pigmented, neutral-cure silicone sealant conforming to ASTM C920, Type S, Grade NS, Class 50, Use NT, G, M, A, O. Dow Corning 756 SMS Building Sealant.
 - f. Type "E": Silicone rubber sealant with mold inhibitor. General Electric Sanitary 1700, Tremco Tremsil 200, Dow Corning 786, Pecora 898, Sonneborn Omni-Plus.
 - g. Type "F": Tremco Acoustical Sealant and Pecora BA-98.
- 3. Sealants at fire penetrations: As specified in Section 07 84 00
 - 4. Sealants at Mechanical Ductwork: As specified in Division 23.
 - 5. Color: Provide standard or custom colors as selected by Architect. In general, colors shall be matching the adjacent materials unless specifically noted otherwise on Drawings.
- D. Primer: Non-staining type, recommended by sealant Manufacturer to suit application.
 - E. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant Manufacturer; compatible with joint forming materials.
 - F. Joint Filler (Backer):
 - 1. Buildings: ASTM C1330, Type B; round bi-cellular or closed cell polyethylene, urethane or neoprene foam rod; oversized 30 to 50 percent; "SofRod" as manufactured by Nomaco.
 - 2. Pavement: ASTM D5249, Type 3, round bi-cellular or closed cell polyethylene, urethane or neoprene foam rod; oversized 30 to 50 percent; "SofRod" as manufactured by Nomaco.
 - G. Bond Breaker: Pressure sensitive tape recommended by sealant Manufacturer to suit application.
 - H. Gloss Reducer: Silica sand No. 20, color to match adjacent surface. Gloss reducer shall be provided at traffic sealant applications.
 - I. Other Materials: Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor and approved by the sealant Manufacturer as compatible, subject to the review by the Architect.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces. Verify, before proceeding with this Work that required inspections of existing conditions have been completed.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

- A. Clean, prepare, and prime joints in accordance with Manufacturer's instructions. Remove loose materials, dust, oil, grease, water, surface dirt, frost, old caulking material and other foreign matter which may impair adhesion of sealant.
 - 1. Clean porous materials where necessary by grinding, sand or water-blast cleaning, mechanical abrading, acid washing or combination of these methods as required to provide a clean, sound base surface for sealant adhesion. Clean nonporous surfaces, either mechanically or chemically.
 - 2. Remove laitance by acid washing, grinding or mechanical abrading. Remove form oils by sand or water-blast cleaning. Remove all loose particles present or resulting from grinding, abrading or blast cleaning by blowing out joints with oil free compressed air or by vacuuming joint prior to application of primer or sealant.
 - 3. Remove protective coatings from metallic surfaces by two rag solvent wipe method. Use clean white cloths or lint free paper towels for cleaning with solvent and drying. Clean joint areas protected with masking tape or strippable film with solvent after removal of tape or film. Do not allow solvent to air dry without wiping.
- B. Verify that joint shaping materials and release tapes are compatible with sealant.
- C. Examine joint dimensions and size materials to achieve required width/depth ratios.
 - 1. Joint widths, depths, and conditions detailed on shop drawings by related work contractors shall be considered as minimum allowable requirements except where they may conflict with sealant Manufacturer's recommendations. In all cases, joints must be uniform in width. Do not seal joints until they are in compliance with drawings, or meet the accepted control section standard. Notify general Contractor and Architect of Conditions not compliant with Drawings or acceptable standards.
 - 2. Clean out and rake to full width and depth, joints to receive sealant, back-up material or preformed joint filler. Make joints of sufficient width and depth to accommodate specified back-up material or preformed joint filler and sealant.
- D. Use joint filler to achieve required joint depths, to allow sealants to perform properly.
- E. Use bond breaker where required.
- F. Protect adjacent surfaces from damage by masking when necessary.

3.03 INSTALLATION

- A. General:
 - 1. Install sealant in accordance with Manufacturer's instructions.
 - 2. In general, seal openings and other locations which normally require sealant to seal against infiltration from air, water and most insects, including; but not limited to:
 - a. Construction and expansion joints.
 - b. Joints between dissimilar materials.
 - c. Joints around windows, door frames, louvers and other penetrations and openings in the exterior wall.
 - d. Interior wall openings.
 - e. Other locations indicated on drawings.

3. Follow sealant Manufacturer's instruction regarding surface preparation, priming, application life, and application procedure. Consult sealant Manufacturer for recommendation for application procedure. Apply sealant within recommended temperature ranges. Consult Manufacturer when sealant cannot be applied within recommended temperature ranges. Consult sealant Manufacturer for recommendation for application of silicone sealant when air temperature is below 40 degrees F., or surface temperatures of sealant contact surfaces are above 115 degrees F.
 4. Apply masking tape, where required, in continuous strips in alignment with joint edge. Remove tape immediately after joints have been sealed and tooled as directed. Sealant on face of adjacent stone or other materials will not be acceptable.
- B. Joints:
1. Free of air pockets, foreign embedded matter, ridges, and sags.
 2. Tool joints concave.
- C. Apply sealant under pressure with hand or power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as detailed.
- D. Neatly point or tool joint surfaces to provide slightly concave surfaces, free of wrinkles and skips, uniformly smooth and with perfect adhesion along both sides of joint. All joints to be "Dry tooled". Do not use water-wet tool or tooling solutions.
- E. Sealant applied to joints adjacent to mortar joints shall be sanded to achieve texture similar to that of adjacent mortar joint.
- F. Consult sealant Manufacturer regarding the proper method of installing back-up material or joint filler at proper depth in joint to provide specified sealant dimensions. Compress back-up material 25 to 50 percent into the joints as required. Do not apply sealant without back-up materials. Install bond breaker strip between sealant and non-release type back-up material. Three side adhesion is acceptable only for the sealing at joinery of members that are to be rigidly attached to each other by means of screws or welding restricting all movement.
- G. Install back-up rod stock into the joint to avoid length-wise stretching. Rod stock shall not be twisted or braided. Use bond breaker strip in all joints where sufficient room for back-up does not exist.
- H. Surfaces of joints to be sealed must be dry. Do not attempt sealant work on wet surfaces or where frost is present. Consult sealant Manufacturer regarding the procedures for determining acceptable surface conditions.

3.04 CLEANING

- A. Clean adjacent surfaces of sealant as work progresses.
- B. Use solvent or cleaning agent as recommended by sealant Manufacturer.
- C. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

3.05 SCHEDULE

- A. Expansion and Control Joints:
 - 1. Horizontal traffic: Type "A" with gloss reducer.
 - 2. Joints around exterior windows and doors, exterior columns, louvers, masonry, concrete to concrete, steel, wall penetrations, connections, parapet caps, other joints to seal off building from exterior air and moisture: Type "B".
 - 3. Glass (except insulating glass or special coated glass), aluminum, E.I.F.S., Natural Stone, and plastics: Type "C-1".
 - 4. Glass (including insulating glass or special coated glass), aluminum and plastics: Type "C-2".
 - 5. Masonry, and Painted Metals: Type "D".

- B. Non-expanding Joints:
 - 1. Glass (except insulating glass or special coated glass), Aluminum, E.I.F.S., Natural Stone, and Plastics: Type "C-1".
 - 2. Glass (including insulating glass or special coated glass), Aluminum and Plastics: Type "C-2".
 - 3. Masonry, and Painted Metals: Type "D".
 - 4. Concrete to Concrete, Stucco, Masonry, Aluminum, Steel, and Wood: Type "C-1".

- C. Mechanical (ductwork and air conditioning): As specified in Division 23, or Type "D" if not indicated in Division 23.

- D. Plumbing Fixtures and other Wet Areas (around toilet, bath, kitchen fixtures, and food service equipment): Type "E".

- E. Acoustical (acoustical applications where sealant is required): Type "F".

END OF SECTION

SECTION 08 11 13
STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Hollow metal steel doors and frames as shown on Drawings and as specified herein.
 - 2. Hollow metal glazing frames as shown on Drawings and as specified herein.
- B. Related Sections:
 - 1. Section 08 14 00 – Wood Doors, for paint grade wood doors.
 - 2. Section 08 71 00 – Door Hardware.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings showing elevations of each door and frame type, typical and details of construction, location and installation requirements for hardware, size and thickness of material.
- B. Fire Rated Doors and Frames:
 - 1. Installation Instructions: Door and frame manufacturer shall clearly identify the hardware products, other materials and work requirements necessary to maintain compliance with UL 10(c) (positive pressure testing) as required by 2018 IBC Section 716.
 - 2. Certification: Submit certification that fire rated doors (including frames and hardware as a unit) will comply with UL 10(c) (positive pressure testing) as required by 2018 IBC Section 716.
- C. Furnish recognized independent test lab certification that products comply with ANSI A250.4.

1.03 DELIVERY AND STORAGE

- A. Deliver welded frames with spreaders and doors with wrappers.
- B. Store doors and frames under protective cover in dry, enclosed spaces at the site. Place doors and frames on non-staining blocking Raise bottoms of doors at least 4 inches high and provide 1/4 inch air space between stacked doors to avoid metal to metal contact and permit air circulation.

1.04 QUALITY ASSURANCE

- A. Doors and frames shall be certified to comply with ANSI A250.4, Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcing, and ANSI A250.8, Recommended Specifications for Standard Steel Doors and Frames.

1.05 WARRANTY

- A. Special Warranty: Furnish the following warranty to Owner:
 - 1. Warrant doors against defects in materials and workmanship for a period of 3 years after date of substantial completion of Project.
 - 2. Replacement under warranty shall include removal of the defective door and hardware, hanging, re-installation of hardware, and painting including adjacent finishes if damaged.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish steel doors and frames from one of the following Manufacturers, except as approved otherwise by the Architect, subject to compliance with specifications requirements:
 - 1. Allegion, Steelcraft Doors www.allegion.com
 - 2. ASSA ABLOY, Curries Company, CECO Door Products, Fleming Steel Doors and Frames, Security Metal Products www.curries.com
 - 3. Republic Builders Products www.republicdoor.com
- B. Doors and frames shall be furnished by the same Manufacturer.

2.02 MATERIALS

- A. Doors: Furnish Level, Model and Physical Performance level in accordance with ANSI A250.8/SDI-100.
 - 1. Level: Level 3, 16 gauge at interior doors and Level 4, 14 gauge at exterior doors and at interior locations scheduled on Drawings.
 - 2. Physical Performance level: Level B at interior doors and Level A at exterior doors and at interior doors where indicated on Drawings, or as otherwise scheduled or indicated on Drawings.
 - 3. Model: Model 2, Seamless.
- B. Core: Honeycomb, Polystyrene, Polyurethane, or Vertical steel stiffener core. Core shall be as allowed by UL 10(c) for fire rated doors.
 - 1. Provide polyurethane core at exterior doors.
- C. Steel: ASTM A1008 cold-rolled or ASTM A1011 hot-rolled. Hot-dip galvanized meeting ASTM A653, Grade G60 or Grade A60 galvanized for exterior openings.
- D. Frames: ANSI A250.8/SDI 100, 14 gauge steel at interior frames with 16 or 14 gauge doors and 14 gauge steel at exterior and interior frames with 14 gauge doors, or as otherwise scheduled or indicated on Drawings.
- E. Glazing Beads: Minimum 20 gauge steel.
- F. Rain Drips: Reese A201 A, or equal by Pemko or National Guard.
- G. Paint: Non-lifting, rust-inhibitive grey primer meeting ANSI A224.1, compatible with field finish specified in Section 09 91 00, applied after bonderizing.
- H. Acoustical Insulation (for door frames): As specified in Section 09 81 00.

2.03 FABRICATION- DOORS

- A. Construct hollow metal doors, flush and vision lite types as scheduled on Drawings, in accordance with ANSI A250.8/SDI-100 with core as specified above. Reinforce top and bottom of doors horizontally by 16 gauge steel channels, full width, spot welded to each face at least 3 inches on center. Bevel edge of lock stile.
 - 1. Door Top Edge: Close top of all doors flush as an integral part of the door construction, or by placing end closure channel with web of channel flush with top edge of door (not inverted), or by addition of end cap at top of door, spot welded to each face at least 3 inches on center, filled and dressed smooth.
 - 2. Door Bottom Edge: Close bottom edges of all exterior doors with inverted end closure or end cap to provide channel to accept concealed automatic door bottom or seal.
- B. Door Edge Joint and Treatment: Joints at the edges of doors shall have manufacturer's standard edge construction with factory welded seam, filled and dressed smooth.
- C. Hardware Reinforcement: Provide steel plate reinforcement of the following minimum thickness fabricated from steel of same material as door faces. Coordinate with hardware schedule:
 - 1. Hinges: 7 gauge by 1-1/2 inch by length of hinge plus 6 inches minimum, securely welded to door edge with a minimum of 6 spot welds.
 - 2. High Frequency Hinges: 12 gauge channel, full length of door edge.
 - 3. Lock Faces and Flush Bolts: 12 gauge steel plate. Provide reinforcement at each door face for locks.
 - 4. All Other Surface Mounted Hardware: 12 gauge steel plate.
- D. Reinforce openings in doors for lites and vents on all sides with 14 gauge steel channel.
- E. Provide solid drip cap at top of exterior out-swinging doors.
- F. Provide non-egress double doors with one-piece Z-astagals of 14 gauge steel unless otherwise indicated or scheduled.
- G. Accurately mortise doors for locks and hinges. Provide adequate box type reinforcement with steel plates welded to the interior reinforcing channels and drilled and tapped. Provide reinforcement for all other items of hardware.
- H. Doors with glass lite openings shall have trim recessed from the face of the door, beveled and attached with screws.
- I. Louvers: Provide sightproof louvers inserted into the panels. Form louver frames of minimum 20-gauge steel. Weld or tenon minimum 24 gauge blades to frame and fasten the entire assembly to the door with moldings. The moldings, when used, shall be an integral part of the louver.
- J. Fire-Rated Doors: Provide fire rated doors investigated and tested as fire door doors, complete with type of hardware to be used. Identify each fire door with recognized testing laboratory labels, indicating applicable fire rating of steel doors. Doors required to meet smoke and draft control assembly requirements shall have labels that identify that the door has been tested and approved for smoke and draft control assemblies (S-label). Construct doors to comply with NFPA Standard No. 80 and UL-10(c).

2.04 FABRICATION - FRAMES

- A. Construct to shapes and sizes shown, meeting various wall thicknesses in accordance with ANSI/SDI-100.
- B. Fully Welded Frames: Continuously weld, fill, grind and dress smooth face frame miters. Continuously back-weld casing, stop, soffit and rabbit.
- C. Mortise, reinforce, drill and tap for standard weight, full mortise template hinges and template strike.
- D. Provide not less than three 18 gauge anchors per jamb, or as shown on Drawings, spaced for maximum stiffness. Provide adjustable 18 gauge floor clips at each jamb, welded to back face of jamb, punched for securing to floor with two spaced anchors.
- E. Make cutouts for required hardware specified under Section 08 71 00, from templates furnished. Reinforce butt cutouts with minimum 8 gauge thick steel plate drilled and tapped and welded in place. When heavy duty hinges are specified, provide high frequency reinforcing at frames for hinges. Coordinate with hardware vendor. Provide strike stops of frames with holes for three rubber door silencers; on double door frames, provide for two silencers per door at head.
 - 1. Hardware Reinforcement: Provide steel plate reinforcement of the following minimum thickness fabricated from steel of same material as frames. Coordinate with hardware schedule:
 - a. Hinge Cutouts: 7 gauge high frequency steel plate drilled and tapped and fully welded in place top and bottom. 7 gauge at intermediate locations.
 - b. Strikes and Flush Bolts: 12 gauge.
 - c. Surface Mounted Hold-Open Arms and Closers: 7 gauge
 - d. Exit Devices and Corner Reinforcement: 12 gauge
- F. For openings over 42 inches wide and at double openings, reinforce head members full length with a matching profile of 12 gauge steel. Provide anchor at midpoint of door, if practical.
- G. Construct frames for UL labeled doors in accordance with UL requirements and label as scheduled. Frames required to meet smoke and draft control assembly requirements shall have labels that identify that the frame has been tested and approved for smoke and draft control assemblies (S-label).
- H. Rain Drips: Provide rain drip at all exterior hollow metal door frames at exposed exterior walls whether scheduled in hardware sets or not.

2.05 FABRICATION - GLAZING FRAMES

- A. Construct in accordance with applicable parts of door frame Specification and as detailed. Extend partition frames around all four sides of openings.
- B. Provide glazing stops, removable one side and integral from the other side, secured with countersunk flat head Phillips screws spaced at not more than 16 inches on center and 2 inches from corners. Miter stops at corners.
- C. Provide applied muntins for divided lite appearance windows as detailed on Drawings.
 - 1. Muntin Profile: As approved by Architect.

2.06 ELECTRIFIED DOOR HARDWARE

- A. Provide hollow metal frames and doors scheduled to receive electrified hardware with conduit, wiring harnesses, concealed plug connectors and other accessories as necessary to properly connect specified electrified hardware. Coordinate connectors on end of wiring harnesses to plug directly into the hardware, hinge, and other connections.

2.07 FABRICATION TOLERANCES

- A. Allowable Tolerances for Fabrication: As specified in ANSI/SDI-117, Manufacturing Tolerances Standard Steel Doors and Frames.

2.08 PAINTING

- A. Bonderize and prime doors and frames with one shop coat of rust inhibitive primer.

PART 3 EXECUTION

3.01 COORDINATION

- A. Coordinate Work with other directly affected sections involving manufacture or fabrication of internal cutouts and reinforcement for door hardware, electric devices and recessed items.
- B. Coordinate Work with frame opening construction, door and hardware installation.
- C. Sequence installation to accommodate required door hardware.
- D. Verify field dimensions for factory assembled frames prior to fabrication.

3.02 EXAMINATION

- A. Verify that project conditions are acceptable before beginning installation of frames.
 - 1. Verify that completed openings to receive knock-down wrap-around frames are of correct size and thickness.
 - 2. Verify that completed concrete or masonry openings to receive butt type frames are of correct size.
- B. Do not begin installation until conditions have been properly prepared.
- C. Correct unacceptable conditions before proceeding with installation.

3.03 INSTALLATION

- A. Install metal door frames plumb, level, rigid and in true alignment as recommended in SDI 105 and ANSI/DHI A115.IG, and the following:
 - 1. Cross Site Reveal: Not to exceed 3/16 inch as measured against stop of installed frames and doors. Doors and frames exceeding maximum allowed cross site reveal shall be removed and replaced at no additional expense to Owner.
- B. Install doors and fasten to maintain alignment with frames to achieve maximum operational effectiveness and appearance.
 - 1. Maintain clearances as specified in ANSI A250.8, 2.1.8.
 - 2. Shim as required per NFPA 80, ANSI/A115.IG and SDI 122.

- C. Fill backs of frames solid with mortar at concrete and masonry construction. Hand trowel a stiff mortar to frames. Pumped mortar slurry is not allowed.
- D. Fill backs of frames with full thickness fiberglass batt insulation specified in Section 07 21 00 where indicated at exterior doors, if not otherwise grouted full (masonry construction, and acoustical insulation specified in Section 09 81 00 where indicated at interior doors.
- E. Install fire doors and frames to comply with NFPA 80 and in accordance with Manufacturer's printed instructions.
- F. Prepare and install doors in accordance with ANSI A115 and SDI 122.

3.04 FIELD QUALITY CONTROL

- A. Manufacturer's certified door consultant shall inspect fire rated doors (including frames and hardware as a unit) and verify compliance with UL 10C (positive pressure testing) as required by 2018 IBC Section 716. Fire rated doors (including frames and hardware as a unit) which do not comply with UL 10C (positive pressure testing) as required by 2018 IBC Section 716 shall be removed and replaced at no additional cost to Owner.

3.05 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 08 14 00

WOOD DOORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Solid core paint grade wood doors.
 - 2. Pre-fitting wood doors to frames and pre-machining of wood doors for hardware.
- B. Related Sections:
 - 1. Section 08 11 13 – Steel Doors and Frames, for hollow metal frames for wood doors.
 - 2. Section 08 71 00 – Door Hardware.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings showing schedule of doors and types, including the following:
 - 1. Location, size, and hand for each door.
 - 2. Dimensions and locations of mortises and holes for hardware.
 - 3. Locations and dimensions of cutouts.
 - 3. Location and extent of hardware blocking and reinforcements.
 - 4. Construction details not covered in Product Data.
 - 5. Fire protection rating for fire rated doors.
 - 6. Submit confirmation of specified duty level in accordance with “Performance Duty Level” per WDMA Bulletin I.S.1A (04).
 - 7. Note discrepancies between the Drawings and door schedules, and the requirements of regulatory and testing agencies.
- B. Product Data: Submit Manufacturer's data showing door construction.
- C. Samples: Before fabrication, submit three (3) corner samples of each type of door to be furnished, showing face, edge, core construction and specified finish for each type specified.
- D. Fire Rated Doors:
 - 1. Installation Instructions: Door manufacturer shall clearly identify the frame, hardware products, other materials and work requirements necessary to maintain compliance with UL 10(c) (positive pressure testing) as required by 2018 IBC.
 - 2. Certification: Submit certification that fire rated doors (including doors, frames and hardware as a unit) will comply with UL 10(c) (positive pressure testing) as required by 2018 IBC.

1.03 QUALITY ASSURANCE

- A. Coordination: Contractor shall be responsible for coordinating and obtaining necessary information from Hardware and Metal Frame Manufacturers. Door Manufacturer shall be responsible for coordinating necessary information received by Contractor from Hardware and Metal Frame Manufacturers in order that doors shall be properly prepared to receive hinges and hardware. Contractor shall provide door supplier with approved frame schedule, hardware schedule, and hardware templates. Furnish to door supplier 60 days prior to desired delivery date of doors.

- B. Fire Rated Wood Doors: Fire doors shall be listed and labeled by a nationally recognized testing and certification agency, in accordance with applicable building codes and shall comply with NFPA 80 for fire ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40 inches above sill) or UL10C.
 - 1. Smoke Control Door Assemblies: Comply with NFPA 105.
 - a. Smoke “S” Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pairs of doors.
- C. Certification: Provide each fire rated and sound rated door with a label permanently attached at eye level, to the hinge stile or, where interfering hardware such as full length hinges are applied, in a location acceptable to the local Code Authority, indicating the testing agency’s approval for the rating required. Do not cover or conceal label.
- D. Performance Duty Level: Provide doors with the following Performance Duty Level per WDMA Bulletin I.S.1A:
 - 1. Performance Duty Level: Extra Heavy Duty.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Edge Protection:
 - 1. Field Finished Doors: Prior to delivery, seal door edges with an approved clear sealer, compatible with field finish specified.
- B. Delivery:
 - 1. Deliver doors to the jobsite only when proper storage site is available.
 - 2. Store doors in an area having controlled temperature and humidity as recommended by the Window & Door Manufacturers Association (WDMA), AWI and the door manufacturer.
 - 3. Store doors flat on factory pallets, or three full 2 x 4’s, one centered and the other two 12 inches from each end. Do not stack doors on end, or on their vertical edge.
 - 4. Protect wood doors from construction activity, dirt, and exposure to sunlight.
- C. Handling:
 - 1. Always handle doors with clean hands or gloves.
 - 2. Do not drag doors across one another.
 - 3. Maintain factory packaging or other means of protection on doors, until date of Substantial Completion.

1.06 WARRANTY

- A. Special Warranty: Furnish the following warranty to Owner:
 - 1. Warrant doors from the date of installation against defects in materials and workmanship. Periods of warranty after date of installation:
 - a. Interior solid core and mineral core: Life of installation.
 - 2. Replacement under warranty shall include removal of the defective door, hanging, installation of hardware, and finishing.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish doors of one of the following Manufacturers, except as approved otherwise by the Architect, subject to compliance with Specification requirements:
1. Marshfield Door Systems www.marshfielddoors.com
 2. Algoma www.algomahardwoods.com
 3. Eggers Industries www.eggersindustries.com
 4. Lynden Door, Inc. www.lyndendoor.com
 5. Oshkosh Architectural Door Company www.oshkoshdoor.com
 6. Graham www.grahamdoors.com
 7. VT Industries, Inc. www.vtindustries.com

2.02 FLUSH DOORS

- A. Cores:
1. Solid Core: Shall conform to ANSI A208.1 LD2, 32 lbs. per cubic foot density. For doors scheduled to receive closers, provide minimum 5 inch solid wood top rail at doors with closers.
 2. Provide supplemental hardwood blocking/reinforcement for locksets, closers, existing devices and other mortised and surface mounted hardware items. Through-bolt attachment is not allowed.
- B. Edge Bandings:
1. Stiles (Dimensions given are minimum sizes allowed after factory trimming to booksize or prefitting).
 - a. Particleboard Core: 1-3/8 inch double banded laminated hardwood stile, laminated strand lumber or structural composite lumber (no finger joints allowed) in inner and outer band to be at least 1/4 inch wide same species lumber as face veneer with the exception of birch doors which will have hard maple stiles.
 2. Rails (Dimensions given are minimum sizes allowed after factory trimming to booksize or prefitting).
 - a. Particleboard Core: 1-1/8 inch minimum mill option hardwood rail.
- C. Face Veneers, Crossbands and Backers: When wood veneer or medium density overlay faces are specified, doors shall be 5 ply (AWI PC-5), made up of a face veneer, crossbanding and a core unit, all securely bonded together utilizing type 1 (fully waterproof) adhesive and the hot press assembly technique. All plies must be placed at right angles to adjacent plies. Face veneers shall have a minimum thickness of 1/50 inch after factory sanding and the individual pieces of veneer forming the face veneer must be spliced or edge glued together. Doors manufactured by cold-pressing 2 or 3-ply pre-manufactured door skins to multiple cores in the same press shall not be acceptable.
1. Provide doors complying with WDMA I.S. 1-A Aesthetic Grade: Custom.
 2. Cross banding shall extend full width and height of door.
 3. Paint Grade: Furnish Medium Density Overlay for paint grade doors. MDO shall meet PS1-74. Overlay shall be factory primed, readily sandable, weatherproof, and carry a Class "B" Fire Rating. Paint grade Birch hardwood and hardwood surfaced doors shall not be considered as meeting this Specification.
- D. Glue: Type 1 (waterproof) for face assembly and Type II (water-resistant) for core assembly per WDMA TM-6 1998 (Adhesive Bond Durability Test Method).

2.03 LABELED FLUSH DOORS

- A. Mineral core flush veneered doors, 5-ply, shall be made up of face veneers, crossbanding, and a core unit securely bonded together utilizing Type I (fully waterproof) adhesive and the hot press assembly technique. Provide matching transom panels where scheduled.
- B. Face Veneers and Crossbanding: Same as specified for non-labeled doors.
- C. Core Unit: Asbestos free, noncombustible mineral composite with a minimum of 28 pounds per cubic foot) density when tested in accordance with ASTM C303, with 10 percent maximum absorption by weight with core in equilibrium at 90 percent relative humidity and 70 degrees F.. Provide flame resistant blocking as required by the hardware schedule. The door listing shall not limit the size or location of such blocking.
 - 1. Category A Edge Construction: Provide fire rated door edge construction with intumescent seals concealed by outer stile (Category A) at 45, 60, and 90 minute rated doors. Comply with specified requirements for exposed edges.
 - 2. Pairs: Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
 - a. Provide fire retardant stiles that are listed and labeled for applications indicated without formed steel edges and astragals.
 - b. Where required for concealed hardware, provide formed steel edges and astragals with intumescent seals. Finish steel edges and astragals with baked enamel.
 - 3. Provide one lock block 5 inches x 12 inches when a bored unit or mortise lock is to be used and two lock blocks when the door is equipped with an exit device.
 - 4. For doors with closers include 5 inch top rail. Provide wide bottom rails for exit, manual and automatic flush bolts and automatic door bottoms.
- D. Rails: Top 1/2 inch minimum, bottom 1-1/2 inches minimum rail (one or two piece) of flame resistant material - salt free. Securely glue rails to core.
- E. Stiles: Manufacturer's standard for receiving a full mortise hinge. No salt treated components shall be used. UL or WH approved for labeled doors meeting the following performance criteria:
 - 1. 5/16 inch inner stile with 1/4 inch outer stile of matching hardwood, except on Birch, where Maple shall be used.
 - 2. Stiles to conform to "Extra Heavy Duty" WDMA Performance Standards.
- F. Vision Frames: Provide one of the following.
 - 1. Furnish metal vision frames primed for field painting for doors with lites. Frames shall meet AWI standard, UL, or WHI approved.
 - 2. Provide Manufacturer's standard solid wood bead options for Architects approval. Provide Manufacturer's approved, veneer-wrapped wood bead for 45, 60 and 90 minute fire doors.
 - 3. Provide glass and glazing at all doors including fire doors. All doors are to be factory glazed. See Section 08 80 00 for glazing requirements.
- G. Manufacture labeled doors to the required size so as to provide proper clearances without field trimming. Machining of labeled doors must be completed before label is applied to assure the full thickness of the edge bands. Machine fire doors to meet NFPA 80 requirements. Provide channels for concealed exit devices specified in Section 08 71 00 and in conformance with UL requirements.

2.04 FABRICATION

- A. Factory fit doors to suit frame opening sizes indicated.
 - 1. Comply with requirements in NFPA 80 for fire rated doors.
 - 2. Undercut: As required per manufacturer's templates and sill condition.
- B. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - 2. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire rated doors.
- C. Openings: Cut and trim openings through doors in factory.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Comply with applicable requirements in Division 08 Section "Glazing."
 - 3. Louvers: Factory install louvers in prepared openings.
- D. Electrical Raceways: Provide flush wood doors receiving electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through wire transfer hardware or wiring harness specified in hardware sets in Section 08 71 00 - Door Hardware. Wire nut connections are not acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Doors shall be hung true and plumb with standard bevel and with uniform 3/32 inch clearance at jambs and head, and 1/2 inch bottom clearance, unless otherwise required. Mortise, drill or otherwise prepare doors for finish hardware specified in Section 08 71 00, Finish Hardware. Pilot drill screw and bolt holes.
- B. Doors that are cut or planed for fitting shall be immediately resealed with a transparent wood sealer. Doors shall operate freely without sticking or binding, without hinge-bound conditions and with hardware installed, properly adjusted and functioning.
- C. Install fire doors and frames to comply with NFPA 80 and in accordance with manufacturer's printed instructions.
- D. Factory Fitted Doors: Align in frames for uniform clearance at edge.

- E. Installation Tolerances:
 - 1. Maximum Diagonal Distortion (Warp): 1/4 inch (6 mm) measured with straight edge or taut string, corner to corner, over an imaginary 42 x 84 inch surface area.
 - 2. Maximum Vertical Distortion (Bow): 1/4 inch (6 mm) measured with straight edge or taut string, top to bottom, over an imaginary 42 x 84 inch surface area.
 - 3. Maximum Width Distortion (Cup): 1/4 inch (6 mm) measured with straight edge or taut string, edge to edge, over an imaginary 42 x 84 inch surface area.
 - 4. Cross Site Reveal: Not to exceed 3/16 inch as measured against stop of installed frames and doors. Doors and frames exceeding maximum allowed cross site reveal shall be removed and replaced at no additional expense to Owner.

- F. Field Finish (Painted Doors): Provide as specified in Section 09 91 00 and in accordance with Door Manufacturer's written instructions.

- G. Field modifications to doors shall not be permitted, except those specifically allowed by manufacturer or fire rating requirements.

- H. Adjusting: Adjust doors for smooth and balanced door movement. Re-hang or replace doors that do not swing or operate freely.

3.03 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes standard steel and stainless-steel construction access doors and frames.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each type of door and frame indicated including materials and finishes and installation details.
- B. Shop Drawings: Submit Drawings showing sizes, door construction, proposed locations, fabrication and installation details, and relationship with and attachment to wall/ceiling construction where installed.
- C. Samples: Minimum 3-inch x 5-inch Samples of each face material.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage and Protection: Deliver and store items in dry, protected areas. Adequately protect against damage while stored at the site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Steel Framed Access Doors and Frames: Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
 - 1. Babcock-Davis www.babcockdavis.com
 - 2. Nystrom Building Products www.nystrom.com
 - 3. Karp Associates www.karpinc.com
 - 4. J.L. Industries, Activar Inc. Construction Products Group www.activarcpg.com
 - 5. Milcor Brand, Hart Cooley Inc. www.milcorinc.com

2.02 ACCESS DOORS

- A. Steel and Stainless Steel Doors: Sizes as shown on the Drawings. Units shall be prime painted steel at painted wall construction and stainless steel in tile and other locations as indicated, in types as required by wall construction, as follows (based on Babcock-Davis):
 - 1. Non-Rated Access Panels:
 - a. Drywall Walls and Ceilings:
 - 1) All Public and Administrative Spaces: Babcock-Davis B-RW recessed access panel with concealed pivoting rod hinge.

- 2) Mechanical, Utility, Equipment and Other Back-of House Spaces: Babcock-Davis B-NW access panel.
2. Fire-Rated Access Panels:
 - a. Drywall Walls and Ceilings: Babcock-Davis B-IW, Insulated, Fire-Rated access panel.
 - b. Masonry, Tile Walls, Etc.: Babcock-Davis B-UT, Insulated, Fire-Rated access panel.
- C. Door and Frame: 16 gauge steel. Provide key-operated cylinder locks. At large doors where recommended by the door Manufacturer, provide additional screw driver operated cam locks in sufficient quantity as recommended by Manufacturer to hold door in flush closed position. 16 gauge steel shall be used for door and frame. Type K door shall have concealed spring hinges to allow door to open a minimum of 175 degrees. Size as required or as indicated on the Drawings.
- D. Access Doors in Fire Rated Construction: Door and frame assemblies shall comply with NFPA 80 and the following:
 1. Doors shall be UL or Warnock Hersey labeled and meet self-closing and self-latching requirements for fire rated assembly where they are installed.
 2. Doors shall be UL 1-1/2 hour fire rated when located in a fire rated wall assembly.
- E. Sizes and Locations: Provide doors in quantities and sizes necessary for access to valves, dampers and other devices or equipment requiring periodic access, including locations indicated on drawings (if any).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install access doors in accordance with Manufacturer's directions at locations shown on Drawings or necessary for access to valves, dampers and other devices or equipment requiring periodic access. Do not install panels in locations where frame will extend over transition between two separate wall or ceiling finish materials (i.e. tile to gypsum board).
- B. Install fire-rated access doors and frames to comply with NFPA 80 and Manufacturer's printed instructions for a fire-rated assembly.
- C. Install plumb and level, true to line.
- D. Remove PVC protectant film off of hatch covers and frames following application of adjacent final finishes (painting, etc.) for wall and ceiling units and following concrete pouring and finishing operations for floor/sidewalk mounted units.

3.02 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 08 36 13

SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Motor operated aluminum overhead sectional doors.

1.02 DESIGN / PERFORMANCE REQUIREMENTS

- A. Performance Requirements: Design doors to meet windload of 20 psf.
- B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.03 SUBMITTALS

- A. Shop Drawings: Submit Drawings indicating type of doors, operation, finishes and installation details.
- B. Samples: Submit 2 samples showing specified finish.

1.04 QUALITY ASSURANCE

- A. Performance Requirements: Design doors to meet windload of 20 psf.
- B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.
- C. Track Configuration and Motor Operators: Requirements below are required to prevent door failures (sudden and rapid door drop).
 - 1. Track configuration shown on Drawings is diagrammatic only.
 - 2. Preferred track configuration shall be high lift or vertical lift to the greatest extent possible to maintain proper downward force on the door and tracks to maintain downward weight at all times with the jamb shaft drive operator specified.
 - 3. Where high lift or vertical lift tracks are not possible tracks shall be installed with greatest slope possible but not less than 12 inches.
 - 4. Track configuration shall provide a minimum of 1/2 panel height (1 panel height is preferred) above the door head prior to track radius.
 - 5. Track configuration and mounting must be coordinated with other building elements including HVAC, Plumbing, and Electrical including duct work, piping, conduit, and associated devices and equipment.
 - 6. Provide proper back clearance from the back face of the bay wall based on height of door plus 2.5 to 3 feet of clearance for the door, tracks, starter springs, and track supports. This zone is from the bottom of the track to the specified head clearance. Coordinate with other trades to assure no HVAC, Fire Protection, Lighting, or Structural is within the zone that could obstruct or interfere with the doors, tracks, and hardware.
 - 7. Avoid cable tensioners.

8. All fasteners in the cable rails/raceways shall be cut or ground off flush to avoid contact with cable and prevent cable fraying.
 9. The use of standard lift tracks is only acceptable when preferred track configuration cannot be achieved. Contact the Architect immediately for direction and installation requirements, including the use of trolley drive operators, when high lift or vertical lift tracks cannot be used.
- D. **Manufacturer Qualifications:** Company specializing in performing Work of this section with a minimum of five years' experience in the fabrication and installation of security closures.
 - E. **Installer Qualifications:** Installer Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.
 - F. **Pre-Installation Conference:** Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work and to discuss proper track configuration requirements and clearances.
- 1.05 DELIVERY, STORAGE AND HANDLING
- A. **Packing and Shipping:** Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
 - B. **Storage:** Adequately protect against damage while stored at the site.
 - C. **Handling:** Comply with Manufacturer's instructions.
- 1.06 PROJECT CONDITIONS
- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- 1.07 COORDINATION
- A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.
- 1.08 WARRANTY
- A. Provide manufacturer's standard 1 year warranty covering overhead door parts and components and 3 year warranty covering anodized and powder coated finishes against fading, cracking, blistering, flaking or peeling.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
 1. Overhead Door Corp. www.overheaddoor.com
 2. Ceco/Windsor Door www.cecodoor.com
 3. Clopay Corp. www.clopaydoor.com
 4. Raynor www.raynor.com

- B. Specifications are based on products as manufactured by Overhead Door Corp.

2.02 ALUMINUM OVERHEAD DOORS

- A. Doors: Overhead 521 Series aluminum sectional glass overhead doors with heavy duty hardware.
- B. Door Panels: 0.05 inch aluminum with 6063-T6 extruded aluminum stiles and rails.
- C. Finish: Powder coated in custom color selected by Architect.

2.03 INSULATED PANELS

- A. Aluminum faced (both sides) 3/8 inch thick EPS solid panels. Color to match frames.

2.04 VISION LITES

- A. Provide fully glazed door sections with EDPM or PVC frame. Provide glazed panels in number of rows (panels) indicated on Drawings.
- B. Glazing: 1/2 inch tempered, insulated thermal units, Solarbronze tinted glass with Low-E coating on No. 2 surface to match insulating glass units for building as specified in Section 08 80 00.

2.05 TRACK SYSTEM AND HARDWARE

- A. Provide heavy duty overhead section door track system with high lift or vertical track configuration and overhead clearance as indicated on Drawings and as required to comply with Design / Performance Requirements for Track Configuration and Motor Operators.
- B. Provide 3 inch tracks.
- C. Roller Brackets and Hinges: Heavy duty grade, heavy steel, galvanized. Rollers to have ball bearings with case hardened inner and outer races.
- D. Heavy-duty 100,000 cycle springs.
- E. Guides: Heavy duty steel angles or sections.
- F. Lock: Keyed lock with interlock switch for automatic operator.

2.06 WEATHERSTRIPPING

- A. Weatherstripping:
 1. EPDM bulb-type strip at bottom section.
 2. Flexible Jamb seals.
 3. Flexible Header seal.

2.07 OPERATION

- A. Electric Motor Operation: Overhead Door Model RSX Jackshaft, jamb mounted, UL listed electric operator, 3/4 HP minimum but not less than size recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
 - 1. Voltage: 208V, 3 Phase (Coordinate with Division 26).
 - 2. Entrapment Protection: Required for momentary contact, includes radio control operation.
 - a. Pneumatic sensing edge up to 18 feet wide. Constant contact only complying with UL 325/2010.
 - 3. Control Panels: Custom fabricated flush mounted control panels provided by the Electrical Contractor which includes three push-buttons (open, stop, close) for each door and inter-tied between multiple control panels for each door.
 - a. Refer to Bay Doors Wiring Diagram located on Drawings for further description and interface requirements of Control Panels.
 - b. Control Panel Locations: Multiple locations as indicated on Drawings.
 - c. Provide door operator control panel with interface with multiple Control Panels as indicated. Provide interface to closure loops, bay exhaust controls and other operating features as required for the Project.
 - 4. Options: Provide Auxiliary Output Module and Monitored Edge Interface Module.
 - 5. Special Operation: Provide in-floor vehicle detector operation, radio control operation with transmitters, and door timer operation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Do not begin installation until openings have been properly prepared.
 - 2. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
 - 3. Verify electric power is available and of correct characteristics.
 - 4. Notify Architect of unsatisfactory preparation before proceeding.
 - 5. Commencement of Work will be construed as acceptance of subsurfaces.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Doors are to be installed by the Manufacturer or authorized representative in strict accordance with Manufacturer's printed instructions.
- B. Install overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions. Tracks shall be high lift or vertical track configuration with overhead clearance as indicated on Drawings and as required to comply with Design / Performance Requirements for Track Configuration and Motor Operators.

- C. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.
- D. Anchor assembly to wall construction and building framing without distortion or stress.
- E. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- F. Fit and align door assembly including hardware.
- G. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.
- H. Upon completion of installation, including Work by other Trades, lubricate, test and adjust doors to operate easily, free from warp, twist or distortion and fitting weathertight for entire perimeter.

3.04 CLEANING AND ADJUSTING

- A. Adjust door assembly to smooth operation and in full contact with weatherstripping.
- B. Clean doors, frames and glass.
- C. Remove temporary labels and visible markings.
- D. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

3.05 PROTECTION

- A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.
- B. Protect installed products until completion of project.
- C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

END OF SECTION

SECTION 08 37 13
FOUR-FOLD DOORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Four-fold metal doors with surface mounted tube frames and overhead mounted electro-mechanical operators.

1.02 SUBMITTALS

- A. Product Data for each type of product specified consisting of manufacturers technical Product Data and installation instructions for each type of door required, including data substantiating that products comply with requirements.
 - 1. Include product data for safety equipment including hinge guards, upgraded safety edges, upgraded photo eyes, upgraded presence sensor and horn / strobe / verbal annunciator.
- B. Submit Shop Drawings showing fabrication and installation of Four-Fold metal doors including plans, elevations, sections, details of components, hardware, operating mechanism, and attachments to the other units of Work. Include wiring diagrams for coordination with electrical trade.
- C. Reference list including five (5) successful installations of this type of door within the past two (2) years.

1.03 QUALITY ASSURANCE

- A. Doors shall be designed to withstand external or internal horizontal wind loads of 20 pounds minimum per square foot. The maximum allowable deflection shall not exceed 1/120 of the span. Fiber stresses in main members shall be limited to 27,000 pounds per square inch. Steel frames shall be designed in accordance with the AISC “Steel Construction Manual”.
- B. Door manufacturer shall have at least 10 years experience in manufacturing door of type specified for emergency vehicle applications.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with manufacturer's instructions.

1.05 WARRANTY

- A. Warranty: Door manufacturer shall provide written guarantee against defects in material and workmanship for a period of three (3) years from date of substantial completion and acceptance.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of the following manufacturer, except as otherwise approved by the Architect, subject to compliance with specifications requirements:
 - 1. Door Engineering and Manufacturing www.doorengineering.com.
- B. Basis of Design: Drawings and Specifications are based on Four-Fold doors as manufactured by Door Engineering and Manufacturing products of design and configuration indicated on Drawings.

2.02 MATERIALS

- A. Tube Steel: ASTM A513 and ASTM A500.
- B. Steel Sheets: Steel sheets of commercial quality, complying with ASTM A1011 hot-rolled steel sheet.
- C. Hardware: Manufacturer's standard components.
- D. Fasteners: Zinc-coated steel.

2.03 FOUR-FOLD DOORS

- A. Model: Door Engineering and Manufacturing Four-Fold doors with recessed infill panels and glazed panels as indicated on Drawings.
- B. Construction: Door framing shall be minimum 14-gauge structural steel tube with 14-gauge sheet steel on the exterior and interior faces. Sheeting shall be formed on the vertical edges with no visible welds on the interior or exterior panel faces. All frames and framing members shall be true to dimension and square in all directions, and no door shall be bowed, warped, or out of line, in the vertical or horizontal plane of the door opening by more than 1/8 inch in 20 feet. Exposed welds and welds which interfere with the installation of various parts shall be ground smooth and flush.
- C. Insulation: Fiberglass (or polyisocyanurate) as standard with the manufacturer.
- D. Surface Mounted Tube Frame: Supply pre-hung tube frame system constructed of minimum TS6 x 4 x 0.25, designed to anchor to masonry wall construction or weld to steel structure as indicated on Drawings. All hinges, track supports and operator supports shall be factory attached.
- E. Factory Finish: Powder coated finish in custom color scheduled on Drawings or selected by Architect.
- F. Operating Hardware: Hardware shall include guide tracks and brackets, trolleys, center guides, not less than three pairs of jamb and fold hinges per opening, and all bolts, nuts, fasteners, etc. necessary for complete installation and operation. Jamb hinges shall be dual shear and have two thrust bearings and two needle bearings each. Jamb hinged shall be gusseted. Fold hinges shall be dual shear with two thrust bearings each. All bearings shall be completely concealed within the hinge barrel and include grease zerks. All hinge pins shall be minimum 3/4 inch diameter hardened steel.

- G. Weatherstripping: Material shall be adjustable and readily replaceable and provide a weather-tight installation. Weatherstripping at center and bottom shall be 1/16 inch cloth inserted neoprene and include no exposed fasteners on the exterior face of the panel.. Weatherstripping at sill shall include two (2) 1/16 inch cloth inserted neoprene sweeps with aluminum retainer. Retainer shall be attached to the door with adhesive
- H. Perimeter Weatherstripping: Provide jamb and head weatherstripping of 1/16 inch cloth-inserted neoprene bulb (or closed cell neoprene).
- I. Vision Panels Glazing: 1/2 inch insulated thermal units, Solarbronze tinted glass with Low-E coating on No. 2 surface to match insulating glass units for building specified in Section 08 80 00.

2.04 OPERATOR

- A. Each Four-Fold door shall be operated by an overhead mounted electro-mechanical drive unit designed for high cycle operation. Operator consists of an electric motor, gear reducer, and rotating drive arm. Door shall be operated with connecting rods attached to the rotating drive arm on the operator and control arms attached to the jamb door sections and to the door lintel. Connecting rods shall be positive drive, keeping the door under firm control at all times. Connecting rods shall be fitted with spherical bearings and control arms shall be equipped with oil impregnated bronze bearings on polished shafts. Exterior mounted operators shall have a formed weather hood.
- B. Operator shall be instantly reversible, open and close rapidly and start and stop gradually. Operator shall be adjustable to allow door to fully clear the opening. Operator shall automatically lock the door in the closed position. Operator shall be equipped with disengaging mechanism to convert to free wheeling mode for manual operation.
- C. Operator shall include a formed hood enclosing the motor, gearboxes and limit switches.
- D. Electric motor shall be of sufficient size to operate doors under normal operating conditions at no more than 75 percent of rated capacity. The motor shall be wound for three phase 208/260/480 VAC, 60 Hertz operation.
- E. Electric Controls: Controls shall be furnished by the door manufacturer and shall be complete for each door, and built in accordance with the latest NEMA standards. Field verify existing incoming electrical service requirements.
 - 1. Controls shall include a programmable logic controller with digital message display or LED indicators. Controller shall include programmable close timers and programmable inputs/outputs.
 - 2. Motor starters shall be magnetic reversing, factory wired with overload and under voltage protection, and equipped with mechanical interlocks. All control components shall be enclosed in one enclosure with a wiring diagram placed on the inside of the cover.
 - 3. Where incoming voltage is single phase, control panel shall include a variable frequency drive to convert voltage to 3-phase for the motor.
 - 4. Enclosure shall be recessed NEMA 4 with disconnect switch at location indicated on Drawings.
 - 5. Pushbuttons for each door shall have one (1) momentary pressure three-button push-button station marked "OPEN", "CLOSE" and "STOP". Push button enclosure shall be NEMA 4.
 - 6. Limit switches shall be provided to stop the travel of the door in its fully open or fully closed position.
 - 7. Hinge Guards: Provide manufacturer's standard plastic hinge guards.

7. Safety edges: Provide manufacturer's upgraded Fail-Safe bump edges on leading edge of all doors to reverse door upon contact with obstruction. Provide wireless safety edge transmitters with low battery alarm.
 8. Photo Eyes: Provide manufacturer's upgraded Exterior Light Curtain Photo Eyes, jamb mounted, thru-beam type photo eyes, NEMA 4 rated, for each door, for continuous protection from the floor to 72 inches AFF to senses both objects and personnel near the floor as well as higher clearance vehicles.
 9. Presence Sensor: Provide manufacturer's upgraded BEA LZR-Widescan Presence Sensor with 3 independent sensing fields for protection from both opening and closing. Overhead mounted at each door.
 - a. Pre-Close Field: Scans door path prior to closing.
 - b. Pre-Open Path: Scans door path prior to opening.
 - c. Motion Field: Senses objects approaching during the closing door motion.
 10. Horn / Strobe / Verbal Annunciator: Provide manufacturer's optional Horn / Strobe / Verbal Annunciator which provide warning prior to automatic closing of door and during both the opening and closing motion.
 11. Radio controls: Provide one (1) radio receiver and (2) single button remote transmitters per door. Remotes shall open and close doors with single button. Coordinate make and model to with Owner's requirements.
 12. Wiring: Door manufacturer shall supply controls and components only. Electrical contractor shall install controls and furnish and install conduits and wiring for jobsite power and control wiring.
- F. Door Operation:
1. Remotes shall open and close doors.
 2. Automatic Function: Doors shall time out and close once the exterior photo eye is activated and cleared. Provide Auto/Manual switch. In Auto, the remotes shall open doors only. In Manual, the remotes shall open, stop and close the doors and the auto close function shall be disabled.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install Four-Fold metal doors in strict accordance with the approved drawings by qualified door erection crews. All door openings shall be completely prepared by the general contractor prior to the installation of the doors. Permanent or temporary electric wiring shall be brought to the door opening before installation is started and shall be completed so as not to delay the inspection test.
- B. Doors shall be set plumb, level, and square, and with all parts properly fastened and mounted. All moving parts shall be tested and adjusted and left in good operating condition.
- C. Test and adjust all operators, controls, and safety equipment for proper operation.

3.02 ADJUSTING AND CLEANING

- A. Inspection of the doors and a complete operating test will be made by the installer in the presence of the general contractor or architect as soon as the erection is complete. Any defects noted shall be corrected. After door approval in the above test, the general contractor must assume the responsibility for any damage or rough handling of the doors during construction until the building is turned over to the owner and final inspection is made.

- B. Clean surfaces and repaint abraded or damaged finished surfaces to match factory-applied finish.

END OF SECTION

SECTION 08 41 13

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Aluminum doors and window wall frames (storefront) for exterior and interior locations.
 - 2. Operable windows within aluminum window wall frames.
- B. Related Sections:
 - 1. Section 08 71 00 – Door Hardware
 - 2. Section 08 80 00 – Glazing

1.02 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Window wall framing system shall provide for flush retained glazing on all sides without projecting stops, with glass set in the center of the frame as indicated on drawings.
 - 2. Framing system shall be suitable for outside or inside glazing.
 - 3. System shall be either screw spline, shear block or a compensating/stick system.
- B. Performance Requirements: Window wall.
 - 1. Limit air leakage through assembly to 0.06 CFM/min/sq. ft. of wall area at 6.24 PSF as measured in accordance with ASTM E283.
 - 2. Water leakage: None, when measured in accordance with ASTM E 331 with a minimum static test pressure of 10 psf.
 - 3. Limit deflection to L/175 with a maximum of 3/4 inch when subjected to 25 psf wind load design pressure acting inward and outward.
 - 4. System shall not deflect more than 1/8 inch at the center point of a horizontal member, or more than 1/16 inch at the center of members located directly above operable doors and windows, once deadload points have been established.
 - 5. System shall accommodate expansion and contraction movement due to surface temperature differential of 180 degrees F.
 - 6. Seismic requirements shall conform to AAMA recommended static test method for evaluating performance of curtain walls and storefront wall systems due to horizontal displacements associated with seismic movements and building sway.
 - 7. Performance requirements for air and water leakage are not applicable to interior units.
- C. Performance - Aluminum Doors (Swinging): Resistance to corner racking shall be tested by the Dual Moment Load test as follows:
 - 1. Test section shall consist of standard top door corner assembly. Side rail section shall be 24 inches (600mm) long and top rail section 12 inches long.
 - 2. Anchor "top rail" positively to test bench so that corner protrudes 3 inches beyond bench edge.

3. Anchor a lever arm positively to side rail at a point 19 inches from inside edge of top rail. Attach weight support pad at a point 19 inches from inner edge of side rail.
 4. Test section shall withstand a minimum load of 200 pounds on the lever arm before reaching the point of failure, which shall be considered a rotation on the lever arm in excess of 45 degrees.
- D. Performance – Operable Windows (Awning): All windows shall be rated in Performance Class HC and shall meet or exceed the minimum performance requirements as specified in accordance with ANSI/AAMA 101-93.
1. Air Infiltration: Infiltration shall not exceed .02 CFM per sq. ft. of ventilator or fixed lite area when tested in accordance with ASTM E283.
 2. Water Resistance: No water penetration at a static air pressure difference of 6.00 PSF when tested in accordance with ASTM E331.
 3. Uniform Structural Load: No member shall deflect more than 1/175 of its span when tested in accordance with ASTM E330 with center member deflections measured at a negative and positive air pressure of 60 PSF held at 10 second intervals.
 4. Thermal Performance: Tested in accordance with ASTM C236.
 - a. Condensation Resistance Factor (CRF): Not less than 53.
 - b. Conductive Thermal Transmittance (U-value): Not more than .60.

1.03 SUBMITTALS

- A. Submit product data, shop drawings and samples in accordance with Section 01 33 00.
1. Product Data: Submit 2 copies of Manufacturer's Specifications, recommendations and standard details for aluminum doors, frames and components of the Work. Include manufacturer's installation manual.
 2. Shop Drawings:
 - a. Include wall elevations at 1/2 inch scale, and full-size detailed sections of every typical composite member.
 - b. Show anchors, joint system, expansion provisions, end dams, water diverters and other components not included in Manufacturer's standard data.
 - c. Include glazing details.
 3. Samples:
 - a. Submit 2 samples of each required aluminum finish on 12-inch long extrusions or 6-inch square sheets of the alloys to be used for the Work.
 - b. Where normal color and texture variations are to be expected, include 2 or more units in each Sample, to show the range of such variations.
 - c. Samples will be reviewed by Architect for color and texture only.
 - d. Architect reserves the right to require samples of typical fabricated sections, showing joints, exposed fastenings (if any), quality of workmanship, hardware and accessory items, before fabrication of the Work proceeds.

1.04 QUALITY ASSURANCE

- A. Standards: Except as otherwise indicated, the requirements for aluminum doors and frames, and the terminology used in this Section, are those of NAAMM, AAMA and AA and in particular, those of the "Entrance Manual" by NAAMM.

- B. Regulatory Requirements:
 - 1. ANSI A117.1, 2009 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA)."
 - 3. 2010 ADA Accessibility Guidelines (ADAAG).
 - 4. The Arizonans with Disabilities Act of 1992 Administrative Rules (AzDAAG)

1.05 PROJECT/SITE CONDITIONS

- A. Field Measurements:
 - 1. Whenever possible, check the actual openings in the construction Work by accurate field measurement before fabrication, and show recorded measurements on final shop drawings.
 - 2. Coordinate fabrication schedule with construction progress as directed and avoid delays of the Work.
 - 3. Where necessary, proceed with fabrication without field measurement, and coordinate installation tolerances to ensure proper fit of units.

1.06 WARRANTY

- A. Warrant entire system of aluminum entrance doors and frames against leaks or other defects for a period of ten (10) years.
 - 1. Defective materials and workmanship are hereby defined to include, but are not limited to, evidence of:
 - a. Penetration of water into the building through fixed glazing and framing components.
 - b. Air infiltration exceeding specified limits.
 - c. Structural failure of components resulting from forces within specified limits.
 - d. Failure of insulated glass units.
 - e. Cracking, crazing, flaking, of coatings or opacifiers on glass.
 - f. Secondary glass damage and/or damage due to falling components.
 - g. Adhesive or cohesive failure of sealant.
 - h. Crazing on surface of non-structural sealant.
 - i. Non-structural sealant hardening beyond Shore A durometer 50 or softening below 20.
 - j. Failure of operating parts to function normally.
- B. Warrant aluminum finish against excessive fading, excessive non- uniformity of color or shade, cracking, peeling, pitting or corroding (all within the limits defined). Warranty shall include replacement at no charge (material and labor) for a period of five (5) years beginning on the date of final acceptance.
- C. Upon notification of defects within the warranty period, make the necessary repairs and replacements at the convenience of the Owner. Repairs and replacements shall include resultant damage to adjacent materials, systems and equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following manufacturers, except as otherwise approved by the Architect, subject to compliance with specifications requirements:
1. Arcadia, Inc. www.arcadiainc.com
 2. EFCO. www.efcocorp.com
 3. Kawneer Co. www.kawneer.com
 4. Oldcastle Building Envelope www.oldcastlebe.com
 5. CRL - US Aluminum Corp. www.crlaurence.com

2.02 MATERIALS

- A. Framing members, transition members, mullions, adapters, and mountings: Extruded 6063 T5 aluminum alloy (ASTM B221 - Alloy G.S. 10aT5).
- B. Screws, miscellaneous fastening devices, and internal components: Aluminum, stainless steel, or zinc plated steel in accordance with ASTM B633. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from the aluminum.
- C. Glazing gaskets: Elastomeric extrusions as required to provide specified performance. PVC glazing gaskets are not acceptable.
- D. Steel Sections: ANSI/ASTM A36; shaped to suit mullion sections.
- E. Glass: As specified in Section 08 80 00.
- F. Sealant: Silicone sealant in accordance with Section 07 92 00.
- G. Shop and Touch-Up Primer for Steel Components: SSPC 15, Type 1, red oxide.
- H. Touch-Up Primer for Galvanized Steel Surfaces: SSPS 20, zinc rich type.

2.03 COMPONENTS

- A. Sizes and Profiles: The required sizes for doors and frame units, and profile requirements, are shown, and are based on Aluminum Entrance and Storefront Frames indicated on Drawings as manufactured by Arcadia as follows:
1. Aluminum Entrance and Storefront Frames: Arcadia AG451 Series.
- B. Awning Windows: N200 windows as manufactured by Arcadia, or equivalent as approved by the Architect from one of the specified manufacturers.

2.04 FABRICATION

- A. General:
1. Weld by methods recommended by the Manufacturer and AWS to avoid discoloration at welds.
 2. Grind exposed welds smooth and restore mechanical finish.
 3. Remove arises from cut edges and ease edges and corners to a radius of approximately 1/64 inch.
 4. Conceal fasteners, wherever possible, except as otherwise shown.
 5. Maintain continuity of line and accurate relation of planes and angles.
 6. Provide secure attachment and support at mechanical joints, with hairline fit of contacting members.

7. Reinforce the Work as necessary for performance requirements, and for support to the structure.
 8. Separate dissimilar metals with bituminous paint or preformed separators which will prevent corrosion.
 9. Separate metal surfaces at moving joints with non-metallic separators to prevent "freeze-up" of joints.
- B. Frames:
1. Fabricate tubular assemblies as shown, with either welded or mechanical joints in accordance with Manufacturer's standards, with concealed fasteners wherever possible.
 2. Provide members of the size, shape, and profile shown.
 3. Reinforce internally with steel channel shapes as necessary to support the required loads. Secure vertical steel at head and sill as necessary for structural performance.
 4. Weatherstripping: Provide compression weatherstripping on door-contact face of door stops on exterior door frames and/or other frames where indicated.
 5. Glass framing members shall provide for flush glazing with through sight lines, without projecting stops for glass thicknesses noted on drawings or as specified in Section 08 80 00.
 6. Provide glazing system for frames to receive lights. Design system for replacement of glass.
 7. System shall provide resilient settings for glass by use of elastomeric extrusions as required to provide specified performance. PVC glazing gaskets are not acceptable.
 8. Fabricate frame assemblies for exterior walls with end dams, flashing and weeps to drain penetrating moisture to exterior.
 9. Provide anchorage and alignment brackets for concealed support of assembly from the building structure.
 10. Allow for thermal expansion of exterior units.
 11. Include flashings in conjunction with components as detailed, finished to match.
- C. Muntins: Where indicated, provide false muntins of applied aluminum strips or extrusions of profile indicated on Drawings or as otherwise approved by Architect, adhesive tape applied to glass with 3M VHB tape. Provide internal 1x spacers within insulating glass units matching muntin locations. Coordinate with insulating glass units specified in Section 08 80 00 as necessary for location of aluminum spacers within insulating glass units at muntin locations.
- D. Doors (Swinging)
1. Materials: Sections shall be extruded for 6063-T5 aluminum alloy (ASTM B221 - Alloy G.S. 10A T5).
 2. Fasteners, where exposed, shall be aluminum, stainless steel or plated steel. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from the aluminum.
 3. Glazing gaskets shall be TPE or EPDM elastomeric extrusions.
 4. Major portions of the door stiles shall be 0.125 inch in thickness and glazing molding shall be 0.050 inch thick.
 5. Construction:
 - a. Medium, unless otherwise indicated on Drawings:
 - 1) Vertical Stile: 3-1/2 inches.
 - 2) Top Rail: 3-1/2 inches.
 - 3) Bottom Rail: 10 inches
 - c. Thickness of stiles and rails: 1-3/4 inches.
 - d. Corner construction: Fillet weld and mechanical clip fastening.

6. Door shall be weatherstripped on 3 sides with metal-backed pile cloth installed in door and/or frame. Provide an integral adjustable (uninterrupted) dual weathering at meeting stiles of pairs of doors.
 7. Hardware: Provide the following items:
 - a. Weatherstrip and door bottom/sweep: Aluminum Door Manufacturer's standard.
 - b. Balance of Door Hardware: As specified in Section 08 71 00 and as scheduled on Drawings.
- E. Flashings and Miscellaneous Trim:
1. Provide interior sills, exterior sill (or subsills) with end dams, closures, flashings, break metal covers, trim and other elements in conjunction with or adjacent to storefront system as required for watertightness and aesthetics. If sill frame does not provide means for conducting water out of the aluminum frame systems, then suitable flashings to ensure that water is conducted out of system shall be provided. Provide water diverters at ends of the horizontal mullion glazing pockets to drain water down the vertical mullion/hamb glazing pockets to sill can or flashing.
 2. Fabricate miscellaneous trim from 0.060-inch-thick minimum aluminum (break metal) finished to match other components, except fabricate interior and exterior sills(or subsills) from 0.075-inch-thick minimum extruded aluminum (unless the sill or subsill is supporting the weight of the system and then a 0.125-inch thick minimum extruded aluminum shall be provided).
 3. Flashings and sill can, in conjunction with mechanically fastened end dams and/or water diverters shall direct water entering the system to the outside of the building and shall not depend solely upon sealants.
- F. Hardware Installation at Factory:
1. Cut, reinforce, drill and tap frames as required to receive hardware except do not drill and tap for surface-mounted items until the time of installation at the Project Site. Comply with Hardware Manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
 2. Install hardware, except surface-mounted hardware, at fabrication plant. Remove only as required for final finishing operations, and for delivery and installation of the Work at the Project Site.
- G. Aluminum Finishes:
1. Prepare the aluminum surfaces for finishing in accordance with the aluminum producer's recommendations and standards of the finisher or processor.
 2. Process components of each assembly in a manner to attain complete uniformity of color.
 3. Color Anodized Finish: Provide medium bronze anodized, Architectural Class 1 anodic coating conforming to Aluminum Association Designation AA-M-12 C22 A42/44.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Comply with Manufacturer's Specifications and recommendations for the installation of aluminum entrance and storefront frames.
 - 1. Furnish necessary material, labor, and equipment for the complete installation of the following: glass framing, vertical and horizontal mullions, transitional members connecting these components, adapters and mountings for trim moldings and facing materials.
 - 2. Set units plumb, level and true in line, without warp or rack of frames, doors or panels.
 - 3. Anchor securely in place.
 - 4. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
 - 5. Set sill members and other members in a bed of compound as shown, or with joint fillers or gaskets as shown to provide weathertight construction.
- B. Comply with Section 07 92 00 for sealants, compounds, fillers and gaskets to be installed integrally with aluminum entrances and storefronts.
 - 1. Seal joints in aluminum entrance and storefront in a concealed manner, unless exposed sealant is indicated.
- C. Comply with Section 08 80 00 and Aluminum Storefront Manufacturers printed instructions for installation of glass shown to be glazed into aluminum entrances and storefront.
- D. Dimensions indicated are based on an assumed design temperature of 70 degrees F. Take into account the ambient temperature range at the time of fabrication and erection.
- E. Cut and trim component parts of the aluminum entrance and storefront during erection only with the approval of the manufacturer or fabricator and in accordance with his recommendations. Do not cut through reinforcing members. Restore finish completely to protect material and remove evidence of cutting and trimming. Remove and replace members where cutting or trimming has impaired strength or appearance.
- F. Do not erect members which are warped, bowed, deformed or otherwise damaged to such extent as to impair strength or appearance. Remove and replace members damaged in the process of erection.

3.03 FIELD QUALITY CONTROL

- A. When requested by Architect or Owner, test each storefront system installed for water leaks in accordance with AAMA 501.2.03. Provide written certification that installed storefront framing systems pass.

3.04 CLEANING

- A. Clean aluminum surfaces promptly after installation of frames, exercising care to avoid damage of the protective coating.
- B. Remove excess glazing and sealant compounds, dirt, and other substances.

END OF SECTION

SECTION 08 42 29.39

LOW-ENERGY SWING ENTRANCE AUTOMATIC DOOR OPERATORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Low-energy electro-mechanical swing door operators for aluminum swing entrance doors.
 - 2. Activation controls.
- B. Related Sections:
 - 1. Section 08 41 13 – Aluminum Entrances and Storefronts, for aluminum entrance doors to receive automatic swing door operators.
 - 2. Section 08 71 00 – Door Hardware.

1.02 SYSTEM DESCRIPTION

- A. Complete package shall consist of electro-mechanical door operator, linkages, and activation controls for application to aluminum entrance doors.
- B. Performance Requirements:
 - 1. Automatic door equipment shall accommodate heavy pedestrian traffic and a minimum door weight of 125 lbs., but not less than weight of doors specified to be automatically operated.
 - 2. Operators shall open and close doors and maintain them in fully closed position when subjected to design wind speed of the Project.
 - 3. Opening/Closing Force: Force required to prevent door from opening or closing shall not exceed 15 lbf. Applied 1 inch from the latch edge of the door at any point in the opening or closing cycle, in accordance with ANSI A156.19.
 - 4. Opening Force (exterior doors): 15 lbf. or less to release latch, 30 lbf. or less to set door in motion, and 15 lbf. or less to fully open door when power is off, in accordance with ANSI A156.19.
 - 5. Closing Time: Not less than 4.5 seconds in accordance with ADA guidelines.
 - 6. Operating Temperature Range: minus 30 degrees F to plus 130 degrees F.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications, recommendations and standard details for operators, activation controls and other components, maintenance and operating manuals, and installation instructions. Furnish specialized tools required for maintenance and adjustment of units.
- B. Shop Drawings:
 - 1. Include elevations at 1/2 inch scale showing installed units.
 - 2. Show fasteners and anchorages details, location of components, adjacent construction interface, location of door activators, dimensions, and preparation requirements for frames and doors.
- C. Samples: Submit sample of required aluminum finish on 12 inches long extrusions or 6 inch square sheets of the alloys to be used for the work.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with the following:
 - 1. ANSI A156.19 "Power Assist and Low-Energy Power Operated Doors."
 - 2. UL 325.
 - 3. ANSI A117.1, 2009 "Accessible and Usable Buildings and Facilities."
 - 4. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
 - 5. 2010 ADA Accessibility Guidelines (ADAAG).
 - 6. The Arizonans with Disabilities Act of 1992 Administrative Rules (AzDAAG)
- B. Installer Qualifications: Manufacturer's authorized representative for installation and maintenance of the type of units required.

1.05 PROJECT/SITE CONDITIONS

- A. Coordination: Coordinate automatic door operators and activation devices with aluminum doors, frames and hardware and other construction as required for mounting of activation devices.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Use means necessary to protect automatic door operators before, during and after installation and protect the installed work of other trades.
- B. In the event of damage, immediately make repairs necessary to the approval of and at no additional cost to the Owner.

1.07 WARRANTY

- A. Warrant entire system of automatic door operators and activation components against defects for a period of three (3) years.
 - 1. Defective materials and workmanship are hereby defined to include, but are not limited to, evidence of:
 - a. Structural failure of components resulting from forces within specified limits.
 - b. Failure to fulfill other specified performance requirements.
 - c. Failure of operating parts to function normally.
- B. Warrant aluminum finish against excessive fading, excessive non- uniformity of color or shade, cracking, peeling, pitting or corroding (all within the limits defined). Warranty shall include replacement at no charge (material and labor) for a period of twenty (20) years beginning on the date of final acceptance.
- C. Upon notification of defects within the warranty period, make the necessary repairs and replacements at the convenience of the Owner. Repairs and replacements shall include resultant damage to adjacent materials, systems and equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following manufacturers, except as otherwise approved by the Architect, subject to compliance with specifications requirements:
1. Besam, Inc. www.besam.com
 2. Dorma Architectural Hardware www.dorma-usa.com
 3. Horton Automatics Division of Overhead Door Corporation www.hortondoors.com.
 4. Stanley Access technologies; Div. Of the Stanley Works www.stanleyworks.com.

2.02 COMPONENTS

- A. Aluminum Entrance Doors: As specified in Section 08 41 13.
- B. Low-Energy Door Operator: Provide manufacturer's standard door operator of size recommended by manufacturer for door size, weight and operation indicated, and complying with the following:
1. Type: Low-energy electromechanical type operator, power open, spring close, self-contained overhead unit with electric motor, reduction or helical gear drive, door arm and linkage assembly, fully-lubricated sealed ball-bearings, springs and other components as standard with manufacturer for type of unit required.
 2. Spring Closing: Spring energy closing. Closing speed controlled by gear train and dynamic braking action of electric motor.
 3. Manual Operation: Operator shall function as a manual door closer in the direction of swing with or without electrical power.
 4. Adjustment Features: Operator shall be fully adjustable without removing entrance door(s), including adjustable speed, adjustable time delay for length of time doors remain open and automatic door re-open if stopped while closing.
 5. Housing: Die-cast aluminum, lubricant filled.
 6. Mounting: Concealed header mounted.
 7. Header: Manufacturer's standard header box with structural integrated end caps, fabricated of 6063-T5 aluminum extrusions. Provide structural sections of minimum .025 inch aluminum. Provide full length removable cover for access to operator and electronic control box.
 8. Linkage Assembly: Manufacturer's standard linkage assembly for type of operator, door and door hinges/pivots specified, providing positive control of door through entire swing.
 9. Mechanical parts shall either be field repairable or replaceable without the use of rebuilt components.
- C. Activation Device: Provide manufactures standard push plate switch for wire connection to door controller, and as follows:
1. Push Plate: 4 inch or 4-1/2 inch square or round wall plate with handicap logo and "Press to Operate Door" engraved on plate.
 2. Designed for mounting on single or double gang electrical box.
 3. Mounting Location: Aluminum window wall mullion location indicated on Drawings.
 4. Normally open momentary contact type switch.
 5. Concealed socket mounting screws.
- D. Aluminum Finishes: As specified in Section 08 41 13.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.
 - 1. Coordinate conduit and wiring with Division 26 - Electrical.
 - 2. Coordinate installation with aluminum entrance doors specified in Section 08 41 13.

3.02 INSTALLATION

- A. Install units in compliance with manufacturer's printed instructions and approved Shop Drawings.
 - 1. Set units plumb, level and true in line, correctly positioned in relation to door frames and doors to be operated.
 - 2. Anchor securely in place using fasteners supplied by automatic operator manufacturer.
 - 3. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- B. Door Activation Devices: Install door activation push-plate controls on each side of door opening as detailed and at locations indicated in compliance with manufacturer's printed instructions and to comply with referenced standards.
- C. Adjust operating components for speed, opening force, delay and other adjustments to comply with referenced standards.
- D. Connect electrical operator and activation devices in accordance with the requirements of Division 26 - Electrical.

3.03 INSTRUCTION

- A. At substantial completion of Project, instruct Owners personnel in the proper use adjustment and maintenance of automatic door operators and activations devices.

3.04 ADJUSTMENT AND CLEANING

- A. Perform final adjustment of operating components for speed, opening force, delay and other adjustments to comply with referenced standards after repeated operation just prior to final occupancy of Project.
- B. Remove and replace or repair where acceptable to Architect, units that do not comply with requirements.
- C. Clean aluminum surfaces promptly after installation, exercising care to avoid damage of the protective coating.

END OF SECTION

SECTION 08 71 00

HARDWARE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. Provide all labor, materials, tools, equipment and incidentals as shown on the Drawings, specified and required to furnish and install finish hardware.
2. Extent of finish hardware is specified. Finish hardware is defined to include all items known commercially as finish hardware, except special types of unique and non-matching hardware specified in the same Section as the door and door frame.
3. Types of products required:
 - a. Mortise Hinges.
 - b. Bored Lock and Latch Sets.
 - c. High-Security Mortise Locks and Latch Sets.
 - d. Panic Exit Devices.
 - e. Removable Mullions.
 - f. Overhead Surface-Mounted Door Closers.
 - g. Heavy-Duty, Concealed Overhead Holders and stops.
 - h. Door Pulls, Push and Protection Armor.
 - i. Stripping and Seals.
 - j. Thresholds.
 - k. Silencers.
 - l. Wall and Floor Stops.

B. Coordination:

1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, the finish hardware.
2. Coordinate the Work of other Sections to provide clearances and accurate positioning of recessed or cast-in-place items.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Provide finish hardware and accessories manufactured by firms specializing in the production of this type of Work and complying with specified standards of ANSI, BHMA, DHI, NFPA, HMMA, SDI and UL.
2. Provide finish hardware from manufacturers who are members of BHMA and participate in BHMA certification programs.

- B. **Installer Qualifications:** The finish hardware installer shall have in his employ an architectural hardware consultant. The architectural hardware consultant shall be a member of the Door and Hardware Institute, who has passed the DHI certification examine and successfully completed an apprenticeship program. The architectural hardware consultant shall be responsible for preparing finish hardware schedules and Shop Drawings and be present at the site for the purpose of checking and supervising the Work of the installer during the time of installation and adjustment of the finish hardware Work, and shall prepare a written field report on status of completed finish hardware installation as specified.
- C. **Performance Criteria:**
1. Where the finish, shape, size, fire-resistance-rating, frequency of use, or function of a member receiving finish hardware is such as to prevent, or make unsuitable, the types of finish hardware specified, furnish similar types having as nearly as practicable the same operation but of type or kind more appropriate to the design intention and requirements of governing authorities having jurisdiction. Clearly identify and highlight to ENGINEER all such required modifications on Shop Drawings submitted for approval.
 2. If finish hardware for any location is not specified, provide finish hardware equal in design and quality to adjacent finish hardware specified for comparable openings at no additional cost to OWNER.
 3. Furnish finish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements, as necessary for proper installation and function.
 4. Unless otherwise specified, comply with DHI, Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames and Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.
- D. **Requirements of Regulatory Agencies:**
1. Provide finish hardware for fire-resistance-rated openings in compliance with NFPA 80.
 2. Provide only finish hardware which has been tested, listed and labeled by UL for the types and sizes of doors required, and complies with the requirements of the door and door frame labels.
 3. Modify features of finish hardware items specified, and provide additional accessories and features as required to meet UL and NFPA requirements, at no additional cost to OWNER.
- E. **Codes:** Comply with applicable requirements of the 2012 Phoenix Building Construction Code and adopted amendments..
- F. **Source Quality Control:**
1. Obtain each type of finish hardware item from only one manufacturer.
 2. Provide Finish Hardware Schedule, for submission to, and for approval by, ENGINEER, prepared in compliance with DHI standards.
 3. Comply with specified BHMA standards.
- G. **Reference Standards:** Comply with the applicable provisions and recommendations of the following, except where otherwise shown or specified:
1. ANSI A117.1, Accessible and Usable Buildings and Facilities.
 2. ANSI in association with Builders Hardware Manufacturers Association, ANSI/BHMA A156.1, Butts and Hinges.

3. ANSI in association with Builders Hardware Manufacturers Association, ANSI/BHMA A156.3, Exit Devices.
4. ANSI in association with Builders Hardware Manufacturers Association, ANSI/BHMA A156.4, Door Controls - Closers.
5. ANSI in association with Builders Hardware Manufacturers Association, ANSI/BHMA A156.6, Architectural Door Trim.
6. ANSI in association with Builders Hardware Manufacturers Association, ANSI/BHMA A156.7, Template Hinge Dimensions.
7. ANSI in association with Builders Hardware Manufacturers Association, ANSI/BHMA A156.8, Door Controls - Overhead Stops and Holders.
8. ANSI in association with Builders Hardware Manufacturers Association, ANSI/BHMA A156.13, Locks and Latches, Mortise.
9. ANSI in association with Builders Hardware Manufacturers Association, ANSI/BHMA A156.16, Auxiliary Hardware.
10. ANSI in association with Builders Hardware Manufacturers Association, ANSI/BHMA A156.18, Hardware - Materials and Finishes.
11. ANSI in association with Builders Hardware Manufacturers Association, ANSI/BHMA A156.21, Thresholds.
12. ANSI in association with Builders Hardware Manufacturers Association, ANSI/BHMA A156.22, Door Gasketing Systems.
13. ANSI in association with National Fire Protection Association, ANSI/NFPA 252, Fire Tests of Door Assemblies.
14. ANSI in association with Underwriters Laboratories Incorporated, Standards for Safety, UL 10B, Fire Tests of Door Assemblies.
15. ANSI in association with Door and Hardware Institute, ANSI/DHI A115.1, Preparation of Mortise Locks in 1-3/8-inch and 1-3/4-inch Standard Steel Doors and Frames.
16. National Fire Protection Association, NFPA 80, Standard for Fire Doors and Fire Windows.
17. Door and Hardware Institute, DHI, Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.
18. Door and Hardware Institute, DHI, Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.
19. Door and Hardware Institute, DHI, Sequencing and Format for the Hardware Schedule.
20. Steel Door Institute, SDI 109, Hardware for Standard Steel Doors and Frames.
21. Steel Door Institute, SDI 118, Basic Fire Door Requirements.
22. Underwriters Laboratories Incorporated, Standards for Safety, UL 305, Panic Hardware.
23. Underwriters Laboratories Incorporated, UL, Building Materials Directory.
24. The Americans with Disabilities Act of 1990 (Public Law 101-336), Appendix A to Title 28 Code of Federal Regulations Part 36 (Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities - ADAAG).
25. Hollow Metal Manufacturers Association, Division of National Association of Architectural Metal Manufacturers, HMMA 830, Hardware Preparation and Locations for Hollow Metal Doors and Frames.
26. The 2012 Phoenix Building Construction Code and adopted amendments.

1.3 SUBMITTALS

- A. Samples: Submit for approval the following:
 1. Actual unit of each finish hardware item specified incorporating all standard and special features and finishes specified, demonstrated and identified by manufacturer's representative to ENGINEER. Samples shall be presented at time of Shop Drawing submittal, as ENGINEER will not review or approve Shop Drawings without concurrent sample submissions.

2. Approved samples may be incorporated into the finish hardware Work.
 3. ENGINEER'S review will be for appearance and for general compliance with required features. Compliance with all other requirements is the responsibility of CONTRACTOR.
- B. Shop Drawings: Submit for approval the following:
1. Copies of manufacturer's data for each item of finish hardware. Include whatever information may be necessary to show compliance with specified requirements and include instructions for installation and for maintenance of operating parts and exposed finishes. Include mounting heights and locations for each item of finish hardware. Provide ENGINEER with latest complete technical catalogue of all available finish hardware manufactured by proposed manufacturers, even if manufacturer specified by ENGINEER is submitted by CONTRACTOR to perform the Work. Furnish templates to fabricators of other work which is to receive finish hardware.
 2. Copies of the Finish Hardware Schedule in the manner and DHI vertical format specified, complying with the actual construction Progress Schedule requirements (for each draft). Include explanation of abbreviations, symbols, and codes used to present scheduled information.
 3. Based on the finish hardware requirements specified, organize the final Finish Hardware Schedule into "hardware sets," indicating complete designation of every item required for each door or opening. Furnish initial draft of schedule at the earliest possible date, in order to facilitate the fabrication of other Work (such as hollow metal frames) which may be critical in the Project Schedule.
Furnish final draft of schedule after samples, manufacturer's data sheets, coordination with Shop Drawings for other Work, delivery schedules and similar information have been completed and accepted.
 4. Finish Hardware Schedules are intended for coordination of the Work. Review and acceptance by ENGINEER does not relieve CONTRACTOR of responsibility to fulfill the requirements as shown and specified.
 5. Operations and Maintenance Manuals:
 1. Submit complete installation, operation and maintenance manuals including: detailed procedure for routine maintenance and cleaning, detailed procedures for repairs such as dents, scratches and staining, detailed maintenance data and schedules, description of operation, spare parts information, and parts identification drawings and manual.
 2. Hardware schedule, including manufacturer, finish and model numbers shall be included in the Operations and Maintenance Manuals as outlined in paragraph 3.6.B below.
- C. Test Reports: Submit for approval certified independent laboratory test reports for BHMA certification program and certification tests for each type of product specified.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials:
1. Deliver items of finish hardware sufficiently in advance of their setting for proper inspection. Comply with the requirements of Section 01651, Transportation and Handling of Materials and Equipment.
 2. Deliver all items of finish hardware in manufacturer's original, undamaged packages, bearing accurate representation of the item within each package.
 3. Pack each piece of finish hardware separately, complete with screws, keying, instructions and templates, tagged to correspond with items submitted on approved Shop Drawings and as specified.
 4. Inspect items upon delivery for damage. Items that arrive in damaged condition shall be permanently removed from the site and not offered again for approval by ENGINEER.

- B. Storage and Handling of Materials:
 - 1. Provide secure storage area for finish hardware items, secured by locks and accessible only to finish hardware installer, ENGINEER and CONTRACTOR.
 - 2. Store finish hardware in manufacturers' original packages.
 - 3. Control the handling and installation of finish hardware items which are not immediately replaceable, so that the completion of the Work will not be delayed by finish hardware losses, both before and after installation.
 - 4. Comply with the requirements of Section 01661, Storage of Materials and Equipment.
- 1.5 JOB CONDITIONS
- A. Scheduling:
 - 1. Deliver individually packaged finish hardware items at the proper time to the proper locations for installation.
 - 2. Coordinate with other Work by furnishing Shop Drawings, inserts, templates and similar items at the appropriate times for proper sequencing of construction without delays.

PART 2 - PRODUCTS

2.1 MATERIALS AND FABRICATION

- A. General:
 - 1. Hand of Door: The Drawings show the swing or hand of each door leaf (left, right, reverse bevel, etc.). Furnish each item of finish hardware for proper installation and operation of the door swing as shown on the Drawings.
 - 2. Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with labels required by governing authorities.
 - 3. Base Metals: Produce finish hardware units of the basic metal and forming method specified, using the manufacturer's standard metal alloy, composition, temper and hardness. Do not substitute materials or forming methods for those specified.
 - 4. Fasteners: Manufacture finish hardware to conform to published templates, generally prepared for machine screw installation. Do not provide finish hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.
 - 5. Furnish screws for installation, with each finish hardware item. Provide Phillips flat-head screws, except as otherwise specified. Finish exposed (exposed under any condition) screws to match the hardware finish or, if exposed in surfaces on other Work, to match the finish of such other Work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.
 - 6. Provide fasteners which are compatible with both the unit fastened and the substrate, and which will not cause corrosion or deterioration of finish hardware, base material or fastener.
 - 7. Provide concealed fasteners for finish hardware units which are not exposed when the door is closed, except to the extent no standard manufacturer units of the type specified are available with concealed fasteners. Do not use through bolts for installation where the bolt head or the nut on the opposite face is exposed in other Work under any condition, except where it is not possible to adequately reinforce the Work and use machine screws or concealed fasteners of another standard type to satisfactorily avoid the use of through bolts.
 - 8. Tools for Maintenance: Furnish a complete set of specialized tools as required for OWNER'S continued adjustment, maintenance, removal and replacement of finish hardware.

- B. Mortise Hinges:
1. Templates and Screws: Provide only template-produced units.
 2. Base Metal: Except as otherwise specified, fabricate hinges from steel and finish to match the latch and lock set.
 3. Number of Hinges:
 - a. Two Hinges: For doors with heights up to 60 inches (1524 mm).
 - b. Three Hinges: For doors with heights 61 to 90 inches (1549 to 2286 mm).
 - c. Four Hinges: For doors with heights 91 to 120 inches (2311 to 3048 mm).
 - d. For doors with heights more than 120 inches (3048 mm), provide 4 hinges, plus 1 hinge for every 30 inches (750 mm) of door height greater than 120 inches (3048 mm).
 4. Hinge Size: Except as otherwise specified or as required to comply with UL and NFPA, provide hinges of the following sizes:
 - a. Interior Doors:
 - 1) Average use, maximum 36-inches wide: 4-1/2-inch by 4 1/2-inch standard weight (0.134-inches).
 - b. Entrance, exterior, restroom, corridor and high frequency use Doors:
 - 1) Maximum 48-inches wide: 5-inch by 5-inch heavy weight (0.190- inch).
 5. Types of Hinges: Provide full-mortise type, antifriction-bearing hinges, swaged for mortise applications, inner leaf beveled, square cornered, unless manufacturer's recommendations indicate that half-mortise, half-surface, full-surface or other type should be used for the frame and door type or condition.
 6. Hinge Pins: Except as otherwise specified, provide hinge pins as follows:
 - a. Pins: Steel.
 - b. All Doors : Non-removable pins. Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed.
 - c. Tips: Slope ends of hinge barrel.
 7. ANSI/BHMA: A156.1 and A156.7.
 8. Comply with UL, List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.
 9. Coordinate and provide manufacturer's recommended wires for electrified hinges. At a minimum 6-wire transfer hinges for bored locksets and mortise locksets, and 10-wire transfer hinges for panic exit devices.
 10. Product and Manufacturer: Provide one of the following:
 - a. T4A3386 by McKinney Products Company, an ASSA ABLOY Group Company
 - b. Stanley Hinges, A Division of Stanley Security Solutions.
 - c. Ives Hinges, Ives Architectural Products, an Allegion PLC Company.
 - d. Hager Hinges, by Hager Companies.

C. Bored Locks and Latch Sets:

1. Strikes: Provide 28-series lip strike, for each location and use shown. Provide stainless steel curved lip strikes, unless otherwise recommended by manufacturer, finished to match lock or latch set trim.
2. Modify specified locks and latches to comply with UL, Building Materials Directory, and List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.
3. Finish: US 26D satin. 4. BHMA: A156.2.
5. Coordinate and provide manufacturer's recommended wires for electrified hinges. At a minimum 6-wire transfer hinges for bored locksets.
6. Product and Manufacturer: Provide one of the following:
 - a. Sargent Manufacturing Company, an ASSA ABLOY Group Company, 11 Line I/C core lever, series 64 construction cores, LL Series Lever and rose trim.

- b. Sargent Manufacturing Company, an ASSA ABLOY Group Company, RX286410G71LL 26D X 24 Volt DC.
- D. High-Security Mortise Locks and Latch Sets:
1. Strikes: Provide manufacturer's standard wrought box strike, for each location and use shown. Provide stainless steel curved lip strikes, unless otherwise recommended by manufacturer, finished to match lock or latch set trim.
 2. Lock Throw: Provide minimum of 3/4-inch anti-friction latch bolt and 1-inch dead bolt throw. Comply with UL requirements for throw of latch bolts and deadbolts on fire-resistance-rated openings.
 3. Materials: Provide the following features and materials:
 - a. Latch Bolt: Two-piece; mechanical; anti-friction; stainless steel.
 - b. Dead Bolt: One-piece; stainless steel with two enclosed hardened-steel roller armor pins.
 - c. Case: Wrought steel, zinc die achromatized.
 - d. Cylinders: High-security; brass; pick- and drill-resistant; ANSI/BHMA A156.5, Grade 1.
 - e. Armor Front: 8-inches by 1-1/4-inches wide minimum; steel.
 - f. Escutcheon: 8-inches by 2-1/2-inches wide by 3/16-inches thick minimum; stainless steel, US 32D.
 - g. Hubs: Sintered steel, copper infiltrated.
 - h. Lever with Stop Pin: Brass, plated to match stainless steel; with additional built-in stop to prevent over-torquing of lever.
 - i. All components shall be of marine quality, wherever possible.
 4. Backset: 2-3/4-inches.
 5. Modify specified locks and latches to comply with UL, Building Materials Directory, and List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.
 6. Finish: US 26D satin.
 7. ANSI/BHMA: A156.13, Series 1000, Security Grade 1.
 8. Coordinate and provide manufacturer's recommended wires for electrified hinges. At a minimum 6-wire transfer hinges for mortise locksets.
 9. Product and Manufacturer: Provide one of the following:
 - a. Sargent Manufacturing Company, an ASSA ABLOY Group Company 64- 8200 Series LL Trim .
 - b. Schlage Manufacturing Company; an Allegion PLC Company L-Series Mortise Lock, 17 Lever, B-rose with 64-42x26Dx106 L Cam.
 10. Product and Manufacturer (Electrified): Provide one of the following:
 - a. Sargent Manufacturing Company, an ASSA ABLOY Group Company RX64-8200 Series LL Trim.
 - b. Schlage Manufacturing Company; an Allegion PLC Company RX L-Series Mortise Lock, 9080EU(24 volts) with 17 Lever, B-rose with 64- 42x26Dx106 L Cam.
- E. Panic Exit Devices:
1. Exit Doors: Where required by governing jurisdictions, provide panic exit devices, of the type required, including UL labels, if required by governing jurisdictions.
 2. Fire Doors: Where shown on the Drawings or specified as a fire-resistance- rated door, provide units listed and labeled by UL, to comply with the fire- resistance-rating and size of door shown.
 3. Strikes: Provide manufacturer's standard wrought stainless steel jamb-mounted top latch bolt and bottom latch bolt for each location and use shown to allow independent opening and closing of each leaf of double doors with panic exit devices; complying with UL List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.
 4. Lock Throws: Provide minimum of 3/4-inch latch bolt throw complying with UL List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.

5. Provide the following features and materials:
 - a. Latch Bolt: Two-piece; mechanical; anti-friction; stainless steel.
 - b. Dead Bolt: One-piece; stainless steel with two enclosed hardened-steel roller armor pins.
 - c. Case: Wrought steel, zinc die chromated.
 - d. Cylinders: High-security; brass; pick- and drill-resistant; ANSI/BHMA A156.5 - E09211A, Sargent Manufacturing Company; an ASSA ABLOY group Company, series 64 construction cores
 - e. Armor Front: 8-inches by 1-1/4-inches wide minimum; steel.
 - f. Escutcheon: 8-inches by 2-1/2-inches wide by 3/16-inches thick minimum; stainless steel, US 32D.
 - g. Hubs: Sintered steel, copper infiltrated.
 - h. Vertical Rod Devices: not permitted unless required by code.
 - i. Concealed bolts: Minimum 1/2-inch diameter, stainless steel.
 6. Backset: Provide minimum backset of 2-3/4-inches.
 7. Finish: US 32D satin.
 8. ANSI/BHMA: A156.3, Type 3 and Type 8, Grade 1; F08, entrance by lever, key locks or unlocks lever for entrances shown as accessible to people with disabilities as required by ADAAG; and F05, entrance by thumb piece, key locks or unlocks thumb piece.
 9. Coordinate and provide manufacturer's recommended wires for electrified hinges. At a minimum 10-wire transfer hinges for panic exit devices.
 10. Product and Manufacturer: Provide one of the following:
 - a. Von Duprin Manufacturing Company; an Allegion PLC Company series 98/99 with 996L lever trim. Order 64-34 rim cylinder to go with device.
 - b. Von Duprin Manufacturing Company; an Allegion PLC Company series 33/35 with 370L lever trim. Order 64-42 for mortise cylinder to go with device.
 - c. Sargent Manufacturing Company; an ASSA ABLOY Group Company series 64-80, ETL trim.
 11. Product and Manufacturer (Electrified): Provide one of the following:
 - a. Von Duprin Manufacturing Company; an Allegion PLC Company series RX98/99 with 996L lever trim, battery back-up and power supply, EPT-10. Order 64-34 rim cylinder to go with device.
 - b. Von Duprin Manufacturing Company; an Allegion PLC Company series RX33/35 with 370L lever trim, battery back-up and power supply, EPT-10. Order 64-42 for mortise cylinder to go with device.
 - c. Sargent Manufacturing Company; an ASSA ABLOY Group Company series 80, ETL trim, 24-volt DC, part 55, battery back-up and power supply.
- F. Removable Mullions
1. Removable Mullion: Provide with each pair of double doors identified in the Finish Hardware Table in Part 3 of the specification.
 2. Fire-Resistance: Provide removable mullions in accordance with UL 305 and NFPA 252 as required by the contract documents.
 3. Finish: US 32D satin.
 4. BHMA A156.3.
 5. Product and Manufacturer: Provide one of the following:
 - a. KR-4954 (standard) 64-42X112X26, KR-9954 (fire-rated) by Von Duprin Manufacturing Company; an Allegion PLC Company.
 - b. 64-L980s (standard), 64-12-L980 (fire) by Sargent Manufacturing Company; an ASSA ABLOY group Company.

- G. Cylinders and Keying System:
1. Equip all locks with manufacturer's cylinders for Sargent Series 64-6300 interchangeable-core pin tumbler inserts. Furnish only temporary construction cores ("64") for the construction period, and remove these before Substantial Completion. Construction control keys and cores shall not be part of OWNER'S permanent keying system.
 2. Permanent keys and cores shall be furnished by the Owner and coordinated with City of Phoenix, Public Works Department.
 3. Cylinder Material: Brass, bronze or stainless steel.
 4. Cylinder Features: 6-pin, high-security, removable core.
- H. Overhead, Surface-Mounted, Door Closers:
1. Provide all doors, unless specially shown on the Drawings or specified as being provided with heavy-duty surface-mounted overhead door closers. Provide both active and inactive door leafs with closers.
 2. Size of Units: Except as otherwise specified, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather, and anticipated frequency of use.
 3. Where parallel arms are specified, and for closers on exterior doors, provide closer unit one size larger than recommended for use with standard arms.
 4. Use parallel arm arrangement for doors that would otherwise have the door closer appearing in finished corridors or entries.
 5. Comply with UL, Building Materials Directory, and List of Inspected Fire Protection Equipment and Materials, and NFPA 80. Modify closers specified, as required.
 6. Provide hold open feature for all non-fire-resistant-rated doors, unless otherwise specified.
 7. Provide long arm to allow door to swing 180° where long arm will eliminate floor mounted stops.
 8. Provide closers with spring power adjustment feature capable of increasing spring power 15 percent minimum in all closer sizes.
 9. Provide individual regulating valves for closing and latching speeds, and separate adjustable backcheck valve.
 10. Provide delayed closing action feature on all door closers. Position valve at top of closure.
 11. Provide the following materials and features:
 - a. Full Metal Cover: Aluminum.
 - b. Case: Cast iron.
 - c. Arms: Plated to match full metal covers.
 - d. Other Parts: Steel.
 - e. Extreme temperature fluid.
 - f. Security torx machine screws.
 - g. Ten year warranty.
 - h. Provide manufacturer's optional corrosion protection.
 12. Finishes: US 26D satin chrome. Color coordinate all arms and other accessories.
 13. Highly Corrosive Atmospheres: Provide all closers with specified manufacturer's optional corrosion protection.
 14. ANSI/BHMA: A156.4, Grade 1.
 15. Product and Manufacturer: Provide one of the following:
 - a. Interior doors and exterior doors – 4040XP series with EDA arm by LCN Manufacturing Company; an Allegion PLC Company.
 - b. 281 series with 25-P10 arm by Sargent Manufacturing Company; an ASSA ABLOY Group Company.

- I. Heavy-Duty, Concealed Overhead Holders and Stops:
 1. Provide heavy-duty, concealed overhead holders and stops on all exterior and all interior doors,. Comply with UL and NFPA requirements for hold-open feature.
 2. Provide the following features and materials:
 - a. Shock Absorber Spring: Heavy tempered steel.
 - b. Channel: Heavy gage brass.
 - c. All other Parts: Stainless steel.
 - d. Adjustment: Degree of hold-open and stop shall be adjustable after installation.
 3. Finish: US 32D satin.
 4. Coordinate placement of concealed overhead holder and stop with overhead closers.
 5. ANSI/BHMA: A156.8, C51511.
 6. Product and Manufacturer: Provide one of the following:
 - a. Heavy-Duty 100H (ADJ) Series Concealed Holders and Stops by Glynn-Johnson Part, an Allegion PLC Company.
 - b. Series 690 by Sargent; an ASSA ABLOY Group Company.

- J. Door Pulls, Push and Protection Armor:
 1. Door Pulls: Provide heavy-duty surface-mounted door pulls with pull plates where specified in List of Finish Hardware Items at end of Part 3.
 - a. Door pulls shall be stainless steel US 32D and have 1-inch diameter 12- inch long handles which project 2-1/2-inches from pull plate surface.
 - b. Pull plates shall be 4-inches by 16-inches, stainless steel US 32D; 0.050-inches thick.
 - c. Provide all non-removable fasteners.
 - d. Pulls shall be fastened to plates at factory.
 - e. ANSI/BHMA: A156.6, J405; B3E.
 - f. Product and Manufacturer: Provide one of the following:
 - 1) Rockwood, an ASSA ABLOY Group Company.
 - 2) Trimco.
 - 3) Ives Door Pulls, Ives Architectural Products, an Allegion PLC Company.
 2. Push Plates:
 - a. Provide 0.125-inch thick stainless steel plate with No. 4 finish.
 - b. Size: 8-inches by 16-inches with beveled edges.
 - c. ANSI/BHMA: A156.6, J304; B3E.
 - d. Manufacturer: Provide one of the following:
 - 1) Rockwood, an ASSA ABLOY Group Company .
 - 2) Trimco.
 - 3) Ives Push Plates, Ives Architectural Products, an Allegion PLC Company.
 3. Protection Armor:
 - a. Provide one armor plate per leaf of each door scheduled to receive armor- plate protection.
 - b. Provide 16-gage stainless steel with No. 4 finish 10-inches high by 2-inches less in width than width of door on the push side and 1-inch less than door width on pull side.
 - c. ANSI/BHMA: A156.6, J101; B3E.
 - d. Manufacturer: Provide one of the following:
 - 1) Rockwood, an ASSA ABLOY Group Company.
 - 2) Trimco.
 - 3) Ives Protection Armor, Ives Architectural Products, an Allegion PLC Company.

- K. Stripping and Seals:
 1. Provide perimeter weather stripping at all exterior doors. Provide stripping and seals for interior doors where scheduled in List of Finish Hardware Items at end of Part 3.

2. Continuity of Stripping: Except as otherwise specified, stripping at each opening shall be continuous and without unnecessary interruptions at door corners and hardware.
 3. Replaceable Seal Strips: Resilient or flexible seal strip of every unit shall be easily replaceable and readily available from stocks maintained by the manufacturer.
 4. Provide bumper-type weather-stripping at jambs and head, including a resilient insert and metal retainer strip, surface-applied, of the following metal, finish and resilient bumper material:
 - a. Housing: Extruded aluminum with dark bronze anodized finish; 0.062-inch minimum thickness of main walls and flanges.
 - b. Dimensions: 1-3/8-inches by 7/8-inches; stop-mounted.
 - c. Seals: Closed-cell extruded silicone. d. ANSI/BHMA: A156.22, R3E264.
 - e. Product and Manufacturer: Provide one of the following:
 - 1) No. 350DSPK and 2891 DPK (for parallel arms) by Pemko Manufacturing Company.
 - 2) National Guard Products, Incorporated.
 5. Provide surface-mounted door-bottom sweep of manufacturer's standard design, as follows:
 - a. Housing: Extruded aluminum, 0.062-inch thick, with mill aluminum finish.
 - b. Seal: Nylon Brush (NB).
 - c. Mounting: Surface.
 - d. ANSI/BHMA: A156.22, R3E344.
 - e. Product and Manufacturer: Provide one of the following:
 - a) No. 18061DNB by Pemko Manufacturing Company.
 - b) National Guard Products, Incorporated.
- L. Thresholds:
1. All exterior and interior doors shall be provided with thresholds. Where one or more mullions are specified, cut threshold to allow mullions to extend continuously for the entire opening.
 2. Surface Pattern: Fluted tread, manufacturer's standard.
 3. Provide countersunk stainless steel screws and expansion shields.
 4. Width: 5-inches wide and of length sufficient to span full width of rough openings; coped and scribed neatly at and around door frames.
 5. Construction:
 - a. Single-piece, Aluminum Mill finish complying with manufacturer's recommendations.
- M. Sealants: Provide elastomeric sealant complying with FS TT-S-00227, Type 2 (non-sag) Class A for use with thresholds.
- N. Silencers:
1. Provide silencers for all door frames.
 2. Provide pneumatic design that, once installed, forms an air pocket to reduce noise.
 3. Provide minimum of three per strike side of door jambs. 4. ANSI/BHMA: A156.16, BHMA 6.5, L03011.
 5. Product and Manufacturer: Provide one of the following:
 - a. Trimco.
 - b. Ives Silencers, Ives Architectural Products, an Allegion PLC Company.
- O. Wall and Floor Stops: Provide the following where scheduled in List of Finish Hardware Items at end of Part 3:
1. Dome-Type Floor Stops:
 - a. Cast bronze extra heavy-duty wall mounted door stop, one per leaf.

- b. Coordinate height of dome-type floor mounted doors stops with threshold condition and undercut of door.
 - c. Finish: US 26D satin chrome.
 - d. ANSI/BHMA: A156.16, L12161.
 - e. Product and Manufacturer: Provide one of the following:
 - 1) Ives Architectural Products, an Allegion PLC Company .
 - 2) Rockwood, an ASSA ABLOY Group Company.
2. Wall Stops:
- a. Cast bronze extra heavy-duty wall mounted door stop, one per leaf.
 - b. Convex rubber bumper.
 - c. ANSI/BHMA: A156.16, L12101.
 - d. Product and Manufacturer: Provide one of the following:
 - 1) Ives Architectural Products, an Allegion PLC Company .
 - 2) Rockwood, an ASSA ABLOY Group Company .

2.2 HARDWARE FINISHES

- A. Provide matching finishes for finish hardware units at each door or opening, to the greatest extent possible in compliance with ANSI/BHMA A156.18.
- B. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of finish hardware exposed at the same door or opening. In general, match all items to the manufacturer's standard finish for the latch and lock set for color and texture.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the substrate to receive finish hardware, and the conditions under which the Work will be performed, and notify ENGINEER, in writing, of unsatisfactory conditions. Do not proceed with the finish hardware Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 PREPARATION

- A. Templates: Furnish finish hardware templates to each fabricator of doors, frames and other Work to be factory-prepared for the installation of finish hardware. Check the Shop Drawings of such other Work, to confirm that adequate provisions are made for the proper installation of the finish hardware.
- B. Prepare Work to receive finish hardware Work in compliance with ANSI/DHI A115.1.

3.3 INSTALLATION

- A. Mount finish hardware units at heights recommended in, Door and Hardware Institute, "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames" and "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames", except as otherwise specified or required to comply with governing authorities having jurisdiction at the site, HMMA 830 and

ADAAG requirements. Refer to and comply with the requirements of Section 08105, Hollow Metal Doors and Frames, Section 08120, Aluminum Doors and Frames, Section 08310, Access Doors and Panels, Section 08333, Overhead Coiling Doors.

- B. Install each finish hardware item in compliance with the manufacturer's instructions and recommendations and approved Shop Drawings. Wherever cutting and fitting is required to install finish hardware onto or into surfaces which are later to be painted or finished in another way, install each item completely and then remove and store in a secure place during the finish application. After completion of the finishes, re-install each item. Do not install surface-mounted items until finishes have been completed on the substrate.
- C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Cut and fit threshold and floor covers to profile of door frames, with mitered corners and hair-line joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.
- F. Screw thresholds to substrate with No. 10 or larger screws, of the proper type for permanent anchorage and of bronze or stainless steel which will not corrode in contact with the threshold metal.
- G. Set thresholds in a bead of elastomeric sealant to completely fill concealed voids and exclude moisture from every source. Do not plug drainage holes or block weeps. Remove excess sealant before sealant cures to a firm set.

3.4 FIELD QUALITY CONTROL

- A. Provide a written field report, prepared by installer's architectural hardware consultant, identifying actual condition, location, manufacturer, and product designation for each item of finish hardware actually present on each door at the site, including whether finish hardware is adjusted and operating properly, compared with each item referenced to approved Shop Drawings and Contract requirements.
- B. Installer's hardware consultant shall provide opinions to, and assist ENGINEER in determining, acceptability of installation as Work proceeds. All comments and discussions, conversations and meetings with ENGINEER shall be included in written field report for submission to ENGINEER for review and approval at completion of finish hardware installation.
- C. As part of written field report to be submitted to ENGINEER for approval, recommend remedial actions for Work not in compliance with the Specifications.
No payment for Work shall be made until remedial recommendations and actions have been approved by ENGINEER and incorporated into the Work.

3.5 ADJUSTMENT AND CLEANING

- A. Adjust and check each operating item of finish hardware and each door, to ensure proper operation or function of every unit. Lubricate moving parts with the type lubrication recommended by manufacturer (graphite-type if no other recommended). Replace units which cannot be adjusted and lubricated to operate freely and smoothly as intended for the application.
- B. Final Adjustment: Where finish hardware installation is made more than one month prior to Substantial Completion, return to the Work during the week prior to acceptance or occupancy, and make a final check and adjustment of all finish hardware items in each space and area. Clean and relubricate operating items as necessary to restore proper function and finish of finish hardware and doors. Adjust door control devices to compensate for final operating of heating and ventilating equipment.
- C. Provide manufacturer's authorized representative to instruct and train OWNER'S personnel in proper adjustment and maintenance of finish hardware during the final adjustment of finish hardware.
- D. Finish hardware which is blemished or defective will be rejected even though it was set in place before defects were discovered. Remove and replace with new finish hardware. Repair all resultant damage to other Work.
- E. Continued Maintenance Service: Approximately six months after the acceptance of finish hardware in each area, the installer, accompanied by the representative of the latch and lock manufacturer, shall return to the Project and re-adjust every item of hardware to restore proper function of doors and finish hardware. Consult with and instruct OWNER'S personnel in recommended additions to the maintenance procedures. Clean and lubricate operational items wherever required. Replace finish hardware items which have deteriorated or failed due to faulty design, materials or installation of finish hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance or the finish hardware.

3.6 LIST OF FINISH HARDWARE ITEMS

- A. Scheduled items for each door are generic and rely on information specified above. The listing of hardware functions and types provided are only a general guideline for the final Finish Hardware Schedule. Submit a Finish Hardware Schedule acceptable to all governing authorities having jurisdiction at the site.
- B. Hardware Schedule: Project information OPT0283778, 11.15.2022, V1
- C. Hardware sets

Legend:
 ⚡ Electrified Opening

Door#	HwSet#
108B	12
14OE	04
101A ⚡	AL-02
101B ⚡	15
102	05
103 ⚡	13
105	05
106	11
107 ⚡	AL-03
108A	12
108C	12
110A	08
110B	OH
111	09
113	03
114	03
115	03
116 ⚡	14
117	06
118	02
119 ⚡	16
120	02
121	01
122	01
123	01
124	01
125	01
126	01
127	01
128	01
129	02
130 ⚡	15
131 ⚡	AL-01
132A	FLD
132B	FLD
132C	FLD
132D	OH
132E	OH
132F	OH
133 ⚡	13
134	10
135	07
136 ⚡	AL-01

Door#	HwSet#
137 ⚡	14
138 ⚡	14
139	17
140A	09
140B ⚡	13
140C	04
140D	04
140F	04
140G	03
142	06
143	01
144	01
145	05

102690 OPT0350576 Version 1

Legend:

 Link to catalog cut sheet







 Electrified Opening

Hardware Group No. 01

For use on Door #(s):

121	122	123	124	125	126
127	128	143	144		

Provide each SGL door(s) with the following:







QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY	28-11U65 LL		626	SAR
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS18S		BLK	IVE
1	EA	DOOR SEAL	188S		BK	ZER

Hardware Group No. 02

For use on Door #(s):

118	120	129
-----	-----	-----

Provide each SGL door(s) with the following:







QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	OFFICE LOCK	64-28-11G05 LL		626	SAR
1	EA	PERM CORE	6300 AS REQ		626	SAR
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS401/402CCV		626	IVE
1	EA	DOOR SEAL	188S		BK	ZER

Hardware Group No. 03

For use on Door #(s):

113	114	115	140G
-----	-----	-----	------

Provide each SGL door(s) with the following:





QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY	28-11U65 LL		626	SAR
1	EA	OH STOP	90S		630	GLY
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	DOOR SEAL	188S		BK	ZER

Hardware Group No. 04

For use on Door #(s):

140E 140C 140F 140D

Provide each SGL door(s) with the following:







QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY	28-11U65 LL		626	SAR
1	EA	OH STOP	90S		630	GLY
1	EA	DOOR SEAL	188S		BK	ZER

Hardware Group No. 05

For use on Door #(s):

102 105 145

Provide each SGL door(s) with the following:







QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIV W/INDICATOR	28-49-8265 LNL VAC/OCC		626	SAR
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS401/402CCV		626	IVE
1	EA	DOOR SEAL	188S		BK	ZER

Hardware Group No. 06

For use on Door #(s):

117 142

Provide each SGL door(s) with the following:







QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PERM CORE	6300 AS REQ		626	SAR
1	EA	STOREROOM LOCK	64-28-11G04 LL		626	SAR
1	EA	OH STOP	90S		630	GLY
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 07

For use on Door #(s):

135

Provide each SGL door(s) with the following:







QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PERM CORE	6300 AS REQ		626	SAR
1	EA	STOREROOM LOCK	64-28-11G04 LL		626	SAR
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS401/402CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 08

For use on Door #(s):

110A

Provide each SGL door(s) with the following:








QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PUSH PLATE	8200 6" X 16"		630	IVE
1	EA	PULL PLATE	8305 10" 4" X 16"		630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 09

For use on Door #(s):

140A 111

Provide each SGL door(s) with the following:




QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PUSH PLATE	8200 6" X 16"		630	IVE
1	EA	PULL PLATE	8305 10" 4" X 16"		630	IVE
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS401/402CCV		626	IVE
1	EA	DOOR SEAL	188S		BK	ZER

Hardware Group No. 10

For use on Door #(s):

134

Provide each SGL door(s) with the following:







QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
3	EA	DBL ACT SPRG HINGE	1001 6 X 4.5		633	MCK
2	EA	PUSH PLATE	8200 6" X 16"		630	IVE
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE

Hardware Group No. 11

For use on Door #(s):

106

Provide each SGL door(s) with the following:

QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PUSH PLATE	8200 6" X 16"		630	IVE
1	EA	PULL PLATE	8305 10" 4" X 16"		630	IVE
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	WALL STOP	WS401/402CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 12





For use on Door #(s):

108B

108A

108C

Provide each SGL door(s) with the following:

QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE	28-11U15 LL		626	SAR
1	EA	OH STOP	90S		630	GLY
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 13









For use on Door #(s):

140B

103

133

Provide each SGL door(s) with the following:

QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
2	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8		652	IVE
1	EA	ELECTRIC LOCK	64-28-10G71-LL-RX		606	SAR
1	EA	PERM CORE	6300 AS REQ		626	SAR
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS401/402CCV		626	IVE
3	EA	SILENCER	SR64		GRY	IVE
1	EA	CARD READER	BY SECURITY		BLK	TBD
1	EA	POWER SUPPLY	PS900 AS REQUIRED		LGR	SCE
1	EA	DOOR CONTACT	BY SECURITY		BLK	TBD

DOOR NORMALLY CLOSED AND LOCKED

PRESENT VALID CREDENTIAL TO READER OR KEY OVERRIDE FOR ENTRY

FREE EGRESS AT ALL TIMES

FAIL SECURE












RX SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM UPON EGRESS

Hardware Group No. 14

For use on Door #(s):

116 137 138

Provide each SGL door(s) with the following:

QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
2	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 TW8		✂ 630	IVE
1	EA	ELECTRIC LOCK	64-28-10G71-LL-RX		606	SAR
1	EA	PERM CORE	6300 AS REQ		626	SAR
1	EA	LOCK GUARD	LG12		630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	WEATHERSTRIP	8303AA		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	8655A-223		A	ZER
1	EA	CARD READER	BY SECURITY		✂ BLK	TBD
1	EA	POWER SUPPLY	PS900 AS REQUIRED		✂ LGR	SCE
1	EA	DOOR CONTACT	BY SECURITY		✂ BLK	TBD

DOOR NORMALLY CLOSED AND LOCKED

PRESENT VALID CREDENTIAL TO READER OR KEY OVERRIDE FOR ENTRY

FREE EGRESS AT ALL TIMES

FAIL SECURE

RX SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM UPON EGRESS

Hardware Group No. 15

For use on Door #(s):

101B 130

Provide each SGL door(s) with the following:

QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	POWER TRANSFER	EPT10		✂ 689	VON
1	EA	PERM CORE	6300 AS REQ		626	SAR
1	EA	RIM CYLINDER	64-34		626	SAR
1	EA	ELEC PANIC HARDWARE	RX-QEL-33A-NL 24 VDC		✂ 626	VON
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS401/402CCV		626	IVE
1	EA	THRESHOLD	545A		A	ZER
3	EA	SILENCER	SR64		GRY	IVE
1	EA	CARD READER	BY SECURITY		✂ BLK	TBD
1	EA	POWER SUPPLY	PS900 AS REQUIRED		✂ LGR	SCE
1	EA	DOOR CONTACT	BY SECURITY		✂ BLK	TBD

DOOR NORMALLY CLOSED AND LOCKED

PRESENT VALID CREDENTIAL TO READER OR KEY OVERRIDE FOR ENTRY

FREE EGRESS AT ALL TIMES

FAIL SECURE

RX SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM UPON EGRESS

Hardware Group No. 16

For use on Door #(s):

119

Provide each SGL door(s) with the following:

QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	POWER TRANSFER	EPT10		✂ 689	VON
1	EA	PERM CORE	6300 AS REQ		626	SAR
1	EA	RIM CYLINDER	64-34		626	SAR
1	EA	ELEC PANIC HARDWARE	RX-QEL-33A-NL 24 VDC		✂ 626	VON
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	WEATHERSTRIP	8303AA		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	8655A-223		A	ZER
1	EA	CARD READER	BY SECURITY		✂ BLK	TBD
1	EA	POWER SUPPLY	PS900 AS REQUIRED		✂ LGR	SCE
1	EA	DOOR CONTACT	BY SECURITY		✂ BLK	TBD

DOOR NORMALLY CLOSED AND LOCKED

PRESENT VALID CREDENTIAL TO READER OR KEY OVERRIDE FOR ENTRY

FREE EGRESS AT ALL TIMES

FAIL SECURE

RX SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM UPON EGRESS

Hardware Group No. 17

For use on Door #(s):

139

Provide each SGL door(s) with the following:

QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	PERM CORE	6300 AS REQ		626	SAR
1	EA	STOREROOM LOCK	64-28-11G04 LL		626	SAR
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	WEATHERSTRIP	8303AA		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	8655A-223		A	ZER











NOTE: IF INSWNGING, REPLACE 39A DOOR SWEEP WITH 111A DOOR BOTTOM AND SPRING STOP ARM CLOSER WITH REG ARM CLOSER AND 100S CONCEALED OH STOP OR WALL STOP IF CONDITIIONS ALLOW IT.

Hardware Group No. AL-01

For use on Door #(s):

131 136

Provide each SGL door(s) with the following:

QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
4	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	POWER TRANSFER	EPT10		✂ 689	VON
1	EA	PERM CORE	6300 AS REQ		626	SAR
1	EA	RIM CYLINDER	64-34		626	SAR
1	EA	ELECT PANIC DEV	RX-QEL-33A-NL-OP		✂ 626	VON
1	EA	OFFSET PULL	8190HD-10"		630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	8655A-223		A	ZER
1	EA	CARD READER	BY SECURITY		✂ BLK	TBD
1	EA	POWER SUPPLY	PS900 AS REQUIRED		✂ LGR	SCE
1	EA	DOOR CONTACT	BY SECURITY		✂ BLK	TBD
1		SEALS	BY FRAME SUPPLIER			

DOOR NORMALLY CLOSED AND LOCKED

PRESENT VALID CREDENTIAL TO READER OR KEY OVERRIDE FOR ENTRY

FREE EGRESS AT ALL TIMES

FAIL SECURE











RX SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM UPON EGRESS

Hardware Group No. AL-02

For use on Door #(s):

101A

Provide each SGL door(s) with the following:

QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
4	EA	HINGE	5BB1HW 5 X 4.5 NRP		630	IVE
1	EA	POWER TRANSFER	EPT10		✓ 689	VON
1	EA	PERM CORE	6300 AS REQ		626	SAR
1	EA	RIM CYLINDER	64-34		626	SAR
1	EA	ELECT PANIC DEV	RX-QEL-33A-NL-OP		✓ 626	VON
1	EA	OFFSET PULL	8190HD-10"		630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	8655A-223		A	ZER
1	EA	CARD READER	BY SECURITY		✓ BLK	TBD
1	EA	INTERCOM	BY SECURITY		✓	BYO
1	EA	POWER SUPPLY	PS900 AS REQUIRED		✓ LGR	SCE
1	EA	DOOR CONTACT	BY SECURITY		✓ BLK	TBD
1		SEALS	BY FRAME SUPPLIER			

DOOR NORMALLY CLOSED AND LOCKED

PRESENT VALID CREDENTIAL TO READER OR KEY OVERRIDE FOR ENTRY

FREE EGRESS AT ALL TIMES

FAIL SECURE











RX SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM UPON EGRESS

Hardware Group No. AL-03

For use on Door #(s):

107

Provide each SGL door(s) with the following:

QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
2	EA	HINGE	5BB1HW 4.5 X 4.5		630	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 TW8		✓ 630	IVE
1	EA	ELECTRIC LOCK	64-28-10G71-LL-RX		606	SAR
1	EA	PERM CORE	6300 AS REQ		626	SAR
1	EA	LOCK GUARD	LG12		630	IVE
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ		689	LCN
1	EA	WALL STOP	WS401/402CCV		626	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	DOOR BOTTOM	111AA		AA	ZER
1	EA	THRESHOLD	8655A-223		A	ZER
1	EA	CARD READER	BY SECURITY		✓ BLK	TBD
1	EA	POWER SUPPLY	PS900 AS REQUIRED		✓ LGR	SCE
1	EA	DOOR CONTACT	BY SECURITY		✓ BLK	TBD
1		SEALS	BY FRAME SUPPLIER			

DOOR NORMALLY CLOSED AND LOCKED

PRESENT VALID CREDENTIAL TO READER OR KEY OVERRIDE FOR ENTRY

FREE EGRESS AT ALL TIMES

FAIL SECURE

RX SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM UPON EGRESS

Hardware Group No. FLD

For use on Door #(s):

132A 132B 132C

Provide each FLD door(s) with the following:

QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
1	EA	ALL HARDWARE	BY OPENING MANUFACTURER			

Hardware Group No. OH

For use on Door #(s):

110B 132D 132E 132F

Provide each RU door(s) with the following:

QT		DESCRIPTION	CATALOG NUMBER		FINIS	MFR
Y					H	
1	EA	ALL HARDWARE	BY OPENING MANUFACTURER			

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Glass and glazing for interior and exterior applications.
- B. Related Sections:
 - 1. Section 08 83 00 – Mirrors, for wall mounted mirrors.

1.02 PERFORMANCE REQUIREMENTS

- A. Glass and glazing materials shall provide continuity of building enclosure vapor and air barrier.
 - 1. To utilize the inner pane of multiple pane sealed units for the continuity of air and vapor seal.
 - 2. Maintain continuous air and vapor barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.
- B. Glass thickness indicated is minimum and shown for detailing only. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with IBC Chapter 24, as measured in accordance with ANSI/ASTM E330.
- C. Limit glass deflection to 1/175 or flexure limit of glass, with full recovery of glazing materials, whichever is less.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's Product Data for glass units, including the following:
 - 1. Structural, physical and environmental characteristics.
 - 2. Size limitations.
 - 3. Special handling or installation requirements
 - 4. Special application requirements for glazing materials.
 - 5. Available colors of glass and glazing materials with color selections.
- B. Samples: Submit samples as follows:
 - 1. Two samples 8 x 8 inch in size of each type of glass product required, illustrating coloration, edge treatment and design.
 - 2. Four-inch-long bead of glazing sealant, color as selected.
- C. Manufacturer's Certificate: Submit Manufacturer's certification that sealed insulated glass meets or exceeds specified requirements.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Conform to 2018 IBC Chapter 24, to local requirements and to State law.

- B. Standards:
 - 1. ANSI/ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 - 2. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
 - 3. GANA'S - Glazing Manual and Laminated Glass Design Guide.
- C. Perform Work in accordance with GANA Glazing Manual, GANA Sealant Manual, and Laminators Safety Glass Association - Standards Manual for Glazing Installation Methods.
- D. Source Limitations: Obtain each type of glass from a single manufacturer using the same type of glass lights and inner layers for each type of glass type or unit specified. Obtain glazing assemblies from one source for each product and/or installation specified and/or required.
- E. Installer Qualifications: An experienced installer who has successfully completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance for a minimum of 10 years; and who employs glass installers for this project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.06 WARRANTY

- A. Provide 5 year Manufacturer's warranty for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Glass Materials: Furnish products of one of the following Manufacturers, except as otherwise approved by the Architect, subject to compliance with Specification requirements:
 - 1. Guardian Industries. www.guardian.com .
 - 2. Oldcastle Glass Group. www.oldcastleglass.com .
 - 3. Pilkington LOF. www.pilkington.com .
 - 4. Vitro Architectural Glass www.vitroglazings.com .
 - 5. Viracon. www.viracon.com.

2.02 GLASS MATERIALS

A. Flat Glass:

1. Shall comply with ASTM C1036 Standard Specification for Flat Glass, Type 1, Class 1 (clear) or Class 2 (tinted, heat-absorbing and light reducing) and Quality q3; 1/4 inch thick minimum.
2. ASTM C1048 Heat Treated Flat Glass, Kind HS or FT, Condition A (uncoated), B (spandrel glass, one surface coated), or C (other coated glass).
 - a. Heat Treated Flat Glass to be by horizontal (roller hearth) process with inherent rollerwave distortion parallel to the bottom edge of the glass as installed except in the following applications; glass units with ceramic frit and base dimensions greater than 84", 1/2" thick glass and base dimensions greater than 84" and all other configurations with base dimensions >96".
 - b. Maximum peak to valley rollerwave 0.003" in the central area and 0.008" within 11.3" of the leading and trailing edge
 - c. For clear or low-iron glass 1/4" to 3/8" thick without ceramic frit or ink, maximum + or – 100 mD (millidiopter) over 95% of the glass surface.
 - d. Maximum bow and warp 1/32" per lineal foot.
 - e. All tempered architectural safety glass shall conform with ANSI Z97.1 and CPSC 16 CFR 1201.
 - f. For all fully tempered glass, provide heat soak testing conforming to EN14179-1 which includes a 2 hour dwell at 500°F±18°F.
 - g. 1/4 inch minimum thickness.

B. Laminated Safety Glass: ASTM C1172, Kind LT, consisting of two lites of 1/8 inch fully tempered float glass with manufacturers standard 0.060-inch polyvinyl butryal sheet. Laminate units in autoclave with heat plus pressure to produce units of the following minimum thicknesses, but not less than required by performance requirements and complying with ANSI Z97.1.

1. Thickness 5/16 inch minimum.

2.03 SEALED INSULATING GLASS MATERIALS

A. Insulating Glass:

1. Shall comply with ASTM E 2190 Standard Specification for Insulating Glass Unit Performance and Evaluation.
 - a. Units shall be certified for compliance by the IGCC in accordance with the above ASTM test method.
2. The unit overall thickness tolerance shall be -1/16" / +1/32" for a 1" two ply insulating unit. Unit constructed with patterned or laminated glass shall be +/- 1/16".
3. Shall comply with ASTM E 546 Standard Test Method for Frost Point of Sealed Insulating Glass Units
4. Shall comply with ASTM E 576 Standard Test Method for Frost Point of Sealed Insulating Glass Units in the Vertical Position
5. Sealed Insulating Glass Units to be double sealed with a primary seal of polyisobutylene or VTS™ and a secondary seal of silicone.
 - a. The minimum thickness of the secondary seal shall be 1/16" for metal spacers and 5/32" for VTS™.
 - b. The target width of the primary polyisobutylene seal shall be 5/32" and the target width of VTS™ shall be 1/4".
 - c. There shall be no voids or skips in the primary seal.
 - d. Up to a maximum of 3/32" of the spacer may be visible above the primary polyisobutylene sealant.

- e. Gaps or skips between primary and secondary sealant are permitted to a maximum width of 1/16" by maximum length of 2" with gaps separated by at least 18" and a maximum width of 1/16" by maximum length of 6" along the VTS™ splice. Continuous contact between the primary seal and the secondary seal is desired.
- 6. To provide a hermetically sealed and dehydrated space, lites shall be separated by a boxed spacer with bent corners and straight butyl injected zinc plated steel straight key joints or an extruded VTS™ thermal plastic spacer.
 - a. Finish: Color to match aluminum frames.
- B. Tinted, Low-E Insulated Glass Units: Vitro Solarban 60 (2) low-E on Solarbronze insulating glass units complying with ASTM E774 and E773 and as follows or as otherwise approved by the Architect from one of the specified acceptable manufacturers:
 - 1. Pane: Double pane
 - 2. Edge Seal: Silicone sealant
 - 3. Outer Pane: 1/4 inch thick, Vitro Solarbronze with Solarban 60 on No. 2 surface.
 - 4. Inner Pane: 1/4 inch thick, clear glass.
 - 5. Visible Light Transmittance: 42 percent.
 - 6. Solar Energy Transmittance: 21 percent.
 - 7. Visible Light Reflectance: 7 percent.
 - 8. Total Solar Energy Reflectance: 15 percent.
 - 9. U-Value:
 - a. Winter Night Time: 0.29.
 - b. Summer Day Time: 0.27.
 - 10. Shading Coefficient: 0.32.
 - 11. Solar Heat Gain Coefficient: 0.28.
 - 12. Light to Solar Gain (LSG): 1.50
 - 13. Interpane Space: Purged dry air.
 - 14. Total Unit Thickness: 1 Inch.
- C. Clear, Low-E Insulated Glass Units: Vitro Solarban 60 (2) low-E on Clear insulating glass units complying with ASTM E774 and E773 and as follows or as otherwise approved by the Architect from one of the specified acceptable manufacturers:
 - 1. Pane: Double pane
 - 2. Edge Seal: Silicone sealant
 - 3. Outer Pane: 1/4 inch thick, clear glass with Solarban 60 on No. 2 surface.
 - 4. Inner Pane: 1/4 inch thick, clear glass.
 - 5. Interpane Space: Purged dry air.
 - 6. Total Unit Thickness: 1 Inch.

2.04 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene or other resilient blocks of 70 to 90 Shore A durometer hardness tested for compatibility with glazing sealant, minimum length 4 inches, sized per GANA guidelines.
- B. Spacers: Neoprene or EPDM blocks of 65+5 Shore A durometer hardness, designed to maintain positioning of glass and prevent shifting of glass in the glazing pocket and tested for compatibility with specified glazing sealant.
- C. Glazing Gaskets: Neoprene or EPDM and silicone compatible, non-cellular dense, 75 +/- 5 Shore A durometer, complying with ASTM C864, option 1 or 2.
 - 1. Bed all gasket corners, molded or not in elastomeric silicone sealant.

- D. Interior Glazing Compound: Polymerized Butyl Rubber and Inert Fillers (pigments), solvent based with minimum 75% solids, non-sag consistency, tack-free time of 24 hours or less, paintable non-staining.
- E. Exterior Glazing Compound: Conforming to ASTM C920, Type S, Grade NS, Use G. Compound shall be paintable, or colored to match frame.
- F. Glazing Tape: Preshimmed 10 percent solids, non-shrinking, butyl rubber tape compatible with sealants. If exposed, tape shall be paintable, or colored to match frame.

2.05 MARKINGS

- A. Tempered glass shall have each light permanently etched with Manufacturer's name and his compliance with ANSI Z-97.1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Examine framing or glazing channel surfaces, backing, removable stop design, and conditions under which glazing is to be performed.
- C. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Comply with combined recommendations of Glass Manufacturer, aluminum frame manufacturer and manufacturer of sealants and other materials used in glazing, except where more stringent requirements are shown or specified.
- B. Clean the glazing, channel, or other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to the substrate.
- C. Do not attempt to cut, seam, nip, or abrade glass which is tempered or heat strengthened.
- D. Comply with "Glazing Manual" by GANA, except as shown and specified otherwise by Manufacturers of glass and glazing materials.
- E. Inspect each piece of glass immediately before installation, and discard those which have observable edge damage or face imperfections.
- F. Install setting blocks of proper size at quarter points or eighth points but at no time closer than 6 inches from the end of the horizontal frame in a bead of clear silicone sealant.
- G. Provide spacers inside and out, and of proper size and spacing, for glass sizes larger than 50 united inches. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width.

- H. Unify appearance of each series of lights by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw and bow oriented in the same direction as other pieces.
- I. Gasket Glazing:
 - 1. Fabricate gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
 - 2. Miter cut and bond ends together at corners where gaskets are used for channel glazing, so that gaskets will not pull away from corners and result in voids or leaks in the glazing system.
 - 3. Insert gasket between glass and frame or fixed stop, securely in place.

3.03 EXTERIOR COMBINATION METHOD (TAPE AND SEALANT)

- A. Clean contact surfaces with solvent.
- B. Cut glazing tape to proper length and set against permanent stops, 3/16 inch below sightline. Weld corners together by butting tape and dabbing with sealant.
- C. Apply bed of sealant along exterior void ensuring full contact with glass.
- D. Place setting blocks at 1/4 points or eighth points, but at a minimum 6 inches from the near edge of block to edge of glass.
- E. Rest glass on setting blocks and push against tape (and heel bead of sealant) with sufficient pressure to ensure full contact and adhesion at perimeter.
- F. Install removable stops, spacer strips inserted between glass, and applied stops at 2-foot intervals, 1/4 inch below sightline. Place glazing tape on glass with tape flush with sightline.
- G. Fill gap between glass and applied stop with sealant to depth equal to bite of frame on glass but not more than 3/8 inch below sightline.
- H. Apply cap bead of sealant along exterior void, to uniform and level line, flush with sightline. Tool or wipe cap bead surface with solvent for smooth appearance.

3.04 INTERIOR COMBINATION METHOD (TAPE AND SEALANT)

- A. Cut glazing tape to proper length and install against permanent stop, projecting 1/16 inch above sightline.
- B. Place setting blocks at 1/4 point or eighth points, but at a minimum of 6 inches from the near edge of block to edge of glass.
- C. Rest glass on setting blocks and push against tape with sufficient pressure to ensure full contact and adhesion at perimeter.
- D. Install removable stops; spacer strips inserted between glass and applied stops at 2 foot intervals, 1/4 inch below sightline.
- E. Fill gap between glass and applied stop with sealant to depth equal to bite of frame on glass to uniform and level line.
- F. Neatly trim off excess tape to sightline.

3.05 ADJUSTING

- A. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in any other way during the construction period, including natural causes, accidents and vandalism.

3.06 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.
- B. Remove labels after Work is completed.

3.07 PROTECTION

- A. Protect glass from breakage immediately upon installation, by attachment of crossed streamers to framing held away from glass.
- B. Do not apply markers of any type to surfaces of glass.

END OF SECTION

SECTION 08 83 00

MIRRORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes framed and unframed custom size wall mounted mirrors as shown on Drawings and as specified.
- B. Related Sections:
 - 1. Section 10 28 13 – Toilet and Bath Accessories.

1.02 SUBMITTALS

- A. Product Data: Submit physical and environmental characteristics, size limitations, and special handling or installation requirements for glass mirror materials.
- B. Samples: Submit samples of mirror support hardware.

1.03 QUALITY ASSURANCE

- A. Standards: ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
- B. Perform Work in accordance with FGMA Glazing Manual.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

PART 2 PRODUCTS

2.01 GLASS MATERIALS

- A. Mirror Glass: ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality q1 mirror select; 1/4 inch thick, with successive layers of chemically deposited silver, electrically or chemically deposited copper, and manufacturer's standard organic protective coating applied to second glass surface. Provide fully tempered units where indicated or required by Code by location.
 - 1. Size(s): As indicated on Drawings.
 - 2. Silvering: Electro-deposited silvering in two coats.
 - 3. Edge Treatment: Square ground edges, polished.

4. Factory seal edges of silvered mirrored glass immediately after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 - a. Edge Seal Approved Manufacturers:
 - 1) "UC-4401" - Vitro Architectural Glass.
 - 2) "Seal-Kwik Edge Sealer" Gunther Mirror Mastics, a Royal Adhesives and Sealants, LLC Company.
 - 3) Approved Substitution as recommended by mirror manufacturer.
5. Laminated Safety Glass Mirrors: Provide laminated mirrored glass fabricated to produce units complying with ASTM C1172, Kind LM, where indicated or required by Code.
6. Safety Mirror Backing: Where indicated on Drawings, or as an option to fully tempered glass mirrors, provide Code approved safety mirror backing tape with bi-directional woven polyolefin backing fabric and pressure-sensitive adhesive coating complying with ANSI Z97.1-2004 Class A & BS, applied to the back of the mirror to produce a surface free of bubbles, blisters, and other imperfections. Verify adhesive and backing is compatible with mirror glass coating.
 - a. Acceptable Products:
 - 1) SS 501 Shatterstop Safety Mirror Backing Tape as manufactured by Shurtape Technologies, LLC www.shurtape.com
 - 2) CRL White Category II Shatterproof Safety Tape for Mirrors as manufactured by C. R. Laurence Co., Inc. www.crlaurence.com
 - 3) Equivalent Code approved safety backing tape.

2.02 ACCESSORIES

- A. Setting Blocks and Gaskets: Neoprene or other resilient blocks of 70 to 90 Shore A durometer hardness tested for compatibility with glazing sealant, minimum length 4 inches.
- B. Mirror Mastic Adhesive: Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), or as listed in VOC limit tables in Section 01 81 19 "Indoor Air Quality Requirements". Products furnished shall comply with whichever VOC content requirement is more stringent.
 1. Polymer type mirror mastic resistant to water, shock, cracking, vibration and thermal expansion, compatible with mirror backing paint and approved by mirror manufacturer.
 2. Provide products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy".
 3. Approved Manufacturers:
 - a. "Super-Set Mirro-Mastic"; Palmer Products Corp. <https://palmeradhesives.com/>
 - b. "Premier Mirror Mastic" Gunther Mirror Mastics; Royal Adhesives and Sealants; A H.B. Fuller Company www.hbfuller.com.
 - c. Approved Substitution as recommended by mirror manufacturer.
- C. U-Channel Frames: Stainless steel channel frame as indicated on Drawings as manufactured by C.R. Laurence Co., Inc. www.crlaurence.com, or equivalent as approved by Architect.
 1. Exposed Frame Width: 5/8 or 3/4 inch, unless otherwise indicated on Drawings or selected by Architect.
 2. Finish: Brushed finish stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION - GENERAL

- A. Comply with combined recommendations of Mirror Manufacturer and manufacturer of mirror mastic adhesive and other materials used in setting mirrors, except where more stringent requirements are shown or specified.
- B. Do not install mirrors on new plaster, freshly painted walls, or where airborne solvents, heavy-duty cleaners, etc., are in the air. Sub-surfaces shall be allowed to cure for a minimum of 72 hours.
- C. Clean the wall surface, or other substrate to receive mirrors, immediately before installation. Remove coatings which are not firmly bonded to the substrate.
- D. Do not attempt to cut, seam, nip or abrade glass which is tempered or heat strengthened.
- E. Comply with "Glazing Manual" by FGMA, except as shown and specified otherwise by Manufacturers of mirrors and mirror mastic materials.
- F. Inspect each piece of mirror immediately before installation, and discard those which have observable edge damage or face imperfections.
- G. Apply barrier coat to mirrored glass backing where required by mirror manufacturer prior to application of mirror mastic adhesive.

3.03 ADHESIVE INSTALLATION OF MIRRORS

- A. Install mirrors by mirror mastic spot method as follows, unless otherwise indicated on Drawings:
- B. Use continuous bottom clip at base of mirror.
- C. Seal bottom edges of mirror track with clear sanitary sealant. Refer to Section 07 92 00. Allow to dry.
- D. Apply adhesive to 60 percent of back of mirror in spots of equal spacing. Apply adhesive to maintain air circulation between back of mirror glass and wall surface.
- E. Set mirror supported by setting blocks or continuous gasket and press against substrate to ensure bond of adhesive.
- F. Hold mirror in place until adhesive fully sets.

3.04 ADJUSTING

- A. Remove and replace mirrors which are broken, chipped, cracked, abraded or damaged in any other way during the construction period, including natural causes, accidents and vandalism.

3.05 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.
- B. Remove labels after Work is completed.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Formed metal stud framing, furring, suspension systems and accessories as shown on Drawings and as specified.

1.02 SUBMITTALS

- A. Product Data: Submit data describing standard framing member materials and finish, product criteria, load charts, limitations, and installation instructions.
- B. Certificates: Mill Certification shall be provided with shipment to verify chemical composition, yield strength, tensile strength, elongation and coating thickness. Include listing of applicable ASTM standards specified in this section and comparison of ASTM requirements to actual materials provided to jobsite.
- C. Manufacturer's letter: Manufacturer shall provide letter stating that the material supplied to the specific project meets or exceed the performance standards listed in these specifications.

1.03 QUALITY ASSURANCE

- A. Perform Work in accordance with the following:
 - 1. ASTM C 754 requirements.
 - 2. Applicable Code and Regulatory Requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products as manufactured by a manufacturing member of the Steel Stud Manufacturers Association (SSMA) or the Steel Framing Industry Association (SFIA), subject to compliance with Specification requirements.

2.02 FRAMING MATERIALS

- A. Studs, Runners and Furring Channels:
 - 1. Steel complying with ASTM C645-07 requirements for metal; C-channel, roll-formed from hot dipped galvanized steel; complying with ASTM A1003 and ASTM A653 G40 or equivalent corrosion resistant coating.
 - 2. Material Thickness: Gauge or Mil thickness indicated on Drawings, but not less than minimum thickness in accordance with the latest edition of the SSMA Product Technical Information manual, Limiting Wall Height Tables, as required by height of wall, or equivalent from the SFIA.
 - 3. Provide 16 gauge structural metal studs specified in Section 05 41 00 at walls where noted with wall hung attachments.

3. Deflection Track: Provide deep leg, 2 inch minimum, head track, or one of the following proprietary systems:
 - a. Slotted Top Track (non-fire rated and fire-rated, as applicable): SLP-TRK® as manufactured by Sliptrack Systems (888) 475-7875 www.BradyInnovations.com, as distributed by Dietrich Metal Framing (614) 438-3210 www.dietrichindustries.com, gauge as per ICBO ER-5344, Table 2. Provide fire rated assemblies in accordance with manufacturer's literature, where applicable.
 - b. Non-Fire Rated Slotted Top Track - Single Track Slip System for Interior Partitions: As manufactured by Metal Lite, Inc., Anaheim, CA (800) 886-6824. Provide for partitions that are not required to be fire rated.
 - c. Fire Rated Shadowline Top Track - Single Track Slip System for Interior Partitions: Applicable configuration as required for fire rating as manufactured by Fire Trak Corporation, Kimball, MN (800) 394-9875. Provide for partitions that are required to be fire rated.
- B. Studs and Track: C-shaped, non-structural rolled steel, punched for utility access.
 1. Stud Sizes: Provide studs of member depth and spacing indicated on Drawings with flange width and material thickness in accordance with the latest edition of the SSMA Product Technical Information manual, Limiting Wall Height Tables, as required by height of wall, or equivalent from the Steel Framing Industry Association (SFIA).
- C. Ceiling Runners: Cold or hot-rolled steel, meet ASTM C754.
- D. Hanger and Tie Wire: Meet ASTM C754.
- E. Compression Struts: C-shaped steel studs in minimum thickness as required to adequately resist the vertical component induced by the bracing wires in suspended ceiling applications.
- F. Furring Members: Of same gauge, material and finish as studs, thickness to suit purpose.
- G. Grid Type Ceiling Suspension System: Heavy duty, direct-hung, tee-grid gypsum board ceiling support system composed of galvanized finish commercial quality cold-rolled steel double web main and cross tees, clips, and preformed curved components.
 1. Hanger Wire: Galvanized steel conforming to Federal Specification FF-QQ-W-461, Finish 5, Class 1 annealed, and not less than 12 gage).
 2. Suspension system shall support the ceiling system specified with a maximum deflection of 1/360 of the span.
 3. Acceptable Manufacturers:
 - a. Armstrong
 - b. USG Interiors, Inc.
- H. Channel Bridging and Bracing: Channel bridging and bracing members of same material and finish as studs. Spazzer® 9200 Bridging and Bracing Bar and Spazzer® Bar Guard, or U-channel assembly, thickness to suit purpose with EasyClip™ U-Series Clip Angle or equivalent.

- I. Clips, Brackets: Galvanized wire or sheet metal designed for attachment of framing, furring and bridging members.
 - 1. Deflection Clips: If acceptable to Building Official, VertiClip™ as manufactured by Signature Industries, LLC, Raleigh, NC (919) 844-0789, or FastClip™ or QuickClip™ as manufactured by Dietrich Metal Framing, Columbus, OH (614) 438-3210 may be provided for attachment of framing to roof and floor construction at head and slide conditions. Provide sizes as required for stud depth(s). Clips shall be manufactured of steel conforming to ASTM A 653 Prime Certified G90 galvanized material, 50 ksi yield strength and 65 ksi ultimate strength. Deflection clips to have positive attachment to structure and stud material while allowing for frictionless movement.
 - 2. Bridging Clips: If acceptable to Building Official, BridgeClip™ as manufactured by Signature Industries, LLC, Raleigh, NC (919) 844-0789, or EasyClip™ U or X series as manufactured by Dietrich Metal Framing, Columbus, OH (614) 438-3210, may be provided for attachment of bridging to studs.
- J. Fasteners: ASTM C1513, self-drilling, self-tapping screws.
- K. Anchorage Devices: Power driven, powder actuated, drilled expansion bolts or screws with sleeves as required for positive anchorage.
- L. Acoustic Sealant: As specified in Section 07 92 00.
- M. Primer: FS TT-P-645, for touch-up of galvanized surfaces.
- N. Backing: Provide backing plate, stud or proprietary backing members of type and configuration indicated on Drawings, and as follows:
 - 1. 16 gauge minimum galvanized steel sheet.
 - 2. 16 gauge minimum c-shaped steel stud.
 - 3. "Notch-Tite" and "Flush Mount" as manufactured by Metal Lite, Inc., 3070 E. Miraloma Avenue, Anaheim, CA 92806 (800) 886-6824.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are ready to receive Work.
- B. Verify field measurements are as shown on Drawings.
- C. Verify that rough-in utilities are in proper location.
- D. Beginning of installation means acceptance of substrate.

3.02 METAL STUD ERECTION

- A. Install stud framing in accordance with ASTM C 754.
- B. Align and secure top and bottom runners at 24 inches o.c. and within 6 inches from each end. Place two beads of acoustic sealant between runners and substrate.
- C. Fit runners under and above openings; secure intermediate studs at spacing of wall studs.

- D. Install studs vertically at center to center stud spacing indicated in stud schedule on Drawings. Place two beads of acoustic sealant between studs and adjacent vertical surfaces. Install felt strips between wall and stud where studs abut exterior walls.
- E. Connect studs to bottom track using fastener method.
- F. Door Opening Framing: Install double studs at door frame jambs. Install stud tracks on each side of opening, at frame head height, and between studs and adjacent studs.
- G. Backing and Blocking: Provide 16 gauge minimum backing and blocking attached to studs. Bolt or screw steel channels to studs. Install backing and blocking for support of plumbing fixtures, toilet partitions, wall cabinets, building accessories, toilet accessories, wall brackets, hardware, and other wall mounted items. If proprietary system is used, install in accordance with Manufacturer's printed instructions.
- H. Coordinate installation of bucks, anchors, blocking, electrical and mechanical Work placed in or behind partition framing.
- I. Splice studs, where necessary, with 8 inch nested lap. Secure each stud flange with flush head screw.
- J. Construct corners using minimum three studs.
- K. Brace stud framing system and make rigid.
- L. Coordinate erection of studs with requirements of door and window frame supports and attachments.
- M. Align stud web openings.
- N. Refer to Drawings for indication of partitions extending to ceiling only and for partitions extending through ceiling to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide nested extended leg ceiling runners, deflection clips or proprietary slip track with studs allowed to float (no screw attachment) to allow for overhead deflection.
- O. Coordinate placement of insulation in multiple stud spaces made inaccessible after stud framing erection.

3.03 WALL FURRING INSTALLATION

- A. Erect wall furring for direct attachment to masonry walls plumb and true to line using galvanized steel or plastic shims as required to plumb wall.
- B. Erect furring channels vertically. Secure in place on alternate channel flanges at maximum 24 inches.
- C. Space furring channels maximum 16 inches on center, not more than 4 inches from floor and ceiling lines, and butting walls.
- D. Install furring channels directly attached to masonry walls, as applicable in accordance with Manufacturer's instructions.

- E. Erect free-standing metal stud framing tight to concrete, concrete and brick masonry walls, attached by adjustable furring brackets in accordance with Manufacturer's instructions.

3.04 CEILING FRAMING INSTALLATION

- A. Install in accordance with ASTM C 754.
- B. Coordinate location of hangers with other Work.
- C. Install suspended ceiling framing independent of walls (except where required for structural support), columns, ducts, pipes, conduit and other obstructions. Where required provide additional suspended structural members in trapeze fashion to span underside of ductwork and other obstructions, with main suspension of ceiling system suspended from the additional members. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
 - 1. Do not attach metal framing to ducts, pipes, conduit and similar items or allow items to come in contact with framing or gypsum board applied to framing.
 - 2. Provide isolation framing assemblies where required for support of framing.
- D. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches beyond each end of openings.
- E. Laterally brace entire suspension system.
- F. No hanger support shall be allowed from roof deck.
- G. At steel beams, joists or other steel construction wrap hangers around, inset through, or clip or bolt to the supports, so as to develop the full strength of the hangers.
- H. At lights or other openings that interrupt the main runner or furring channels reinforce grillage with 3/4 inch channels, wire tied atop and parallel to the main runner channels.
- I. Do not bridge control and expansion joints with metal furring. Provide separate supports on each side of joint.

3.05 GRID TYPE CEILING SUSPENSION SYSTEM INSTALLATION

- A. Grid Type Ceiling Suspension System: Install suspension system in accordance with manufacturer's instruction and the following:
 - 1. ASTM C636 and as supplemented in this Section.
 - 2. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical tile and Lay-in Panel Ceilings, for seismic zone/class indicated on General Structural Notes on Drawings.
 - 3. IBC Chapter 16 requirements for suspended ceilings for Seismic Design Category indicated in General Structural Notes on Drawings.
- B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.
- C. Install after major above-ceiling Work is complete. Coordinate the location of hangers with other Work.
- D. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

- E. Hang suspension system independent of walls, columns, ducts, pipes, conduit, and other obstructions. Where required, provide additional suspended structural members to form "trapeze" to span underside of ductwork or other obstruction, with main suspension of ceiling system suspended from the additional members.
 - 1. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.

3.06 FIELD QUALITY CONTROL

- A. Testing: At Owner's request, Contractor shall provide spot testing of actual properties of steel framing to verify compliance with specifications.

3.07 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes gypsum board and installation accessories as shown on Drawings and as specified herein.
- B. Related Sections:
 - 1. Section 09 22 16 – Non-Structural Metal Framing, for metal stud framing and furring.

1.02 SYSTEM DESCRIPTION

- A. Acoustical Attenuation for Interior Partitions: Comply with STC rating indicated for Partition Types indicated on Drawings and in accordance with ANSI/ASTM E90.

1.03 SUBMITTALS

- A. Product Data: Submit data on gypsum board, joint, finish and accessories.
- B. Samples: Submit sample of textured finish prior to application.
- C. Reports: Submit fire test report for fire rated assemblies and acoustical performance test reports for acoustically-rated assemblies.

1.04 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in Gypsum Board Systems Work with 2 years documented experience and approved by Manufacturer.
- B. Regulatory Requirements: Conform to applicable code for fire rated assemblies as shown on the Drawings.
- C. Comply with applicable specification recommendations of GA-216 and GA-600 as published by the Gypsum Association.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Comply with GA-216 and Manufacturer's directions.

1.06 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Maintain temperature of installed gypsum board spaces in range of 55 degrees F. to 90 degrees F. until building is entirely closed, in accordance with Gypsum Association GA-220 and GA 236.
 - 2. Ventilate as required to eliminate excessive moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
1. CertainTeed Corp., Saint Gobain www.certainteedcorp.com
 2. Georgia-Pacific Gypsum (GP) www.buildgp.com
 3. National Gypsum Company www.nationalgypsum.com
 4. Pabco Gypsum www.pabco gypsum.com
 5. USG www.usg.com

2.02 GYPSUM BOARD MATERIALS

- A. Materials – General: Gypsum board manufactured in or imported from China is Not Permitted.
- B. Standard Gypsum Board: ANSI/ASTM C36 or ASTM C1396; 5/8 inch thick, maximum permissible length; ends square cut, tapered edges. Provide sag-resistant type for ceiling applications.
- C. Fire Rated Gypsum Board: ANSI/ASTM C36 or ASTM C1396; fire resistive type, UL rated; 5/8 inch, maximum permissible length; ends square cut, tapered edges. Provide sag-resistant type for ceiling applications.
- D. Moisture Resistant Gypsum Board: Mold and moisture resistant gypsum board complying with ANSI/ASTM C630 or ASTM C1177, and resistant to mold and mildew per ASTM D3273 and ASTM G21; 5/8 inch thick, maximum permissible length; tapered edges. 5/8 inch fire-resistant rated units where indicated.
1. Acceptable Products:
 - a. M2Tech mold and moisture resistant gypsum board, CertainTeed Corp.
 - b. DensArmor Plus Interior Guard moisture, mold and mildew resistant coated glass mat faced gypsum core panels, Georgia-Pacific Gypsum.
 - c. Gold Bond BRAND XP Gypsum Board, National Gypsum Company.
 - d. Pabco Mold cure Plus, Pabco Gypsum.
 - e. USG Sheetrock Brand Mold Tough Gypsum Panels, USG
- E. Ceramic Tile Backer Board: As specified in Section 09 30 00 - Ceramic Tile.

2.03 ACCESSORIES

- A. Adhesive: ASTM C557.
- B. Acoustical Sealant: As specified in Section 07 92 00.
- C. Corner Beads: GA216; Type CB; electro-galvanized steel.
- D. Edge Trim: GA216; Type L or J bead; electro-galvanized steel and Type LC rolled-formed zinc.
- E. Reveal Trim: 6063 T5 extruded aluminum or electro-galvanized steel. Fry Reglet profiles indicated on Drawings or as selected by Architect.
1. Finish: Prime painted.
- F. Control Joint: No. 093, roll-formed zinc, as manufactured by U.S.Gypsum, Unimast, or Dietrich.

- G. Joint Materials: ANSI/ASTM C475; reinforcing tape, joint compound, adhesive, water, and fasteners. For coated board and gypsum sheathing, use material recommended by Board Manufacturer.
 - 1. Use 2 inch wide 10 x 10 glass mesh tape at moisture resistant gypsum board.
 - 2. Use only setting type joint compound at moisture resistant gypsum board.
- H. Screws: Steel drill screws conforming to ASTM C1002.
 - 1. Type G for fastening to gypsum board, Type S for fastening to light gauge steel framing and Type W for fastening to wood framing.
 - 2. Nails are not permitted
- I. Drywall Primer:
 - 1. Paint material specifically formulated to fill the pores and equalize the suction difference between gypsum board surface paper and the compound used on finished joints, angles, fastener heads and accessories and over skim coatings.
 - 2. Drywall primer which is applied to the finished surface of the work specified in this section shall be provided as specified under Sections 09 91 00 and 09 72 00 as applicable.
 - 3. A good quality, white latex drywall primer formulated with high binder solids, applied undiluted, and shall be applied to gypsum board surfaces prior to the application of texture materials.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that site conditions are ready to receive Work and opening dimensions are as instructed by the Manufacturer.
- B. Beginning of installation means acceptance of substrate.

3.02 GYPSUM BOARD INSTALLATION

- A. Install gypsum board in accordance with GA-201, GA-216, and ASTM C840 and Manufacturer's instructions as applicable.
 - 1. Coordinate installation with installation of tile backer board specified in Section 09 30 00 indicated to be used under ceramic tile.
 - 2. Extend tile backer units out a minimum of 12 inches beyond edge of shower surrounds.
 - 3. Provide moisture resistant gypsum board at all "wet" walls and behind all urinals and toilets, extending a minimum of 12 inches beyond edge of urinal or toilet.
- B. Erect single layer standard gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- C. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.

- D. Ceiling Boards:
 - 1. Install gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- E. Use screws when fastening gypsum board to metal framing.
- F. Direct Bonding to CMU or ICF: Where gypsum board is indicated to be applied directly to CMU or ICF wall substrate, comply with gypsum board Manufacturer's recommendations for application of adhesive, and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- G. Treat cut edges and holes in moisture resistant gypsum board with sealant.
- H. Place control joints and reveal trims consistent with lines of building spaces as indicated on Drawings and as recommended by Board Manufacturer. Place reveal trim where indicated at gypsum board abutting masonry wall surfaces.
- I. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials. Use J-metal edge where indicated at unfinished gypsum board edges against other finish materials.

3.03 JOINT TREATMENT

- A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
- B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.
- C. Taping, filling, and sanding is not required at surfaces behind ceramic tile.

3.04 ACOUSTICAL WALLS AND TREATMENT

- A. Install acoustical sealant in accordance with Manufacturer's instructions and Section 07 92 00.
- B. Install acoustical sealant at gypsum board perimeter at:
 - 1. Metal framing: Two beads.
 - 2. Base layer of double layer applications, if applicable.
 - 3. Face layer.
 - 4. Seal all around all gypsum board penetrations by conduit, pipe, ductwork, and rough-in electrical/telephone boxes, etc.
- C. Install acoustical sealant where gypsum board joins other walls or surfaces at sound control partitions.

3.05 FINISHING OF GYPSUM BOARD SURFACES

- A. Provide finish of gypsum board surfaces in accordance with the Gypsum Association "Recommended Specification: Levels of Gypsum Board Finish" as follows as noted on Room Finish Schedule:
 - 1. Level 0 (Temporary Construction): No taping, finishing, or accessories required.

2. Level 1 (Fire Taping at plenum areas above ceiling, in attics, in areas where the assembly will be concealed or in building service corridors and other areas not normally open to public view):
 - a. Joints and interior angles shall have tape embedded in joint compound.
 - b. Surface shall be free of excess joint compound.
 - c. Tool marks and ridges are acceptable.
 3. Level 2 (Areas to receive FRP, solid surface material, or other applied wall panels):
 - a. Joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating joint compound over joints and interior angles.
 - b. Fastener heads and accessories shall be covered with a coat of joint compound.
 - c. Surface shall be free of excess joint compound.
 - d. Tool marks and ridges are acceptable.
 - e. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level.
 4. Level 3: Not Used.
 5. Level 4: Typical finish for all locations. Use Level 5 finish if space is indicated to receive gloss, semi-gloss, or enamel paints:
 - a. Joints and interior angles shall have tape embedded in joint compound and 2 separate coats of joint compound applied over flat joints and one separate coat of joint compound applied over interior angles.
 - b. Fastener heads and accessories shall be covered with 3 separate coats of joint compound.
 - c. Joint compound shall be smooth and free of tool marks and ridges.
 - d. Surface to be coated with Drywall Primer as specified herein prior to application of texture.
 - e. Untextured surfaces to be coated with Drywall Primer prior to application of final finishes as specified in 09 91 00 and 09 72 00, as applicable.
 6. Level 5: Used at areas indicated to receive gloss, semi-gloss, or enamel paints only.
 - a. Joints and interior angles shall have tape embedded in joint compound and 2 separate coats of joint compound applied over flat joints and one separate coat applied over interior angles.
 - b. Fastener heads and accessories shall be covered with 3 separate coats of joint compound.
 - c. A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to the entire surface to fill imperfections in the joint work, smooth the paper texture and provide a uniform surface for decorating. Excess compound shall be immediately sheared off, leaving a film of skim coating compound completely covering the paper.
 - d. The surface shall be smooth and free of tool marks and ridges.
 - e. Surface to be coated with Drywall Primer as specified herein prior to application of texture.
 - f. Untextured surfaces to be coated with Drywall Primer prior to application of final finishes as specified in Sections 09 91 00 and 09 72 00, as applicable.
- B. Surfaces shall be free of dust, dirt and oil and shall received Drywall Primer before application of texture or skim coat as required by the manufacturer of the texture or skim coat materials.

- C. Surface Finish: Produce surface finish to match approved sample, type as indicated below.
 - 1. All locations: Smooth finish, unless otherwise indicated on Drawings or approved by Architect.

3.06 CLEANING

- A. After completion of wallboard installation, taping and texturing, remove rubbish, excess material and equipment from building and job site, leaving floors and other surfaces clean.
- B. Remove overspray from adjoining construction.
- C. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

3.07 PROTECTION

- A. Protect Work from damage until acceptance.
- B. Repair or replace damaged Work.

END OF SECTION

SECTION 09 30 00

TILE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes ceramic, mosaic, and similar tile products and installation materials for installation on walls as shown on Drawings and as specified herein.
- B. Related Sections:
 - 1. Section 10 21 16.56 – Precast Shower Bases, for precast terrazzo shower bases.
 - 2. Division 22 – Plumbing, for floor drains and trench drains at locations to receive ceramic tile.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's data for tile and accessory materials, including recommended procedures for mixing materials and setting tile for each application type.
- B. Samples: Submit a minimum of four samples of each type of tile required and associated grout type and manufacturers selection of colors, marked with Manufacturer's name and location where tile is to be installed. Tile and Grout color samples shall be submitted within the same submittal package.
- C. Proposed alternate tile setting methods to those specified for review and approval.

1.03 QUALITY ASSURANCE

- A. Comply with applicable requirements of ANSI A-108 Series and the TCNA 2023 "Handbook for Ceramic, Glass, and Stone Tile Installation." Tile shall bear the TCNA grade seal.
- B. Subcontractor's Qualifications: The firm executing the work under this Section shall have five (5) years experience in work of similar scope and nature to that specified.
- C. Blending: Tile Manufacturer to blend tile at the factory.
 - 1. Provide additional blending at the job site as needed to obtain the Architect's approval.
- D. Static Coefficient of Friction: Provide floor tile products and finished floor tile installation with a wet DCOF of 0.42 or greater when tested with the BOT-3000 using SLS solution per procedures in ANSI A137.1.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver manufactured materials in original, unbroken containers bearing name of Manufacturer, brand, and grade seals. Keep materials dry, clean and protected against deterioration.

1.05 MAINTENANCE

- A. Extra Materials: Furnish one (1) square foot of tile for each 100 square feet of each color and size of tile and grouting materials used in the Project. If less than 100 square feet is installed, provide a minimum of four (4) square foot of extra stock for each tile type and color. Extra materials shall be furnished in original packaging.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as otherwise approved by the Architect, subject to compliance with Specification requirements.
 - 1. Tile Products: Provide tile products of manufacturer's indicated on Drawings or as otherwise selected by Architect and/or Owner.
 - 2. Setting and Grouting Materials:
 - a. Bostik – Hydroment www.bostik-us.com
 - b. C-Cure, as mfrd by Bonded Materials Company www.c-cure.com
 - c. Custom Building Products www.custombuildingproducts.com
 - d. Laticrete www.laticrete.com
 - e. MAPEI Corporation www.mapei.com
 - f. Tec Specialty Products, Inc., an H.B. Fuller comp. www.tecspecialty.com

2.02 TILE MATERIALS

- A. Ceramic, Porcelain, Mosaic and Other Tile: As scheduled on Drawings.
- B. Trim Shapes: Provide Manufacturer's full selection of trim shapes as required
 - 1. Provide all bases, caps, stops, returns, trimmers, and other shapes indicated or required to produce a completely finished installation.
 - 2. Except as may be shown otherwise on the Drawings, provide color and finish matching the adjacent tile.

2.03 INSTALLATION MATERIALS

- A. Mortar for Thin Set Installation: Stain-resistant, latex modified portland cement mortar per A118.4 and applicable TCNA Method.
- B. Grout: All grout shall be stain resistant type.
 - 1. Latex grout: Conforming to ANSI 118.6 and the TCNA Handbook, by an approved Manufacturer. Grout shall be sealed as recommended by manufacturer.
 - 2. Epoxy grout: Chemical-resistant per ANSI 118.3, water-cleanable during installation, by an approved Manufacturer. Epoxy grout is required at all wet areas.
 - 3. Color(s): As scheduled on Drawings or as otherwise selected by Architect.

2.04 ACCESSORIES

- A. Ceramic Tile Backer Units: Provide one of the following. Furnish units with manufacturer's recommended joint tape. Moisture resistant gypsum board is not allowed as a substrate for tile.
1. Cement Backer Board: Provide cementitious backer units complying with ANSI 118.9.
 - a. Thickness: 1/2 inch. Provide 5/8 inch Type X where tile backer units are part of a fire rated partition assembly.
 - b. Subject to compliance with requirements, provide one of the following:
 - 1) C-Cure; C-Cure Board 990.
 - 2) Custom Building Products; Wonderboard.
 - 3) Fin Pan Inc., Util-A-Crete Concrete Backer Board.
 - 4) USG Corporation; DUROCK Cement Board.
 2. Fiberglass-Mat Faced Gypsum Backing Board: ASTM C1178:
 - a. Thickness: 1/2 inch. Provide 5/8 inch Fireguard Type X where tile backer units are part of a fire rated partition assembly.
 - b. Edges: Square.
 - c. Surfacing: Coated fiberglass mat on face, back, and long edges.
 - d. Mold Resistance (ASTM D3273): 10, in a test as manufactured.
 - e. Permeance (ASTM E96): Not more than 1.0 perms when tiled.
 - f. Acceptable Products:
 - g. Subject to compliance with requirements, provide the following:
 - 1) 1/2 inch DensShield or 5/8 inch DensShield Fireguard Type X, Georgia-Pacific Gypsum.
- B. Waterproofing and Crack Isolation Membrane: Provide one of the following:
1. Laticrete Blue 92 Anti-Fracture Membrane, or Laticrete Hydro Ban Waterproofing and Crack Isolation Membrane; Laticrete International.
 2. RedGard Waterproofing and Crack Prevention Membrane, Custom Building Products.
 3. UltraCure 971 Elastomeric Waterproofing and Crack Isolation Membrane, C-Cure.
- C. Edge and Transition Strips: Solid brass, extruded aluminum, or roll-formed stainless steel edge and transition strips, height and/or size as indicated; with integral perforated anchoring leg for setting the strip into the setting material. Refer to Drawings for locations.
1. Height: As required to suit application, flush with finished floor/wall surface.
 2. Finish: As indicated on Drawings, or as selected by Architect.
 3. Products: Subject to compliance with specification requirements, provide one of the following as selected by Architect, unless otherwise indicated on Drawings:
 - a. Schlüter – QUADEC/-K, SCHIENE, DECO, RENO, or DILEX as indicated on Drawings or as selected by Architect.
- D. Expansion/Control Joint Backing Material: Provide closed cell polyethylene foam weighing not less than 2.7 lbs. per cubic feet, and in dimension approximately 20 percent thicker than width of the expansion joint in which used.
- E. Expansion/Control Joint Sealant: Provide in colors selected by the Architect, complying with requirements of Section 07 92 00.
1. At joints between floors and walls, and at perimeter of metal door frames, provide one-part low modulus moisture cure silicone rubber sealant conforming to FS TT-S-001543A, Class A, FS TT-S-00230C, Type II, Class A and ASTM C 920, Type S, Grade NS, Class 25, Use NT, M, G, A, and O.

2. At joints in traffic areas, and at perimeter joints, provide two-part polyurethane material conforming to ASTM C920, Type M, Grade P, Class 25, Use T, with Shore A hardness of 35 - 45.
- F. Prefabricated Precast Terrazzo Shower Bases: As specified in Section 10 21 16.56.
- G. Tile and Grout Sealer: Colorless, penetrating, stain-resistant sealer recommended tile and grout manufacturers for type of tile and grout indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine subsurfaces to receive Work and report detrimental conditions in writing. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordinate with other Work which affects, connects with or is concealed by this Work. Before proceeding, make certain required inspections have been made.
- C. Where tile units will be thin-set directly to the substrata, do not commence installation of the tile units until substrata are within the following tolerances:
1. Horizontal surfaces: Level within 1/8 inch in ten feet in all directions;
 2. Vertical surfaces: Level within 1/8 inch in eight feet in all directions.
 3. Deflection:
 - a. Horizontal Surfaces: Less than 1/360 of the span.
 - b. Vertical Surfaces: Verify that design of the wall or partition will not permit deflection exceeding 1/360 of the span for point and uniform loading. Space wood or metal studs not less than 16 inches on centers.
- D. Fill low spots and grind or sand high spots to provide required tolerances. Use latex modified Portland cement based trowelable leveling and patching compound to fill holes, cracks and depressions in accordance with tile setting materials printed instructions.
- E. Conditions of Surfaces to Receive Tile:
1. Verify that surfaces to receive tile are firm, dry clean, and free from oily or waxy films and curing compounds.
 2. Verify that grounds, anchors, plugs, recess frames, bucks, electrical work, mechanical work, and similar items in or behind the tile have been installed before proceeding with installation of tile.
 3. Scarify hard steel trowel finish concrete surfaces.
 4. Completely remove curing compounds on concrete surfaces by scarification or cleaning methods acceptable to tile setting materials manufacturer.

3.02 PREPARATION

- A. Lay out Work so that no tile of less than half size occurs.
1. For heights stated in feet and inches, maintain full courses to produce nearest attainable heights without cutting tile.
 2. Align joints in wall tile vertically and horizontally except where other patterns are shown or specified. Align joints in walls to conform to patterns selected.
 3. Align joints in floor tile at right angles to each other and straight with walls and conform to patterns selected or indicated.
- B. Obtain Architects and/or Owner's approval of tile layouts for each area prior to installation, typical for all areas.

- C. Obtain exact locations of expansion joints and accessories before installing tile.
- D. Locate accessories in tile walls as indicated on Drawings or as directed by Architect. Where the size of accessory does not line up with the jointing pattern of adjacent tile, the cutting of tile and arrangement of joints around the accessories shall be as directed by Architect.

3.03 INSTALLATION

- A. Install tile backer board at wet walls and other locations where indicated and as follows:
 - 1. Install cement backer board and treat joints in accordance with ANSI A108.11, manufacturer's recommendations and TCNA Setting methods specified.
 - 2. Install glass-mat faced gypsum backing board in accordance with ASTM C840, manufacturer's recommendations, and TCNA Setting methods specified.
- B. Tile –General:
 - 1. Install tile in accordance with ANSI Specifications A108.1 through A118.1 and Manufacturer's recommendations.
 - 2. Cut and drill neatly as required without marring tile. Rub smooth necessary cuts with a fine stone. Set cut edge against fixture, cabinet or other tile with joint at least 1/16-inch wide.
 - 3. Joint Widths: Install tile with joint widths indicated on Drawings, or as selected by Architect and/or Interior Designer for various tile types, sizes and applications.
- C. Prefabricated Precast Terrazzo Shower Bases: Installed as specified in Section 10 21 16.56.
- D. Crack Isolation Membrane: Install waterproofing and crack isolation membrane over cracks and sawcuts up to 1/8 inch in width in concrete slab in accordance with Manufacturer's printed instructions. Sawcut joints over 1/8 inch shall be treated as control joints.
- E. Substrate Construction, Expansion, Control Joints, and Isolation Joints: Do not bridge joints which are designed to experience movement. Carry these types of joints through the mortar and tile installation materials.
 - 1. Where waterproofing is specified, clean the joint and install open or closed cell backer rod to the proper depth as outlined in TCNA EJ171 Guidelines.
 - 2. Compress sealant as specified in Section 07 92 00 into the joint, coating the sides and leaving it flush with the surface.
 - 3. After the sealant is dry, place bond breaker tape over the joint.
 - 4. Apply waterproofing membrane over joint and substrate in accordance with manufacturer's printed instructions.
 - 5. Install tile onto the membrane, but do not bridge the joint.
 - 6. After tile is properly set, fill joint as specified herein under Tile Expansion and Control Joint Sealant article.
- F. Waterproofing Membrane: Install waterproofing and crack isolation membrane at all wet areas and as indicated on Drawings. Install in accordance with Manufacturer's printed instructions. Utilize where membrane is required beneath tile at floors or walls in wet areas. Waterproof coves at wet areas in accordance with Manufacturer's recommendations to a minimum height of 8 inches above floor. Allow membrane to cure before applying bonding materials.

- G. Thin Set: Where indicated to be thin-set, install tile using TCNA Method for substrate condition and type for latex-Portland cement mortar, and as follows:
1. Walls (dry): TCNA W244 C or F, or W243 typical dry area walls. Use white color thin-set mortar for glass tile installations (if any).
 2. Walls (wet): TCNA W244C or W245 (as appropriate to type of tile backer board used) with waterproofing membrane at wet area walls over tile backer board ("wet" or plumbing walls including showers, tubs and other wet walls).
 3. Submit any proposed alternate setting methods to Architect for review and approval prior to installation. Include product and installation instructions for any proposed alternate setting materials.
- H. Grout:
1. Mix grout to a creamy consistency.
 2. Mix only as much grout as can be used in one hour.
 3. Thoroughly force into joints, fill entire depth.
 4. Finished surface of joints shall be uniformly smooth, and continuously level with edges of tile.
- I. Expansion and Control Joint Sealant:
1. Workmanship for caulking and sealants shall conform to requirements of Section 07 92 00.
 2. Provide expansion/control joints in accordance with TCNA EJ171 and where indicated on Drawings, and:
 - a. Interior: 20'-0" to 25'-0" in each direction, except provide joints at 8'-0" to 12'-0" in each direction at areas exposed to direct sunlight or moisture and at above ground concrete slab substrates.
 3. Joints between tile and door frames and other metal accessories, tile and ceiling, wall tile and wall tile at inside corners and wall tile and floor tile shall be sealed with silicone rubber sealant.
 4. Provide expansion joints at tile columns, curbs and pipes and fill with sealant. At building structural joints extend expansion joints through the tile. Seal with sealant. In no case shall tile be carried over expansion joints without a joint in the tile.
- J. Seal tile and grout in accordance with Manufacturer's recommendations.

3.04 CURING

- A. Damp cure all cement based tile installations, including Portland cement grouts, for 72 hours minimum.
1. Cover with clean non-staining 40-pound Kraft paper.
 2. Do not use polyethylene sheets directly over tile on horizontal surfaces.
 3. Keep all traffic off newly installed floors for at least 72 hours. Protection may be necessary.

3.05 TOLERANCES

- A. Tile: Do not exceed the following deviations from level and plumb, and from elevations, locations, slopes and alignments shown:
1. Horizontal surfaces: 1/8 inch in 10'-0" in all directions;
 2. Vertical surfaces: 1/8 inch in 8'-0" in all directions.
 3. Lippage: 1/8 inch maximum.
 4. Maximum Variation of Joint Width: 1/16 inch at tile with joints up to 1/4 inch in width, 1/8 inch at tile with joints over 1/4 inch in width.

3.06 CLEANING

- A. Wipe surfaces clean after grouting, remove traces of mortar and grout. Do not use acid solution for cleaning glazed tile.
- B. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

3.07 PROTECTION

- A. Close spaces to traffic or other Work until tile is firmly set. Protect from damage until acceptance. Repair damaged Work at no additional cost to Owner.
- B. Prohibit foot and wheel traffic from using newly tiled floors for at least 7 days. Place large, flat boards in walkways and wheelways where use of newly tiled floor is unavoidable.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes acoustical panel ceilings including exposed grid suspension system, wire hangers, main runners, cross tees, wall angle moldings and accessories as shown on Drawings and as specified herein.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings showing complete layout of systems including attachments, intersections of members and edge conditions.
- B. Product Data: Provide data on metal grid system components and each acoustical panel, including manufacturer's certificate that products meet or exceed specified requirements.
- C. Samples:
1. Submit 2 samples of each type of unit specified, minimum of 6 inches x 6 inches, including color selection when applicable.
 2. Submit samples of Manufacturer's full color selection for selection by Architect.

1.03 QUALITY ASSURANCE

- A. Qualifications: Installer shall be approved by Manufacturer of material or system.
- B. Standards: Comply with the following:
1. ASTM C635, "Standard Specification for Acoustical Tile and Lay-In Panel Ceilings."
 2. ASTM C636, "Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels."
 3. ASTM E580, "Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions."
 4. Ceilings and Interior Systems Construction Association (CISCA) "Recommendations for Direct-Hung Acoustical tile and Lay-in Panel Ceilings."
 5. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical tile and Lay-in Panel Ceilings, for seismic zone/class indicated on General Structural Notes on Drawings.
 6. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
- C. Surface Burning Characteristics: Class A per ASTM E1264 and Fed. Spec. SS-S-118B, Flame Spread 25 or under, per ASTM E-84 (UL Label).
- D. Provide acoustical ceiling system which has been manufactured, fabricated and installed to provide Noise Reduction Coefficient (NRC) ratings as specified.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.05 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Do not install ceiling panels until building is closed in and HVAC system has been in operation for a minimum of 48 hours with ambient temperature and humidity conditions maintained at the levels indicated for the Project when occupied for its intended use.
 - 2. Locate materials onsite, in areas where units will be installed, at least 24 hours before beginning installation to allow materials to reach temperature and moisture content equilibrium.

1.06 MAINTENANCE

- A. Extra Materials: Provide an additional six (6) panels of each type of acoustical and/or specialty/decorative unit installed, in labeled cartons, to the Owner at completion of Work, for his maintenance use, at no additional cost. Provide, at minimum, one full carton of each type of acoustical unit.

1.07 WARRANTY

- A. Provide manufacturer's standard warranties agreeing to repair or replace acoustical panels and suspension systems that fail within the warranty period. Failures include manufacturing defect, sagging and warping of acoustical panels, and rusting of grid system.
 - a. Warranty Period:
 - 1. Acoustical Panels: Manufacturer's standard maximum warranty for each type of panel used.
 - 2. Grid and Suspension System: Manufacturer's standard maximum warranty, but not less than 10 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of the following Manufacturers, except as approved otherwise by the Architect, subject to compliance with Specification requirements.
 - 1. Armstrong World Industries www.ceiling.com
 - 2. Rockfon North America www.rockfon.com
 - 3. USG Interiors, Inc. www.usg.com
 - 4. Certainteed Saint Gobain www.certainteed.com

2.02 SUSPENSION SYSTEM

- A. Ceiling Suspension System: Intermediate duty with components formed from commercial quality cold rolled steel electro-zinc coated.
 - 1. Main-Runners: Minimum of 1-1/2 inch in height with an exposed capped face of width of 15/16 inch or 9/16 inch as indicated on Drawings.
 - 2. Cross-Tees: Minimum of 1-1/4 inches or 1-1/2 inches in height with an exposed capped face in a width and profile to match main runners.
 - 3. Finish: Exposed faces of main and cross runners shall be a baked enamel paint finish, Colors as follows:
 - a. White, unless otherwise indicated on Drawings.
- B. Hanger Wire: Galvanized steel conforming to Federal Specification FF-QQ-W-461, Finish 5, Class 1 annealed, and not less than 12 gauge).
- C. Suspension system shall support the ceiling system specified with a maximum deflection of 1/360 of the span.
- D. Wall and Penetration Moldings: 24 MSG painted steel with a minimum one inch wide lower flange, finish and configuration to match grid. For circular penetrations and/or curved walls/soffits provide edge molding manufactured to exact diameter of circular penetration or flexible vinyl edge trim capable of curving to exact diameter of wall or penetration without distortion.
- E. Compression Struts: C-shaped steel stud in compliance with Section 09 22 16. Provide in minimum thickness as required to adequately resist the vertical component induced by the bracing wires.
- F. Hold-Down Clips: Provide access type hold-down clips where required by Acoustical Ceiling Manufacturer for type and condition and where panels weigh less than one pound per square foot.

2.03 CEILING PANELS

- A. Acoustical Ceiling Panels: Provide panel products matching Manufacturer's designations indicated on Drawings and complying with the following:
 - 1. Light reflectance of LR-1 (over 75 percent), per Fed. Spec. SS-S-118B and ASTM E1264 for factory finished panels. Field painted panels are not required to comply.
 - 2. Size: As indicated on Interior Finish Material Legend on Drawings.
- B. Gypsum Core Lay-in Panels: Provide the following at Kitchen and Food Preparation Areas, unless otherwise scheduled on Drawings:
 - 1. Sheetrock Brand ClimaPlus Vinyl #3270, or equivalent as selected by Architect from one of the specified manufacturers.
 - 2. Finish: Vinyl faced and backed gypsum core with sealed edges.
 - 3. ASTM E1264 Classification: Type XX, Pattern G.
 - 3. Size: 24 inch x 48 inch x 1/2 inch.
 - 4. Light reflectance: .77 per ASTM E1264.
 - 5. NRC: .10 in suspended mounting.
 - 6. CAC: 40 (continuous ceiling).
 - 7. USDA approved for use in food preparation areas.
 - 8. Edge Detail: Square.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing, with a copy to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Verify, before proceeding with this Work, that required inspections of existing conditions have been completed.

3.02 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance the following:
 - 1. ASTM C635, ASTM C636 and as supplemented in this Section.
 - 2. ASTM E580, "Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions."
 - 3. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical tile and Lay-in Panel Ceilings, for seismic zone/class indicated on General Structural Notes on Drawings.
 - 4. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
 - 5. 2018 IBC Chapter 8 installation requirements and Chapter 16 requirements for suspended ceilings for Seismic Design Category indicated in General Structural Notes on Drawings for location where project is located.
- B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum. Individual component deflection shall not exceed 1/360 of span.
- C. Locate system on room axis according to reflected ceiling plan. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders.
- D. Install after major above-ceiling Work is complete. Coordinate the location of hangers with other Work.
- E. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.
- F. Hanger Wire Installation: Secure hanger wires to upper structural elements above. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for the supporting structural member, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures. Tie wires with a minimum of three tight turns and space hangers so that each hanger wire supports a maximum of 16 sq. ft. Lay-out as reflected and dimensioned in reflected ceiling plan.
- G. Laterally brace and seismic stabilizer bars, struts and clips as required to comply with Seismic design requirements.

- H. Hang suspension system independent of walls, columns, ducts, pipes, conduit, and other obstructions. Where required, provide additional suspended structural members to form "trapeze" to span underside of ductwork or other obstruction, with main suspension of ceiling system suspended from the additional members.
 - 1. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- I. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- J. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.
- K. Do not eccentrically load system, or produce rotation of runners.
- L. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions. Fit border trim neatly against abutting surfaces.
- M. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.
- N. Install protection over light fixtures in accordance with UL assembly requirements, where required.

3.03 INSTALLATION - ACOUSTICAL LAY-IN UNITS

- A. Material shall be dry and clean at time of application.
- B. Install acoustical units in accordance with Manufacturer's instructions, and as specified herein.
- C. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- D. Lay directional patterned units one way with pattern parallel to longest room axis. Fit border trim neatly against abutting surfaces. Where recommended by Manufacturer, use tiles one at a time from at least four open boxes to avoid creating any pattern due to slight variations from box to box.
- E. Install units after above-ceiling Work is complete.
- F. Install acoustical units level in uniform plane, and free from twist, warp and dents.
- G. Cut panels to fit irregular grid and perimeter edge trim. Field rabbet panel edge. Double cut and field paint exposed edges of reveal edge units.
- H. Where round obstructions occur, provide preformed closers to match edge molding.
- I. Field paint cut edges to match surface color and sheen.

3.04 INSTALLATION TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

3.05 ADJUSTING

- A. Remove damaged or soiled panels and replace with new units, as directed by Architect.
- B. 'Touch-up' minor abraded surfaces.

3.06 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 09 54 23

LINEAR METAL CEILINGS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Strip linear metal pans and suspension systems for interior and exterior locations, including concealed grid suspension system, wire hangers, seismic restraints, moldings, and accessories as shown on Drawings and as specified herein.
- B. Related Sections:
 - 1. Section 09 51 00 – Acoustical Ceilings.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of ceiling suspension system required, including installation Instructions.
- B. Manufacturer's data: Submit manufacturer's catalog cuts or standard drawings showing details of system with project conditions clearly identified and manufacturer's recommended installation instructions, including independent lab report on wind testing.
- C. Performance Data: For installed products indicated to comply with design loads and other criteria, include structural analysis and other analytical data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Samples: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below:
 - 1. Linear Metal Pan: Set of 12-inch- long Samples of each type and color and a 12-inch- long spliced section.
 - 2. Suspension System Members: 12-inch- long Sample of each type.
 - 3. Exposed Molding and Trim: Set of 12-inch- long Samples of each type, finish, and color.
 - 4. Filler Strips: Set of 12-inch- long Samples of each type, finish, and color.
 - 5. Sound Absorber: 12 inches long.
 - 6. End Cap: Full size.
- E. Shop Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Linear pattern.
 - 2. Joint pattern.
 - 3. Ceiling suspension members.
 - 4. Method of attaching hangers to building structure.
 - 5. Furnish layouts for clips and other ceiling attachment devices whose installation is specified in other Sections.
 - 6. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
 - 7. Ceiling perimeter and penetrations through ceiling; trim and moldings.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each linear metal ceiling.
- G. Maintenance Data: For finishes to include in maintenance manuals.

1.03 QUALITY ASSURANCE

- A. Qualifications: Installer shall be approved by Manufacturer of material or system.
- B. Standards: Comply with the following:
 - 1. ASTM C635, "Standard Specification for Acoustical Tile and Lay-In Panel Ceilings."
 - 2. ASTM C636, "Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels."
 - 3. ASTM E580, "Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions."
 - 4. Ceilings and Interior Systems Construction Association (CISCA) "Recommendations for Direct-Hung Acoustical tile and Lay-in Panel Ceilings."
 - 5. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical tile and Lay-in Panel Ceilings, for seismic zone/class indicated on General Structural Notes on Drawings.
 - 6. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
- C. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
- D. Source Limitations: Obtain each set of linear metal pans and suspension systems from one source with resources to provide products of consistent quality in appearance, physical properties, and performance.
- E. Surface-Burning Characteristics: Complying with ASTM E 1264 for Class A materials, as determined by testing identical products according to ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- F. Seismic Performance: System seismic performance verified through full-scale testing in accordance with ICC-ES – AC-156 Acceptance Criteria for Seismic Qualification Testing of Non-Structural components.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.05 COORDINATION

- A. Coordinate layout and installation of linear metal pans and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.06 WARRANTY

- A. Provide manufacturer's standard warranties agreeing to repair or replace linear metal ceiling pans and suspension systems that fail within the warranty period. Failures include manufacturing defect, sagging and warping of panels, delamination of finishes, and metal components or grid system.
 - a. Warranty Period:
 - 1. Linear Metal Panels: 1 year.
 - 2. Grid and Suspension System: Manufacturer's standard maximum warranty, but not less than 10 years.

1.07 MAINTENANCE

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
 - 1. Linear Metal Ceiling Components: Quantity of each pan, carrier, accessory, and exposed molding and trim equal to 2 percent of quantity installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of the following Manufacturers, except as approved otherwise by the Architect, subject to compliance with Specification requirements.
 - 1. USG Interiors, Inc. www.usg.com
 - 2. Equal as prior approved by Architect.

2.02 PERFORMANCE REQUIREMENTS FOR EXTERIOR SOFFIT LOCATIONS

- A. Performance Requirements:
 - 1. Provide panels that have been manufactured, fabricated and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.
 - 2. Structural Properties: Metal wall panel system including anchorages and related components shall be engineered to withstand applicable loads including live, dead, positive and suction wind, seismic, etc. Fastener strength and connection strength shall be analyzed and engineered.
 - a. Maximum deflection under positive or suction full design loads of substrate system shall not exceed 1/180th of span, or 1/2 inch maximum.
 - b. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with applicable code.
 - 1. Design Wind Speed: As scheduled on Structural Drawings.
 - c. Design corners for simultaneous positive (inward) and negative (outward) design pressure on both surfaces. Partial loading on one surface shall be considered.
 - d. Design metal members supporting wall panels to meet the following performance criteria and loads:
 - 1) Net deflection of steel framing members, perpendicular to the plane of the wall: 1/360 times span, or 1/2 inch, whichever is less. Span is defined as the distance between anchor centerlines. For cantilevers, span is defined as two times the distance between anchor centerline and end of cantilever.

- 2) Where a framing member runs continuously past a deflecting support, the support deflection shall be considered in the analysis.
 - 3) Connection points of framing members to anchors, combined movement of anchor relative to building structure, and framing member relative to anchor: 1/16 inch maximum in any direction.
 - 4) Do not exceed the allowable values for stresses established by the specifications listed in code standards. Do not exceed the yield stress in determining allowable values.
 - 5) Where permitted by code, a 1/3 increase in allowable stress for wind or seismic load is generally acceptable. Do not apply a 1/3 increase in combination with any reduction applied to combined loads.
- e. Limit net permanent deflection at 1.5 times the design pressure loads to 1/1000 span maximum, for steel framing members supporting wall panels. No failure or gross permanent distortion of framing members, anchors or connections is permitted. At connection points of framing members to anchors, combined movement of anchor relative to building structure, and framing member relative to anchor, shall not exceed 1/16 inch set after load is removed.
3. Provisions for Thermal Movement: Design the system to provide for such expansion and contraction of component materials caused by an exterior ambient temperature ranging from 20 degrees F to surface temperature of 180 degrees F without causing undue stress on structural elements, damaging loads on fasteners, reduction of performance, or other detrimental effects. The amount of movement that is accommodated in the design shall be identified on Shop Drawings.
4. Provision for Movement of the Structure:
- a. Design system to accommodate 3/8 inch live load deflection, as well as thermal expansion and elastic shortening of the building. Obtain all necessary projected data and make such provision in the work. The amount of such movement that is accommodated in the design shall be identified on the Shop Drawings.
 - b. Design the system to accommodate the seismic drift requirements in the 2018 IBC.

2.03 MATERIALS

- A. Basis of Design: Subject to compliance with project requirements, the design is based on the following: USG Corporation, "Paraline Plus".
1. Classification: Provide ceiling panels complying with ASTM E 1264 for type, form and pattern as follows:
 - a. Type: VII, Perforated aluminum facing (linear pan).
 - b. Pattern: A062 with round 1/16 inch perforations @ 0.23 inches o.c. 5 percent open area on face of pans only.
 - c. Provide mineral glass or fiber base backing at interior locations.
 2. Pan Face Width: 7 inches.
 3. Pan Face Finish: As scheduled on Drawings.
 4. Acoustical Backer:
 - a. Interior Locations: 5/8 inch wet felt acoustic backer.
 - b. Exterior Locations: None.
 5. CAC: As standard with manufacturer for acoustic backing indicated.
 6. Accessories:
 - a. Interior Locations: Shadow molding.
 - b. Exterior Locations: Shadow molding and Snap-Lock Reveal Inserts.
 7. Pan Length: 12 feet.

- B. Pan Splices: Construction same as pans, in lengths 8 to 12 inches; with manufacturer's standard finish.
- C. End Caps: Metal matching pans; fabricated to fit and conceal exposed ends of pans.
- D. Moldings and Trim: Provide manufacturer's standard moldings and trim for exposed members, and as indicated or required, for edges and penetrations of ceiling, around fixtures, at changes in ceiling height, and for other conditions; of same metal and finish as linear metal ceiling pans.
- E. Sound-Absorbent Fabric Layer: Provide fabric layer, sized to fit concealed surface of pan, and consisting of black, nonwoven, nonflammable, sound-absorbent material with surface-burning characteristics for flame-spread index of 25 or less and smoke-developed index of 50 or less, as determined by testing per ASTM E84.
 - 1. Bond fabric layer to pan in the factory with manufacturer's standard nonflammable adhesive.
- F. Suspension Systems:
 - 1. Interior Locations: Standard 15/16 inch suspension T-grid system using main runners, cross-tees, wall angles or shadow moldings of types, structural classifications, and finish indicated complying with references Standards.
 - a. Components: Components: All main beams and cross tees shall be commercial quality hot dipped galvanized steel (galvanized steel or aluminum) as per ASTM A653. Main beams and cross tees are double-web steel construction with 15/16 inch type exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel (aluminum or stainless steel) in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).
 - 1) Structural Classification: ASTM C635, Intermediate Duty.
 - 2) Color: Black, unless otherwise indicated on Drawings.
 - b. Attachment Devices: Size for five times design load indicated in ASTM C635, Table 1, Direct Hung unless otherwise indicated.
 - c. Wire for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least 3 times design load, but not less than 12 gauge.
 - e. Provide braces, hanger rods, flat hangers, angle hangers, moldings and edge trims as standard with manufacturer for type of panel selected.
 - 2. Exterior Locations: Manufacturer's standard flat panel carrier system for direct attachment to plywood substrate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Examine subsurfaces to receive Work and report detrimental conditions in writing to Owner's Representative.
 - 2. Commencement of Work will be construed as acceptance of subsurfaces.
 - 3. Examine alignment of support members before installing linear ceiling panels. Do not proceed with such installation if the members are not aligned to the tolerances required by Linear Ceiling Panel Manufacturer.

- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.
 - 1. All work above ceiling system shall be satisfactorily completed prior to start of the ceiling installation.
 - 2. Coordinate ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.
 - 3. Interior Locations: HVAC system shall be in operation prior to proceeding with installation. Before starting the HVAC system, make sure supply air is properly filtered and the building interior is free of construction dust.

3.02 PREPARATION

- A. Coordination: Furnish layouts for anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
- B. Layout: Measure each ceiling area and establish layout of linear metal ceiling panels to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half-width panels at borders and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

3.03 INSTALLATION

- A. Install suspension system and panels in compliance with ASTM C636; CISCA “Ceiling Systems Handbook and Seismic Guidelines; approved construction drawings; with the authorities having jurisdiction; and in accordance with the manufacturer's installation instructions for Linear Metal Ceiling products specified.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Delete subparagraph above or first subparagraph below. Retain below only if fire-resistance-rated ceilings are selected.
 - 3. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 6. Do not attach hangers to steel deck tabs.
 - 7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
- C. Flat Panel carrier for Exterior Locations: Screw fasten carriers at proper spacing and alignment in accordance with Manufacturer's instructions.

- D. Secure bracing wires to ceiling suspension members and to supports with a minimum of four Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs.
- E. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- F. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- G. Cut linear metal pans for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet.
- H. Install linear metal pans in coordination with suspension system and exposed moldings and trim.
 - 1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated.
 - 2. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating ceiling.
 - 3. Install pans with butt joints using internal pan splices and in the following joint configuration:
 - a. Staggered a minimum of 12 inches, or as otherwise indicated on Drawings or selected by Architect.
 - 4. Where metal pan ends are visible, install end caps unless trim is indicated.
 - 5. Install filler strips where indicated.
 - 6. Interior Locations: Install sound-absorbent fabric layers in perforated metal pans.

3.04 ADJUSTING AND CLEANING

- A. Clean exposed surfaces of linear metal ceilings, including trim and edge moldings after removing strippable, temporary protective covering if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.
- B. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 09 65 13

RESILIENT WALL BASE AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Resilient wall base.
 - 2. Adhesives and other related installation materials as necessary.

1.02 SUBMITTALS

- A. Product Data: Submit data on specific products, describing physical and performance characteristics, sizes, patterns and colors available.
- B. Samples: Submit 2 samples of each material specified illustrating color and pattern.

1.03 QUALITY ASSURANCE

- A. Qualifications: Installation shall be by qualified installer approved by the Manufacturer of the materials.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.05 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Installation shall not begin until Work of other Trades is substantially completed and the area or rooms where flooring is to be installed has been maintained at a minimum temperature of 70 degrees F. for at least 48 hours.
- B. Maintain ambient temperature required by Adhesive Manufacturer three days prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wall Base and Flooring Accessories: Furnish products of one of the specified Manufacturers, except as otherwise approved by the Architect, subject to compliance with Specification requirements.
 - 1. Roppe www.roppe.com
 - 2. As prior approved by Architect.

2.02 BASE

- A. Base: ASTM F1861.
 - 1. Material: Type TV thermoplastic vinyl, unless otherwise scheduled Drawings.
 - 2. Height: 4 inches, unless otherwise scheduled on Drawings.
 - 3. Thickness: 1/8 inch thick
 - 4. Length: Coils/Rolls in manufacturer's standard lengths. Cut lengths are not allowed.
 - 5. Type: Top set, coved typical, toeless at carpet.
 - 6. Color: As scheduled on Room Finish Schedule on Drawings, or as otherwise selected by Architect from manufacturer's full line of colors.
- B. Base Accessories: Premolded end stops and external corners of same material, size, and color as base.

2.03 ACCESSORIES

- A. Adhesives: Suitable for substrate conditions involved as recommended by the Manufacturer of the resilient base and accessory materials. Adhesives shall be waterproof, stabilized type. Asphalt emulsions are not acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.

3.02 PREPARATION

- A. Remove substrate ridges and bumps and vacuum substrate to condition acceptable to receive adhesive.

3.03 INSTALLATION - BASE

- A. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.
- B. Miter internal corners. At external corners, use premolded units. At exposed ends use premolded units.
- C. Install base on solid backing. Bond tight to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.04 CLEANING

- A. Remove dirt, debris and adhesive from wall base and adjacent surfaces using Manufacturers recommended methods and leave installation in a clean, undamaged condition.
- C. During the course of the Work and on completion, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 09 65 60
RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Resilient Athletic Flooring, including recycled rubber roll/sheet flooring.
- B. Related Sections:
 - 1. Concrete Substrate: Section 03 30 00 Cast-In-Place Concrete.

1.02 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide recycled rubber resilient flooring, which has been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.03 SUBMITTALS

- A. Product Data: Submit product data, including manufacturer's guide specifications product sheet, for specified products.
- B. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures.
- C. Samples: Submit selection and verification samples for finishes, colors and textures.
- D. Quality Assurance Submittals: Submit the following:
 - 1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
 - 2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- E. Manufacturer's Instructions: Manufacturer's installation instructions.
- F. Manufacturer's Field Reports: Manufacturer's field reports specified herein.
- G. Closeout Submittals: Submit the following:
 - 1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
- H. Warranty: Warranty documents specified herein.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

- B. **Manufacturer's Qualifications:** Manufacturer capable of providing field service representation during construction and approving application method.
- C. **Mock-Ups:** Install at project site a job mock-up using acceptable products and manufacturer-approved installation methods. Obtain Architect's approval of finish color, texture and pattern, and workmanship standard.
 - 1. **Mock-Up Size and Location:** As directed by the Architect.
 - 2. **Maintenance:** Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
 - 3. **Incorporation:** Approved mock-up may be incorporated into final construction upon Owner's approval.
- D. **Preinstallation Meetings:** Conduct preinstallation meeting at the site to verify project requirements, substrate conditions, manufacturer's instructions and manufacturer's warranty requirements. Meeting shall include, at a minimum, the Contractor, the flooring installer, flooring manufacturer and installers of related materials. Architect shall be notified of the date and time of the meeting not less than one week prior to meeting.

1.05 DELIVERY, STORAGE & HANDLING

- A. **Ordering:** Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. **Delivery:** Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. **Storage and Protection:** Store materials at temperature and humidity conditions recommended by manufacturer and protect from exposure to harmful weather conditions.

1.06 PROJECT CONDITIONS

- A. **Temperature Requirements:** Maintain air temperature in spaces where products will be installed for time period before, during and after installation as recommended by manufacturer.
- B. **Field Measurements:** Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.07 WARRANTY

- A. **Manufacturer's Warranty:** Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not a limitation of, other rights Owner may have under Contract Documents.
- C. **Warranty Period:** 5 years commencing in Date of Substantial Completion.

1.08 MAINTENANCE

- A. **Extra Materials:** Deliver to Owner extra materials from same production run as products installed.

- B. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals (Maintenance Materials) Section.
 - 1. Quantity: Furnish quantity of recycled rubber flooring units equal to 5 % of amount installed.
- C. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.

PART 2 PRODUCTS

2.01 Resilient Athletic Flooring

- A. Manufacturer: ECO Surface Commercial Flooring; manufactured in the USA by ECORE International; www.ecosurfaces.com
- B. Flooring: ECOSurfaces Ecofit Recycled Rubber Resilient Flooring:
 - 1. Roll Size:
 - a. Width: 48 inches.
 - b. Total Thickness: 8.2mm (3.2mm wear layer fusion bonded to rubber backing).
 - c. Length: 50 linear feet
 - 2. Colors: As selected by Architect.
- C. Product Testing:
 - 1. Tensile Strength, lb/ sq. in. (ASTM D412): 200 min.
 - 2. Flexibility, 1/4 inch mandrel (ASTM F137): pass
 - 3. Static Load, 400 lbs (ASTM F970): less than 0.005 inch.
 - 4. Coefficient of Friction (ASTM D2047): greater than 0.9
 - 5. Chemical Resistance (ASTM F925): slight change.
 - 6. Noise Reduction (ASTM C423): 0.05 sabine per sq. ft.
 - 7. Thermal Conductivity (ASTM C518): 0.445 Btu-in per hr-sq. ft. –deg F.
 - 8. Impact Insulation Class (ASTM E492): 48
 - 9. Sound Transmission Coefficient (ASTM E413): 51
 - 10. Sustainability (ASTM E2129): data collected.
 - 11. CHPS Section 01350 (ASTM D5116): Pass.

2.02 ACCESSORIES

- A. Adhesives: Suitable for the underfloor substrate conditions involved as recommended by the Manufacturer of the flooring materials. Adhesives shall be waterproof, stabilized type.

2.03 SOURCE QUALITY

- A. Source Quality: Obtain recycled rubber resilient flooring materials from a single manufacturer.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.02 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.03 PREPARATION

- A. Surface Preparation: [Specify applicable product preparation requirements.].

3.04 INSTALLATION

- A. Recycled Rubber Flooring Installation: Comply with Flooring Manufacturer's Technical Manual for installation procedures and techniques for flooring installation.

3.05 FIELD QUALITY REQUIREMENTS

- A. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.

3.06 CLEANING

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.07 PROTECTION

- A. Protection: Protect installed product and finish surfaces from damage during construction.

END OF SECTION

SECTION 09 77 33

FRP WALL PANELS

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Manufacturer's Specifications and installation instructions for each material and accessory.
- B. Submit Manufacturer's full range of color and pattern samples of wall panels and trim pieces for Architect's selection. Submit two samples of selected products.
- C. Submit cleaning and maintenance instructions in accordance with Section 01 77 00.

1.02 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials clearly labeled to identify Manufacturer, brand name, quality or grade and fire hazard classification.
- B. Store horizontally in original undamaged packages.

1.03 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Install materials when temperature and humidity conditions approximate conditions that will exist when building is occupied.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the specified Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements.
 - 1. Crane Composites, Inc. (Kemlite), Channahon, IL (800) 435-0080 www.kemlite.com
 - 2. Glasteel www.glasteel.com ; Stabilit / Resolite Company.
 - 3. Marlite, Inc., Dover, OH (303) 343-6621 www.marlite.com

2.02 MATERIALS

- A. FRP Panels: Fiberglass reinforced plastic panels complying with the following:
 - 1. Class: Class I (A) FR panels.
 - 2. Thickness: 0.090.
 - 3. Texture: Embossed pebble texture.
 - 4. Color: Color as scheduled on Finish Schedule on Drawings.
- B. Adhesive for panel installation: Manufacturer's recommended type for use with selected materials, waterproof, mildew resistant nonstaining type.
- C. Edge Sealant: Type "E" clear mildew resistant silicone sealant as specified in Section 07 92 00, or mildew resistant sealant recommended by manufacturer for sealing panel edges and moldings.

- D. Moldings: All molding shall be 1-piece vinyl of the following types, color to match FRP.
 - 1. Panel Edges: "J" type Cap molding.
 - 2. Panel to Panel: "H" type Division Bar molding.
 - 3. Inside Corner: "J" type Inside Corner molding with radius edge.
 - 4. Outside Corner: "J" type Outside Corner molding with extended leg.
 - 5. Ceiling: "J" type Ceiling molding with radius edge, or use inside corner molding.
- E. Fasteners: Manufacturer's standard nylon drive pins.
- F. Miscellaneous Items: Furnish and install supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation whether or not specified or indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Examine substrate and conditions under which the material is to be installed.
 - 2. Verify that surfaces, when tested with moisture meter, have proper moisture content.
 - 3. Verify that nails and screws are recessed, with joints and depressions taped, finish and sealed.
 - 4. Remove contaminants from areas to be covered.
 - 5. Do not proceed with Work until Work of other Trades which passes through wall covering has been completed and unsatisfactory conditions have been corrected.
 - 6. Start of Work indicates acceptance of responsibility for performance and any required remedial Work.

3.02 INSTALLATION

- A. Install panels in accordance with Manufacturer's printed instructions using full sheet mastic coverage method plus nylon fasteners.
- B. Make joints with 1/8 inch space for expansion and use moldings designed for each condition for the Project.
- C. Bevel back edges of panels with block plane to permit proper fit into moldings.
- D. Place a continuous bead of sealant in the receiver channel of all moldings immediately prior to installation of FRP panels. Place continuous bead of sealant at all edges and tool to smooth, slightly concave shape.
- E. If one end of panel must be mechanically fastened, do not fasten the other end.
- F. Remove plumbing escutcheons, switchplates, wall plates, and surface-mounted fixtures, and cut wall paneling evenly to fit. Replace items after completion of Work.
- G. Where applicable, install paneling before installation of plumbing, casings, bases, cabinets and other items to be applied over paneling.

3.03 CLEANING

- A. Remove excess adhesive and smudges with soft cloth and mineral spirits.

END OF SECTION

SECTION 09 81 00
ACOUSTICAL INSULATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Acoustical insulation above ceilings and within partitions as shown on Drawings and as specified.

1.02 SUBMITTALS

- A. Product data: Submit Manufacturer's data, installation instructions, limitations and recommendations. Include certification and test data substantiating combustibility of each type of insulation.

1.03 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide insulation and related materials with fire-test-response characteristics as required by code, as determined by testing identical products per ASTM E84 for surface-burning characteristics, by UL or another testing and inspection agency acceptable to authorities having jurisdiction. Identify material with appropriate markings of applicable testing and inspection agency.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the specified Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements.
 - 1. CertainTeed Corp., Saint Gobain www.certainteed.com
 - 2. Johns Manville Building Products Group www.johnsmanville.com
 - 3. Knauf Insulation www.knaufinsulation.com
 - 4. Owens Corning Fiberglas www.owenscorning.com

2.02 MATERIALS

- A. Sound Attenuation Blankets: ASTM C665, Type 1 (unfaced).
 - 1. Thickness: 3-1/2 inches, unless otherwise indicated on Drawings.
 - 2. Surface Burning Characteristics: When tested in accordance with ASTM E84.
 - a. Maximum Flame Spread: 25.
 - b. Maximum Smoke Developed: 50.
 - 3. Fire Resistance Ratings: Passes ASTM E119 as part of a complete fire tested wall assembly.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.
- C. Clean substrates and voids where insulation will be placed of substances harmful to insulation.

3.02 INSTALLATION

- A. Install acoustical insulation batts in sound-rated stud partition walls where indicated on Drawings. Size batts for a friction fit and install in accordance with Manufacturer's printed instructions.
- B. Install acoustical insulation batts above lay-in ceilings, and other locations as shown on Drawings, in strict accordance with Manufacturer's printed instructions.
- C. Butt ends of batts closely together and fill all voids.

3.03 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Painting as specified and as noted on Drawings.
 - 2. Surfaces requiring finishing and left unfinished by the requirements of other Sections shall be painted or finished as part of the Work of this Section.
- B. Related Sections:
 - 1. Section 07 19 00 – Water Repellents, for penetrating water repellent coating applied to exposed exterior integrally colored CMU wall construction not otherwise indicated to be painted.
 - 2. Section 32 17 23 – Pavement Markings, for traffic marking and striping for pavement and curbs.

1.02 DEFINITIONS

- A. Touch-Up: Painting of items missed by painter at no additional cost to Owner.
- B. Re-Paint: Repairs to paint work for damages caused by other trades.
- C. Properly Painted Surfaces: Surface that is uniform in appearance, color, and sheen, and free of foreign material, lumps, skins, runs, sags, holidays, misses, strike-through, and insufficient coverage. Surface free of drips, splatters, spills, and overspray caused by Paint Applicator. Compliance will be determined when viewed without magnification at a distance of 5 feet minimum under normal lighting conditions and from normal veiling position (MPI(a), PDCA P1.92).
- D. Damage Caused by Others: Damage caused by individuals other than those under direct control of Painting Applicator (MPI(a), PDCA P1.92).
- E. Latent Damage: Damage or conditions beyond control of Painting Applicator caused by conditions not apparent at time of initial painting or coating work.

1.03 SUBMITTALS

- A. Product Data: Submit schedule of manufacturers of products required for the Work, together with specifications recommended by each manufacturer.
- B. Samples: Submit samples of each type of finish specified.
 - 1. Architect will furnish Contractor a color schedule of colors selected either from manufacturer's stock colors or specially requested color mixes before Work is begun.
 - 2. Submit two 8 inch x 10 inch samples of each color, including the correct sheen and texture, on heavy cardboard or masonry. Submit sealer and stain finishes on material of the same quality and species of wood on which that particular finish shall be used. Rejected samples shall be resubmitted until approved.

3. Samples shall be submitted at least 30 days prior to the start of painting work. Label and identify each sample as to location and application. Upon submittal of color samples, minor variations or changes in color selection may be requested by the Architect and new samples ordered, until final color approval.

1.04 QUALITY ASSURANCE

- A. Standards: Preparation, application and workmanship shall be in accordance with manufacturer's recommendations and applicable provisions of the following:
 1. Master Painters Institute (MPI) Architectural Painting Specification Manual.
 2. Gypsum Association - GA210, "Gypsum Board for Walls and Ceilings."
- B. MPI Grade: All work shall be performed in accordance with MPI Premium Grade finish requirements.
- C. Design Criteria: Systems specified are in addition to prime coats provided under other Specification Sections of the Project Manual.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's sealed original containers with Manufacturer's original legends and labels intact on each container. Deliver amount of materials necessary to meet Project requirements in single shipment.
- B. Storage: Store materials in a single location.
 1. Adequately protect against damage while stored at site.
 2. In no case shall the amount or method of materials stored exceed the amount permitted or the manner allowed by local ordinances, state laws, or fire underwriter regulations.
 3. Keep storage area clean and rectify any damage to area at completion of work of this Section. Maintain storage area at 55 deg. F minimum.

1.06 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Do not apply exterior paint in damp or rainy weather or until after the surface has dried thoroughly from the effects of such weather.
 1. Perform painting operations at temperature and humidity conditions recommended by Manufacturer for each operation and for each product.
 2. Do not apply varnish or paint when temperature is below 50 degrees F.. Avoid painting surfaces exposed to hot sunlight.
 3. During interior application, maintain minimum temperature of 65 degrees F. unless otherwise directed by Architect or manufacturer's printed instructions. Hold temperature as constant as possible.
 4. Provide adequate ventilation at all times so the humidity cannot rise above the dew point of the coldest surface to be painted.
 5. Moisture-containing surfaces, such as concrete, stucco and cement plaster shall have a moisture content of less than 8 percent as measured by moisture meter. Remove surface salt deposits prior to painting. Verify that pH is neutral, or within acceptable limits of Paint Manufacturer. Paint after thoroughly cured.
 6. Apply painting systems at lighting level of 540 Lux (50 foot candles) minimum on surfaces to be painted. Inspection of painting work shall take place under same lighting conditions as application. If painting and coating work is applied under temporary lighting, deficiencies discovered upon installation of permanent lighting will be considered latent damage as defined in Article 1.02 of this Section and the MPI Architectural Painting Specification Manual.

1.07 MAINTENANCE

- A. Extra Materials: Provide painting materials in Manufacturer's original containers with originals labels intact, in each color and or sheen used. Upon completion of the Work, furnish Owner with one fresh gallon of each type and color of paint and finish used on this Project, including primers and undercoats used. Label containers with manufacturer's name, batch, date, color name, anticipated shelf life, mixture instructions, and cautions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following manufacturers, except as otherwise approved by Architect, subject to compliance with specification requirements.
1. Benjamin Moore www.benjaminmoore.com
 2. Dunn-Edwards Corporation www.dunnedwards.com
 3. Glidden Professional (ICI) www.gliddenprofessional.com
 4. PPG Paints www.ppg.com
 5. Sherwin Williams www.sherwin-williams.com
 6. Tnemec www.tnemec.com

2.02 MATERIALS

- A. Materials used for any painting system shall be from a single manufacturer, unless approved otherwise in writing by painting system manufacturer. Include such approvals in Product Data submittal.
- B. Provide materials in accordance with the Schedule of Paint Products at the end of this Section as applicable to project. Contractor shall provide either waterborne or solventborne products at contractor's option and as follows:
1. Waterborne:
 - a. Provide where low odor and fast dry are desired.
 - b. Non-blocking materials shall be used for doors, door jambs, railings and other locations subject to handling, or where surfaces will come into contact with other painted surfaces or belongings.
 2. Solventborne (for exterior use only):
 - a. Provide where harder finish is required (such as "wet" areas) and odor will not create problems with occupants.
 - b. These products shall not be used where color retention is a concern. Verify with Architect.
 3. All interior and exterior materials used shall comply with applicable Federal and local air pollution regulations, lead content laws, and current VOC requirements. If products listed in Schedule of Paint Products located at the end of this Section are not in compliance with regulations, laws, or requirements, Contractor shall notify Architect and shall provide information regarding substitute products.
- C. Basic painting materials such as linseed oil, shellac, turpentine, thinners, driers, and other similar products, shall be of highest quality, pure, be compatible with other coating materials, made by reputable, of manufacturer's listed or listed in MPI manuals, and have identifying labels on containers. Paint materials shall be factory fresh.
- D. Alternate materials submitted for prior approval shall have qualities and materials equal to the other listed manufacturer's scheduled, top of the line, first quality products. Materials selected for coating systems for each type of surface shall be the products of a single manufacturer.

- E. Standard Gloss Range: Provide paints in accordance with the following MPI standard ranges as measured in accordance with ASTM D523, and as indicated on the drawings:

<u>MPI Gloss and Sheen Standards</u>	<u>Gloss @ 60°</u>	<u>Sheen @ 85°</u>
Gloss Level 1 – traditional matte finish – flat	max. 5 units, and	max. 10 units
Gloss Level 2 – high side sheen flat – ‘velvet-like’ finish	max. 10 units, and	10-35 units
Gloss Level 3 – traditional ‘eggshell-like’ finish	10-25 units, and	10-35 units
Gloss Level 4 – ‘satin-like’ finish	20-35 units, and	min. 35 units
Gloss Level 5 – traditional semi-gloss	35-70 units	
Gloss Level 6 – traditional gloss	70-85 units	
Gloss Level 7 – a high gloss	more than 85 units	

- F. Paints shall be ready mixed except for field catalyzed coatings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Before beginning work of this Section, examine and test subsurfaces to be painted or coated for adhesion of painting and coating systems. Report in writing to Architect conditions that will adversely affect adhesion of painting and coating work. Do not apply painting and coating systems until such adverse conditions are corrected by party responsible for adverse conditions. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Report defects in substrates that become apparent after application of primer or first finish coat to Architect in writing and do not proceed with further work on defective substrate until such defects are corrected by party responsible for defect.

3.02 PROTECTION

- A. Before painting, remove hardware, accessories, electrical plates, lighting fixtures and similar items and protect.
1. Provide “Wet-Paint” signs and other barricades and protections as required to protect adjacent surfaces and work of other trades, whether being painted or not.
 2. Mask permanent labels.
 3. Provide, distribute, and maintain a sufficient supply of clean drop cloths and other protective coverings.
 4. Protect foliage and other exterior finished surfaces from contact with cleaning materials and thoroughly flush with water after contact.
 5. On completion of each space, replace above items.
 6. Remove rags and waste used in painting operations from building each night. Take every precaution to avoid danger of fire.

3.03 SURFACE PREPARATION

- A. General: Prepare surfaces in accordance with MPI requirements and requirements of Manufacturer for each painting/coating system specified, unless instructed differently in Contract Documents. Bring conflicts to attention of Architect in writing.
1. Surfaces requiring painting or finishing shall be thoroughly dry and cured, free of dirt, dust, rust, stains, scale, mildew, wax, grease, oil, deteriorated substrates, bond-breakers, efflorescence and other foreign matter detrimental to the coating’s adhesion and performance. Repair voids, cracks, nicks and other surface defects with appropriate patching material. Finish flush with surrounding surfaces and match adjacent finish texture.

2. Spot prime marred or damaged shop coats on metal surfaces with appropriate metal primer.
 3. Determine moisture content of plaster, stucco, cementitious materials, wood and other moisture-holding materials by use of a reliable electronic moisture meter.
 4. Determine alkalinity of plaster, stucco and other cementitious materials by performing appropriate tests.
 5. Do not paint surfaces where moisture content or alkalinity exceeds that which is allowed by paint manufacturer.
 6. Do not perform exterior painting while surface is damp, unless recommended by Manufacturer, nor during rainy or frosty weather. Interior surfaces shall be dry before painting.
- B. Wood:
1. Sandpaper in direction of grain to smooth and even surface, leaving no sanding marks, and then dust off. After primer or stain coat has been applied, thoroughly fill nail holes, minor holes, cracks and other surface imperfections with putty tinted with primer or stain to match wood or stain color. Bring putty flush with adjoining surfaces. Sand woodwork between coats to a smooth surface. Cover knots and sap streaks with a thin coat of shellac, or seal with a suitable stain blocking sealer.
 2. Finish door edges after final fitting.
 3. Backpriming: Backprime interior woodwork, which is to receive paint or enamel finish, with enamel undercoater paint.
- C. Steel and Iron:
1. Remove grease, oil, mill scale, rust and rust scale and touch-up chipped or abraded places on items that have been shop coated. Remove and reprime incompatible or damaged shop applied primers. Comply with the Steel Structures Painting Council's (SSPC) recommendations for cleaning of uncoated steel and iron surfaces.
 2. When area will be exposed to view, sandpaper the entire primed area smooth, feather the edge of surrounding undamaged prime coat and spot prime in a manner to eliminate evidence of repair.
- D. Galvanized Metal and Aluminum:
1. Thoroughly clean by wiping surfaces with a non-hydrocarbon solvent that will not leave an oily residue. Apply surface conditioner or vinyl-wash pretreatment as required for proper adhesion if required by paint manufacturer. Prime galvanized metal with galvanized iron primer as recommended by paint manufacturer. A test sample of the complete painting system should be applied and checked for adhesion before final painting begins.
 2. Clean visible portions of throats of galvanized steel ductwork with solvent; wipe dry with clean rags and paint flat black.
- E. Concrete:
1. Except for steam cured products, cure cement type surfaces from 60 to 90 days in accordance with Paint Manufacturer's recommendations before painting.
 2. The method of surface preparation shall be at Contractor's discretion, provided the results are satisfactory to the Architect, and the method is in compliance with applicable codes and requirements.
 3. Repair surfaces to be painted prior to application of prime and finish coat(s). Apply a tinted primer to the substrate to help identify surface imperfections. After the primer has thoroughly dried, patch, fill and repair surface imperfections to match and flush-out with adjacent finish texture and profile.

4. Before first paint coat is applied, spot prime nails and other exposed metal occurring in the surfaces with a rust inhibitive primer as recommended by paint manufacturer.
- F. Plaster and Gypsum Board Surfaces:
1. Fill cracks, holes or imperfections with compatible patching material and smooth off to match adjoining surfaces. Before painting, surfaces shall be first tested for dryness with a moisture testing device.
 2. Apply no paint or sealer on gypsum board or plaster when the moisture content exceeds 8 percent. Test sufficient areas in each space and as often as necessary to determine if the surface has the proper moisture content for painting. If the moisture content is between 8 percent and 12 percent, prime with alkali resistant primer.
 3. If 8 percent or less, prime with specified primer. Remove the dry salt deposits from plaster surfaces by brushing with a stiff brush before painting.

3.04 WORKMANSHIP

- A. Spread materials smoothly and evenly. Apply coats to not less than wet and dry film thicknesses and at spreading rates for specified products as recommended by Manufacturer, but not less than as specified for each paint system.
- B. Apply each coat of paint evenly and comply with manufacturer's drying time before applying subsequent coats.
- C. Touch up suction spots after application of first finish coat.
- D. Finished work shall be uniform, match approved color, texture and coverage, and free from runs, sags, clogging or excessive flooding. Make edges of paint adjoining other materials or colors sharp and clean, without overlapping. Where varnishes or enamel is used, lightly sand, dust and clean undercoats to obtain a smooth finish coat. Sand carefully between each coat with fine sandpaper as necessary to produce even, smooth surfaces and to provide proper adhesion of subsequent coats.
- E. Where clear finishes are required, ensure tinted fillers match wood. Work fillers well into the grain before set. Wipe excess from the surface.
- F. Where specific mil thicknesses are required, check thickness by the following methods:
 1. Over ferrous metal - Elecometer Film Gauge
 2. Other surfaces - Tooke Dry Mil Inspection Gauge
- G. Finished work shall be a 'Properly Painted Surface' as defined in this Section.

3.05 APPLICATION

- A. The number of coats scheduled is the minimum number of coats required. Additional coat(s) shall be applied, at no additional cost to the Owner, to completely hide base material, provide uniform color and to produce satisfactory finish results.
- B. Apply coatings without thinning except as specifically required by label directions, or required by these specifications. In such cases, thinning shall be the minimum reduction permitted.

- C. Priming will not be required on items delivered with prime or shop coats, unless otherwise specified, or if shop applied prime coat is not compatible with specified painting system. Touch up prime coats applied by others as required to ensure an even primed surface before applying finish coat.
- D. Block Fillers: Provide level of block fill as scheduled to conform with the following:
 - 1. Level 1 – Regular Fill: Minimum block fill, reduces irregularity in masonry profile. One coat, spray applied.
 - 2. Level 2 – Medium Full Fill: Masonry profile slightly reduced. One coat, spray applied and back-rolled.
 - 3. Level 3 – Full Fill: Minimum block fill required for semi-gloss and gloss finishes. Use where conformance with health regulations is required. Number of coats as required to conceal most of masonry texture, spray applied and back-rolled.
- E. Plumbing, Mechanical and Electrical:
 - 1. Exterior and interior exposed water, gas, waste piping, sprinkler piping, conduit, lighting and electrical panels, telephone terminal boxes, galvanized ducts and insulated ducts, shall be painted in areas other than mechanical rooms, unless otherwise scheduled.
 - 2. Paint exposed unfinished fixtures, metal ducts, switch boxes, control panels, devices, starters, junction boxes, vents, drains, and other similar items, as directed by Architect.
- E. Spray paint prime coated (not pre-finished) grilles and registers with enamel or lacquer to match walls and ceilings. Paint materials shall not sag, run or bind movable parts of grilles, registers, louvers, baffles and other similar items.
 - 1. Throats of ducts shall be given one coat of flat black paint, wherever visibility of the interior of the duct is allowed through registers or other similar items. At fiber lined duct, use black latex paint.
 - 2. Examine the Mechanical and Electrical Drawings and Specifications to determine the amount of exposed work to be painted.
- F. Paint exposed surfaces of every member, paint items inaccessible after installation before installation, if required to be painted. Paint all exposed surfaces of overhead roof or floor structures, including deck, except where specifically indicated not to be painted.
- G. Edges, tops, and bottoms of wood doors shall be sealed and finished with the same finish as the door faces, to meet door manufacturer's warranty requirements. Verify edge color with Architect as different colors may be selected for each face.
- H. Paint items fitted with finish hardware after hardware has been temporarily removed.
- I. Heating and other equipment on or adjacent to walls or surfaces scheduled for painting, shall be disconnected, using workmen skilled in appropriate trades and moved temporarily to permit painting of surface. Following completion of painting, replace and reconnect items.
- J. In multiple coat paint work, tint each succeeding coat with slightly lighter color, but approximating shade of final coat, to facilitate checking application of specified number of coats. Tint final coat to scheduled and approved color. Tint prime and undercoats to a color similar to finish coat. Each coat of material applied must be inspected and approved by the Architect before the application of the succeeding specified coat; otherwise no credit for the concealed coat will be given, and the Contractor shall assume the responsibility to recoat work in question. Contractor shall notify the Architect when each coat is completed.

- K. Brush, wipe or roll stain in 2 coat application. Avoid lap marks by maintaining "wet-edge" continually being merged with existing liquid coverage and stop only at natural edges, turns and breaking places.
- L. Do not paint over Underwriters' Laboratory labels, fusible links, exposed sprinkler heads and other similar items.
- M. Paint piping, electrical or other equipment, conduit, vents and other similar items, on roof or other exterior locations as directed by Architect.
- N. Finish closets with same color as adjoining rooms, unless otherwise specified. Finish other surfaces same as nearest or adjoining surfaces, unless otherwise shown or scheduled.
- O. Paint surface of walls which will be concealed by cabinets and other items mounted on or attached to walls.

3.06 ADJUSTING

- A. Correct deficiencies in workmanship required to leave surfaces in conformance with 'Properly Painted Surface' as defined in this Section.

3.07 CLEANING

- A. During the course of the Work and upon completion of work, remove misplaced paint and stain spots or spills from floors, walls, glass, or other surfaces and leave work clean, orderly, and in acceptable condition. Remove debris caused by work of this Section from premises. Leave Work in clean condition acceptable to Architect and Owner.
- B. Remove oily rags and waste daily, taking precaution to prevent fire.

3.08 SCHEDULES

- A. Color Schedule:
 - 1. Architect will provide a complete schedule of colors. Colors may be selected from various manufacturer's color palettes. Manufacturer supplying paint shall match these colors. Contractor shall prepare duplicate set of samples of treatments for major surfaces. If a specific surface or item receiving a paint finish does not have a specific color indicated or selected by the Architect, obtain clarification from the Architect. Do not assume the confirmation of the same color on the adjacent surfaces.
 - 2. Final coat of paint shall be not be applied until colors have been approved by the Architect.
- B. Schedule of Finishes: Refer to the "Finish Schedule" on the Drawing for designated finishes of areas.
- C. Finishing of the following listed items and materials will not be required and shall be protected, except where explicitly specified otherwise:
 - 1. Stainless Steel, brass, bronze, copper, nickel, monel metal, chromium, anodized aluminum; specially finished articles such as porcelain enamel, plastic coated fabrics, and baked enamel, unless otherwise indicated.

2. Finished products such as ceramic tile, stone tile, glass, resilient flooring, and similar items.
3. Pre-finished products such as wood casework, elevator cabs, pre-finished (powder-coated) metals, and similar items.

3.09 EXTERIOR PAINT FINISHES

- A. This schedule uses the generic names listed in the Schedule of Paint Products.
- B. System 101 (Ferrous Metals): Apply to exposed steel such as metal doors and frames, grilles, light fixture standards in parking areas, metal handrails, sectional doors that are not otherwise pre-finished, and other exposed miscellaneous ferrous metals that are not pre-finished. Refer to High Performance Finish Systems Article 3.12 below for high performance paint finish applied to exposed exterior bollards, enclosure and pedestrian gates, trash enclosure gates, steel framed canopies, and similar items indicated to receive high performance paint system and that are not otherwise prefinished.
1. 1st Coat: Ferrous Metal Primer (Red or White color as applicable to finish coats).
 2. 2nd Coat: Same material as 3rd coat in accordance with manufacturer's recommendations.
 3. 3rd Coat:
 - a. Flat: Paint - Waterborne (100% Acrylic) (if noted on Drawings). Sheen shall be 4 to 6% per a 85 degree gloss meter.
 - b. Semi-Gloss unless noted otherwise. Enamel, Semi-Gloss - Waterborne (100% Acrylic - Non-Blocking).
 - c. Gloss (if noted on Drawings): Enamel, Gloss - Waterborne (100% Acrylic - Non-Blocking).
- C. System 102 (Galvanized Metals): Apply to exposed galvanized metal such as copings, louvers and metal flashings. Refer to High Performance Finish Systems Article 3.12 below for high performance paint finish applied to exposed exterior bollards, enclosure and pedestrian gates, trash enclosure gates, steel framed canopies, and similar items indicated to receive high performance paint system and that are not otherwise prefinished.
1. Clean metal to remove foreign matter or any coating applied by the metal manufacturer. Apply Surface Conditioner or Vinyl Wash Pretreatment (if required by paint manufacturer).
 2. 1st Coat: Galvanized Metal Primer.
 3. 2nd Coat: Same material as 3rd coat as recommended by manufacturer.
 4. 3rd Coat:
 - a. Flat: Paint, Flat - Waterborne (100% Acrylic) unless noted otherwise.
 - b. Semi-Gloss (if noted on Drawings): Enamel, Semi-Gloss - Waterborne (100% Acrylic - Non-Blocking).
 - c. Gloss (if noted on Drawings): Enamel, Gloss - Waterborne (100% Acrylic - Non-Blocking).
- D. System 103 (Aluminum): Apply to exterior louvers and other miscellaneous exposed exterior unfinished aluminum surfaces.
1. Clean metal to remove foreign matter or any coating applied by the metal manufacturer. Apply Surface Conditioner or Vinyl Wash Pretreatment.
 2. 1st Coat: Aluminum Primer.
 3. 2nd Coat: Same material as 3rd coat as recommended by manufacturer.
 4. 3rd Coat:
 - a. Flat: Paint, Flat - Waterborne (100% Acrylic) (if noted on Drawings) Sheen shall be less than 10% per a 85 degree gloss meter.
 - b. Semi-Gloss unless noted otherwise. Enamel, Semi-Gloss - Waterborne (100% Acrylic - Non-Blocking).

- E. System 104 (Concrete Masonry Units): Apply to exterior concrete masonry unit construction indicated to be painted. (Refer to Section 07 19 00 “Water Repellents” for water repellent coating applied to exposed exterior integral colored decorative face CMU.) Roller apply 2nd or 3rd coat.
1. 1st Coat: Concrete Masonry Block Filler. Provide Level 2 or 3 Fill as required by gloss.
 2. 2nd Coat: Same material as 3rd Coat as recommended by manufacturer.
 3. 3rd Coat:
 - a. Flat: Paint, Flat - Waterborne (100% Acrylic) unless noted otherwise. Sheen shall be 4 to 6% per a 85 degree gloss meter. One of the coats shall be roller applied.
 - b. Semi-Gloss (if noted on Drawings): Enamel, Semi-Gloss - Waterborne (100% Acrylic - Non-Blocking).
 - c. Gloss (if noted on Drawings): Enamel, Gloss – Waterborne (100% Acrylic - Non-Blocking).
- F. System 105 (Concrete and Stucco): Apply to exterior cementitious surfaces specifically indicated to be painted. Roller apply 2nd or 3rd coat.
1. 1st Coat: Concrete and Masonry Primer.
 2. 2nd Coat: Same material as 3rd coat as recommended by manufacturer.
 3. 3rd Coat:
 - a. Flat: Paint, Flat - Waterborne (100% Acrylic) unless noted otherwise. Sheen shall be 4 to 6% per a 85 degree gloss meter. One of the coats shall be roller applied.
 - b. Semi-Gloss (if noted on Drawings): Enamel, Semi-Gloss - Waterborne (100% Acrylic - Non-Blocking).
 - c. Gloss (if noted on Drawings): Enamel, Gloss – Waterborne (100% Acrylic - Non-Blocking).
- G. System 106 (Exterior Wood): Not Used.
- H. System 107 (Exterior Gypsum Board): Not Used.
- I. System 108 (Sealer - Masonry Parapet Top Surfaces): Not Used.

3.10 INTERIOR PAINT FINISHES

- A. This schedule uses the generic names listed in the Schedule of Paint Products.
- B. System 201 (Ferrous Metals): Apply to exposed metals such as steel doors, hollow metal frames, metal beam saddles, columns, grilles and registers, stair and hand railings, ladders, and other exposed miscellaneous metals.
1. 1st Coat: Ferrous Metal Primer (Red or White color as applicable to finish coats).
 2. 2nd Coat: Same material as 3rd Coat as recommended by manufacturer.
 3. 3rd Coat:
 - a. Eggshell: Enamel, Eggshell.
 - b. Semi-Gloss (if noted on Drawings): Enamel, Semi-Gloss.
 - c. Gloss (if noted on Drawings): Enamel Gloss.

- C. System 202 (Interior Wood Finishes - Enamel): Apply to wood doors indicated to be painted.
 - 1. 1st Coat: Enamel Undercoater.
 - 2. 2nd and 3rd Coat:
 - a. Eggshell: Enamel, Eggshell
 - b. Semi-Gloss (if noted on Drawings): Enamel, Semi-Gloss
 - c. Gloss (if noted on Drawings): Enamel, Gloss
- D. System 203 (Interior Wood Finish - Flat): Apply to plywood telephone backing boards and other miscellaneous softwood as noted, specified or scheduled.
 - 1. 1st Coat: Enamel Undercoater/Primer.
 - 2. 2nd and 3rd Coat: Flat Paint, - Waterborne (Vinyl Acrylic)
- E. System 204 (Galvanized Metals): Apply to exposed galvanized metal.
 - 1. Clean metal to remove foreign matter or any coating applied by the metal manufacturer. Apply Surface Conditioner or Vinyl Wash Pretreatment (if required by paint manufacturer)
 - 2. 1st Coat: Galvanized Metal Primer
 - 3. 2nd and 3rd Coats:
 - a. Eggshell: Enamel, Eggshell
 - b. Semi-Gloss (if noted on Drawings): Enamel, Semi-Gloss
 - c. Gloss (if noted on Drawings): Enamel Gloss
- F. System 205 (Aluminum): Apply to interior louvers and other miscellaneous exposed unfinished aluminum surfaces.
 - 1. Clean metal to remove foreign matter or any coating applied by the metal manufacturer. Apply Surface Conditioner or Vinyl Wash Pretreatment.
 - 2. 1st Coat: Aluminum Primer
 - 3. 2nd and 3rd Coats:
 - a. Eggshell: Enamel, Eggshell
 - b. Semi-Gloss (if noted on Drawings): Enamel, Semi-Gloss
 - c. Gloss (if noted on Drawings): Enamel, Gloss
- G. System 206 (Gypsum Board, Plaster and Concrete - Wet Areas): Apply to gypsum board, plaster and concrete surfaces in toilet rooms, janitor rooms, kitchens, and other areas as scheduled.
 - 1. 1st Coat: Enamel Undercoater - Solventborne, unless noted otherwise.
 - 2. 2nd and 3rd Coats:
 - a. Eggshell (if noted on Drawings): Enamel, Eggshell - Solventborne.
 - b. Semi-Gloss: Enamel, Semi-Gloss - Solventborne or Enamel - Solventborne (Epoxy-Polyester).
- H. System 207 (Gypsum Board, Plaster and Concrete - Non-Wet Areas): Apply to gypsum board, plaster and concrete except for wet areas.
 - 1. 1st Coat: Waterborne Primer/Sealer. (Solventborne {Alkyd} shall be used at new untextured smooth gypsum board surfaces covered with powdery or unstable soft top joint cement)
 - 2. 2nd and 3rd Coat:
 - a. Eggshell: Enamel, Eggshell
 - b. Semi-Gloss (if noted on Drawings): Enamel, Semi-Gloss
 - c. Flat (if noted on Drawings): Paint, Flat
- I. System 208 (Ferrous Metal - Chemical Resistant Finish): Not Used.

- J. System 209 (Interior Concrete Masonry - Wet Areas): Blok-Guard & Graffiti Control VOC, Sure Klean Weather Seal as manufactured by PROSOCO, Inc. www.prosoco.com. Apply to interior surfaces of Apparatus bays and adjacent connected spaces:
1. Clean CMU surfaces in accordance with manufacturer's preparation instruction.
 2. Surfaces shall be allowed to cure for 28 days before application.
 3. Spray applied application.
 - a. 1st Coat: Saturate, wet-on-wet spraying from the bottom up. Avoid excessive overlapping. Apply enough material to create 6-8 inch rundown below the contact point.
 - b. 2nd Coat: Let 1st coat application penetrate masonry surface for 2-3 minutes. Reapply in same saturating manner as first coat to ensure complete coverage of recessed surfaces.
 - c. Immediately brush out runs and drips to prevent build up.
 4. This product is not listed in the Table of Paint Products at the end of this Section.
- K. System 210 (Interior Concrete Masonry or Plaster - Extremely Wet Areas): Not Used.
- L. System 211 (Interior Concrete Masonry - Non-Wet Areas): Apply to exposed interior concrete masonry block units except areas specified above for enamel finish.
1. 1st Coat: Block Filler, w/o Aggregate. Provide Level 1, 2 or 3 Fill as required by gloss.
 2. 2nd Coat: Same material as 3rd Coat as recommended by manufacturer.
 3. 3rd Coat: Enamel, Semi-Gloss - Waterborne.

3.11 CLEAR WOOD FINISHES

- A. This schedule uses the generic names listed in the Schedule of Paint Products.
- B. System 301 (Stained and Clear Finish): Apply to wood doors, handrails and chair rails. Fill open grain hardwood such as Oak.
1. Stained and Finished with Clear Satin or Gloss Varnish - Solventborne:
 - a. 1st Coat: Semi-Transparent Stain - Solventborne (Oil)
 - b. 2nd Coat: Varnish, Gloss – Polyurethane (Solventborne)
 - c. 3rd Coat:
 - 1) Satin: Varnish, Satin – Polyurethane (Solventborne)
 - 2) Gloss: Varnish, Gloss – Polyurethane (Solventborne)
 2. Stained and Finished with Clear Satin or Gloss Varnish– Waterborne:
 - a. 1st Coat: Semi-Transparent Stain - Solventborne (Oil)
 - b. 2nd Coat: Varnish, Gloss – Polyurethane (Waterborne)
 - c. 3rd Coat:
 - 1) Satin: Varnish, Satin – Polyurethane (Waterborne)
 - 2) Gloss: Varnish, Gloss – Polyurethane (Waterborne)r

3.12 HIGH PERFORMANCE FINISH SYSTEMS

- A. General: Products included in the following high performance systems are not listed in the Schedule of Paint Products located at the end of this Section.
- B. System 401 (Exterior Steel) Apply to exposed exterior bollards, enclosure and pedestrian gates, trash enclosure gates, steel framed canopies, and similar items indicated to receive high performance paint system and that are not otherwise prefinished.
1. Clean steel to SSPC-SP6 (Commercial Blast Cleaning).
 2. 1st Coat: Tnemec Series 66 Hi-Build Epoxoline at 3 to 5 mils DFT, or Sherwin Williams Macropoxy 646 Fast Cure Epoxy, B58W610/B58V600, or International PC Interzinc 52 applied at 4 to 6 mils DFT, or PPG CORAFLOX ADS High Build

- Epoxy Primer/Intermediate KL ADS 538 at 2.5 to 6.0 mils DFT or PPG Pitt-Guard Rapid Coat D-T-R Epoxy Coating 95-245 Series applied at 5.0 to 7.0 DFT.
3. 2nd Coat: Sherwin Williams Fluorokem HS Fluoropolymer Urethane, B65-570/B65V580 applied at 3 to 4 mils DFT, or Tnemec Fluoronar Series 1070 Fluoropolymer Polyurethane or Interfine 979 at the following DFT mil thickness, or PPG CORAFロン ADS High Build Epoxy Primer/Intermediate KL ADS 538 at 2.5 to 6.0 mils DFT or PPG Pitthane Ultra Gloss Urethane Enamel 95-812 Series at 2.0 to 3.0 mils DFT:
 - a. 1.5 mils at inaccessible locations that do not require abrasion resistance such as overhead canopies and building ornamentation.
 - b. 2.5 mils at locations that require abrasion resistance such as guardrails and railings and other items subject to human or mechanical contact.

3.13 SCHEDULE OF PAINT PRODUCTS

- A. Only those products which are specifically required by this Section shall be provided. Products listed in the following Schedule that are not specified in this Section are for information only.
- B. Schedule of Paint Products Disclaimer: Manufacturers of commercial paint products are in a constant state of product development to improve paint products and develop new paint products, including product changes to comply with local and state VOC regulations and to be more environmentally conscious. As such the products listed in the following schedule of paint products may have changed in product name, number, formula, or type. Where products listed have been changed or replaced by the manufacturer, provide highest quality commercial grade paint products recommended by the manufacturer for the discontinued or replaced product, subject to approval by the Architect.

(continued)

EXTERIOR PRIMERS/UNDERCOATERS	Benjamin Moore	Dunn-Edwards	Glidden Profess.	PPG Paints	Sherwin Williams	Tnemec
Red Ferrous Metal Primer Waterborne	V110.20	BRPR00-1-RO ---	4020	90-708	B66N00310	18
Solventborne	M06-20	---	4160	7-858	B50NZ3	10-99
Galvanized Metal Primer Waterborne	M04	UGPR00-1 GAPR00	4020	90-712	B66W00310	18
Solventborne	---	---	4160	6-209	B50WZ0030	66
Vinyl Wash Pretreatment /Surface Conditioner						
Waterborne	---	ME01	88	---	B71Y1	---
Solventborne	V155	---	---	97-687	N/A	---
Aluminum Metal Primer Waterborne	P04	UGPR00-1	4020	90-712	B66W00310	18
Solventborne	V131.01	GAPR00	4160	6-204	B50WZ0030	66
White Ferrous Metal Primer Waterborne	M04-01	BRPR00-1- WH	4020	90-712	B66W00310	18
Solventborne	M07-01	---	4160	7-852	B50WZ004	10-99W
Concrete and Masonry Block Filler Waterborne (100% Acrylic)	958.11	SBPR00	4000	16-90	B42W00150	54-580
Waterborne (modified Copolymer)	---	SBSL00-1	GP3010	6-7, 6-15	B25W25	130
Solventborne	V163.90	---	---	95-217	B42W00400	54-660
					B42V00401	
Concrete and Masonry Primer Waterborne	068	ESPR00-1	GP3030	4-603, 4-100	LX02W0050	151
Solventborne	---	---	---	---	---	66
Waterborne Epoxy (2 component)	V163	SLPR00	2110N Aquapon WB	98 Series	B73A00200 B73V00200	84
Masonry Surface Conditioner Waterborne	066	---	GP3030	4-808	LX03W0100	151
Solventborne	077	---	Amerlock Sealer	---	---	205
Exterior Gypsum Board Primer/Undercoater Waterborne	023	UGPR00-1	GP6001	6-609	B42W08041	6
Solventborne	024	---	GP2110	17-941NF	Y24W08020	36-603

(continued)

EXTERIOR PRIMERS/UNDERCOATERS (continued)	Benjamin Moore	Dunn-Edwards	Glidden Profess.	PPG Paints	Sherwin Williams	Tnemec
Exterior Wood Primer						
Waterborne (100% acrylic)	023	EZPR00-1	GP6001	6-609	B42W08041	6
Solventborne	094	---	GP2110	17-941NF	Y24W08020	36-603
Multi-Purpose Primer						
Waterborne (100% acrylic)	023	UGPR00-1	GP3210	90 Series	B51W620	18
Solventborne	024	GAPR00	4160	97-689	---	37H
High Build Polyamide Epoxy Primer (2 Part)						
Waterborne	V440	---	4030	98 Series	B73A200/B73V200	462
Solventborne (ferrous metals)	V400	Carboguard 890	Amerlock 2	97-DTR	B67A5/B67V5	66
Solventborne (galvanized metal)	V400	Carboguard 890	Amerlock 2	97-DTR	B67A5/B67V5	66

EXTERIOR PAINT – FINISH COATS	Benjamin Moore	Dunn-Edwards	Glidden Profess.	PPG Paints	Sherwin Williams	Tnemec
Paint, Flat (Gloss Rating 0-15 @ 85 degree gloss meter)						
Waterborne (Vinyl Acrylic or 100% Acrylic)	183	SSHV10	GP2250	10-Series	C01W00251	---
Waterborne (100% Acrylic)	N447	ACHS10 SSHL10	GP2200	6-610XI	A-100/A06W0151	115
Paint, Gloss Level 3 (Eggshell)						
Waterborne (100% Acrylic)	N185	EVSH30	GP2402	6-2045XI	A82W00151	--
Solventborne	P23	---	---	---	---	15
Enamel, Gloss Level 4 (Low Luster)						
Waterborne (100% Acrylic - Non-Blocking)	N448	EVSH40	GP2402	90-474	A82W00151	6
Solventborne	P23	---	---	---	---	--
Enamel, Gloss Level 5 (Semi-Gloss)						
Waterborne (100% Acrylic - Non-Blocking)	N449	EVSH50	GP2406	6-901XI	A76W00051	30
Solventborne	V201	9 Series	4328	---	B54WZ-400	23
Solventborne (Industrial)	V201	9 Series	4328	---	B54WZ-400	23
Solventborne (Acrylic Aliphatic Polyurethane - 2 Component)	V510	Carbothane 133HB	Am450H	95-8800 Series	B65-350/B60V30	73

(continued)

EXTERIOR PAINT – FINISH COATS (continued)	Benjamin Moore	Dunn-Edwards	Glidden Profess.	PPG Paints	Sherwin Williams	Tnemec
Enamel, Gloss Level 6 (Gloss)						
Waterborne (100% Acrylic - Non-Blocking)	P28	EVSH60	GP3028	90-374/6-8534	A77W00051	---
Solventborne (Quick Dry)	V220	10 Series	4318	7-800/ 95-9000 Series	B54WZ-400	---
Solventborne (Silicone)	P21	42-53E	95-5000	95-5000	B56-300	---
Solventborne (Industrial)	P22	10 Series	4328	7-284	B54-150	2H
Solventborne (Aliphatic Polyurethane - 2 Component)	V500	---	Am450H	95-812 Series	B65-300/B60V30	1074
Solventborne (Acrylic Aliphatic Polyurethane - 2 Component)	V500	Carbothane 134 HG	---	---	B65W00721 B65V00720	1074
Elastomeric (Smooth)						
Waterborne (100% Acrylic)	055	Gardner Gibson Shur- Stik	GP2260	4-310 Matte	CF16-50 CF12-800	156
Textured Coating, Smooth						
Waterborne (Vinyl Acrylic)	3194.1	W320	GP2260	4-series	CF17W0801	180
Solventborne	---	---	---	---	---	---
Textured Coating, Medium						
Waterborne (Vinyl Acrylic)	3196.1	W322	GP3230	4-series	CF17W0811	181
Solventborne	---	---	---	---	---	---
Textured Coating, Coarse						
Waterborne (Vinyl Acrylic)	3192.1	W323	GP3230	4-series	CF17W0821	---
Floor Paint (Single or 2-component)						
Waterborne (Acrylic Epoxy)	V440	Sanitile 555	98 Series	98 Series	B90 Series	287
Solventborne	V400	Sanitile 945	GP3118	95-1	B62Z-100	280
Aluminum Paint						
Solventborne	P22-78	---	4309	6-230	B65S14 (moisture cure)	530
Aluminum Metal						
Waterborne	---	Rust-Oleum 5200 ALumi- Non	4020	90 Series	B71S00200	---
Solventborne	P22-78	---	---	---	B65S14 (moisture cure)	1077

INTERIOR PRIMERS/UNDERCOATERS	Benjamin Moore	Dunn-Edwards	Glidden Profess.	PPG Paints	Sherwin Williams	Tnemec
Red Ferrrous Metal Primer Waterborne	V110.20	BRPR00-1-R0	4020	90-708	B66N00310	18
White Ferrrous Metal Primer Waterborne	P04-01	BRPR00-1-WH	4020	90-712	B66W00310	18
Galvanized Metal Primer Waterborne	P04-01	UGPR00-1	4020	90-712	B66W00310	18
Aluminum Primer Waterborne	P04	UGPR00-1	4020	90-712	B66W00310	18
Primer/Sealer (for drywall, etc.) Waterborne (Vinyl Acrylic) Waterborne (Zero VOC)	253 N534	VNSL00 VNSL00	GP1030 GP9116	6-4 9-900	B28W08601 B28W02600	51-792 ---
Vinyl Acrylic Wall Sealer Waterborne	253	VNSL00	GP1030	6-2 17-921	B28W08601	51-792
Enamel Undercoater/Primer Waterborne (100% Acrylic)	253	IKPR00-1	GP1020	17-951	B51W620	18
Block Filler, w/ Aggregate Waterborne	---	MBPR00	---	---	---	130
Block Filler, w/out Aggregate Waterborne Waterborne (100% Acrylic)	958.11 958.11	SBSL00-1 SBPR00	GP3010 4000	6-7 6-15, 16-90	B25W25 B42W00150	54-580 130
Epoxy Polyester Primer Waterborne	---	---	Am400BF	---	B70W100/B601V15	462

(continued)

INTERIOR PRIMERS/UNDERCOATERS (continued)	Benjamin Moore	Dunn-Edwards	Glidden Profess.	PPG Paints	Sherwin Williams	Tnemec
Vinyl Wash Pretreatment/Surface Conditioner						
Waterborne	---	ME01	88	---	B71Y1	---
Concrete and Masonry Primer						
Waterborne	068	ESPR00-1	GP3030	4-100, 4-603	LX02W0050	151

INTERIOR PAINT - FINISH COATS	Benjamin Moore	Dunn-Edwards	Glidden Profess.	PPG Paints	Sherwin Williams	Tnemec
Acoustic Paint						
Waterborne (Vinyl-Acrylic)	258	W615	GP1210v	50 Series	Procoat ProCoustic Acoustical Tile and Ceiling Coating	180
Paint, Gloss Level 1 (Flat)						
Waterborne (Vinyl Acrylic)	275	SWLL10	GP1210v	6-70	B30W04651	180
Waterborne (Low Odor/Low VOC)	N534	SWLL10	GP1410	9-110	B30W02651	115
Waterborne (Low Odor/Zero VOC)	N534	SZRO10	GP9110	9-110	B30W02651	---
Enamel, Gloss Level 2 (Low Sheen)						
Waterborne (100% Acrylic)	N537	SPMA30	GP1433v	---	---	6
Waterborne (Vinyl Acrylic)	274	SWLL30	GP1412	6-510	B24W02651	---
Waterborne (Low Odor/Zero VOC)	N537	SZRO30	GP9100	9-510	B20W02651	---
Enamel, Gloss Level 3 (Eggshell)						
Waterborne (100% Acrylic)	N538	SPMA40	GP1403	**6-411	B66-660	---
Waterborne (Vinyl-Acrylic)	274	SWLL40	GP1412		B20W4651	
Waterborne (Low Odor/Zero VOC)	N538	---	GP9300	9-300XI	B20W02651	---
Waterborne (Non-Blocking - 100% Acrylic)	N538	EVSH40	GP1403	**6-411	B75W00051	---

(**Not 100% Acrylic, but is their top of line product)
(continued)

INTERIOR PAINT – FINISH COATS (continued)	Benjamin Moore	Dunn-Edwards	Glidden Profess.	PPG Paints	Sherwin Williams	Tnemec
Enamel, Gloss Level 5 (Semi-Gloss)						
Waterborne (100% Acrylic)	N539	SPMA50	GP1416	6-8510	B66-650	29
Waterborne (Non-Blocking - 100% Acrylic)	N539	EVSH50	GP1407	6-8510	A76W00051	---
Waterborne (Low Odor/Low VOC)	N539	SWLL50	GP1456	9-510	B31W04651	29
Waterborne (Low Odor/Zero VOC)	N539	SZRO50	GP9200	9-510	B31W02651	---
Waterborne (2 Component Epoxy)	V440	Sanitile 255	98 Series	98 Series	B70-200/B60V25	113
Enamel, Gloss Level 6 (Gloss)						
Waterborne (Non-Blocking - 100% Acrylic)	N540	EVSH60	GP3028	90-375	A77W00051	---
Waterborne (2 Component Epoxy)	V440	Sanitile 555	4408 Low-VOC	98 Series	B73W00300 B73V00300	114
Waterborne (Low Odor/Low VOC)	N540	---	GP3038	---	---	28
Floor Paint (Single or 2-component)						
Waterborne(Epoxy-Acrylic)	V440	Sanitile 555	---	98 Series	B-8100 Series	287

(Continued)

INTERIOR STAIN	Benjamin Moore	Dunn-Edwards	Glidden Profess.	PPG Paints	Sherwin Williams	Tnemec
Semi-Transparent Stain						
Waterborne (Water Repellent)	---	Okon Weather Pro	1700V	Olympic Premium Sir	---	633
Waterborne	---	Okon Weather Pro	1700V	Olympic Premium Sir	---	617
Lacquer-Based Stain						
Waterborne	---	---	---	---	---	---
Pigmented Solid Color Stain						
Waterborne (100% Acrylic)	089	ACHS10 SSHL10	---	Olympic	---	617
Semi-Transparent Toner						
Waterborne (Water Repellent)	---	Okon Weather Pro	1700V	Olympic Premium	---	633

INTERIOR CLEAR FINISHES	Benjamin Moore	Dunn-Edwards	Glidden Profess.	PPG Paints	Sherwin Williams	Tnemec
Resin Sealer						
Waterborne	---	---	1808	Olympic	---	462
Sanding Sealer						
Waterborne (Acrylic Urethane)	---	---	1916V	---	---	---

(Continued)

INTERIOR CLEAR FINISHES (continued)	Benjamin Moore	Dunn-Edwards	Glidden Profess.	PPG Paints	Sherwin Williams	Tnemec
Varnish, Flat						
Varnish, Satin (Low Sheen)						
Waterborne (Acrylic Urethane)	423	Cabot 8082	1802	Olympic	Minwax OM Poly	---
Varnish, Semi-Gloss						
Waterborne (Acrylic Urethane)	---	Cabot 8087	Aqua Zar	---	Minwax OM Poly	---
Waterborne (Acrylic)	---	---	---	---	Polycrylic S/G	---
Varnish, Gloss						
Waterborne (Acrylic Urethane)	422	Cabot 8080	1808	Olympic	Minwax OM Poly	---
Solventborne (Polyurethane)	428	Deftane Gloss	1908	---	Minwax FD Poly	---
Spar Varnish, Gloss						
Paste Wax						
Solventborne	---	---	---	---	Minwax Pastewax	---
Lacquer Sanding Sealer						
Waterborne	---	Valspar Zenith PKS7200	Gemini TCHS	---	T65F520	---

INTERIOR CLEAR FINISHES (continued)	Benjamin Moore	Dunn- Edwards		Glidden Profess.	PPG Paints	Sherwin Williams	Tnemec
Lacquer, Flat Waterborne	---	Valspar Zenith 7001		---	---	T75F528	---
Lacquer, Semi-Gloss Waterborne	---	Valspar Zenith 7006		---	---	T75F526	---
Lacquer, Gloss Waterborne	---	Valspar Zenith LKC 7009		---	---	T75C525	---
Lacquer, Crystal Clear Sanding Sealer Waterborne	---	---		---	---	T65F520	---
Lacquer, Non-Yellowing, Flat Waterborne	---	Valspar Zenith LKF7001		---	---	T75F528	---
Lacquer, Non-Yellowing, Semi-Gloss Waterborne	---	Valspar Zenith LKF7006		---	---	T75F526	---
Lacquer, Non-Yellowing, Gloss Waterborne	---	Valspar Zenith LKF7006		---	---	T75C525	---

END OF SECTION

SECTION 10 11 00
VISUAL DISPLAY BOARDS

PART 1 GENERAL

1.01 SUBMITTALS

- A. Shop Drawings: Submit brochures and Drawings of visual display boards showing method of construction and mounting techniques.
- B. Samples: Submit color samples of visual display board surfaces and trim for color selection from Manufacturer's full range of standard colors and patterns.
- C. Contract Closeout Submittals: Submit 2 copies of Manufacturer's printed maintenance instructions in accordance with Section 01 77 00.

1.02 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at the site.

1.03 WARRANTY

- A. Furnish Manufacturer's printed standard warranty for chalkboards.

PART 2 MATERIALS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements.
 - 1. Allen Display www.allendisplay.com
 - 2. ADP/Lemco, Inc. www.adplemco.com
 - 3. Allied Building Products www.alliedbuildingsupplyinc.com
 - 4. MooreCo, Inc. www.moorecoinc.com
 - 5. Claridge Products & Equipment, Inc. www.claridgeproducts.com
 - 6. Ghent Manufacturing Inc. www.ghent.com
 - 7. Marsh Industries, Inc. www.marsh-ind.com
 - 8. Platinum Visual Systems; a division of ABC School Equipment, Inc. www.pvsusa.com

2.02 LIQUID MARKER BOARDS

- A. Core: 3/8 inch particle board manufactured without formaldehyde.
- B. Backing: Aluminum foil.

- C. Enamel Finish: 24 gauge stretcher-level steel sheet manufactured in accordance with the performance specification for porcelain enamel steel chalkboards. Enamel finish shall be applied automatically to the steel, in a uniform thickness and fired under rigidly controlled temperatures to fuse the porcelain permanently to the steel. Finished surface shall be highly scratch and stain resistant.

2.03 TACK BOARDS

- A. Natural Cork Tack Boards: Cork composition with a specially compounded binder that insures the board shall retain its resilience and softness throughout its lifetime, such as manufactured by Claridge.
 - 1. Backing: Hardboard.

2.04 TRIM

- A. Aluminum Trim:
 - 1. Style: Manufacturer's standard extruded aluminum frames with Claridge Series 3 chalk trough, map rail at top of board with four 4 map clips per each 8'-0" section and side trim.
 - 2. Finish: Brushed aluminum.

2.05 FABRICATION

- A. Factory assemble visual display board and ship to the job, ready to fasten to wall, pressure laminated to backing and framed on each side with extrusions as shown on review shop drawings and as specified.
- B. Combination Units: Fabricate boards to be installed as combination units with vertical mullion type joint trim between adjacent boards for installation as one joined combination unit.
- C. Aluminum extrusions: Cut to exact length and accurately. At corners, except at chalk trough, reinforcing angles shall be used.
- D. Sizes: As indicated on Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work shall be construed as acceptance of subsurfaces.
- B. Verify that grounds and solid blocking necessary for proper installation of chalkboard panels has been installed. Stud walls shall have solid blocking for attachments of chalkboards and tackboards.

3.02 INSTALLATION

- A. Visual Display Boards: Install at locations shown on Drawings in accordance with Manufacturer's printed Specifications, except as otherwise detailed.
 - 1. Install plumb, level and true to line, securely attached to grounds, blocking and supports.

- B. Combination Units: Site assemble units with indicated trim and accessories to form combination unit of size indicated on Drawings.
 - 1. Provide vertical mullion type joint trim between marker board and tack board of combination unit.

3.03 CLEANING

- A. Upon completion of installation, clean chalkboards and leave in ready-to-use condition.
- B. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 10 14 00

SIGNAGE

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Interior room and code required identification signage.
 - 2. “No Smoking,” “Smoke Free...,” and similar signage.
 - 3. Exterior formed metal building address and fire department logo signage.
 - 4. Reflective tape for pipe bollards.
 - 5. Dedication Plaque.
- B. Related Sections:
 - 1. Section 10 14 53 – Traffic Control Signs, for exterior parking lot and drive traffic control signage.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's brochures indicating materials and finishes.
- B. Shop Drawings: Show sizes of members, method of construction, copy layout, wiring diagrams for illuminated building signage, and mounting details for proper mounting for interior signage, unit number signage, exterior building name and address signage and code required identification signage. Furnish template for mounting metal letters.
- C. Samples: Submit sample letters, panels, and completed signs, fonts and proposed anchorages.

1.03 QUALITY ASSURANCE

- A. Verify addressing requirements, including sizes and locations with governing authority prior to fabricating exterior signage.
- B. Regulatory Requirements: Comply with the following:
 - 1. ANSI A117.1, 2009 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
 - 3. 2010 ADA Accessibility Guidelines (ADAAG).
 - 4. The Arizonans with Disabilities Act (AzDA) (ARS Section 41-1492.03).
- C. Provide electrical components for back-lighted signage that are listed and labeled by UL and that comply with applicable NEMA standards.
- D. Coordinate fabrication and installation of monument sign with concrete supporting base.
- E. Coordinate fabrication and installation of dedication plaque with supporting construction and finishes for location indicated to be installed.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.

- B. Storage and Protection: Store items in dry, protected areas. Adequately protect against damage while stored at the site. Keep free of corrosion or other damage.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions shown on Drawings by taking field measurements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
 - 1. Interior Room, Non Smoking, and Similar Code Required ID Signage:
 - a. ASI-Modulex www.asimodulex.com
 - b. Best Manufacturing Company www.bestsigns.com
 - c. Epic Sign Group www.epicsigngroup.com
 - d. Mountain States Specialties
 - e. Signsource www.signsource.com
 - f. Skyline Signs Inc. www.skylinesigns.net
 - g. Vomar Products, Inc. www.vomarproducts.com
 - h. Other regional source as approved by Architect.
 - 2. Metal Signage:
 - a. ASI-Modulex www.asimodulex.com
 - b. ARK Ramos Manufacturing Co., Inc. www.arkramos.com
 - c. Matthews. www.matthewsbronze.com
 - d. Southwell. www.southwellco.com
 - e. Spanjer Brothers, Inc.
 - f. Metallic Arts. www.metallicarts.com
 - g. Other regional source as approved by Architect.

2.02 MATERIALS

- A. Materials shall be new stock, free from defects, imperfections strength, durability, and appearance. Types of materials and colors shall be selected by Architect based on final signage design.
- B. Metals - General:
 - 1. For fabrication of exposed metal work, use only materials which are smooth and free of surface blemishes including pitting, roughness, seam marks, roller marks, and trade names.
 - 2. Do not use materials which have stains and discolorations.
 - 3. For exposed items of work which include plain flat surfaces in width of more than 50 times the metal thickness, provide sheet stock from mill which has been stretcher leveled to highest standard of flatness commercially available.
 - 4. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the aluminum producer or finisher for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.
 - 5. Hot-dip Galvanized Steel Sheets: ASTM A653, with G90 zinc coating.

- C. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested in accordance with ASTM D 790, a minimum allowable continuous service temperature of 176 deg F (80 deg C), and of the following general types:
 - 1. Colored Coatings for Acrylic Plastic Sheet: Use colored coatings, for background colors, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for the application intended. Color(s) as selected by Architect.
 - 2. Transparent Sheet: Where sheet material is indicated as "clear," provide colorless sheet in matte finish, with light transmittance of 92 percent, when tested in accordance with the requirements of ASTM D 1003.
 - 3. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored opaque acrylic sheet in colors and finishes as selected by Architect from the manufacturer's standards.
- D. Extruded Aluminum Sign Frames: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of 6063-T5.
- E. Melamine plastic laminate, 1/8 inch thick, rated non-static, fire retardant and self extinguishing.
- F. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.
- G. Adhesive: Liquid silicone adhesive or other adhesive recommended by the sign manufacturer for type of mounting indicated.
- H. Tape: VHB (very high bond) double-stick foam tape as manufactured by 3M.
- I. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
- J. Reflective Tape for Pipe Bollards: Pressure—sensitive, self-adhesive, reflective engineers tape as indicated on Drawings as manufactured by 3M or equivalent as approved by Architect.

2.03 METAL SIGNAGE

- A. Building Mounted Metal Letters and Logos:
 - 1. Material: Fabricate individual metal letters from sheet metal of gauge recommended by manufacturer for size of characters, but not less than 22 gauge.
 - 2. Characters/Font: Size and font style as indicated on Drawings or as selected by Architect to match existing.
 - 3. Fabrication: Reverse pan design, 12 inches high, with depth and spacing to match existing adjacent buildings as approved by Architect.
 - a. Continuously solder or weld all seams to prevent water intrusion. Provide screened weep hole on back bottom of each individual character.
 - 4. Fabricated with stand-off from building façade for back-illumination.
 - 5. Light Components: LED's spaced as necessary for ample halo/back-light illumination with remote power supplies as necessary per LED count.

6. Finish: Fluoropolymer factory applied finish containing a minimum of 70 percent Penawalt Kynar 500 resin and meeting AAMA's 605.2 high performance specifications. Apply 3 coats including primer coat, color coat, and clear top coat.
 - a. Color: As scheduled on Drawings or otherwise selected by Architect.
 7. Mounting: Threaded studs set in adhesive, projected with 1 inch stand-offs for back illuminated signage.
- B. Dedication Plaque: Provide cast bronze dedication plaque of design on Drawings cast from bronze.
1. Finish: Dark oxidized pebble finish approved by Architect.
 2. Provide for anchorage of type indicated on Drawings or as otherwise approved by Architect.

2.04 ROOM AND IDENTIFICATION SIGNAGE

- A. Fabricate signage from acrylic sheet with aluminum frame as detailed on Drawings. And as follows:
1. All signage shall comply with applicable ADA requirements.
 2. Sign Base Sheet Thickness: 1/8 inch thick minimum.
 3. Colors: As scheduled on Drawings.
 4. Aluminum Frames: Fabricate sign mounting frames from aluminum formed to frame profile indicated with slots or stops to accept acrylic sheet sign panel as detailed. Provide means to lock sign panels in place after being inserted into sign frame.
 5. Mounting: Fabricate units for fastening with screws, double-stick tape or adhesive mount as indicated on Drawings or as approved by Architect.
 6. Finish and contrast:
 - a. Frame Finish: As scheduled on Drawings.
 - b. Sign Characters: Characters shall contrast with eggshell matte background by at least 20 percent.
 7. Letters and Braille characters:
 - a. Raised 1/32 inch upper case, sans serif or simple serif, and accompanied with Grade 2 Braille. Raised characters shall be at least 5/8 inch high, but not higher than 2 inches.
 - b. Letters and numbers: Width-to-height ratio from 3:5 to 1:1, and stroke width-to-height ratio from 1:5 to 1:10.
 - c. Text: Required quantity of each sign shall be as directed by Architect.
- B. Self Adhesive Vinyl: Self-adhesive vinyl letters and numbers as indicated on Drawings. Font type and size as indicated on Drawings or as selected by Architect.
1. Color: As indicated on Drawings or as selected by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Construction Manager. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. General: Locate sign units where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
- B. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.
- C. Install plumb and level in accordance with Manufacturer's instructions.
- D. Securely fasten wall mounted items to solid backing.
- E. Do not field cut any signage members.
- F. Clean and polish exposed surfaces.
- G. Self-Adhesive Vinyl Letters: Clean glass as recommended by manufacturer and apply letters level and at proper spacing at locations indicated.
- H. Wall Mounted Panel Signs: Fasten units to achieve secure attachment by fastening with concealed tamper-resistant headed screws, double-stick tape or adhesive mount as indicated on Drawings or as approved by Architect.
 - 1. Height shall be 60 inches above finish floor to centerline of sign at wall mounted signs, unless otherwise indicated on Drawings.
 - 2. When screw fastening, provide a minimum of 2 screws per sign, or as otherwise indicated on Drawings.
 - 3. Silicone-Adhesive Mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.
 - 4. Double-Stick Tape Mounting: Clean surfaces to be joined and apply double stick tape to back of wall mounted signage in continuous strips at approximate 2 inch center to center spacing between strips. Apply sign to wall surface taking care to properly align and plumb signage before removing release paper.
- I. Illuminated Individual Characters: Accurately locate anchors using supplied templates and anchor securely in place.
 - 1. Extend and connect conduit and wiring to electrical connection provided by Division 26.
 - 2. Exposed conduit and/or wiring is not permitted.
 - 3. All wiring shall be performed by a qualified and licensed Electrician.
- J. Reflective Tape for Pipe Bollards: Install pressure—sensitive, self-adhesive, reflective engineers tape on pipe bollards as indicated on Drawings after finish painting is complete.
- K. All exterior wall penetrations shown on Drawings or otherwise required for signage installation shall be located by using full-size installation templates furnished by the signage fabricator.
- L. Seal, patch and paint all penetrations.

3.03 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 10 14 53
TRAFFIC CONTROL SIGNS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes traffic control signs and supports.

1.02 QUALITY ASSURANCE

- A. Standards: Comply with requirements of the Manual on Uniform Traffic Control Devices (MUTCD) with Arizona State amendments, as published by the Federal Highway Administration.

1.03 SUBMITTALS

- A. Submit product data, shop drawings and samples.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials, General: Comply with requirements of the MUTCD, as follows, and as detailed on Drawings.
- B. Metals: New stock, free from defects impairing strength, durability or appearance.
 - 1. Steel Shapes, Plates, Rod, Bars and Bar-size Shapes: ASTM A36.
 - 2. Hot-dip Galvanized Steel Sheets: ASTM A653, with G90 zinc coating.
 - 3. Steel Tubing: ASTM A500.
 - 4. Aluminum Sheet: ASTM B209 having strength and durability meeting 5005-H15, .080 inch minimum thickness.
- C. Signage Supports: Provide galvanized steel pipe, tube or u-channel sign support posts as detailed on Drawings, complying with city/town standards. Provide welded steel caps at all hollow pipe or tube supports. Paint with thermoset acrylic polyurethane enamel or polyester powder coated finish in color indicated on Drawings or as selected by Architect.
 - 1. U-Channel Sign Posts: As manufactured by Zumar Industries, Inc., or equivalent www.zumartraffic.com.
- D. Plastics: New stock, free from defects and of the best quality available.
- E. Paints: Type made for the surface material on which it is to be applied and recommended by the manufacturer of the paint. No paint that will fade, discolor or delaminate as a result of proximity to UV light sources or heat therefrom shall be used.
- F. Sign hardware and Accessories: As manufactured by Zumar Industries, Inc. or equivalent www.zumartraffic.com.

2.02 FABRICATION

- A. Fabricate in accordance with requirements and details of the MUTCD, MAG Standard Details, and as indicated on Drawings.

2.03 FINISHES

- A. Galvanizing: Galvanize all steel components of traffic control signs.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153 for steel and iron hardware and with ASTM A123 for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - 2. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with the following.
 - 1. SSPC-SP 3, "Power Tool Cleaning."
- D. Shop/Factory/Finishing:
 - 1. Paint shall be thoroughly and evenly applied and shall be well worked into corners and joints and shall not have edge or joint buildups.
 - 2. Paint shall be evenly applied and without pinholes, scratches, orange peeling, application marks, etc.
 - 3. Workmanship in connection with finishes shall conform to the standard of the trade. Prime coats or other surface pre-treatments, where recommended by the manufacturer for paints, shall be included in the work.

PART 3 EXECUTION

3.01 ERECTION, INSTALLATION, APPLICATION

- A. Installation, General: Comply with requirements and details of the MUTCD, MAG standard details, and as detailed on Drawings.
- B. Install items square, plumb, true, and accurately fitted. Leveling is to be done only by instruments.
- C. Embed signage support pipes in concrete filled holes as detailed.

3.02 CLEANING

- A. After installation, surfaces marred during erection, and exposed bolts, bolt heads, etc., shall be retouched with the same paint used previously.

END OF SECTION

SECTION 10 21 16.56
PRECAST SHOWER BASES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Prefabricated precast terrazzo shower bases as shown on Drawings and as specified herein.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications, design data and installation instructions.
- B. Shop Drawings: Submit drawings showing layout, dimensions and construction details. Show details of installation and connection to plumbing.
- C. Samples: Submit samples showing finish, including colors and textures.
- D. Certificates: Submit manufacturer certification that products furnished meet specification requirements.

1.03 QUALITY ASSURANCE

- A. Qualifications: Manufacturer shall be regularly engaged in the manufacture of standard units of the type specified.
- B. Regulatory Requirements: Comply with the following:
 - 1. ANSI A117.1, 2009 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
 - 3. 2010 ADA Accessibility Guidelines (ADAAG).
 - 4. The Arizonans with Disabilities Act (AzDA) (ARS Section 41-1492.03).

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following manufacturers, subject to compliance with specifications requirements:
 - 1. Acorn Engineering Company www.acorneng.com
 - 2. Florestone Products Co., Inc. www.florestone.com
 - 3. As approved by Architect.

2.02 SHOWER BASES

- A. Precast polished terrazzo receptor manufactured of marble chips cast in white Portland cement to produce a compressive strength of not less than 3,000 psi. Ground smooth and sealed. No air holes or bubbles allowed in finished surface. Coved corners and pitched to the drain outlet for positive drainage. Integral drain body of brass with removable stainless steel strainer for inside caulked connection to 2 inch drain pipe. 3 inch integral threshold on one side. Non-threshold sides shall have galvanized tiling flanges which extend 1-1/2 inch above the 1-1/4 inch wide shoulder.
1. Color: As scheduled on Drawings, or as selected by Architect from manufacturer's full range of colors/patterns.
 2. Size: As indicated on Drawings.
 3. Bedding Compound: As recommended by Manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces. Verify that backup framing is correctly positioned to receive units.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's directions. Set accurately in position.
- B. Verify drain placement by positioning the base in the opening and install drain fitting in accordance with fitting manufacturer's directions.
- C. Set shower base in place with front lip resting tight to the floor. Provide bedding compound in accordance with manufacturer's directions, set in position and secure in place. Allow no traffic on bottom until the bedding compound has set.

3.03 CLEANING

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 10 26 00
WALL PROTECTION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Stainless steel corner guards.
 - 2. Stainless steel wall cladding.

1.02 QUALITY ASSURANCE

- A. Subcontractor qualifications: Fabricate and install the work of this Section using a subcontractor having a minimum of 5 years experience and trained in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance and desired aesthetic affect of the work of this Section.
- B. Reference standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following.
 - 1. NAAMM Metal Finishes Manual.
 - 2. AWS Structural Welding Code.
 - 3. SMACNA Architectural Sheet Metal Manual.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications, design data and installation instructions.
- B. Shop Drawings: Submit shop drawings showing sizes and fastening methods.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.
- B. Storage and Protection: Adequately protect against damage while stored at the site.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions shown on Drawings by taking field measurements.
- B. Temperature at the time of installation must be between 65-75 degrees F and be maintained for at least 48 hours after the installation to allow for proper adhesive set up.
- C. Relative humidity shall not exceed 80 percent.
- D. Do not expose wall panels to direct sunlight during or after installation. This will cause the surface temperature to rise, which in turn will cause bubbles and delamination.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Stainless Steel Corner Guards: Furnish products of the following manufacturer, except as otherwise approved by the Architect, subject to compliance with specifications requirements:
1. Acrovyn; Construction Specialties, Inc. www.c-sgroup.com
 2. Stainless Architectural Supply www.sasmfg.com
 3. As approved otherwise by Architect.

2.02 COMPONENTS

- A. Surface Mounted Stainless Steel Corner Guards:
1. 14 gauge Type 304 stainless steel with No. 4 satin finish.
 2. Size: 1-1/2 inches by 1-1/2 inches, unless otherwise indicated on Drawings.
 3. Corner: Square or rounded corner as indicated on Drawings, or as selected by Architect.
 4. Height: 48 inches, or as otherwise indicated on Drawings.
 5. Hardware: Provide attachment hardware for complete and secure assembly.
- B. Stainless Steel Sheet: ASTM A167 and unless indicated otherwise on Drawings, required by design, or directed by Architect, provide Type 304.
1. Finish: No. 4 Brushed, or as scheduled otherwise on Interior Drawings and Specifications.
- C. Adhesives, Anchors and Joint Sealers:
1. Joint Sealant: As specified in Section 07 92 00.
 2. Screws: Stainless steel, flat head countersink screws of sufficient length to penetrate wall studs.
 3. Adhesives: 3M fastbond 30, or as otherwise recommended by the decorative metal fabricator.
 4. Double-Sided Tape: 3M VHB double-sided, very high bond adhesive tape of type and width to suite application.

2.03 FABRICATION

- A. General:
1. Form and fabricate the Work to meet installation conditions.
 2. Include accessories to adequately secure the Work in place.
 3. Make provisions to connect with or to receive abutting construction.
- B. Field measurements: Verify dimensions before proceeding with shop fabrication of panels. Obtain field measurements for work required to be accurately fitted to other construction. Be responsible for the accuracy of such measurements and precise fitting and assembly of finished work.
- C. Fabricate stainless steel wall cladding from minimum 24-gauge stainless steel sheet to conform to Drawings and approved Shop Drawings. Hem all edges. Fabricate cladding with flat-lock seams, unless otherwise indicated on Drawings. Coordinate fabrication with adjacent and abutting finishes and equipment, cabinets, and other items indicated on Drawings.
1. Form wall cladding without warp or oil canning of surface finish. Provide heavier gauge where necessary to eliminate warp and oil canning.

- D. Coordinate fabrication with electrical, mechanical and plumbing components, fixtures and equipment.
- E. Fabricate cladding for adhesive or screw attachment to wall as indicated on Drawings.
- F. Where screws are used to attach stainless steel corner guards, pre-drill and countersink to accept flathead countersunk screws.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
 - 2. Verify that prepared bases are in correct position and properly sized.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

- A. Surface Preparation: Surfaces to receive stainless steel corner and wall end guards shall be cleaned to remove all dust, debris, and other contaminants that would interfere with adhesive bond.
- B. Place corner guards in locations/rooms where units will be installed and acclimate to building conditions as specified herein in Project/Site Conditions article for a minimum period of 24 hours prior to installation.

3.03 INSTALLATION

- A. Install components in accordance with manufacturer's printed instructions and details on Drawings.
- B. Wall Cladding:
 - 1. Form, cut, drill, and fit stainless steel wall cladding as required for installation. Do not cut or abrade finishes that cannot be restored in the field.
 - 2. Install items accurately placed in location, plumb, level and in alignment and elevation with adjoining work. Fit field connections accurately together to form hairline joints.
 - 3. Attachment: Stainless steel sheet to supporting wall construction with adhesive. Double-sided VHB tape, and/or concealed fasteners to the greatest extent possible. Where exposed fasteners are unavoidable in the finished work, or indicated on Drawings as fastening method, provide Phillips round or low-profile head machine screws, except where decorative fasteners are indicated as part of the finished work. Evenly space and pre-drill holes for fasteners.

- C. Corners Guards:
 - 1. Install straight, true and to heights as indicated.
 - 2. Install stainless steel corner guards with adhesive or double-sided VHB tape as preferred method of attachment. Where necessary to provide secure attachment or where higher abuse is anticipated, install with countersunk #10 stainless steel screws in pre-drilled holes as standard with manufacturer, spaced at not more than 24 inches center to center.

3.04 ERECTION TOLERANCES

- A. Maximum Variation from Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset from True Alignment: 1/4 inch

3.05 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 10 28 13

TOILET AND BATH ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes toilet accessory items as specified and as indicated on Drawings, including installation of Owner Furnished toilet accessories.
 - 1. This Section also include stainless steel wall mounted shelving.
- B. Related Sections:
 - 1. Section 08 83 00 – Mirrors, for wall mounted mirrors.

1.02 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with the following:
 - 1. ICC/ANSI A117.1, 2009 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
 - 3. 2010 ADA Accessibility Guidelines (ADAAG).
 - 4. The Arizonans with Disabilities Act (AzDA) (ARS Section 41-1492.03).

1.03 SUBMITTALS

- A. Product Data: Submit Drawings and brochures of toilet accessory items showing sizes, construction and mounting techniques, and installation locations (Plans and Elevations).

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at site.
- C. Handling: Comply with Manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. To establish function, capacity and quality, toilet accessories scheduled on Drawings are based on products of Bobrick Washroom Equipment Co., Inc (Bobrick), A.R. Nelson, and Koala Kare Products. Comparable toilet accessory products by one of the following Manufacturers may be provided, as approved by the Architect, subject to compliance with Specification requirements.
 - 1. A.R. Nelson (Shower Curtains only)
 - 2. ASI www.americanspecialties.com
 - 3. Bobrick Washroom Equipment Co., Inc. www.bobrick.com
 - 4. Bradley Corporation www.bradleycorp.com
 - 5. GAMCO a division of Bobrick www.gamcousa.com
 - 6. Koala Kare Products www.koalbear.com (Baby Changing Stations Only).

2.02 MATERIALS

- A. Stainless Steel: AISI, Type 302/304, with satin No. 4 finish. Unless specified or indicated, the use of other stainless steel alloys shall not be allowed.
- B. Sheet Steel: Cold rolled, commercial quality, ASTM A1008. Surface preparation and metal pretreatment as required for applied finish.
- C. Chromium Plating: Nickel and chromium electro-deposited on metal, ASTM B456, Type SC 2.
- D. Mirror Glass: FS DD-G-451, Type I, Class 1, Quality 1, 1/4 inch thick, with silver coating, copper protective coating, and non-metallic paint covering.
- E. Galvanized Steel Mounting Devices: ASTM A123, hot-dip galvanized after fabrication.
- F. Locks: Tumbler type, keyed alike unless specified otherwise.
- G. Fasteners: Theft-proof screws. Use no adhesive mountings.
- H. Backing Plates: 16-gauge cold-rolled steel for mounting grab bars in stud partitions.
- I. Perimeter Sealant: Type "E" clear mildew resistant silicone sealant as specified in Section 07 92 00.

2.03 TOILET AND BATH ACCESSORIES

- A. Contractor Furnished and Installed Toilet and Bath Accessories: As scheduled on Drawings.
- B. Wall Mounted Stainless Steel Shelving: As scheduled on Drawings or otherwise selected by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination with other Work: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Install items in accordance with Manufacturer's published instructions and approved installation drawings in locations as shown on Drawings, and in compliance with ANSI A117.1 as applicable.

- B. Secure toilet room accessories to adjacent walls and partitions in accordance with the Manufacturer's instructions for each item and each type of substrate construction and as follows:
 - 1. Attachment to Toilet Partitions: Secure at screw attachment point with sheet metal screws furnished by Manufacturer or by 3/16 inch diameter through-bolts.
 - 2. Attachments of Recessed Accessories: Place shims between framing and cabinet at screw attachment points.
 - 3. Attachment of Surface Mounted Accessories: At metal stud walls, provide concealed sheet metal backing plate as indicated on Drawings to allow attachments with No. 18 x 1-1/2 inch sheet metal screws. At solid walls, rawl plugs, expansion shields or toggle bolts shall be provided. Mirrors shall be locked to wall hangers by tightening locking screws concealed in lower frame. Soap dispensers shall be mounted with 4 inch clearance from filler top to underside of any horizontal projection.

- C. Grab Bars:
 - 1. Framed wall construction: Install concealed anchor plates to studs. Attachment to studs must be sufficient to withstand a downward load of at least 300 pounds, when tested according to ASTM F446. Accurately position and fasten before wall finish is applied. After wall surface is finished, secure concealed mounting plate to anchor plate using stainless steel machine screws furnished by the Manufacturer.
 - 2. Toilet Compartments: Through-bolted connection to anchors.

- D. Seal wall penetrations with sealant as specified in Section 07 92 00 to prevent moisture penetration through joints around fixtures.

3.03 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

- B. Remove temporary labels and protective coatings just prior to Substantial Completion of Project.

- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

- D. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Fire extinguishers.
 - 2. Cabinets for fire extinguishers.
 - 3. Wall brackets for fire extinguishers.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's data and installation instructions for each item, including construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 1. Fire Extinguishers: Include rating and classification.
 - 2. Fire Extinguisher Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Samples for Verification: For each type of exposed factory-applied color finish required for cabinets, prepare 6-inch x 6-inch square Samples.

1.03 QUALITY ASSURANCE

- A. Standards: Comply with ANSI/UL 92 and 711.
- B. Regulatory Requirements: Conform to ANSI/NFPA 10 and the following:
 - 1. ANSI A117.1, 2009 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
 - 3. 2010 ADA Accessibility Guidelines (ADAAG).
 - 4. The Arizonans with Disabilities Act of 1992 Administrative Rules (AzDAAG).
 - 5. Fire extinguishers shall be listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 6. Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
 - 7. Provide fire extinguishers approved, listed, and labeled by FMG.
- C. Fire-Rated Fire Extinguisher Cabinets: Listed and labeled to comply with requirements of ASTM E814 for fire-resistance rating of walls where they are installed.

1.04 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

1.05 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - c. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
 - 1. Amerex (Fire Extinguishers only) www.amerex-fire.com
 - 2. Larsen's Manufacturing Company www.larsensmfg.com
 - 3. J.L. Industries www.jlindustries.com
 - 4. Potter Roemer Fire Protection Equipment www.potterroemer.com

2.02 EQUIPMENT

- A. Multi-Purpose Dry Chemical Extinguisher:
 - 1. Capacity and UL Rating: 10 lbs., 4A-60B:C, or as otherwise required by Fire Official.
 - 2. Rechargeable type.
 - 3. Tank: DOT approved steel cylinder.
 - 4. Metal head, handles, valves and siphon tube. Plastic handles, valve assemblies and siphon tubes are not allowed.
 - 5. Replaceable molded valve stem seal.
 - 6. Pressure gauge.
- B. Fire Extinguisher Cabinet:
 - 1. Model Architectural Series as manufactured by Larsen's Manufacturing Co. as scheduled on Drawings, or equivalent as approved by Architect.
 - 2. Trim Style and Projection: Semi-recessed, 1-1/2 inch rolled edge, and surface mounted. Refer to Drawings for locations.
 - 3. Inside box dimensions: Manufacturer's standard for size of extinguisher specified.
 - 4. Door:
 - a. Vertical Duo with Larsen-Loc, or as otherwise indicated on Drawings.
 - b. Trim and Door (Stainless Steel): One piece, constructed of #4 finish, 304 stainless steel. Doors to be tubular, hollow-metal design.
 - c. Door Glazing: Plastic, clear, 1/8 inch thick acrylic.
 - 5. Recessed Box: Heavy gauge, black baked acrylic enamel box.
 - 6. Fire Rated Assemblies: Provide UL fire rated type box where cabinet is mounted within a fire-rated wall.
 - a. Units complying with ASTM E814 capable of installing in up to 2 hour rated assemblies.
 - 7. Cabinet Signage: Vertical lettering "FIRE EXTINGUISHER" on door; color red.
 - 8. Cabinet Mounting Hardware: Appropriate to cabinet.
- C. Wall Brackets: Manufacturer's standard J-type for wall-hung extinguishers.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged units.
- C. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

- A. Prepare recesses for recessed cabinets as required by type and size of cabinet and trim style.

3.03 INSTALLATION

- A. Install items in accordance with Manufacturer's directions. Install cabinets and wall brackets plumb and level at heights shown on Drawings.
- B. Comply with regulatory requirements and anchor securely.
- C. Verify that extinguishers are charged and tagged.
- D. Place extinguishers in cabinets and on wall brackets.

3.04 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 10 51 00

METAL LOCKERS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes metal lockers of the following type:
 - 1. Standard duty, multi-tier metal lockers of configurations indicated on Drawings.
 - 2. Locker room benches.
- B. Related Sections:
 - 1. Section 10 51 56 – Turn-Out Gear Storage, for turn-out gear storage lockers and fire hose storage racks.

1.02 SUBMITTALS

- A. Product data and installation instructions for locker units.
- B. Shop Drawings that show locker locations and relation to adjacent surfaces. Show lockers in detail, method of installation, fillers, trim, base, and accessories. Include locker numbering sequence information.
- C. Samples: Submit 2 samples or color chart for color selection.

1.03 QUALITY ASSURANCE

- A. Uniformity: Provide lockers that are standard products of single manufacturer with interchangeable like parts. Include necessary mounting accessories, fittings, and fastenings.
- B. Regulatory Requirements:
 - 1. ANSI A117.1, 2009 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
 - 3. 2010 ADA Accessibility Guidelines (ADAAG).
 - 4. The Arizonans with Disabilities Act of 1992 Administrative Rules (AzDAAG)
- C. Designated ADA compliant units shall be affixed with "handicap accessible" label on door.
- D. Shelf location and hook arrangements shall comply with ANSI standards.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Do not deliver lockers until building is enclosed and ready for locker installation.
- C. Storage and Protection: Adequately protect against damage during delivery, handling, storage, and installation.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions shown on Drawings by taking field measurements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
1. ASI Storage Solutions www.asilockers.com
 2. Lyon Workspace Products www.lyonworkspace.com
 3. Penco Products www.pencoproducts.com
 4. Republic Storage Systems www.republicstorage.com

2.02 MATERIALS

- A. Steel: Prime grade mild cold-rolled sheet steel free from surface imperfection, capable of taking a high-grade enamel finish and in compliance with ASTM A1008.
- B. Sheet Steel: Sheet steel components shall be fabricated using zinc-coated steel free from surface imperfection, capable of taking a high-grade enamel finish and in compliance with ASTM A879.
- C. Hooks: Zinc plated forged steel, ball ends.
- D. Bolts and Nuts: Zinc plated truss fin head bolts and hex nuts.

2.03 HEAVY DUTY LOCKERS

- A. Heavy Duty Lockers:
1. Tops, Bottoms, Backs, Sides, and Shelves: 24 gauge sheet steel.
 2. Doors: 14 gauge sheet steel.
 3. Door Frames: 16 gauge steel.
- B. Locker Body: Steel specially formed for added strength and rigidity and to ensure tight joints at fastening points.
1. Tops and bottoms with three sides formed 90 degrees, the front offset formed to be flush with horizontal frame member.
 2. Shelves with four sides formed to 90 degrees, front edge having a second bend.
 3. Hole spacing in locker body construction: Not exceeding 9 inches.
 4. Door Frames: 16 gauge formed into 1 inch wide face channel shapes with a continuous vertical door strike integral with the frame on both sides of the door opening. Double, triple or four tier locker cross frame members shall be 16 gauge channel shaped securely welded to vertical framing members to ensure a square and rigid assembly.
 5. Provide vertical door frame members with additional 3/8-inch flange as a continuous door strike.
 6. Mortise and tenon intermembering parts; electrically weld together in a rigid assembly capable of resisting strains.

7. Securely weld cross frame members of channel shapes to vertical framing members to ensure rigidity, including intermediate cross frame on double tier lockers.
 8. Optional factory assembly of locker bodies using rivets.
- C. Locker Doors: One-piece sheet steel.
1. Box Lockers: Channel formations on lock and hinge sides, right angle flanges on top and bottom; pre-punch doors for padlock latch and friction catch and built-in combination and key locks.
 2. Provide holes for attaching number plates.
 3. Ventilation: Manufacturer's standard louver configuration for multi-tier box lockers of sizes indicated.
- D. Hinges:
1. 2-inch-high, 0.074-inch-thick sheet steel, double spun, full loop, tight pin, projection welded to door frame and securely fastened to the door with two steel rivets.
 - a. Doors over 24 inches high: Four, 2-inch-high five-knuckle hinges.
 - b. Doors less than 24 inches high: Two, 2-inch-high five-knuckle hinges.

2.04 DOOR HANDLES AND LATCHING

- A. Multi-Tier Box Lockers:
1. Chrome-plated zinc alloy die-cast case and handle.
 2. Punch doors for use with padlocks or built-in locks.
 3. Equip doors for use with padlocks with an 18 gauge combination door pull, staple, and lock hole cover plate with integral friction catch.
 4. Case: Kick-proof type shielding movable part and providing padlock strike to prevent scratching and marring the door.
 5. Firmly secure one rubber silencer in frame at each latch hook.

2.05 ACCESSORIES

- A. Number Plates: Provide each locker with a polished aluminum number plate, 2-1/4 inches wide by 1 inch high, with black numerals not less than 3/8-inch-high; attach to face of door with two aluminum rivets.
- B. Front Fillers: 20 gauge steel formed in an angle shape, with 20 gauge slip joint angles formed in an angle shape with double bend on one leg forming a pocket to provide adjustable mating with angle filler.
1. Attachment by means of concealed fasteners.
 2. Finish to match lockers.

2.06 FABRICATION

- A. Locker Types and Sizes:
1. Standard multi-Tier Lockers: 12 inches wide x 12 inches high x 12 inches deep each, unless otherwise indicated on Drawings.
- B. Fabricate lockers square, rigid, without warp, with metal faces flat and free of distortion.
- C. Knock-Down Lockers: Fabricate lockers on the unit principle, each locker with individual door and frame, individual top, bottom, back, and shelves, with common intermediate divisions separating compartments. Verify dimensions and arrangement before fabrication.

- D. Finish: Enamel powder coat paint finish electrostatically applied and properly cured to manufacturer's specifications for optimum performance. Finishes containing volatile organic compounds and subject to out-gassing are not acceptable. Locker exterior and interior shall be painted the same color.
 - 1. Powder Coat - Dry Thickness: 1 to 1.2 mils.
 - 2. Color: As selected from manufacturer's standard colors.

2.07 LOCKER ROOM BENCHES

- A. Benches:
 - 1. Bench Seat: Laminated selected hardwood, 1-1/4 inch full finished thickness, corners rounded and sanded, surfaces finished with two coats of clear lacquer.
 - a. Width: 12 inches.
 - b. Length: As indicated on Drawings.
 - 2. Pedestal: Manufacturer's standard bench support pedestal fabricated from steel angle and/or pipe, designed to support bench seat on floor as shown on Drawings.
 - a. Finish: Powder coated finish in color as selected by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
 - 2. Verify that prepared bases are in correct position and properly sized.

3.02 INSTALLATION

- A. Install metal lockers and accessories at locations shown in accordance with manufacturer's instructions and approved Shop Drawings.
- B. Install lockers plumb, level, square and flush.
- C. Anchor lockers to wall as recommended by the manufacturer.
 - 1. Secure units to wall through back of units to solid blocking or studs or other solid structure with suitable anchors to resist 100 pounds pullout force.
- D. Bolt adjoining locker units together to provide rigid installation.
- E. Install fillers using concealed fasteners. Size trim units in field and scribe to adjacent surfaces. Provide flush hairline joints against adjacent surfaces.
- F. Install number plates after installation to assure proper number sequence.
- G. Install benches by fastening bench tops to pedestals and securely anchoring pedestal bases to supporting concrete floor using appropriate anchors.

3.03 ADJUSTING AND CLEANING

- A. Adjust doors and latches to operate without binding. Verify that latches are operating satisfactorily.

- B. Touch-up with factory-supplied paint and repair or replace damaged products before substantial completion.
- C. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

3.04 PROTECTION

- A. Protect installed products until completion of project.

END OF SECTION

SECTION 10 51 56

TURN-OUT GEAR STORAGE

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Turn-out gear wall mount and floor mounted grid lockers.
 - 2. Hose storage racks.
- B. Related Documents: Refer to the GearGrid Fire Take-Off form attached to this Section.
- C. Related Sections:
 - 1. Section 05 50 00 – Metal Fabrications, for free-standing steel tube wall structure to support turn-out gear storage lockers in center of room.

1.02 SUBMITTALS

- A. Product data and installation instructions for locker units.
- B. Shop Drawings showing equipment locations and relation to adjacent surfaces. Show lockers and racks in detail, assemblies, method of installation, trim, base, and accessories.
- C. Samples: Submit 2 samples or color chart for color selection.

1.03 QUALITY ASSURANCE

- A. Provide standard products of single manufacturer regularly engaged in the manufacture of specified equipment with interchangeable like parts. Include necessary mounting accessories, fittings, and fastenings.
- B. Manufacturer shall have a minimum of five (5) years' experience in the direct manufacturer of storage systems.
- C. Installer shall have experience in storage system assembly and installation.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Do not deliver lockers until building is enclosed and ready for locker installation.
- C. Storage and Protection: Adequately protect against damage during delivery, handling, storage, and installation.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions shown on Drawings by taking field measurements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of the following Manufacturer, except as approved by the Architect, subject to compliance with Specification requirements:
1. Firefighters Gear Lockers:
 - a. Mid-Minnesota Wire (GearGrid Product Line) www.geargrid.com.

2.02 LOCKERS

- A. Turn-Out Gear Storage Lockers: GEARGRID Jumbo wall mounted and floor mounted gear lockers in quantity and location indicated on Drawings.
1. Jumbo Size: 24 inches W. x 24 inches Deep x 72 inches high.
 2. Adjustability: Wire shelves adjustable in 3 inch increments.
 3. Frame: Heavy-duty 1-1/4 inch x 16 gauge wall thickness ASTM A513 square steel tubing.
 4. Side and Back Grids: High-strength 1/4 inch diameter ASTM A510 cold drawn steel wire, resistance welded to a 3 inch square pattern.
 5. Construction: All components cold-formed. Units shall be welded at all applicable joints. Use of fasteners will only be required to allow for knock-down shipping, securing units to mounting surface and applicable accessories.
 6. Doors: Provide with door kits.
 7. Name Plate: 20 GA sheet metal, accepts 2 inch x 16 inch custom printed name plate.
 8. Mounting Brackets: 11 GA. Steel.
 9. Finish: Components shall be cleaned using a phosphatized bath, clear water rinse and electro-statically coated with a Durable TGIC powder coating.
 - a. All system components excluding assembly and mounting hardware and stainless steel components shall be TGIC powder coated.
 - b. Color: As scheduled on Drawings or otherwise selected by Architect.
- B. Shelves and Accessories:
1. Shelves/Hooks: Two shelves, upper and lower, constructed of high-strength 1/4" wire, and three apparel hooks per locker including coat drying hanger and glove drying hanger.
 2. Horizontal hang rod.
 3. Helmet holder.
 4. Provide additional items, if any, identified in the "GearGrid Fire Take-Off" form attached to this Section.

2.03 HOSE RACK

- A. Hose Rack: Heavy duty hose rack, steel framed with wire infill panels. Capable of supporting up to 3,800 lbs. Designed to accommodate hose sizes from 1-1/2 inch to 5 inches.
1. Dimensions 73-1/4 inches wide by 26 inches deep by 82 inches high.
 2. Three sections wide for hoses only.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
 - 2. Verify that prepared bases are in correct position and properly sized.

3.02 INSTALLATION

- A. Assemble and install lockers in accordance with Manufacturer's recommendations and approved Shop Drawings.
- B. Install plumb and square and bolt units together. Secure to substrate with suitable anchors to resist 100 pounds pullout force.
- C. Touch up minor blemishes as approved. Verify that doors and latches operate easily and properly.

3.03 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

(attachment 1 – GearGrid Fire Take-Off form)

GEARGRID FIRE TAKE-OFF FORM

Exchange ID #:

Request From	CONTACT	PHONE	
EMAIL		FAX	
ADDRESS	CITY	STATE	







PROJECT GENERAL INFO

PROJ. NAME			
CITY	STATE	Addenda	
BID DATE	BID TIME	EXPECTED DELIVERY	PHASES? # of PHASES
ARCHITECT	CONSTRUCTION MANAGER		

WALL MOUNT LOCKERS

Qty of Lockers in each run - (List runs separately)	Locker Type and Size	Doors (Yes or No)	Tubular Frame Wall	Notes
	h			Wall mount lockers come in standard widths of 18", 20" or 24". The standard depth is 20" and height is 72". Lockers are typically mounted appx 8" above finished floor. Lockers are offered in 7 standard colors. Lockers come with 2 adjustable shelves, one of which has a nameplate holder, and 3 apparel hooks. Other accessories available, please see locker accessories below. ***Tubular Frame Wall available to create a floor mounted wall that lockers can be mounted to.

FREESTANDING LOCKERS - Mobile, Floor Mount or Tubular Wall Structure

	QTY of Each	Locker Width	Wheels or Floor Mount	Doors Y or N	Notes
2 - Pack 					Mobile lockers are available in the configurations shown to the left. Lockers are mounted to a welded base which will accept wheels or floor mounts. Individual lockers are available in 18", 20" or 24" widths and are 20" deep. Standard locker offering includes 2 adjustable shelves, one of which has a name plate holder, and 3 apparel hooks.
3 - Pack 					
4 - Pack 		18" ONLY			
4 - Pack 					
6 - Pack 					
8 - Pack 		18" ONLY			

LOCKER ACCESSORIES

Qty	Accessory	Qty	Accessory	Qty	Accessory
	Power Bar (18", 20" or 24" Wall Mount Only)		Heavy Hanger		Helmet Holder
	Secure Box Small (6"w x 6"h x 12" d)		GearDryer Hanger		Binder Rack
	Secure Box Large (6"w x 11"h x 12" d)		GearGlove Hanger		Glove Rack
	Top Side Storage (not for use with doors)		GearHanger (Stainless Hangbar)		Additional Apparel Hooks
	Stow-Away Seat (not for use on mobile)		Backboard Rack		

OTHER GEARGRID PRODUCTS

QTY	Detailed Description of Product

SPEC SECTION:

NOTES and SPECIAL CONSIDERATIONS

SECTION 10 75 00

FLAGPOLES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Internal halyard ground set flagpole, including baseplate and foundation sleeve.
- B. Related Sections:
 - 1. Division 03 Concrete Sections for concrete foundation and foundation sleeve.
 - 2. Division 26 – Electrical, for ground-set up-lighting for light poles.

1.02 SYSTEM DESCRIPTION

- A. Design Requirements: Comply with National Association of Architectural Metal Manufacturer's "Guide Specifications for the Design of Metal Flagpoles," Standard FP-1.

1.03 SUBMITTALS

- A. Shop Drawings: Submit Drawings showing sizes, finishes, methods of installation and accessories.
- B. Samples: Submit samples showing material and finish.
- C. Manufacturer's calculated engineering data for base.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at the site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements.
 - 1. American Flagpole Division, Kearney-National www.americanflagpole.com
 - 2. Baartol www.baartol.com
 - 3. Concord Industries www.flagpoles.com
 - 4. Eder Flag Manufacturing co., Inc. www.ederflag.com
 - 5. Ewing Group www.ewinggroup.com
 - 6. Morgan-Francis Div. www.morgan-francis.com
 - 7. The Flag Company, Inc.; Flag Pole Warehouse www.flagwarehouse.com
 - 8. Pole-Tech Co., Inc. www.poletch.com

2.02 FLAGPOLES

- A. Poles: Cone tapered aluminum ground set of seamless cold drawn ASTM B241, 6063-T6 aluminum tubing with 0.188-inch wall thickness, with base and top diameter as required for height(s) of poles specified.
 - 1. Height(s): 30'-0", unless otherwise indicated on Drawings.
- B. Accessories: Equip pole with the following:
 - 1. Internal Halyard Fittings: Manufacturer's standard cable based internal halyard and winch mount system with locking door and reinforced door frame assembly.
 - 2. Truck Assembly: Single sheave, revolving truck assembly.
 - 3. Ball: 14 gauge Bronze Anodized spun aluminum flag pole ball ornament of diameter to be compatible with height of pole and no larger than butt (bottom) diameter of pole.
 - 4. Provide upgraded 1/4 inch thick Bronze anodized aluminum casting base.
- C. Pole and Hardware Finishes: Bronze Anodized.
- D. Foundation: 16 gauge corrugated galvanized foundation tube with self-centering bottom plate and hardwood or resilient wedges and lightning protector ground spikes, as shown on Drawings.
- E. Concrete: 3,000 psi minimum unless otherwise noted on Drawings, meeting requirements of Section 03 30 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.

3.02 PREPARATION

- A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with heavy coat of bituminous paint or manufacturer's standard protective bituminous tape.

3.03 INSTALLATION

- A. Coordinate installation with installation of adjacent site improvements including flagpole lighting.
- B. Install flagpole, base assembly, and fittings in accordance with Manufacturer's instructions.
- C. Electrically ground flagpole installation.
- D. Install foundation plate and centering wedges for flagpole base set in concrete and fasten. Fill foundation tube sleeve with sand and compact.
- E. Allow concrete to cure at least 14 days before erecting pole.

3.04 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 11 31 00

APPLIANCES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes residential grade kitchen and laundry equipment and appliances, including installation of appliances indicated to be Furnished under Allowance in accordance with Section 01 21 00 - Allowances.
- B. Related Sections:
 - 1. Divisions 23 and 26 for utility piping and electrical outlets for equipment and appliances.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's specifications and installation instructions.
- B. Shop Drawings: Submit drawings showing space requirements, and piping and wiring rough-in locations for gas, water, power, and for ductwork.
- C. Samples: Submit samples or brochures showing color selection.
- D. Operating and Maintenance: Submit 2 copies of Manufacturer's instructions for operating and maintaining equipment.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.04 WARRANTY

- A. Furnish Manufacturer's standard warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Kitchen and Laundry Equipment and Appliances: Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with specifications requirements:
 - 1. General Electric www.ge.com
 - 2. Whirlpool www.whirlpool.com
 - 3. Frigidaire www.frigidaire.com
 - 4. In-Sink-Erator www.insinkerator.com

2.02 EQUIPMENT

- A. As selected by Owner and/or Architect with Allowance specified in Section 01 21 00, including but not limited to the following:
 - 1. Refer to Drawings for appliances.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Install equipment at locations shown on Drawings in accordance with Manufacturer's instructions.
- B. Connect equipment to power, water and ductwork rough-ins as applicable. Securely fasten built-in items where required.

3.03 FIELD QUALITY CONTROL

- A. Tests: Test each item for proper operation. Check and adjust oven thermostats for correct temperature.

3.04 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 12 21 00

BLINDS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Aluminum, horizontal blinds as shown on the Drawings and as specified.

1.02 SUBMITTALS

- A. Samples: Submit samples of blind materials, colors and patterns.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage and Protection: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.04 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions shown on Drawings by taking field measurements; proper fit and attachment of parts is required.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as otherwise specified approved by the Architect, subject to compliance with Specification requirements:
 - 1. Graber or Bali Brands, Springs Window Fashions (SWF) www.springswindowfashions.com
 - 2. Hunter Douglas Inc. www.hunterdouglas.com
 - 3. levolor Kirsch Window Fashions, Levolor Corporation www.levolor.com

2.02 HORIZONTAL MINI-BLINDS

- A. Aluminum, Horizontal Blinds: Graber / Bali Classics 1-inch horizontal Blinds, or as otherwise approved by Architect.
 - 1. Slats: 5000 Series cold-rolled aluminum with recycled content. Nominally 1.00 inches wide x .006-inch-thick, processed with Advanced Finishing Technology (AFT), providing a smooth, hard, less porous Surface.
 - a. Finish: Topcoat of polyester baked enamel in color scheduled on Drawings or as otherwise selected by Architect from manufacturer's full range of standard colors.
 - 2. Headrail: 1-inch high x 1-inch wide x .025-inch thick U-shaped steel.
 - 1. Finish: Phosphate treatment, chrome-free sealer, HAP urethane primer and polyester baked topcoat in color as selected to match slats.

3. Tilter: Injection-molded thermoplastic with clutch mechanism to prevent damage due to over-tilting.
4. Tilt Rod: Electro-zinc coated solid steel, 1/4-inch square.
5. Tilt Wand: Clear polycarbonate, hexagonal cross section, approximately 1/4-inch diameter. Spring clip attachment to tiler shaft.
6. Cord Lock: Snap-in design metal incorporating a floating, shaft-type locking pin. Crash proof safety feature to lock blind automatically upon release of cord.
7. Drum and Cradle: Low-friction thermoplastic. Proved for each ladder.
8. Installation Brackets: Rivet-hinged front cover with finish matching headrail.
9. Braided Ladders: 100 percent polyester yarn incorporating two extra strength rungs per ladder for slat support. Standard spacing of 22.5mm.
10. Bottom Rail: Tubular shape, 0.25-inch-thick, finish matching slats.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination with other Work: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Install window blinds in strict accordance with Manufacturer's instructions. Install straight and plumb, securely fastened, and with horizontal and vertical lines level and true with window framing.
- B. Evidence of drilling, cutting and fitting to room finish shall be concealed in the finish work. Provide uniform clearance at edges not to exceed 3/16 inch. Adjust hardware for smooth operation.
- C. Install blinds between vertical window mullions with discontinuous head channel and slats, allowing independent blind operation for separate glazing units, unless otherwise indicated on Drawings.

3.03 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 12 24 13

ROLLER SHADES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes manual operated cordless solar shades as indicated on Drawings and as specified herein.

1.02 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall be a firm qualified to install the product specified, as demonstrated by prior experience.

1.03 SUBMITTALS

- A. Samples of shade fabric for verification of selection.
- B. Shop Drawings showing mounting details and typical installation recommendations.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Packing and shipping:
 - 1. Materials shall be stored in a clean area free of corrosive fumes and dust, and away from construction activities.
 - 2. Materials shall be stacked horizontally using plastic or wood shims such that drainage and ventilation are provided for, and such that water cannot accumulate in, about, or upon the containers.
 - 3. Stacks shall be covered with tarpaulins or plastic to prevent contaminants from contacting surfaces, while also allowing for ventilation.

1.05 PROJECT/SITE CONDITIONS

- A. Prior to installation, roof shall be watertight, windows and frames installed and glazed, interior doors hung and wet work including concrete, masonry, plaster, stucco, gypsum board taping and finishing (including sanding) shall be complete and dry.
 - 1. Ceilings, window pockets, and electrical and mechanical work above the product shall be complete.

1.06 WARRANTY

- A. Product shall be warranted against manufacturing defects in materials and workmanship for 3 years after completion of installation.
 - 1. Manufacturer shall have the option to either repair or replace the defective product as approved by the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following manufacturers, except as otherwise approved by the Architect, subject to compliance with specifications requirements:
1. SWF Contract as manufactured by Springs Window Fashions www.swfcontract.com
 2. MechoShade Systems, Inc. www.mechoshadesystems.com
 3. Mariak www.mariak.com
 4. SKYCO Shading Systems, Inc. www.skycoshade.com
 5. As approved by Architect.
- B. Basis of Design: Drawings and Specifications are based on solar shades manufactured by SWF Contract.

2.02 MANUAL MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
1. Bead Chains: #10 Stainless steel.
 2. Loop Length: As required to operate full height of window shade.
 - a. Limit Stops: Provide upper and lower round nickel-plated steel ball stops.
 - b. Chain-Retainer Type: Locking-style chain retainer restricts the operation of the chain unless the chain retainer is properly mounted to a fixed surface such as a window frame, sill, or wall. Compliant with American National Standard for Safety of Corded Window Covering Products ANSI A100.1. Non-locking P-Clip is not acceptable.
 - 1) Color: As selected by Architect.
 3. Spring Lift-Assist Mechanisms (SA): Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.
 - a. Provide 6 lb. (2.7 kg) lift assist for shades as recommended by manufacturer.
- B. Rollers: Extruded-aluminum tubes engineered with channel to accept fabric spline. The diameter and wall thickness to be determined by manufacturer based on fabric selection and shade size to provide minimal deflection and optimal performance.
1. Clutch System: Consists of fiberglass filled nylon for wear resistance, smooth operation and corrosion resistance. The clutch is comprised Velvetrol™ internal spring arrangement for a smooth pulling force that locks the shade in any position when operating the control loop. The clutch mechanism is bi-directional and does not require adjustment or lubrication. Clutch to be inserted in roller tube at manufacturing. Clutch size to be selected by manufacturer based on fabric selection and shade size.
 2. Roller Drive-End Location: As indicated on Drawings or selected by Architect.
 3. Direction of Shade Roll: Regular, from back of roller.
 4. Fabric-to-Roller Attachment: Removable spline system shall consist of a co-extruded PVC spline heat-welded to the shade fabric and inserted into an engineered channel on the roller tube. The spline system allows for adjustability on-site and ease in changing fabric bands in the field.
 5. Idler End: Constructed of high strength, fiberglass filled nylon with spring-loaded pin-end technology for wear resistance, smooth operation, and corrosion resistance.

- C. Mounting Hardware: Brackets, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
 - 1. Thickness; 16 gauge.
 - 2. Material: Stamped steel.
 - 3. Description: Non-fascia bracket, white powder coated. Fascia bracket, white powder coated.

- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to couple up to three inline rollers into a linked shade system that is operable by one roller drive-end assembly. Linking system allows alignment of hem bars without removing shade from brackets by the Infinite Adjuster.

- E. Fabric Band Bottom Bar:
 - 1. Fabric Band Bottom (Hem) Bar: Extruded aluminum.
 - a. Type: Hem bars to be extruded aluminum in weight sufficient for proper shade operation. Enclosed in heat sealed pocket of fabric band material.
 - 2. Color: As scheduled on Interior Finish and Material Legend on Drawings, or as otherwise selected by Architect.

- F. Installation Accessories:
 - 1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller end brackets without exposed fasteners.
 - a. Shape: L-shaped.
 - b. Size: Manufacturer's standard required to conceal roller and fabric band when shade is fully open, but not less than height 3.75 inches (95 mm) by 1.5 inches (38 mm).
 - c. Color and Finish: Clear satin anodized.
 - d. End cap: to cover exposed ends of fascia
 - 2. Exposed Pocket: Rectangular, extruded aluminum 3-sided enclosure covering front, top and back, with optional end caps, and optional removable bottom closure plate.
 - a. Width 4.75 inches (121 mm) by Height 5 inches (127 mm).
 - b. End cap: to cover exposed ends of pockets.
 - c. Color and Finish: Clear satin anodized.
 - 3. Blackout Channels: Extruded aluminum channels with two piece snap design to conceal fasteners. Provide synthetic pile inserts designed to eliminate light gaps at sides of shades.
 - a. Side Size: 2 inch (51 mm) by 1 inch (25 mm) to eliminate light gaps at sides of shades.
 - b. Center Size: 4 inch (102 mm) by 1 inch (25 mm) to eliminate light gaps between adjoining shades.
 - c. Sill Size: 2 inch (51 mm) by 1 inch (25 mm) to eliminate light gaps at bottom edge of shades.
 - d. Color and Finish: Clear satin anodized.

2.03 FABRIC BAND MATERIALS

- A. Fabric Band Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

- B. SWFcontract Nightfall Blackout Fabric, Light-Blocking Fabric: Opaque fabric, stain and fade resistant.
 - 1. Source: Springs Window Fashions.
 - 2. Type: Blackout, PVC-coated fiberglass with bonded PVC film.
 - 3. Roll Width: 72 inches (1829 mm).
 - 4. Orientation on Fiber Band: As indicated on Drawings or as selected by Architect.
 - 5. Features: Washable, Antistatic treatment.
 - 6. Color: As scheduled on Interior Finish and Material Legend on Drawings, or as otherwise selected by Architect.

2.04 FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with ANSI - WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
 - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).
 - 2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to- end installations at centerlines of mullion or other defined vertical separations between openings.
- C. Fabric Band Fabrication: Fabricate fabric bands without battens or seams to extent possible except as follows:
 - 1. Railroaded Materials: Railroad material where material roll width is less than the required width of fabric band and where indicated. Provide battens and seams as required by railroaded material to produce fabric bands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of fabric band.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work, field measurements, and mounting surfaces and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.
- C. Subcontractor shall verify that site is free of conditions that interfere with shade installation and operation and shall begin installation only when any unsatisfactory conditions are rectified.

3.02 INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units per manufacturer's written instructions.
 - 1. Opaque Fabric Bands: Located so fabric band is not closer than 2 inches (51 mm) to interior face of glass. Allow clearances for window operation hardware.

3.03 CLEANING

- A. Clean surfaces after installation, per manufacturer's written instructions. Do not use cleaning methods involving heat, bleach, abrasives, or solvents.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, ensuring that window treatments are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged window treatments that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.
- D. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

3.04 DEMONSTRATION

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout the entire operational range.

END OF SECTION

SECTION 12 31 00

MANUFACTURED METAL CASEWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Custom fabricated stainless steel casework and countertops as shown on Drawings and as specified herein.
- B. Related Sections:
 - 1. Section 06 40 00 – Architectural Woodwork, for plastic laminate and wood veneer faced casework.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings showing layout, dimensioned plans and elevations, adjacent conditions, large-scale details, hardware, and attachment devices.
 - 1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 2. Show locations and cutouts and holes for plumbing fixtures, faucets, and other items.
 - 3. Indicate hardware locations and types.
 - 4. Indicate locations of and clearances from adjacent walls, finishes and equipment.
- B. Samples:
 - 1. Submit samples of stainless steel sheet to be used in specified finish and thickness.
 - 2. Submit one Sample of each type of hardware specified or required.
- C. Qualification Data: For fabricator.

1.03 QUALITY ASSURANCES

- A. Qualifications: Manufacturer shall be company specializing in manufacturing the products specified in this Section with minimum 5 years documented experience.
- B. Source Limitations: Obtain stainless steel casework, including countertops, through one source from a single manufacturer.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 19 – Project Meetings.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.
- C. Storage: Adequately protect against damage while stored at the site.
- D. Handling: Comply with Manufacturer's instructions.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Where stainless steel casework is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.06 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that stainless steel casework can be supported and installed as indicated.

1.07 WARRANTY

- A. Furnish written warranty that stainless steel casework, including hardware, shall remain free from defects in material or workmanship for a period of two (2) years from date of substantial completion of Project and shall be removed and replaced without cost or expense to Owner. Defects include, but are not limited to the following:
 1. Slippage, shift, or failure of attachments to wall, floor, or supporting construction.
 2. Weld or structure failure.
 3. Warping or unloaded deflection of components.
 4. Failure of hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish manufactured metal casework of one of the following Manufacturers, or as otherwise pre-approved by the Architect, subject to compliance with Specification requirements:
 1. LOC Scientific www.locscientific.com
 2. Kloppenburg & Co. www.kloppenberg.com
 3. Kewaunee Scientific Corporation www.kewaunee.com
 4. Mott Manufacturing www.mott.ca
 5. As approved by Architect.

2.02 MATERIALS

- A. Stainless Steel Sheet: ASTM A666, Type 304, stretcher-leveled standard flatness.
 1. Minimum Nominal Stainless Steel Thickness for Stainless Steel Casework: .0625 inch (16 gauge), except 18 gauge may be used for backed countertops.
 2. Finish: ANSI No. 4 Brushed Finish, unless otherwise indicated on Drawings.

2.03 HARDWARE

- A. General: Provide metal casework manufacturer's standard brushed stainless steel finish, commercial-quality, heavy-duty hardware equal to or complying with products specified.
- B. Shelf Standards and Supports for Cabinet Mounted Shelving: K&V 255 standards and 256 supports.
- C. Drawer and Door Pulls: Stainless steel, wire pulls; 4 inches long; 5/16 inches in diameter; and fastened from back with 2 screws. Provide 2 pulls for drawers more than 24 inches in width.

- D. Drawer Slides: All drawer glides shall be Accuride Eclipse Easy-Close, full extension, 150 lb. capacity minimum for all applications.
- E. Hinges: Other function hinges may be submitted for approval for special circumstances.
 - 1. ANSI-A156.9, B01612 – concealed hinge, self closing with soft close, 120 to 125 degree of opening, full overlay type for screw attachment complete with mounting plates. Blum Clip Top m120 deg.+ with Add-On Blumotion Soft Close, or equal as manufactured by Mepla, Salice, or Hettich.
 - 2. Other function hinges may be submitted for approval for special circumstances.
- F. Door Catches: Nylon-roller spring catch or dual, self-aligning, permanent magnet catch. Provide 2 catches on doors more than 48 inches in height.
- G. Locks: National C8138 for drawers; National C8123 for doors.
- H. Heavy-Duty Standard and Brackets for Pantry Shelving: Herman Miller, or equal.
- I. Provide all other hardware as necessary to fulfill function of architectural woodwork and cabinets as shown on Drawings, subject to approval by Architect.
- J. Finish: ANSI No. 4 Brushed Finish, unless otherwise indicated on Drawings.

2.04 FABRICATION

- A. General: Assemble and finish units at point of manufacture. Use precision dies for interchangeability of like-size drawers, doors, and similar parts. Perform assembly on precision jigs to provide units that are square. Reinforce units with angles, gussets, and channels. Integrally frame and weld to form a dirt and vermin-resistant enclosure. Maintain uniform clearance around door and drawer fronts of 1/16 to 3/32 inch. Exposed fasteners are not allowed.
 - 1. Sizes and Configurations: As indicated on Drawings.
 - 2. Fabricate casework from .0625 inch (16 gauge) stainless steel.
 - 3. Fabricate “L” shapes front corner reinforcement gussets and hinge reinforcements from .0781 inch (14 gauge) stainless steel.
 - 4. Fabricate bottom leveler gussets from .1250 inch (11 gauge) stainless steel.
 - 5. All cabinets shall have a cleanable smooth interior. Front and rear reinforcing members, and channel shaped uprights shall be enclosed full height.
 - 6. Front face joints shall be fully welded, ground smooth and polished to provide a continuous flat front plane free of crevices.
 - 7. Where necessary, provide removable back panels for access to stops, valves, junction boxes, and service lines.
 - 8. Provide one-piece die-formed cabinet bottom construction with return side flanges turned down. Spot weld flanges to cabinet sides.
 - 9. Cabinet bottoms shall be turned down at front to form 1-1/4 inch U-channel to accept stainless steel toe kick.
 - 10. All base cabinets shall be supported on (4) adjustable leveling glides.
 - 11. Bottom of base cabinets shall be removable to provide access to leveling glides or punched 3/4 inch dia. Corner holes to access levelers and to accept stainless steel or PVC press plugs.
- B. Flush Doors: Outer and inner pans that nest into box formation, with full height channel reinforcements at center of door. Fill doors with noncombustible, sound-deadening material. Provide recessed block-outs in door backing plate to accept hinges.

- C. Drawers: Fronts made from outer and inner pans that nest into box formation, with no raw metal edges at top. Sides, back, and bottom fabricated in one piece with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal. Weld drawer front to sides and bottom to form a single, integral unit. Provide drawers with rubber bumpers, ball-bearing slides, and positive stops to prevent metal-to-metal contact or accidental removal.
- D. Adjustable Shelves: Front, back, and ends formed down, with edges returned horizontally at front and back to form reinforcing channels.
- E. Stainless Steel Countertops: Fabricate counters with integral sinks, sizes as indicated. Provide with square edges as detailed on Drawings.
 - 1. Connections shall be shielded arc welded and ground smooth to match adjacent surfaces.
 - 2. Reinforce as necessary for rigidity.
 - 3. Fabricate in largest sections practicable, with integral back and end splashes as indicated.
 - 4. Fabricate counters with backing material of plywood or MDF as specified. Provide Marine Grade plywood at countertops with sinks or within 24 inches of sink.
 - 5. Coat back of stainless steel assemblies with sound deadening material. Provide with mounting hardware as appropriate to the installation and as necessary.
- F. Provide cutouts, rough openings, and recesses for appliances, outlet boxes, lighting fixtures, plumbing components, fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges. Extend J-boxes as required by NEC.
- G. Provide closure panels, scribes, and fillers formed from .0625 inch (16 gauge) stainless steel, secured to cabinet without exposed fasteners.
- H. Provide stainless steel backsplash and wall cladding between base and upper cabinets. Return all exposed edges.

2.05 ACCESSORIES

- A. Adhesives:
 - 1. Laminate Adhesive: 3M Fastbond 30, or equivalent to suit application.
 - 2. Wall Panel Adhesive: Cartridge type compatible with paneling and wall substrate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of metal casework.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Install level, plumb, and true; shim as required, using concealed shims. Where metal casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- B. Base Cabinets: Adjust top rails and subtops within 1/16 inch of a single plane. Fasten cabinets to partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 24 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch.
- C. Wall Cabinets: Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 24 inches o.c. Align similar adjoining doors to a tolerance of 1/16 inch.
- D. Install countertops level and aligned with base cabinets. Attach to base cabinets with concealed fasteners.
- E. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.
- F. Adjust metal casework and hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.
- G. Comply with requirements in Division 22 Sections for installing water service fittings and piping.
- H. Adhere stainless steel backsplashes and wall panels with adhesive.

3.03 ADJUSTING

- A. Repair or replace defective work, as directed by Architect or Owner's Representative at completion of installation.
- B. Adjust doors, drawers, and hardware to function smoothly.

3.04 CLEANING

- A. Clean finished surfaces. Touch up as required and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- B. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 12 36 61

SOLID SURFACING COUNTERTOPS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Solid surfacing material countertops and backsplashes as indicated on Drawings and as specified.
 - 2. Solid surfacing material windowsills.
- B. Related Sections:
 - 1. Section 06 40 00 – Architectural Woodwork, for subtops for solid surfacing material countertops.

1.02 SUBMITTALS

- A. Product Data: Indicate product description, fabrication information and compliance with specified performance requirements.
- B. Shop Drawings: Indicate dimensions, component sizes, edge details, fabrication details, locations and dimensions of cutouts, required locations of support and blocking members, attachment provisions and coordination requirements with adjacent work.
- C. Samples: Submit two (2), 12-inch x 12-inch samples of each color/finish of solid surfacing material required.
- D. Maintenance Data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions.

1.03 QUALITY ASSURANCE

- A. Fabricator/Installer Qualifications:
 - 1. Certified or approved by the Manufacturer.
 - 2. Subject to approval by Architect.
 - 3. Have adequate physical facilities and sufficient production capacity to produce, transport, deliver, and install the required units without causing delay in the work.
 - 4. Have a minimum of 2 years of fabrication experience.
- B. Fire Test Response Characteristics: Provide materials with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspection agency acceptable to authorities having jurisdiction:
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed Index: 450 or less.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver no components to project site until areas are ready for installation. Store indoors in a dry area and away from extreme temperatures.
- B. Deliver materials and accessory products in manufacturer's unopened containers.

- C. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.05 WARRANTY

- A. Provide manufacturer's ten year limited warranty against visible defects and failure due to manufacturing defects. Damage caused by physical or chemical abuse or damage from excessive heat is excluded from warranty. Warranty shall provide material and labor to repair or replace defective materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish solid surfacing materials of the following manufacturer as scheduled on the Room Finish Legend on Drawings, or equivalent prior approved by Architect:
 - 1. Corian as manufactured by Du Pont, Inc. www.dupont.com
 - 2. As approved by Architect.

2.02 MATERIALS

- A. Solid Surfacing Material: Manufacturer's proprietary formulation of fully densified composite of modified polymer resins and mineral fillers with through body colors meeting ANSI Z124.3 or ANSI Z124.6.
 - 1. Color and Finish: As scheduled on Room Finish Schedule on Drawings by reference to Manufacturer's proprietary color and finish designations, or equivalent as approved by the Architect.
 - 2. Thickness: Fabricated from 1/2-inch-thick material minimum.
 - 3. Provide edge details of profiles shown on the Drawings. Ease edge slightly where edge is indicated to be square.
 - 4. Provide backsplashes, where shown on the Drawings, to dimensions shown on the Drawings.
- B. Provide edge details of profiles shown on the Drawings.
- C. Provide backsplashes, where shown on the Drawings, to dimensions shown on the Drawings.
- D. Superficial damage to a depth of 0.010 inch (.25mm) to solid surfacing materials shall be repaired by sanding and/or polishing.

2.03 ACCESSORY PRODUCTS

- A. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints. Color to match fabrication material.
- B. Panel Adhesive: Manufacturer's standard neoprene-based panel adhesive meeting ANSI A136.1-1967 and UL(R) listed.
- C. Sealant:
 - 1. For conditions exposed to moisture; Manufacturer's standard mildew-resistant, FDA/UL(R) recognized silicone sealant in colors matching components.
 - 2. For conditions not exposed to moisture; Manufacturer's standard silicone sealant in colors matching polymer material.

2.04 FABRICATION

- A. Fabricate components to greatest extent practicable to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
- B. Where indicated, form units with integral thermal formed sinks of type, size and profile indicated on Drawings.
- C. Form joints between components using manufacturer's standard joint adhesive; without conspicuous joints. Reinforce joints with 2 inch strip of solid surfacing material.
 - 1. Avoid joints within 1 inch of inside or outside corners.
- D. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings. Coordinate with scheduled and specified plumbing fixtures and toilet room accessories.
- E. Cut, rout and finish component edges with clean, sharp returns. Rout radii and contours to template. Repair or reject defective and inaccurate work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Install components plumb and level, scribed to adjacent finishes, in accordance with approved shop drawings and manufacturer's installation instructions.
- B. Provide materials in largest pieces available to minimize field joints.
- C. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.
- D. Cut and finish component edges with clean, sharp returns. Rout radii and contours to template.
- E. Anchor securely to base cabinets or other supports as indicated.
- F. Align countertops and form seams to comply with manufacturer's printed recommendations using adhesive in color to match countertop.
- G. Install countertops and windowsills with no more than 1/8 inch sag, bow or other variation from straight line.
- H. Provide backsplashes and sidesplashes as indicated on the drawings. Adhere to countertops using manufacturer's standard color-matched silicone sealant and panel adhesive.

- I. Carefully dress joints smooth, remove surface scratches and clean entire surface.
- J. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Keep clean until Date of Substantial Completion. Replace stained components.

3.03 PROTECTION

- A. Protect surfaces from damage until Date of Substantial Completion. Repair work or replace damaged work that cannot be repaired to Architect's satisfaction.

3.04 CLEANING

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 12 93 00

SITE FURNISHINGS AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Backflow preventer security cages.
 - 2. Splash blocks.
 - 3. Other items as may be indicated on Drawings.
- B. Related Sections:
 - 1. Section 05 50 00 – Metal Fabrications, for fabricated steel tube bicycle racks.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's product data showing products selected.
- B. Samples: Submit samples of selected colors for verification purposes.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SITE ACCESSORIES

- A. Backflow Prevention Device Enclosures: Provide enclosure cover of type and size indicated on Drawings, as manufactured by Backflow Prevention Device Inspection, Inc (BPDl) www.bpdiaz.com, or Guardshack Enclosures www.guardshackenclosures.com
- B. Precast Concrete Splash Blocks: Plant-cast, 5,000 psi, air-entrained concrete splash blocks, size as indicated on Drawings by 3 inches deep with formed dish shape to direct water away from building.
- C. Other items as may be indicated on Drawings.

2.02 INSTALLATION ACCESSORIES

- A. Installation Accessories: As recommended by or provide by the accessory manufacturer for the type of installation indicated, and as follows:
 - 1. Epoxy Anchor Bolt Adhesive: Commercial grade, 2-component, non-sag, moisture insensitive, high-strength structural epoxy. Acceptable products include, but are not limited to the following:
 - a. Quikrete HS Anchor Epoxy.
 - b. Simpson Strong-Tie Set-XP.
 - c. ITWRedHead G5 High Strength Epoxy.
 - 2. Mechanical Anchors: In accordance with Section 05 50 00. Anchors shall have tamper-resistant heads.

PART 3 EXECUTION

3.01 EXAMINATION

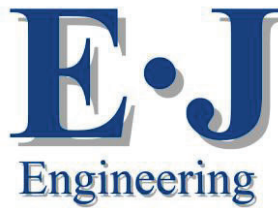
- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Handle and install site accessories in accordance with manufacturer's recommendations and installation instructions.
- B. Backflow Prevention Device Enclosures: Set units at each backflow prevention device or water valve as indicated on Drawings and in accordance with manufacturer's instructions using theft resistant fasteners to concrete base secured with epoxy anchoring adhesive.
- C. Splash Blocks: Place on finished grade below each roof downspout location as indicated on Drawings.
- D. Other Site Furnishings as Accessories: Place at locations indicated. Where indicated to be anchored, anchor in place with tamper resistant fasteners in accordance with manufacturer's recommendations or as otherwise indicated on Drawings or approved by Architect.

END OF SECTION

CITY OF PHOENIX FIRE STATION #74



EJ Engineering, Inc.
21505 N. 78th Ave
Suite 130
Peoria, AZ 85382

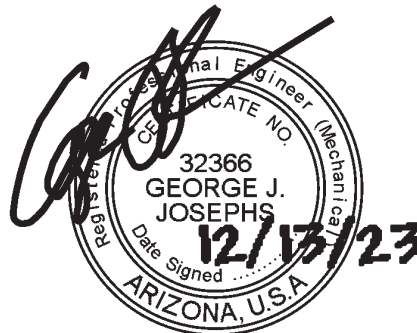
623.362.1400 Phone
www.ejengineering.com

FIRE PROTECTION SPECIFICATIONS

SECTION 211313 – WET PIPE SPRINKLER SYSTEM

A handwritten signature in black ink, appearing to read 'John L. Echeverri'.

John L. Echeverri, Principal
NICET Level IV Automatic Sprinklers
NICET Level III Special Hazards
NFPA Certified Fire Protection Specialist
NICET SET Cert. 78493 & CFPS Cert. 1915
NICET SET Cert. 78493 Exp. 03/2026



SECTION 211313 – WET PIPE SPRINKLER SYSTEM

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION

- A. Provide all labor, materials, equipment, and services necessary for a complete and fully automatic operation of the Automatic Fire Sprinkler Protection system in conformity with requirements of the Authority Having Jurisdiction (AHJ), Owner, Architect, and EJ Engineering Group, Inc., as indicated herein and in the Contract Documents. It shall further include furnishing and installing all miscellaneous items required for the proper operation of the Fire Protection system, whether specifically called for or not. Install and deliver all systems and subsystems in complete working order and in full accordance with the intent and meaning of these documents. Scope shall include new sprinklers and piping, appurtenances and all AHJ approvals.
- B. All Architectural drawings and specifications, general, special, and supplementary conditions, owner's certificate, and stock disclosure forms shall be considered a part of these specifications.
- C. Prior to submitting bid as well as prior to installation, become thoroughly familiar with actual existing conditions and of the present installations of other disciplines (ductwork, structure, etc.). The intent of the work is indicated on the engineered construction documents and described herein, and no consideration shall be granted by reason of lack of familiarity on the part of the Contractor with respect to actual physical conditions, requirements, and practices at the project site. Be fully informed regarding all regulations and limitations of the available spaces for installation. Later claims for labor, work, material, and equipment required for any difficulties that could have clearly been foreseen will not be recognized; all such difficulties shall be properly handled by this Contractor at no additional cost to the Owner. Submit appropriate RFI (Request For Information) documentation including (1) item to be addressed (2) options and (3) recommendation(s) prior to commencement of any work in areas that require further elaboration.
- D. Carefully check the documents of other sections to determine the requirements of any related work furnished and/or installed by that section. Submit appropriate RFI (Request For Information) documentation prior to commencement of any work as required.
- E. Keep site free from surplus material, tools, and rubbish at all times during construction. Leave the site in clean condition at all times.
- F. Protect materials and equipment from all damage due to theft, fire, vandalism, weather, etc. The installation of piping, fittings, couplings, or other items than new in all respects shall not be acceptable and shall be removed if discovered. Such costs shall be completely borne by this FP Contractor and/or the project General Contractor.
- G. Repair any damage, at no extra cost to the Owner, caused to work of other sections.
- H. Repair any damaged fireproofing, structure, etc., at no extra cost to the Owner, caused to integrity of any original construction or other section.
- I. Contractor agrees that he/she and his/her subcontractors, agents, and employees will provide and maintain a safe place to work, and that he/she and they will comply with all laws and regulations of any government authority having jurisdiction thereof, including but not limited to

OSHA. The Contractor agrees to indemnify, defend, and hold harmless, Engineer, Owner and Architect from and against any liability, loss, damage, or expense, including attorney's fees, arising from a failure or alleged failure on the part of Contractor, his/her and their agents, and employees to provide and maintain a safe place to work or to comply with all laws and regulations of any governmental AHJ thereof.

- J. Transmit all information required for work being performed by other sections in ample time for proper installation, and for the provision of all openings required in floors, ceilings and/or walls.
- K. Field drilling and cutting of holes in building structure required for work under this section shall be coordinated in writing through the General Contractor (GC), and approved by Owner and Structural Engineer in writing prior to commencement of any work. General Contractor shall bear all costs for such coordination, drilling, cutting, and reinforcing.
- L. General Contractor shall furnish and set all sleeves, including sealants commensurate with the construction of the wall, floor, roof and elsewhere as will be required for the proper protection of each piping passing through building surfaces. Coordinate work expeditiously with the GC.
- M. Provide **embossed** design placards, identification signs, and pipe labels on all system equipment and piping. The use of engraving tools is not an acceptable substitute to a professionally embossed design placard. Pipe labels shall be placed on mains and branch lines such that they are clearly visible from floor level.
- N. Check the dimensional accuracy of the center-to-center pipe dimensions indicated on the approved construction documents to account for slope, etc. Include in bid costs for all required work, including AHJ field requirements, as may be required due to final structural member layout as well as dimensions along roof slopes.
- O. Notify the GC and Engineer in writing, within five (5) days of award of contract, of the proposed delivery schedule of any equipment or material.
- P. Submit a single guarantee stating that all portions of the work are in accordance with contract requirements. Guarantee all work against faulty and improper material and workmanship for a minimum period of one (1) year from date of substantial completion by Owner. Where contract, other specification sections, and/or State law specify guarantees or warranties for longer terms, then longer terms shall apply.
- Q. Correct any deficiencies during the guarantee period, all to the satisfaction of the Owner, at no additional cost to the Owner within a reasonable time. The Contractor shall be responsible for any damage caused by such deficiencies and repair thereof and reimburse the Owner for all costs; including damage caused by him/her or by defects in his/her work, materials, or equipment.
- R. During the warranty period, the Contractor shall provide emergency repair service for the entire system. This service shall be provided at a minimum on a 24-hour per day, 7-day per week basis.
- S. This contract shall begin at a point of connection to the underground fire riser water supply line. Coordinate required work with Utility Contractor. This point of connection may occur at either the flange connection at the base of the fire riser, or at a point 5-feet beyond the building. In either case, it shall be the shared responsibility of the GC, Utility Contractor, and the Fire Protection Contractor to ensure that the appropriate water line size, floor sleeve with clearances per NFPA-13, and final location with minimum dimensions to walls per local AHJ has been determined and verified in accordance with approved Fire Protection construction documents (including fire line reference plan and hydraulic calculations). Due to demand requirements, a minimum 6-inch underground fire line supply line is anticipated.

1.2 RELATED WORK

- A. Painting of sprinkler system components, including piping and valves, if required in other sections of the specification manual shall be by the painting contractor. However, the protection and preparation of the sprinkler piping, equipment, appurtenances, and sprinklers for the painting contractor shall be the responsibility of this fire sprinkler contractor. This includes the placement and removal of protective caps, bags, or other protective devices on sprinklers designed to prevent paint from touching any portion of the sprinkler assembly.
- B. The fire sprinkler contractor shall remove all labels, stickers, fabrication identification tags, excess pipe dope or Teflon tape, oil residues and grease from the sprinkler piping before the system is turned over to a painting contractor for painting. If pipe is to remain unpainted, then the same shall apply. Pipe manufacturer engraving or labeling shall NEVER be removed.
- C. The fire sprinkler contractor is to install protective plastic bags on all fire sprinklers in areas where the roof deck and/or structural systems or components are to be painted. In addition, all brass valves shall be protected from painting. Painted or over-sprayed valves shall be replaced at no additional cost to the Owner.
- D. The painting contractor shall remove all plastic bags and valve coverings after final painting is complete. The GC shall coordinate this work with the fire sprinkler contractor AND painting contractor PRIOR to commencement of any work.
- E. Any fire sprinkler that has been over-sprayed with paint or otherwise compromised shall be replaced per NFPA and fire sprinkler manufacturer recommendations and requirements. Cleaning or otherwise removing paint from an installed fire sprinkler shall not be acceptable. Painted fire sprinklers shall be replaced PRIOR to call for inspection at no additional cost to the Owner.
- F. Alarm System only includes flow or supervisory devices installed by this Fire Protection Contractor for local or remote annunciation of Automatic Fire Sprinkler System. Wiring of the actual devices is by Electrical or Alarm Contractor.
- G. Concrete-filled pipe guard posts for protection of Fire Protection equipment shall be provided where equipment or materials are subject to vehicular or other damage. This includes, but is not limited to, Post Indicator Valves, Backflow Assemblies, Fire Department Connections, etc.
- H. Concrete splash blocks shall be at main drain, auxiliary drain, and test Outlets.

1.3 WORK TO BE PERFORMED

- A. Complete automatic fire sprinkler system protection throughout the project in accordance with these documents. This shall include, but not limited to the following items:
 - 1. System piping (CRR of 1.00 or greater and automatic sprinklers with appropriate temperature ratings for the anticipated ambient temperatures in the individual areas).
 - 2. 2-way Fire Department Connection (chrome finish) with appropriate Fire Department threads, check valve and automatic drip as required. The use of "Storz" connections is discouraged and shall be provided only where required by the AHJ.
 - 3. Operating and maintenance manual including NFPA-25.
 - 4. Identification signs and embossed riser design placards.
 - 5. Waterflow indicating equipment and valve supervisory devices. Coordinate wiring with Electrical/Alarm Contractor. This includes supervision or annunciation of on-site fire

protection backflow assemblies; the installation of properly sized conduit and wiring from the backflow assembly to the interior of the building shall be coordinated and appropriately installed PRIOR to preparation of parking and landscaping areas.

6. Inspector's test and auxiliary drains.
 7. Equipment Shop Drawing submittal detailing each individual type of installed equipment; including manufacturer, model/sprinkler identification number, size, and its UL Listing and/or FM Approval Stamp.
 8. Sleeves and related waterproof and/or fire-rated sealants.
 9. Inserts, hangers, bracing, etc., as required to hang, support, and protect the system piping in accordance with NFPA.
 10. Providing AHJ-listed backflow valve assembly where required and, having assembly tested and approved by an AHJ certified technician prior to request for final inspection. FP Contractor shall provide a means for full forward flow testing of the interior backflow assembly via one of the industry accepted methods that is also accepted by the local AHJ. Coordinate with AHJ via shop drawing plan submittal to AHJ.
 11. Accuracy of pre-fabricated and field-fabricated pipe, location of sprinkler deflectors per NFPA and manufacturer, piping elevations, riser nipple lengths and all system dimensions.
 12. Complete testing of system, including the completion of *Contractor's Material and Test Certificate for Aboveground Piping*. In addition, verification that the Utility Contractor has completed the *Contractor's Material and Test Certificate for Underground Piping*.
 13. System flushing of the aboveground piping system prior to connection of the underground system.
 14. Guarantee all equipment and system for a one (1) year period after date of substantial completion as determined by Architect, Owner or his/her Agent and General Contractor.
- B. All work shall conform to the requirements of the applicable portions of the International Building and Fire Codes, Uniform Building and Fire Codes (where applicable), and National Fire Codes and Standards (i.e., NFPA-13, 25, 291 and 101) in addition to Local, State, Federal Codes with Amendments, Local Fire Department Design Guidelines, and Industry Standards and Practices. If there is a conflict, then it shall be the Contractor's responsibility to bring the conflict to the attention of the Engineer immediately, and in writing via a Request For Information (RFI) for resolution prior to commencement of any work. This conflict shall then be resolved at no additional cost to the Owner.
- C. Contractor shall be fully responsible for all filing, and Building Department and/or Fire Department permit fees associated with securing approvals necessary for this work, including coordinating lock box permits for Building Keys and Keyed FDC caps when required.
- D. Installing Contractor Qualifications: Installation of new automatic fire sprinkler system components; piping, equipment, specialties, accessories, and repair/servicing shall only be performed by a qualified installer. The term qualified shall mean experienced in such work, familiar with all precautions required and having complied with all the requirements of the State and Local AHJ's. Installer shall be licensed with the State and Local AHJ's, and shall have a minimum NICET Level III Technician as the on-site superintendent during the installation. If Local AHJ has a separate licensing or similar requirement, the NICET Level III Technician shall be a minimum requirement. Submit evidence of such qualifications with submission of bid and provide immediate confirmation of NICET Level III Certification upon request by Owner or this Consulting Engineer.

1.4 DEFINITIONS

- A. Provide: Furnish and Install.
- B. Furnish: Purchase and deliver to other trades or Owner. Always verify prior to bidding.
- C. Install: Install materials, equipment, or assemblies furnished by other trades or Owner. Verify prior to commencement of bidding.
- D. Authority Having Jurisdiction (AHJ) includes City and State officials.
- E. Owner: Includes Owner, his/her Agents, Architect and Engineers.
- F. Insurance Carrier: Queen Creek insurance carrier requirements match NFPA, and other Published Standards as indicated on the Engineered Construction Documents.
- G. NFPA: National Fire Protection Association. Includes Codes, Standards and Recommended Practices. Latest published and adopted (adopted by either State or Local Authority Having Jurisdiction) editions are utilized within the body and requirements of this specification and associated set of construction documents.

1.5 DESIGN CRITERIA

- A. Provide wet pipe fire sprinklers in all areas as required by NFPA, AHJ, and these specifications and/or approved construction documents. All areas of the building shall maintain a minimum temperature of not less than 40-degrees Fahrenheit at all times. This includes areas above ceilings. Where winter temperatures require the mechanical engineer to provide heating, then the FP Contractor shall clearly identify the heat source(s) on the shop drawings when submitting the plans to the AHJ and coordinate further with the GC to ensure that ALL areas will be heated to not less than 40-degrees Fahrenheit 24/7/365, and that the fire sprinkler temperature ratings and distances are appropriate (per NFPA-13) given the final installed location of the heat source(s). Refer to Engineered Construction Documents for additional information.
- B. Refer to approved set of construction documents, including the architectural documents to ascertain all areas requiring work.
- C. It is this Contractor's responsibility to ascertain final roof slope prior to installation to ensure proper system design parameters are maintained (i.e., many sprinklers have maximum roof slope requirements). This fire protection contractor shall clearly indicate actual roof slope on shop/fabrication/construction drawings after reviewing structural shops with the GC.
- D. The construction documents generally indicate all piping within the heated building envelope. Provide and install additional anti-freeze protection where required by the local AHJ. Engineered Fire sprinkler system construction documents indicate that all areas of the building shall maintain forty (40) degrees Fahrenheit Ambient Temperature as defined by the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) published data. Chemical-based anti-freeze systems are NOT acceptable. Where acceptable by code a minimum 2-inch nominal diameter wet-pipe system shall be provided in lieu of dry-piped subsystems. Provide pipe insulation as an additional anti-freeze measure on the aforementioned sub-systems where required. Contractor shall be fully aware of system design limitations when utilizing dry-pipe systems. Generally, all portions of this project will maintain a minimum of 40-degrees Fahrenheit at all times (24/7/365). However, it shall be this contractor's responsibility to ensure that the mechanical system installed meets those requirements in geographically required areas.

- E. Each wet-pipe sprinkler system/area shall produce a minimum discharge density per square foot or minimum operating pressure utilizing the most hydraulically demanding area of operation as required by NFPA, AHJ, and indicated on the Engineered Construction Documents.
- F. Minimum K-factor to be utilized for this work shall be 5.6 in all areas.
- G. Where the provided flow test has expired (i.e., not current, or reliable and/or outside of the time frame allowed by the AHJ) then the Fire Protection Contractor shall be responsible for contacting this Consulting Engineer to obtain new flow test data. FP Contractor will be held to submitting such a request via a written RFI through the GC. Test shall be conducted at the nearest hydrants on water main serving this project. FP Contractor and this Engineer shall coordinate permits, fees, test date/time, witnessing, and location with AHJ. Test shall be conducted per local AHJ and Water Purveyor requirements. Fire Protection Contractor will be held to paying for any flow test permits, fees, etc. Fire Protection Contractor shall NOT conduct new flow test, or obtain updated flow test information and/or data without first contacting this consulting engineer via RFI.
- H. As a *minimum*, water supply utilized in the hydraulic calculations shall maintain a 5-psi or 10% safety factor. Additional safety factor requirements may be imposed by the local AHJ. In addition, all system losses, including backflow devices, to a point nearest the actual flow test location shall be taken into account (i.e., source). Refer to Engineered Construction Documents for raw flow test data and flow test data with safety factors. Additional safety factors may also exist and may be found on the hydraulic calculations and/or the hydraulic design data blocks that are a part of the Engineered Construction Documents herein.
- I. The Contractor is directed to the fact that these Specifications are performance-type meaning that at the time of submission of bid the Contractor has contacted ALL governing agencies as to the required Scope of Work for the entire project. This shall include contacting Fire Marshals and AHJ and including his/her bid an amount to do such work as required by the AHJ. Submission of bid shall so indicate that all agencies have been contacted. In his/her bid include all required work such as backflow assemblies, fire pump units, Fire Department connections, etc., as required to provide a complete and working system ready to use when the building is occupied by the Owner.

1.6 SUBMITTALS

- A. Owner, his/her Agent, Architect, and this Fire Protection Consultant shall review material submittals for conformance to these specifications.
- B. The Contractor shall submit with his/her shop drawing submittal; including fabrication drawings, hydraulic calculations, and manufacturer's data sheets for each type and model of equipment utilized in the project. This FP Contractor shall submit drawings and hydraulic calculations in accordance with State, Local, and Fire Marshal mandates including NICET Level III or IV and/or P.E. Stamp and Fire Marshal Association Standards where required. FP Contractor will be supplied with the AutoCAD version of these Engineered Construction Documents; including hydraulic calculations for preparation of shop drawing submittal to local AHJ. Where the Engineered Construction Documents have already been approved by the local AHJ, then the submittal of the shop/fabrication drawings including equipment and material cut sheets shall be made via the GC to this engineer and the owner for review.
- C. When a data sheet indicates numerous products, the proposed product shall be clearly delineated by arrows or other suitable means. This includes sprinkler orifice sizes, finishes and temperature ratings. Failure to clearly indicate such products will result in immediate rejection of entire submittal without comment.

- D. Within thirty (30) days after award of contract, the Contractor shall submit six (6) sets of shop/fabrication drawings including hydraulic calculations, manufacturer's data sheets and catalog cut sheets where applicable for all necessary approvals from Architect and this Fire Protection Consultant prior to ordering of equipment or fabrication of materials.
- E. Contractor shall submit complete submittal packages. Partial and/or incomplete packages will be returned without further explanation. No extension of the contract time will be granted for the Contractor's failure to allow sufficient time for review and processing, or for submittals, which have been returned due to improper or incomplete submission.
- F. The Contractor will not be authorized to commence with any portion of this work, including material orders or fabrication, until the submittals for that portion of the work are received, reviewed, and approved by all required parties, including the AHJ.
- G. Prior to shop drawing submittal to Architect, the drawings shall clearly display the following stamps of approval as required:
1. Local Fire Marshal/Fire Department (plans and calculations only)
 2. State Fire Marshal (plans and calculations only); where required.
 3. General Contractor (plans, calculations, and equipment submittal)
- H. Record Drawings
1. The Contractor shall maintain an approved set of construction documents on site at all times. A set, with all required stamps of approval, shall be made available to AHJ and Owner upon request.
- I. Operating and Maintenance Information
1. The Contractor shall provide the Owner with a manual (deliver two (2) 8-1/2-inch x 11-inch copies to the Owner) containing:
 - a. Detailed description of the system.
 - b. Description of maintenance required or recommended as would be provided under a maintenance schedule.
 - c. One (1) copy of NFPA-25.
 - d. Aboveground and Underground Material and Test Certificates.
 - e. List of recommended spare parts.
 - f. Service Directory
 - g. One (1) reproducible set of Mylar record drawings and/or PDF files of drawings on DVD or thumb-drive media.
 2. Contractor shall install code-approved metal sprinkler and drawing cabinets containing spare sprinklers and Mylar Record drawings.
- J. Changes:
1. Contractor shall not make any piping layout changes during installation from the approved engineered layout unless specifically approved in writing by the Engineer. This does not include minor amendments for coordination purposes, or to clear obstructions or ductwork.
 2. Any changes made other than stated above are at the Contractor's own expense and responsibility.
 - a. Contractor shall submit RFI (Request For Information) and receive written response prior to commencement of work.
- K. Leak Damage:
1. The Contractor shall be responsible during the installation and testing period of the sprinkler system for any damage to work by others, to the building, its contents, etc.,

due to leaks in any equipment or by overflow, and shall be held to pay for the necessary replacement or repairs to work by others damaged by such leaks.

- L. Jobsite Safety:
1. Contractor shall deliver materials to the project site, unload, and store in location determined by General Contractor and/or Owner.
 2. Maintain the premises free from accumulation of waste material or rubbish caused by this work.
 3. At the completion of work remove all surplus materials, grease, oils, etc. from piping system and its components, and leave premises in a neat, workmanlike manner.
 4. All work shall be performed in compliance with the Occupational Safety and Health Act of 1970, Construction Safety Acts Standards, and acceptable industry standards.
- M. Guarantee Period:
1. The Contractor shall guarantee in writing all materials and workmanship for a period of not less than one (1) year beginning with date of substantial completion. Contractor shall be responsible for any damage caused by him/her or (his/her subcontractor's), or by defects in his/her (or his/her subcontractor's) design, work, materials, or equipment.
 2. During the warranty period, the Contractor shall provide emergency repair service for the entire automatic sprinkler system. This service shall be provided on a twenty-four (24) hour per day, Seven (7) day per week basis. Coordinate details with GC and Owner's Agent.
- N. Acceptance:
1. Acceptance of the work will not be given until:
 - a. The completed automatic fire sprinkler system has been inspected, tested, and approved by the AHJ, Owner and his/her Agents, including this Engineering Firm.
 - b. Required submittals, system operation, and maintenance manuals, "record" drawings, spare parts, and special tools have been provided to, reviewed, and accepted by Owner.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All equipment and system components furnished and installed shall be new and unused, of first quality, domestically produced (made in the USA) and be Listed by Underwriters Laboratories, Inc. and/or Approved by Factory Mutual for their intended use. All such equipment and system components shall also be installed within the limitations of the respective UL Listing or FM Approvals. Equipment and material used for this project shall be consistent in one manufacturer and type.
- B. Manufacturers:
1. Viking
 2. Tyco/Grinnell

3. Victaulic and VicPlus

2.2 PIPING

A. Manufacturers:

1. Wheatland Tube (JMC Steel Group)
2. Bull Moose Tube Company
3. Youngstown Tube

B. In addition to being of USA manufacture, system piping/tubing shall meet the requirements of NFPA-13 to be UL Listed or FM Approved. Contractor shall base his/her bid on the use of any one or a combination of the following **(ALL PIPING SHALL HAVE A CORROSION RESISTANCE RATIO (CRR) OF 1.00 OR GREATER, AS PER UL LISTINGS):**

1. Pipe meeting ASTM A-795 and/or A-135 requirements for above grade use. All piping shall be code approved black carbon steel, and be domestically manufactured. ***GC shall contact this engineer the day the first pipe material delivery arrives on site for coordination of field observation visit PRIOR to installation.***
2. Riser piping located 5-feet beyond building to riser flange: Class 150 centrifugal cast iron enameling, or cement-lined mechanical joint conforming to USAS A-21.6 (AWWA Specification C-106) or conforming to ASTM D-2992 and ASTM D-2996. Class 50 Ductile Iron Pipe (DIP).
3. Block all underground piping, fittings and thrust blocks per NFPA and/or specific AHJ requirements.
4. Pipe flanges, fittings, piping, and flanged fittings shall be designed to withstand a working pressure of 175 psi and be cast iron with standard ring gaskets.
5. All pipe and fittings exposed to the weather, downstream of all inspector's test valves, between exterior wall and check valve on FDC, or located in a corrosive atmosphere shall be hot-dipped zinc-coated (galvanized) per ASTM A-153.
6. Flexible couplings, fittings and welded outlets shall all be UL Listed, and/or FM Approved, and domestically manufactured.
7. When system piping pierces a foundation wall below grade or is located under the foundation wall, clearance shall be provided to prevent breakage of piping due to building settlement. DO NOT locate pipe joints or fittings within or under a foundation wall and clearance shall be provided around piping by utilizing sleeves per NFPA13. Sleeve per manufacturer recommendations and fill space with waterproof seal commensurate with construction.
8. **USE OF FOREIGN-MADE PIPING OR FITTINGS SHALL NOT BE PERMITTED. SUCH PRODUCT SHALL BE REMOVED AT CONTRACTOR'S EXPENSE. NEGOTIATIONS FOR ADDITIONAL WARRANTIES OR CREDITS SHALL NOT BE CONSIDERED. OMISSION OF MANUFACTURER-ORIGINATED PIPE LABELS PER NFPA-13 WILL ESTABLISH A SUSPECT PIPING INSTALLATION THAT MAY REQUIRE REMOVAL OF ANY INSTALLED PIPING AT CONTRACTOR'S EXPENSE.**
9. CPVC piping shall NOT be permitted in this building regardless of occupancy or construction.

10. MINIMUM WALL THICKNESS FOR CUT-GROOVE OR THREADED PIPING LOCATED IN AREAS WHERE WATER SUPPLIES ARE KNOWN TO HAVE CORROSIVE PROPERTIES SHALL BE IN ACCORDANCE WITH SCHEDULE 40.
11. IN AREAS WHERE WATER SUPPLIES ARE KNOWN TO HAVE CORROSIVE PROPERTIES, THE FIRE PROTECTION CONTRACTOR SHALL BE RESPONSIBLE FOR TESTING OR OBTAINING INFORMATION PERTINENT TO THE QUALITY OF THE WATER PRIOR TO SUBMITTAL. IF CORROSIVE PROPERTIES EXIST, THE FIRE PROTECTION CONTRACTOR SHALL BE RESPONSIBLE FOR THE TREATMENT OF THE FIRE PROTECTION WATER IN ACCORDANCE WITH NFPA-13 AND NFPA-25.

2.3 VALVES

- A. Manufacturers:
 1. Viking
 2. Victaulic
 3. Grinnell
- B. All water supply control valves shall be indicating (OS&Y or Butterfly) type and shall be furnished with a valve supervisory device wired by Electrical/Alarm Contractor.
- C. Valves shall be rated for minimum 175 psi working water pressure.
- D. Valves shall be marked with the name or registered trademark of the manufacturer, size of the valve and UL or FM marking.
- E. Valves shall be identified to indicate function and zone.
- F. All valves shall be located within 6-feet of the finished floor.

2.4 SPRINKLERS

- A. Manufacturers:
 1. Viking
 2. Victaulic
 3. TYCO
- B. Sprinklers shall be of the Listed automatic glass bulb type, and shall be distributed throughout the building per code and approved construction documents; except solder-type concealed or certain specific application/storage sprinklers.
- C. Quick & Standard response sprinklers shall be utilized in areas appropriate and suitable for use per NFPA-13.
- D. The Contractor shall be responsible for maintaining an acceptable aesthetic continuity by utilizing similar types and manufacturer of sprinklers. Equivalent orifice sizes, K-factors, etc. are required in designated areas with identical use.

- E. Each new sprinkler shall be factory-identified by the manufacturer through a Sprinkler Identification Number (SIN). The SIN will provide specific sprinkler characteristic and specific information.
- F. Sprinklers required due to ceiling projections/obstructions and ductwork shall not be considered additional sprinklers. Contractor shall be responsible for providing additional sprinklers.
- G. Spacing to obstructions shall be per individual sprinkler Listing and NFPA-13.
- H. Provide corrosion resistant sprinklers with factory-applied coating where sprinkler is to be located in a corrosive atmosphere (e.g., overhangs, canopies, locker, and shower areas, etc.).
- I. Sprinkler and escutcheon finishes shall be suitable for area or ceiling finish provided by the Owner or his/her Agent. Verify finish of all sprinklers and escutcheons with General Contractor and Architect prior to placing materials order.

2.5 FIRE DEPARTMENT CONNECTION (FDC)

- A. New Fire Department connection(s) shall be provided in accordance with AHJ requirements. Provide with swing check valve. Automatic drip shall be required. FDC is wall mounted as shown on the FP Drawings. Provide a two (2) way **chrome finished** FDC.
- B. Hose threads shall match those of local Fire Department apparatus and local AHJ requirements. Where local requirements are not specific, provide National Standard Threads (NST). The use of "Storz" connections, unless specifically required by the AHJ in writing, is not permissible for this project.

2.6 SUPERVISORY AND ALARM EQUIPMENT

- A. Water-flow indicators with adjustable pneumatic retard shall be provided to indicate water-flow for each sprinkler system.
- B. Valve supervisory devices shall be provided for all new valves controlling the water supply to each sprinkler system.
- C. Wiring of alarm and supervisory devices under separate contract.
- D. Electrical/Fire Alarm Contractor shall off-site monitor sprinkler systems or as required by AHJ.

2.7 INSPECTOR'S TEST CONNECTIONS AND DRAINS

- A. Provide inspector's test connection at most remote portion of each system. Provide sight glass on all inspectors' test locations. Discharge shall be controlled by labeled globe valve and shall terminate outside building through a smooth bore brass outlet orifice equal to smallest sprinkler orifice utilized in system (1/2-inch orifice outlet).
- B. System drainage shall generally occur through main drain at riser. Additional auxiliary drains shall be provided for trapped sections of system piping. Auxiliary drains shall be piped to termination outside the building per NFPA-13, and these engineered construction documents.

2.8 HANGERS, BRACING, AND SLEEVES

- A. Manufacturers:
 - 1. Tolco
 - 2. Grinnell
 - 3. Michigan
- B. Use beam clips or hang from top chord of joists. Do not hang from bottom chord or joists or bridging. Provide restraining straps as required.
- C. Trapeze-hang all mains where possible. Verify all hanger types with structural shop drawings prior to commencement of work.
- D. Provide sway bracing. Install bracing in accordance with NFPA-13. Piping shall be generally supported by clamps and rods and secured to overhead construction. Sway bracing on these plans is not solely for earthquakes.
- E. Use galvanized hangers for piping in corrosive atmospheres.
- F. Install chrome wall plates wherever exposed sprinkler piping passes through ceiling/floors/walls.
- G. Provide pipe sleeves and waterproof packing materials commensurate with construction through all masonry and/or fire rated floors, ceilings, and walls.
- H. Structural engineer shall provide where required by Local requirements calculations assuring the building structure is capable of supporting entire fire sprinkler system with water-filled piping and components in addition to NFPA-13 load requirements at a single point. This FP Contractor shall coordinate with Structural Engineer as required.

2.9 FIRESTOP SYSTEMS

- A. Manufacturers:
 - 1. Hilti Firestop Systems
 - 2. Flame Safe
 - 3. 3M
- B. Set sleeves securely in place and install systems per manufacturer's recommendations and instructions. Provide sleeves with not less than minimum clearances for various types of walls per UL, Manufacturer, and NFPA-13.
- C. All sleeves and packing shall be watertight and commensurate with the construction of the wall, ceiling, or floor. Sleeves and sealants shall additionally meet all AHJ requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Starting and Completion Dates:

1. The overall schedule for installation shall be established by the Owner and executed by the GC and this Fire Protection Contractor. Closely coordinate project schedule with all concerned parties.

3.2 INSPECTIONS AND OBSERVATIONS

1. The Contractor shall examine daily all areas in which the work will be performed, and immediately report unsatisfactory working conditions to the Owner or his/her Agent for resolution. The Contractor shall not proceed with any work until all unsatisfactory working conditions have been corrected.
2. Owner, Architect, and all AHJ's including Fire Protection Consultant, shall be allowed to conduct inspections and field observations as they choose. Approved construction documents must be available and remain on the project site during installation.

3.3 INSTALLATION GENERAL

- A. All holes made by the Contractor in any wall, floor, or ceiling shall be patched by the Contractor therein restoring area to its original condition or better, and assuring its fire resistance and integrity.
- B. Removal and repair of all finished surfaces shall be coordinated with the Architect and GC, and subject to his/her approval.
- C. Location of all equipment, piping, valves and drains shall be subject to Architect and/or Owner approval.
- D. Standard metal identification signs shall be provided per NFPA-13.
- E. All system components shall be installed in accordance with manufacturer's recommendations and instructions. All special tools recommended by the manufacturer shall be utilized.

3.4 INSTALLATION PIPING, SPRINKLERS, AND MISCELLANEOUS

- A. Where sprinkler piping is installed in finished areas, the Contractor shall install all new piping such that it is concealed above finished ceilings; provide a minimum separation of 12-inches between the ceiling height and the bottom of the pipe. Pipe installed in unfinished areas may be exposed.
- B. All exposed piping which passes through a wall, ceiling, or floor shall be provided with an escutcheon plate.
- C. All piping shall be installed so as not to obstruct any portion of a window, doorway, stairway, exit, or passageway, and shall not interfere with the operation or accessibility of any mechanical, plumbing, or electrical equipment. Run piping horizontally and at right angles to walls, and ceilings or along slope of ceiling and roof.
- D. Center sprinklers in both horizontal directions with respect to ceiling components such as ceiling grid, (in quarter points of 4-foot direction and in center of 2-foot direction), light fixtures, HVAC diffusers, speakers, and detectors as required.
- E. It is this Contractor's responsibility to ascertain slope prior to installation to ensure proper system design parameters are maintained including remote area sizes.

- F. All sprinkler piping, drain, and test piping, etc. installed through exterior walls shall be galvanized and have a 4-foot minimum length to first valve located inside insulated building envelope.
- G. All piping shall be substantially supported from building structure, and only approved hangers shall be utilized. Sprinkler lines shall **not** penetrate, or be supported from ductwork.
- H. Install sprinkler piping in exposed areas as high as possible using necessary fittings and auxiliary drains to maintain a maximum clear height and to keep volume of area aesthetically acceptable.
- I. Maintain sprinkler deflector minimum and maximum distances to walls, ceilings, roof, and other sprinklers in accordance with manufacturer's specific listing. Minimum distance between standard-coverage sprinklers shall be 6-feet.
- J. Provide sprinklers below all obstructions greater than 48-inches.
- K. Combustible building contents shall not be moved into the building without complete automatic sprinkler system protection.
- L. All system piping shall be installed such that all portions of the system may be efficiently drained.
- M. Provide Fire Protection during construction in accordance with OSHA, Local AHJ, and State AHJ.
- N. This Contractor shall provide a complete and working system in all respects.
- O. Provide pressure relief valves on each sprinkler system.
- P. Drains shall terminate at a point outside building. Such terminations shall not damage stock, equipment, vehicles, planting areas, injure personnel, or patrons, or cause an unsightly area in front of any entrances.
- Q. Provide factory-furnished sprinkler guards for all sprinklers located within 7-feet of finished floor and/or wherever sprinklers may be subjected to mechanical damage (this includes any sprinklers below open grate system).

3.5 WELDING

- A. No welding or flame cutting shall be permitted on the premises.
- B. Shop welding (off-site) shall meet all NFPA-13 and AWS B2.1.
- C. Contractor shall retrieve all discs from piping prior to site delivery. Where required by local AHJ, discs shall be individually affixed to each weld location for affirmation by local Fire Department inspector. Contractor shall be held to ensuring all piping is void of any discs, debris, or other obstructions prior to installation and connection of each individual piece.

3.6 FINAL INSPECTION AND TESTS

- A. Overhead piping: Tested for a period of two (2) hours at a hydrostatic pressure of not less than 200 psi and all piping fittings, valves, and sprinklers shall be completely watertight.
 - 1. Complete *Contractor's Material and Test Certificate for Aboveground Piping*. Forward copy to GC and include *in Owner's Operation and Maintenance Manual*.

- B. Underground piping: Tested (by Utility Contractor) for a period of two (2) hours at a hydrostatic pressure of not less than 200 psi and all piping, valves and fittings shall be completely watertight. Coordinate test with Utility Contractor to ensure proper testing and test schedule. Test prior to connection to aboveground piping.
 - 1. Complete *Contractor's Material and Test Certificate for Underground Piping*. Forward copy to GC and include in *Owner's Operation and Maintenance Manual*.
- C. Replace system components that do not pass the test procedures specified. Retest repaired portions of the system.
- D. All underground piping shall be thoroughly flushed (by Utility Contractor) in accordance with NFPA-13, and at a minimum velocity of 10-feet per second prior to connection to overhead/aboveground piping system. The flush test must be witnessed by AHJ. Test shall occur prior to trench backfill.
- E. Contractor shall provide at least five (5) working days' notice to Architect and this Consultant for all tests and field observations.
- F. Contractor shall make all arrangements with AHJ for final inspection, and witnessing of the final acceptance tests.

END OF SECTION 211313



Flow Test Summary

Project Name: EJE 23250 - Phoenix FS #74
Project Address: 1900 W Chandler Blvd, Phoenix, AZ 85045
Date of Flow Test: 2023-05-04
Time of Flow Test: 7:40 AM
Data Reliable Until: 2024-05-04
Conducted By: COP Water Services Department (602.262.5077)
City Forces Contacted: COP Water Services Department (602.262.5077)
Permit Number: WSFT 23008035

Raw Flow Test Data

Static Pressure: 92.0 PSI
Residual Pressure: 80.0 PSI
Flowing GPM: 2,495
GPM @ 20 PSI: 6,566

Data with a 12 PSI Safety Factor

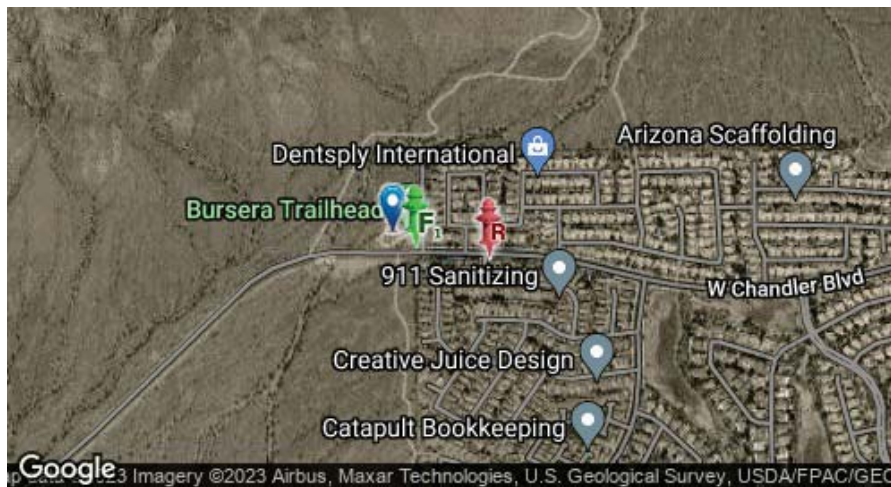
Static Pressure: 80.0 PSI
Residual Pressure: 68.0 PSI
Flowing GPM: 2,495
GPM @ 20 PSI: 5,950

Hydrant F₁

Pitot Pressure (1): 45 PSI
Coefficient of Discharge (1): 1.34
Hydrant Orifice Diameter (1): 3.05 inches

The maximum design static pressure in the City of Phoenix shall be 80 PSI for sprinkler systems.

Note: A Big Boy Hose-Monster was utilized during the flow test.



- Project Site
- Static-Residual (#011-25-215) Hydrant
- Flow Hydrant (#011-24-302)

Distance Between F₁ and R
536 ft (measured linearly)

Static-Residual Elevation
1277 ft (above sea level)

Flow Hydrant (F₁) Elevation
1265 ft (above sea level)

Elevation & distance values are approximate

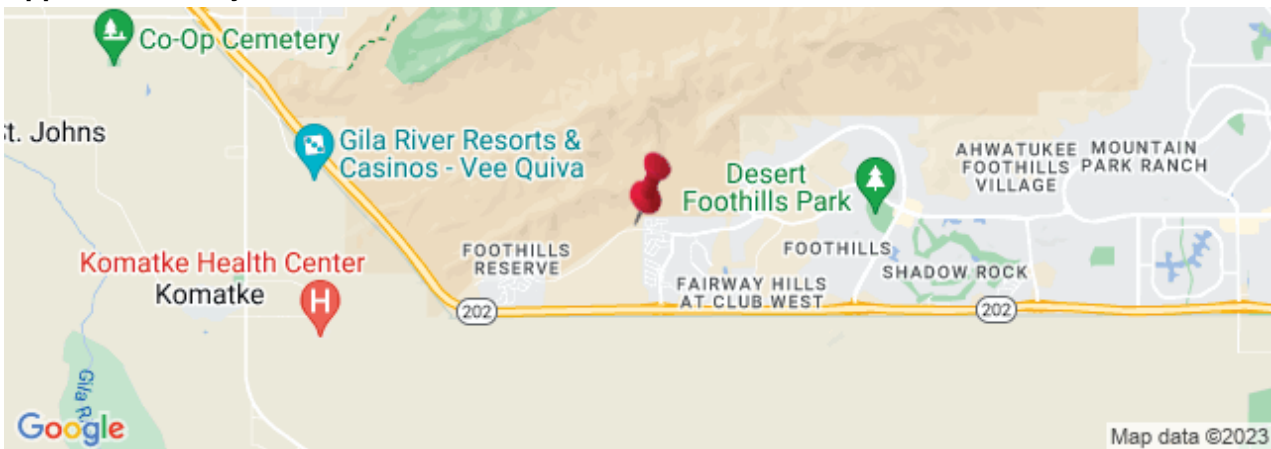
Static-Residual Hydrant



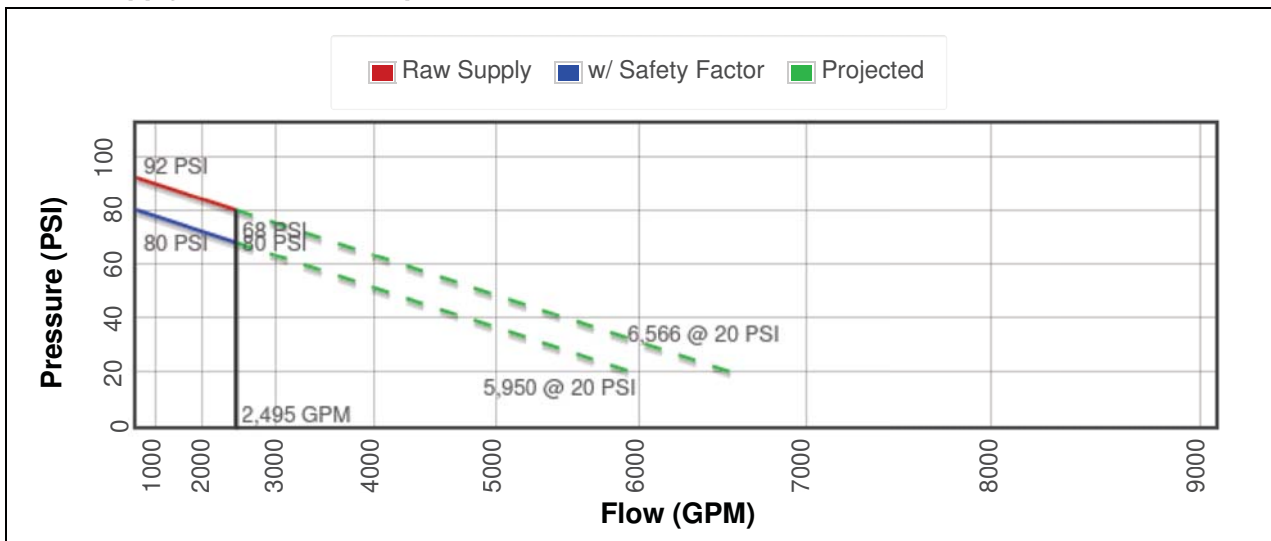
Flow Hydrant (only hydrant F1 shown for clarity)



Approximate Project Site



Water Supply Curve $N^{1.85}$ Graph



Location: 1900 W CHANDLER BLVD 011-24
KIVA/Project # WSFT 23008035
For: DIBBLE ENGINEERING
Requested By: KODY **Request Date:** 4/18/2023
Phone: N/A **E-MAIL:** N/A
Test Type: 2.5" Std. X 4" Std. COMPLEX
Observers: C.O.P.
TIME: 7:40 AM **Test Date:** 5/4/2023

CAUTION: Results of this flow test identify water system characteristics for the date, time, and locations of this test only.

Pressure and flows within the water system can vary with time, seasonal and operational pressure variations can be as much as 20 psi. It is expected and should be considered when preparing designs based upon fire flow test data.

Numerous factors affect the water system, such as water level fluctuations in reservoirs, operating pressure ranges at booster pump stations, elevations at point of use, daily demand fluctuations, seasonal demands, emergency demands, water treatment plant availability, increased demands due to growth, operation/maintenance schedules, etc.

Designers should consider the above when preparing designs based upon fire flow test data. The City of Phoenix may be able to provide additional information on water system characteristics upon request.

NOTE: TEST LOCATION SKETCH IS ATTACHED

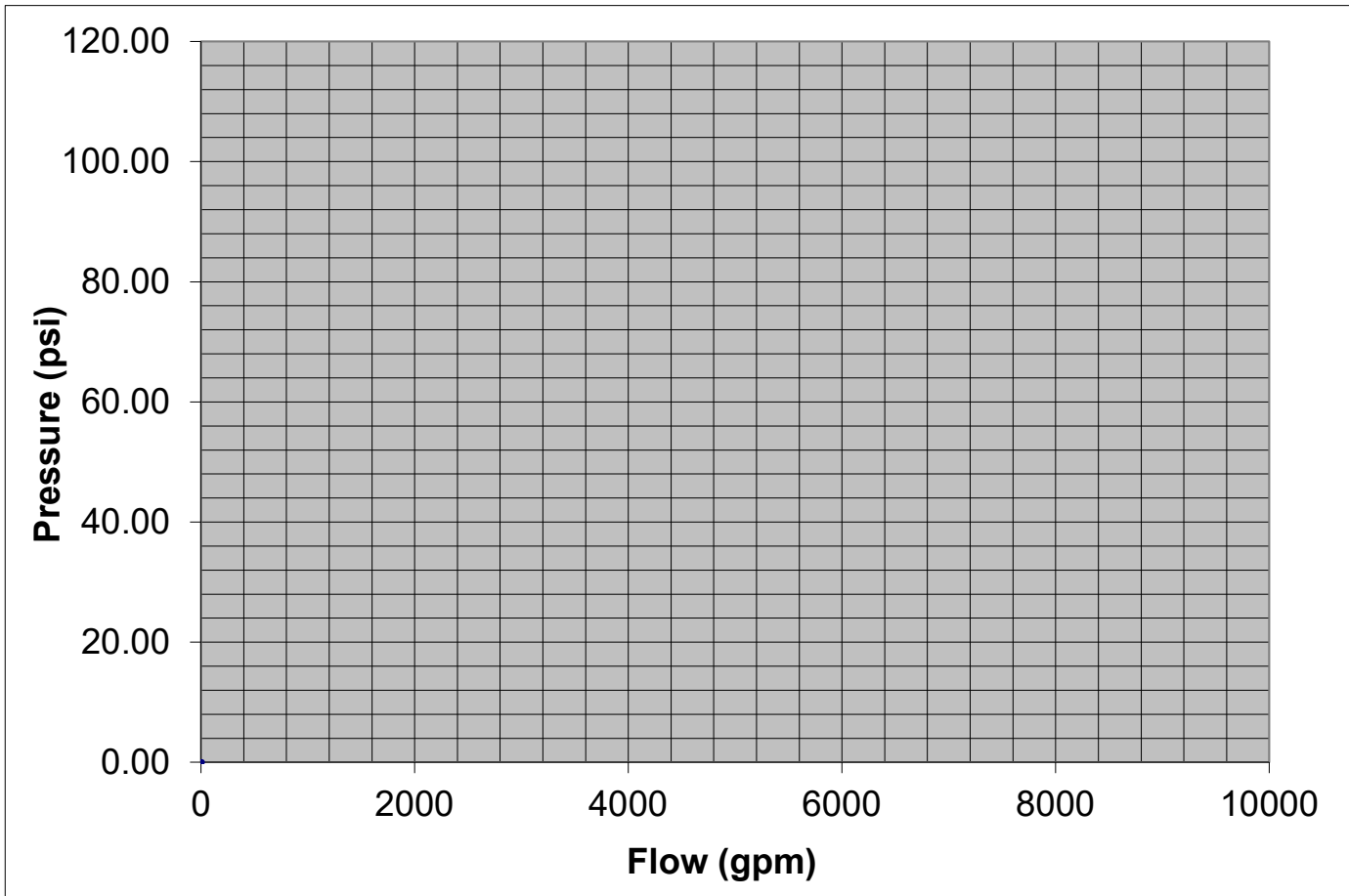
Observed Test Data						
Hydrant Designation	Hydrant Number	Flow Opening (2.5" or 4")	Static Pressure (psi)	Residual Pressure (psi)	Pitot Pressure (psi)	Flow (gpm)
Pressure; R	215		92	80		
Flow, F1	302	4			45	2495
Flow, F2						
Flow, F3						
Flow, F4						
Note: Hydrant Nozzle Coef. = 0.9			**Pressure Drop % 13.0%		Total Flow: 2495	

Pressure (psi)	20	25
Flow (gpm)	NA	NA

** Theoretical calculation of expected flows or rated capacities are based on sufficient discharge to cause a drop in pressure at the residual hydrant of at least 25%.

Calculated flow values will not appear if a 25% pressure drop between static and residual pressures is not reached. If additional volume is required, a complex 4-inch port fire flow test may be needed.

Instructions: All Fields Highlighted Green can be used.



Revision Date: July 2019

Hydraulic Calculations

for

Project Name: Phoenix Fire Station No 74: (23250)
Location: NWC 19th Avenue & Chandler, Phoenix, AZ 85045,
Drawing Name: 23250 FP2.0 & 3.0.cad

Calculation Date: 12/14/2023

Design

Remote Area Number: 1
Remote Area Location: Apparatus Bay
Occupancy Classification: Ordinary Group I
Commodity Classification: N/A

Density 0.15 gpm/ft²
Area of Application: 1950 ft² (Actual 1975 ft²)
Coverage per Sprinkler: 130 ft²
Type of sprinklers calculated: Upright
No. of sprinklers calculated: 20
No. of nozzles calculated: 0

In-rack Demand: N/A gpm at Node: N/A
Hose Streams: 150.00 at Node: 13 Type: Allowance at Source
100.00 at Node: 55 Type: Hydrant

Total Water Required (including Hose Streams where applicable):
From Water Supply at Node 13: 731.67 @ 64.626 (Safety Margin = 14.134)

Type of System: Wet/CMDA
Volume of Dry/PreAction/Antifreeze/OtherAgent System: N/A

Water Supply Information:

for Node: 13 Date: 05/04/2023
Location: 1900 W Chandler Blvd, Phoenix, AZ 85045
Source: COP Water Services Dept. 602.262.5077

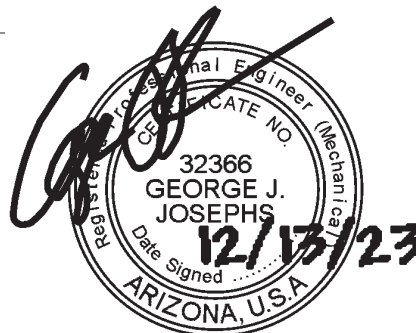
Name of Contractor: TBD
Address:
Phone Number:
Name of designer: EJ Engineering, Inc.
Authority Having Jurisdiction: City of Phoenix Fire Prevention

Notes:

Automatic peaking results Left: N/A Right: N/A



John L. Echeverri, Principal
NICET Level IV Automatic Sprinklers
NICET Level III Special Hazards
NFPA Certified Fire Protection Specialist
NICET SET Cert. 78493 & CFPS Cert. 1915
NICET SET Cert. 78493 Exp. 03/2026

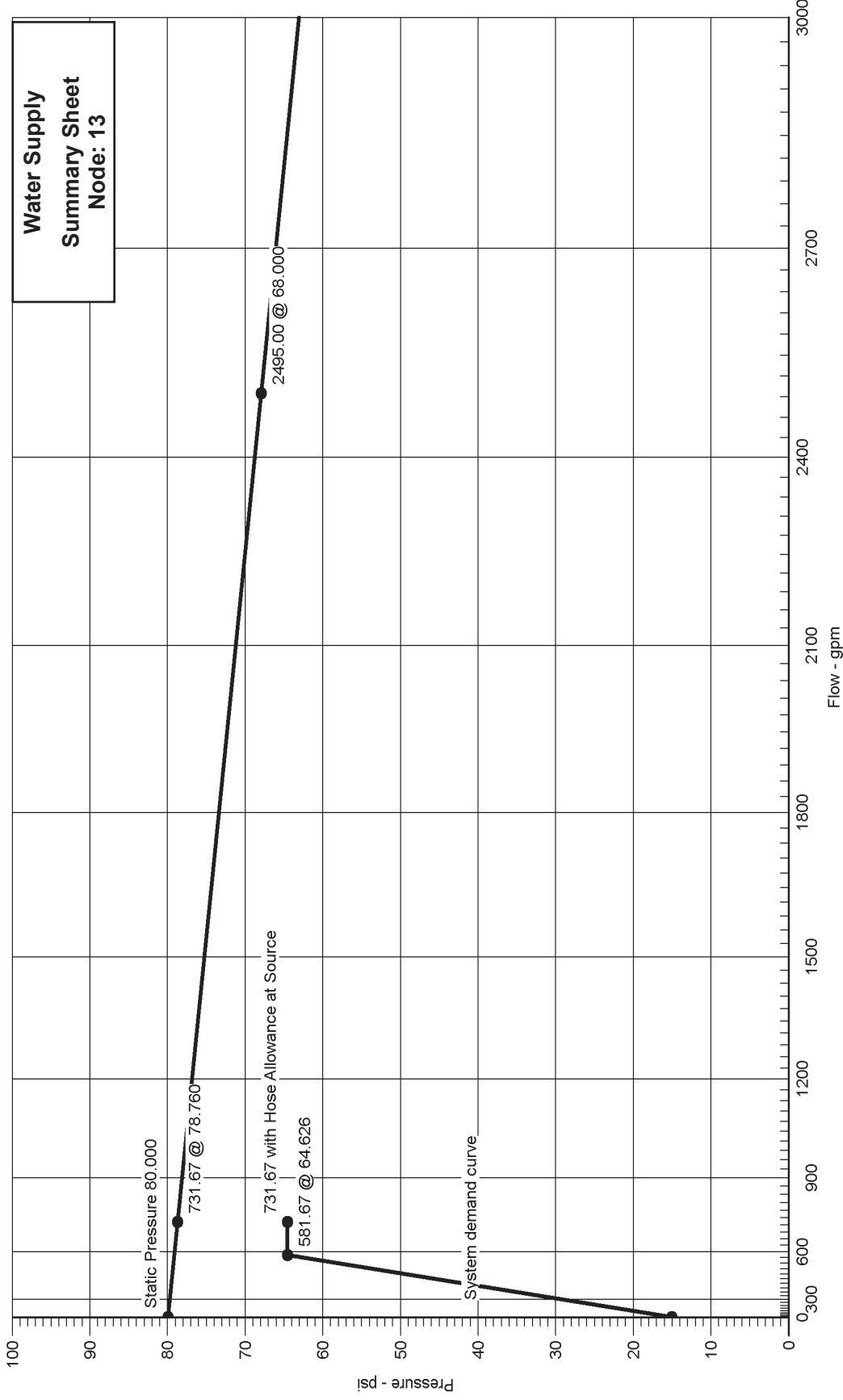


Hydraulic Graph

Job Name: Phoenix Fire Station No 74
Remote Area Number: 1

N 1.85

Date: 12/14/2023



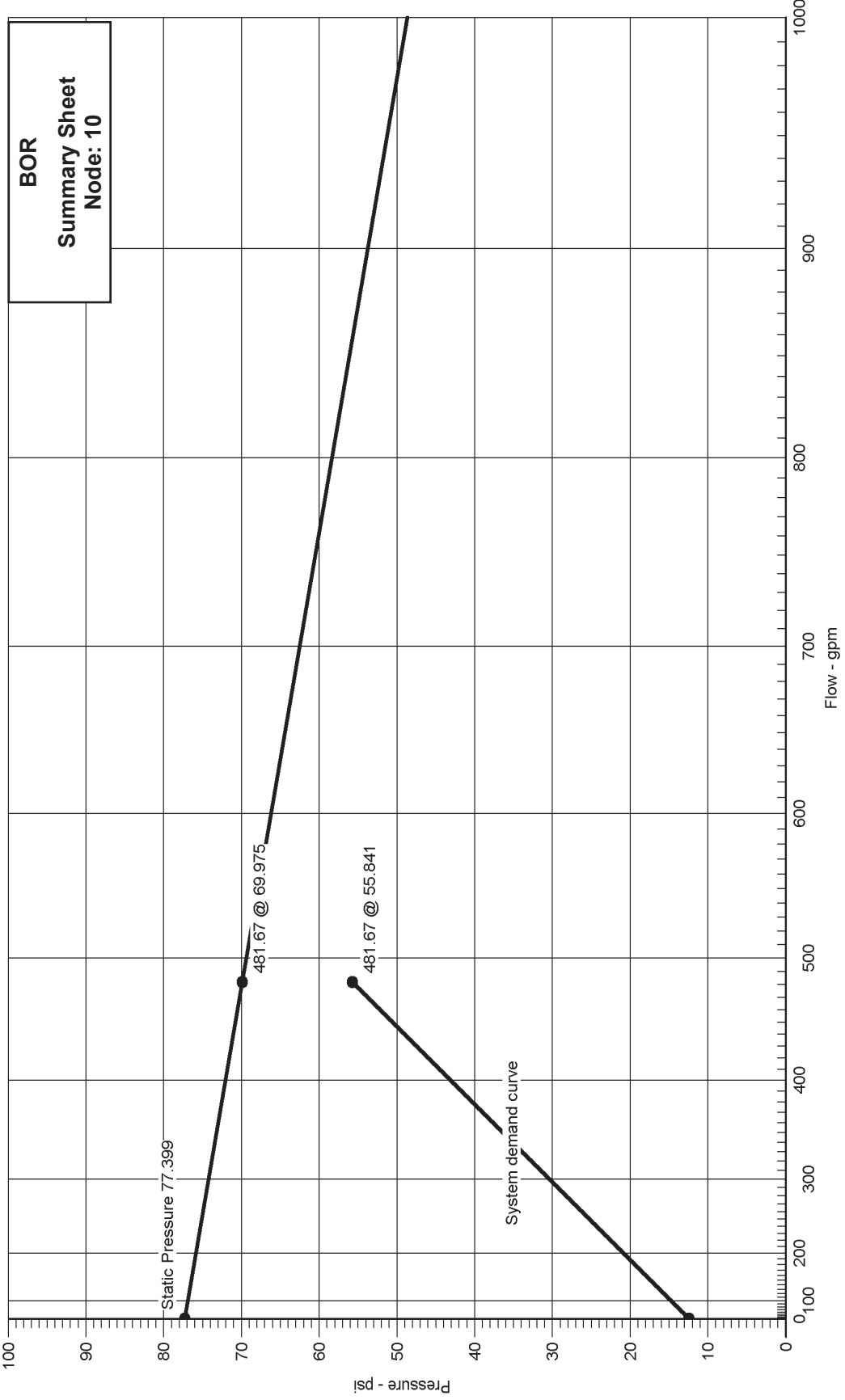
Supply:static:80.000
Residual:68.000
Flowing:2495.00
Available Flow @ 20 PSI:5274.52

Hydraulic Graph

Job Name: Phoenix Fire Station No 74
Remote Area Number: 1

N^{1.85}

Date: 12/14/2023





Summary Of Outflowing Devices

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Hydrant	55	100.00	100.00	0	55.441		
Sprinkler	101	19.50	19.50	5.6	12.125		
⇒ Sprinkler	102	19.50	19.50	5.6	12.125		
Sprinkler	103	19.50	19.50	5.6	12.127		
Sprinkler	104	20.21	19.50	5.6	13.022		
Sprinkler	105	21.66	19.50	5.6	14.959		
Sprinkler	106	23.18	19.50	5.6	17.134		
Sprinkler	107	23.39	19.50	5.6	17.445		
Sprinkler	108	23.43	19.50	5.6	17.504		
Sprinkler	109	23.57	19.50	5.6	17.710		
Sprinkler	110	23.57	19.50	5.6	17.721		
Sprinkler	111	24.59	19.50	5.6	19.288		
Sprinkler	112	24.86	19.50	5.6	19.701		
Sprinkler	113	25.08	19.50	5.6	20.055		
Sprinkler	114	25.27	19.50	5.6	20.370		
Sprinkler	115	25.81	19.50	5.6	21.249		
Sprinkler	116	25.96	19.50	5.6	21.496		
Sprinkler	117	26.36	19.50	5.6	22.153		
Sprinkler	118	27.65	19.50	5.6	24.387		
Sprinkler	119	27.81	19.50	5.6	24.667		
Sprinkler	120	30.75	19.50	5.6	30.158		

⇒ Most Demanding Sprinkler Data

Supply Analysis							
Node	Name	Static (psi)	Residual (psi)	@ Flow (gpm)	Available (psi)	@ Total Demand (gpm)	Required Pressure (psi)
13	Water Supply	80.000	68.000	2495.00	78.760	731.67	64.626

Node Analysis					
Node Number	Elevation (Foot)	Node Type	Pressure at Node (psi)	Discharge at Node (gpm)	Notes
13	-5'-0	Supply	64.626	581.67	
55	2'-0	Hydrant	55.441	100.00	
101	29'-10	Sprinkler	12.125	19.50	
102	29'-10	Sprinkler	12.125	19.50	
103	29'-10	Sprinkler	12.127	19.50	
104	29'-10	Sprinkler	13.022	20.21	
105	29'-10	Sprinkler	14.959	21.66	
106	25'-10	Sprinkler	17.134	23.18	
107	25'-10	Sprinkler	17.445	23.39	
108	29'-10	Sprinkler	17.504	23.43	
109	29'-10	Sprinkler	17.710	23.57	
110	25'-10	Sprinkler	17.721	23.57	
111	25'-10	Sprinkler	19.288	24.59	
112	21'-10	Sprinkler	19.701	24.86	
113	21'-10	Sprinkler	20.055	25.08	
114	21'-10	Sprinkler	20.370	25.27	
115	25'-10	Sprinkler	21.249	25.81	
116	25'-10	Sprinkler	21.496	25.96	
117	21'-10	Sprinkler	22.153	26.36	

Node Number	Elevation (Foot)	Node Type	Pressure at Node (psi)	Discharge at Node (gpm)	Notes
118	21'-10	Sprinkler	24.387	27.65	
119	21'-10	Sprinkler	24.667	27.81	
120	25'-10	Sprinkler	30.158	30.75	
1	29'-4		12.653		
2	29'-4		12.971		
3	29'-4		13.027		
4	29'-4		13.968		
5	29'-4		16.005		
6	29'-4		19.838		
7	20'-10		34.249		
8	20'-10		34.789		
9	10'-10½		48.701		
10	1'-0	Gauge	55.841		
11	-5'-0		58.512		
14	29'-4		12.653		
15	25'-4		18.291		
16	25'-4		18.908		
17	25'-4		20.554		
18	25'-4		23.999		
19	20'-10		33.989		
20	25'-4		18.097		
21	29'-4		18.680		
22	29'-4		18.897		

Node Number	Elevation (Foot)	Node Type	Pressure at Node (psi)	Discharge at Node (gpm)	Notes
23	21'-4		20.988		
24	21'-4		21.690		
25	21'-4		23.563		
26	21'-4		27.481		
27	20'-10		33.912		
28	21'-4		20.767		
29	25'-4		22.614		
30	25'-4		22.873		
31	21'-4		25.907		
32	21'-4		26.201		
33	25'-4		31.961		
60	-5'-0		64.528		

Pipe Information									
Node 1	Elev 1 (Foot)	K-Factor	Flow added this step (q)	Nominal ID	Fittings & Devices	Length (Foot)	C Factor	Total(Pt)	Notes Fitting/Device (Equivalent Length) Fixed Pressure Losses, when applicable, are added directly to (Pf) and shown as a negative value.
Node 2	Elev 2 (Foot)		Total Flow (Q)	Actual ID	Equiv. Length (Foot)	Fitting (Foot)	Pf Friction Loss Per Unit (psi)	Elev(Pe)	
						Total (Foot)		Friction(Pf)	
101	29'-10	5.6	19.50	1	(See Notes)	0'-6	120	12.125Route 1..... Sprinkler, E(2'-0)
1	29'-4		19.50	1.0490		2'-0	0.124177	0.217	
						2'-6		0.310	
1	29'-4			1½	(See Notes)	8'-8	120	12.653	E(4'-0), T(8'-0)
2	29'-4		19.50	1.6100		12'-0	0.015416		
						20'-8		0.319	
2	29'-4		19.50	1½		1'-0	120	12.971	Flow (q) from Route 2
3	29'-4		39.00	1.6100		1'-0	0.055575	0.056	
3	29'-4		19.50	1½		8'-0	120	13.027	Flow (q) from Route 3
4	29'-4		58.50	1.6100		8'-0	0.117670	0.941	
4	29'-4		20.21	1½		10'-0	120	13.968	Flow (q) from Route 4
5	29'-4		78.71	1.6100		10'-0	0.203732	2.037	
5	29'-4		21.66	1½	(See Notes)	4'-0	120	16.005	Flow (q) from Route 5 T(8'-0)
6	29'-4		100.37	1.6100		8'-0	0.319423		
						12'-0		3.833	
6	29'-4		47.00	1½	(See Notes)	8'-6	120	19.838	Flow (q) from Route 8 PO(8'-0)
7	20'-10		147.36	1.6100		8'-0	0.650038	3.685	
						16'-6		10.726	
7	20'-10		303.55	4		12'-0	120	34.249	Flow (q) from Route 6
8	20'-10		450.92	4.2600		12'-0	0.045030	0.540	
8	20'-10		30.75	4	(See Notes)	109'-8	120	34.789	Flow (q) from Route 20 6E(13'-2)
9	10'-10½		481.67	4.2600		79'-0	0.050876	4.312	
						188'-8		9.599	
9	10'-10½			4	(See Notes)	8'-7	120	48.701	f, sCV(22'-0), BV(12'-0), BOR
10	1'-0		481.67	4.0260		34'-0	0.066989	4.286	
						42'-7		2.854	
10	1'-0			8	(See Notes)	20'-8½	140	55.841	E(33'-6)
11	-5'-0		481.67	8.5500		33'-6	0.001286	2.601	
						54'-2½		0.070	

Pipe Information

Node 1	Elev 1 (Foot)	K-Factor	Flow added this step (q)	Nominal ID	Fittings & Devices	Length (Foot)	C Factor	Total(Pt)	Notes
11	-5'-0		100.00	8	(See Notes)	250'-6	140	58.512	Flow (q) from Route 21 7E(33'-6), BFP(-5.000), GV(7'-5½), T(65'-1)
60	-5'-0		581.67	8.5500		306'-11	0.001823		
						557'-5		6.016	
60	-5'-0			12	(See Notes)	231'-0	150	64.528	GV(6'-11½), S
13	-5'-0		581.67	11.3100		6'-11½	0.000411		
						237'-11½		0.098	
			150.00					64.626	Hose Allowance At Source
13			731.67						Total(Pt) Route 1
102	29'-10	5.6	19.50	1	(See Notes)	0'-6	120	12.125	***** Route 2 ***** Sprinkler, E(2'-0)
14	29'-4		19.50	1.0490		2'-0	0.124177	0.217	
						2'-6		0.310	
14	29'-4			1½	(See Notes)	8'-8	120	12.653	E(4'-0), T(8'-0)
2	29'-4		19.50	1.6100		12'-0	0.015416		
						20'-8		0.319	
								12.971	Total(Pt) Route 2
103	29'-10	5.6	19.50	1	(See Notes)	0'-6	120	12.127	***** Route 3 ***** Sprinkler, T(5'-0)
3	29'-4		19.50	1.0490		5'-0	0.124192	0.217	
						5'-6		0.683	
								13.027	Total(Pt) Route 3
104	29'-10	5.6	20.21	1	(See Notes)	0'-6	120	13.022	***** Route 4 ***** Sprinkler, T(5'-0)
4	29'-4		20.21	1.0490		5'-0	0.132646	0.217	
						5'-6		0.730	
								13.968	Total(Pt) Route 4
105	29'-10	5.6	21.66	1	(See Notes)	0'-6	120	14.959	***** Route 5 ***** Sprinkler, T(5'-0)
5	29'-4		21.66	1.0490		5'-0	0.150805	0.217	
						5'-6		0.829	
								16.005	Total(Pt) Route 5
106	25'-10	5.6	23.18	1	(See Notes)	0'-6	120	17.134	***** Route 6 ***** Sprinkler, T(5'-0)
15	25'-4		23.18	1.0490		5'-0	0.170977	0.217	
						5'-6		0.940	

Pipe Information

Node 1	Elev 1 (Foot)	K-Factor	Flow added this step (q)	Nominal ID	Fittings & Devices	Length (Foot)	C Factor	Total(Pt)	Notes Fitting/Device (Equivalent Length) Fixed Pressure Losses, when applicable, are added directly to (Pf) and shown as a negative value.	
										Node 2	Elev 2 (Foot)	Total Flow (Q)	Actual ID	Equiv. Length (Foot)	Fitting (Foot)	Total (Foot)	Pf Friction Loss Per Unit (psi)	Elev(Pe)	Friction(Pf)
15	25'-4		23.39	1½		8'-0	120	18.291												Flow (q) from Route 7
16	25'-4		46.57	1.6100		8'-0	0.077162	0.617		
16	25'-4		23.57	1½		10'-0	120	18.908	Flow (q) from Route 10	
17	25'-4		70.14	1.6100		10'-0	0.164624	1.646		
17	25'-4		24.59	1½	(See Notes)	4'-0	120	20.554	Flow (q) from Route 11 T(8'-0)	
18	25'-4		94.74	1.6100		8'-0	0.287067	3.445		
18	25'-4		51.78	1½	(See Notes)	4'-6		120		23.999	Flow (q) from Route 15 PO(8'-0)
19	20'-10		146.52	1.6100		8'-0	0.643131	1.951		
19	20'-10		157.03	4		12'-6		8.039		
19	20'-10		157.03	4		12'-0	120	33.989	Flow (q) from Route 12	
7	20'-10		303.55	4.2600		12'-0	0.021655	0.260		
								34.249	Total(Pt) Route 6	
107	25'-10	5.6	23.39	1	(See Notes)	0'-6	120	17.445 Route 7 Sprinkler, E(2'-0)	
20	25'-4		23.39	1.0490		2'-0	0.173850	0.217		
20	25'-4			1½		2'-6		0.435		
20	25'-4			1½		9'-0	120	18.097		
15	25'-4		23.39	1.6100		9'-0	0.021583	0.194		
								18.291	Total(Pt) Route 7	
108	29'-10	5.6	23.43	1	(See Notes)	0'-6	120	17.504 Route 8 Sprinkler, T(5'-0)	
21	29'-4		23.43	1.0490		5'-0	0.174395	0.217		
21	29'-4			1½		5'-6		0.959		
21	29'-4			1½		10'-0	120	18.680	Flow (q) from Route 9 T(8'-0)	
22	29'-4		23.43	1.6100		10'-0	0.021651	0.217		
22	29'-4		23.57	1½	(See Notes)	4'-0	120	18.897		
6	29'-4		47.00	1.6100		8'-0	0.078474	0.942		
6	29'-4			12'-0						
								19.838	Total(Pt) Route 8	

Pipe Information

Node 1	Elev 1 (Foot)	K-Factor	Flow added this step (q)	Nominal ID	Fittings & Devices	Length (Foot)	C Factor	Total(Pt)	Notes Fitting/Device (Equivalent Length) Fixed Pressure Losses, when applicable, are added directly to (Pf) and shown as a negative value.
Total (Foot)	Friction(Pf)								
		109	29'-10	5.6	23.57	1	(See Notes)	0'-6		120	17.710	..... Route 9 ..... Sprinkler, T(5'-0)
22	29'-4		23.57	1.0490	5'-0	0.176293		0.217	
					5'-6			0.970	
								18.897	Total(Pt) Route 9
110	25'-10	5.6	23.57	1	(See Notes)	0'-6	120	17.721 Route 10 Sprinkler, T(5'-0)
16	25'-4		23.57	1.0490		5'-0	0.176393	0.217	
						5'-6		0.970	
								18.908		Total(Pt) Route 10
111	25'-10	5.6	24.59	1	(See Notes)	0'-6	120	19.288 Route 11 Sprinkler, T(5'-0)
17	25'-4		24.59	1.0490		5'-0	0.190775	0.217	
						5'-6		1.049	
								20.554		Total(Pt) Route 11
112	21'-10	5.6	24.86	1	(See Notes)	0'-6	120	19.701 Route 12 Sprinkler, T(5'-0)
23	21'-4		24.86	1.0490		5'-0	0.194546	0.217	
						5'-6		1.070	
								20.988		Flow (q) from Route 13
23	21'-4		25.08	1½		8'-0	120		Flow (q) from Route 14
24	21'-4		49.93	1.6100		8'-0	0.087792	0.702	
24	21'-4		25.27	1½		10'-0	120	21.690	Flow (q) from Route 17
25	21'-4		75.21	1.6100		10'-0	0.187288	1.873	
25	21'-4		26.36	1½	(See Notes)	4'-0	120	23.563	Flow (q) from Route 18 PO(8'-0)
26	21'-4		101.57	1.6100		8'-0	0.326513	3.918	
						12'-0			
26	21'-4		55.47	1½	(See Notes)	0'-6		120	27.481	Flow (q) from Route 18 PO(8'-0)
27	20'-10		157.03	1.6100		8'-0	0.731140	0.217	
						8'-6		6.215	
27	20'-10			4		12'-0		120	33.912	Flow (q) from Route 18 PO(8'-0)
19	20'-10		157.03	4.2600		12'-0	0.006398	0.077	
								33.989	Total(Pt) Route 12

Pipe Information

Node 1	Elev 1 (Foot)	K-Factor	Flow added this step (q)	Nominal ID	Fittings & Devices	Length (Foot)	C Factor	Total(Pt)	Notes Fitting/Device (Equivalent Length) Fixed Pressure Losses, when applicable, are added directly to (Pf) and shown as a negative value.
Total (Foot)	Friction(Pf)								
		113	21'-10	5.6	25.08	1	(See Notes)	0'-6		120	20.055	***** Route 13 ***** Sprinkler, E(2'-0)
28	21'-4		25.08	1.0490	2'-0	0.197783		0.217	
					2'-6			0.494	
28	21'-4			1½		9'-0	120	20.767	
23	21'-4		25.08	1.6100		9'-0	0.024554	0.221	
								20.988	Total(Pt) Route 13
114	21'-10	5.6	25.27	1	(See Notes)	0'-6	120	20.370	***** Route 14 ***** Sprinkler, T(5'-0)
24	21'-4		25.27	1.0490		5'-0	0.200647	0.217	
						5'-6		1.104	
								21.690		Total(Pt) Route 14
115	25'-10	5.6	25.81	1	(See Notes)	0'-6	120	21.249	***** Route 15 ***** Sprinkler, T(5'-0)
29	25'-4		25.81	1.0490		5'-0	0.208649	0.217	
						5'-6		1.148	
29	25'-4			1½		10'-0	120	22.614	
30	25'-4		25.81	1.6100		10'-0	0.025903	0.259	
30	25'-4		25.96	1½	(See Notes)	4'-0		120	22.873	Flow (q) from Route 16 T(8'-0)
18	25'-4		51.78	1.6100		8'-0	0.093881		
						12'-0		1.127	
								23.999	Total(Pt) Route 15
116	25'-10	5.6	25.96	1	(See Notes)	0'-6	120	21.496	***** Route 16 ***** Sprinkler, T(5'-0)
30	25'-4		25.96	1.0490		5'-0	0.210889	0.217	
						5'-6		1.160	
								22.873		Total(Pt) Route 16
117	21'-10	5.6	26.36	1	(See Notes)	0'-6	120	22.153	***** Route 17 ***** Sprinkler, T(5'-0)
25	21'-4		26.36	1.0490		5'-0	0.216849	0.217	
						5'-6		1.193	
								23.563		Total(Pt) Route 17
118	21'-10	5.6	27.65	1	(See Notes)	0'-6	120	24.387	***** Route 18 ***** Sprinkler, T(5'-0)
31	21'-4		27.65	1.0490		5'-0	0.236998	0.217	
						5'-6		1.303	

Pipe Information

Node 1	Elev 1 (Foot)	K-Factor	Flow added this step (q)	Nominal ID	Fittings & Devices	Length (Foot)	C Factor	Total(Pt)	Notes	
										Node 2	Elev 2 (Foot)	Total Flow (Q)	Actual ID	Equiv. Length (Foot)	Fitting (Foot)	Total (Foot)	Pf Friction Loss Per Unit (psi)	Elev(Pe)	Friction(Pf)
31	21'-4			1½		10'-0	120	25.907		
32	21'-4		27.65	1.6100		10'-0	0.029422	0.294		
32	21'-4		27.81	1½	(See Notes)	4'-0	120	26.201		
26	21'-4		55.47	1.6100		8'-0	0.106631			
						12'-0		1.280		
								27.481	Total(Pt) Route 18	
119	21'-10	5.6	27.81	1	(See Notes)	0'-6	120	24.667		
32	21'-4		27.81	1.0490		5'-0	0.239517	0.217		
						5'-6		1.317		
								26.201	Total(Pt) Route 19	
120	25'-10	5.6	30.75	1	(See Notes)	0'-6	120	30.158		
33	25'-4		30.75	1.0490		5'-0	0.288450	0.217		
						5'-6		1.586		
33	25'-4			1½	(See Notes)	8'-6	120	31.961		
8	20'-10		30.75	1.6100		16'-0	0.035810	1.951		
						24'-6		0.877		
								34.789	Total(Pt) Route 20	
55	2'-0		100.00	6	(See Notes)	46'-4½	140	55.441		
11	-5'-0		100.00	6.4000		81'-2½	0.000288	3.035		
						127'-7½		0.037		
								58.512	Total(Pt) Route 21	

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

C Value Multiplier

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}} \right)^{4.87} = \text{Factor}$$

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51

Fittings Legend

ALV Alarm Valve	AngV Angle Valve	b Bushing
BaIV Ball Valve	BFP Backflow Preventer	BV Butterfly Valve
C Cross Flow Turn 90°	cplg Coupling	Cr Cross Run
CV Check Valve	DelV Deluge Valve	DPV Dry Pipe Valve
E 90° Elbow	EE 45° Elbow	Ee1 11¼° Elbow
Ee2 22½° Elbow	f Flow Device	fd Flex Drop
FDC Fire Department Connection	fE 90° FireLock(TM) Elbow	fEE 45° FireLock(TM) Elbow
flg Flange	FN Floating Node	fT FireLock(TM) Tee
g Gauge	GloV Globe Valve	GV Gate Valve
Ho Hose	Hose Hose	HV Hose Valve
Hyd Hydrant	LtE Long Turn Elbow	mecT Mechanical Tee
Noz Nozzle	P1 Pump In	P2 Pump Out
PIV Post Indicating Valve	PO Pipe Outlet	PrV Pressure Relief Valve
PRV Pressure Reducing Valve	red Reducer/Adapter	S Supply
sCV Swing Check Valve	SFx Seismic Flex	Spr Sprinkler
St Strainer	T Tee Flow Turn 90°	Tr Tee Run
U Union	WirF Wirsbo	WMV Water Meter Valve
Z Cap		

Hydraulic Calculations

for

Project Name: Phoenix Fire Station No 74: (23250)

Location: NWC 19th Avenue & Chandler, Phoenix, AZ 85045,

Drawing Name: 23250 FP2.0 & 3.0.cad

Calculation Date: 12/14/2023

Design

Remote Area Number: 2
 Remote Area Location: Attic
 Occupancy Classification: Light Hazard
 Commodity Classification: N/A

Density 0.10 gpm/ft²
 Area of Application: 1950 ft² (Actual 1389 ft²)
 Coverage per Sprinkler: 120 ft²
 Type of sprinklers calculated: Upright
 No. of sprinklers calculated: 28
 No. of nozzles calculated: 0

In-rack Demand: N/A gpm at Node: N/A
 Hose Streams: 0.0 gpm at Node: 13 Type: Allowance at Source
 100.00 at Node: 55 Type: Hydrant

Total Water Required (including Hose Streams where applicable):
 From Water Supply at Node 13: 669.63 @ 71.647 (Safety Margin = 7.300)

Type of System: Wet, CMDA
 Volume of Dry/PreAction/Antifreeze/OtherAgent System: N/A

Water Supply Information:

for Node: 13 Date: 05/04/2023
 Location: 1900 W Chandler Blvd, Phoenix, AZ 85045
 Source: COP Water Services Dept. 602.262.5077

Name of Contractor: TBD
 Address:
 Phone Number:
 Name of designer: EJ Engineering, Inc.
 Authority Having Jurisdiction: City of Phoenix Fire Prevention

Notes:

Automatic peaking results Left: N/A Right: N/A



John L. Echeverri, Principal
 NICET Level IV Automatic Sprinklers
 NICET Level III Special Hazards
 NFPA Certified Fire Protection Specialist
 NICET SET Cert. 78493 & CFPS Cert. 1915
 NICET SET Cert. 78493 Exp. 03/2026

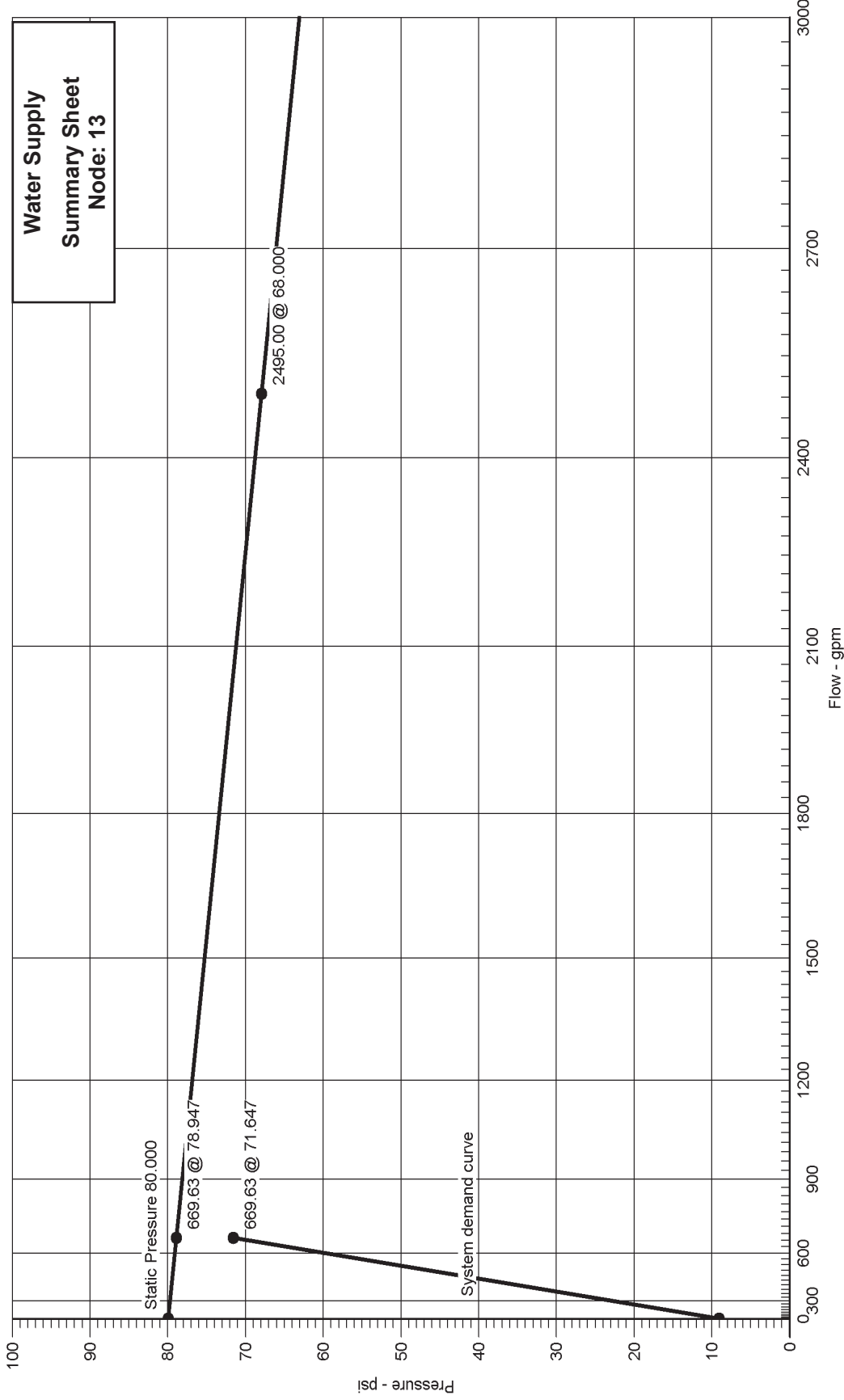


Hydraulic Graph

Job Name: Phoenix Fire Station No 74
Remote Area Number: 2

N 1.85

Date: 12/14/2023



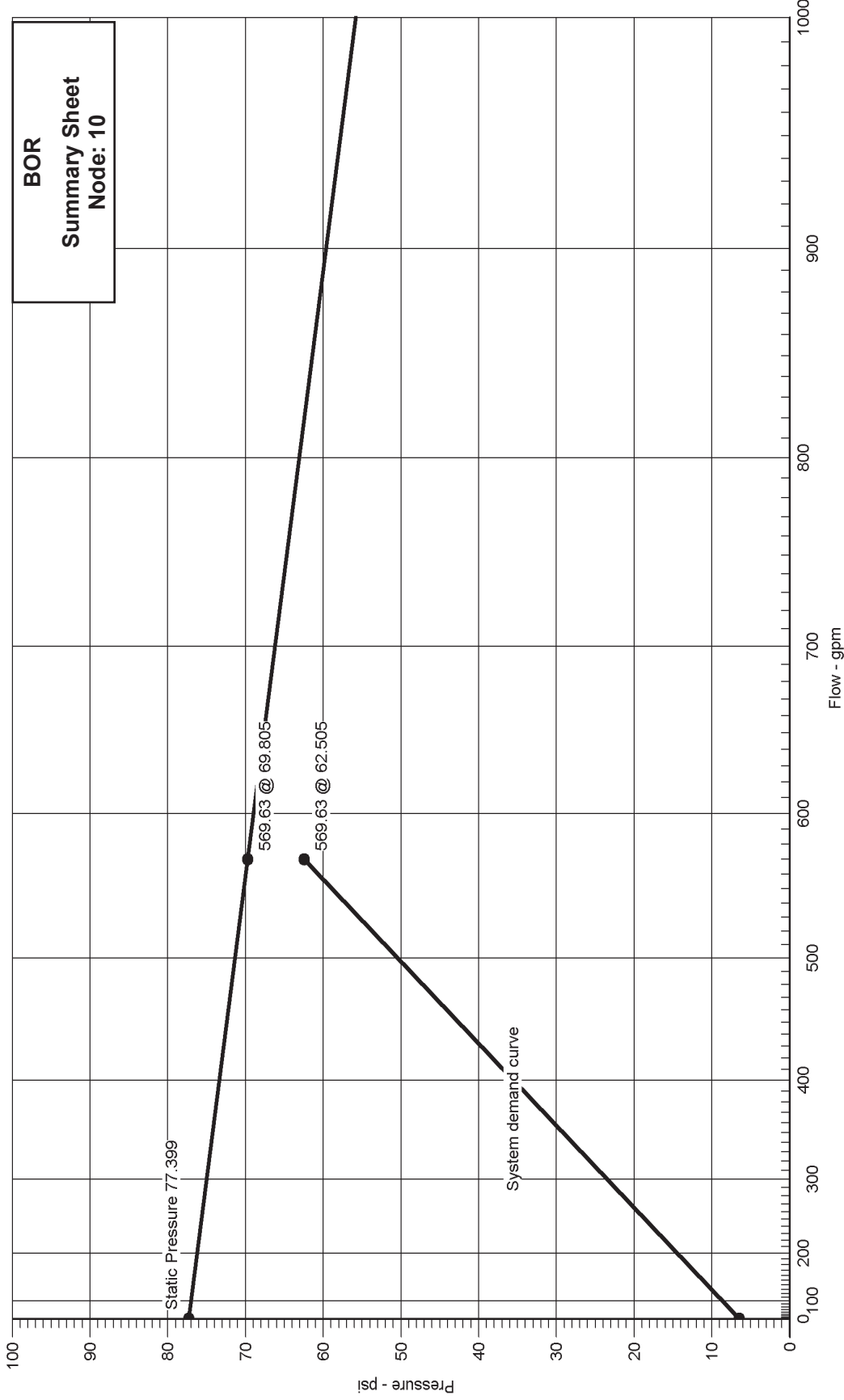
Supply:static:80.000
Residual:68.000
Flowing:2495.00
Available Flow @ 20 PSI:5274.52

Hydraulic Graph

Job Name: Phoenix Fire Station No 74
Remote Area Number: 2

N 1.85

Date: 12/14/2023



BOR
Summary Sheet
Node: 10



Summary Of Outflowing Devices

Job Number: 23250 - Phoenix FS #74
Report Description: Light Hazard (2)

Device	Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
Hydrant 55	100.00	100.00	0	62.130			
⇒ Sprinkler 201	14.82	12.00	5.6	7.000			
Sprinkler 202	14.87	12.00	5.6	7.056			
Sprinkler 203	15.02	12.00	5.6	7.190			
Sprinkler 204	15.46	12.00	5.6	7.619			
Sprinkler 205	15.95	12.00	5.6	8.115			
Sprinkler 206	17.04	12.00	5.6	9.264			
Sprinkler 207	18.04	12.00	5.6	10.377			
Sprinkler 208	19.95	12.00	5.6	12.694			
Sprinkler 209	22.29	12.00	5.6	15.837			
Sprinkler 210	25.07	12.00	5.6	20.040			
Sprinkler 211	27.29	12.00	5.6	23.747			
Sprinkler 212	15.97	12.00	5.6	8.131			
Sprinkler 213	16.03	12.00	5.6	8.194			
Sprinkler 214	16.18	12.00	5.6	8.349			
Sprinkler 215	16.65	12.00	5.6	8.842			
Sprinkler 216	17.18	12.00	5.6	9.411			
Sprinkler 217	18.34	12.00	5.6	10.730			
Sprinkler 218	19.40	12.00	5.6	12.007			
Sprinkler 219	21.44	12.00	5.6	14.664			
Sprinkler 220	23.94	12.00	5.6	18.268			
Sprinkler 221	26.90	12.00	5.6	23.083			
Sprinkler 222	22.23	12.00	5.6	15.763			
Sprinkler 223	22.34	12.00	5.6	15.920			
Sprinkler 224	22.74	12.00	5.6	16.489			
Sprinkler 225	23.57	12.00	5.6	17.710			
Sprinkler 226	24.94	12.00	5.6	19.836			
Sprinkler 227	26.95	12.00	5.6	23.167			
Sprinkler 228	29.02	12.00	5.6	26.846			

⇒ Most Demanding Sprinkler Data

Supply Analysis							
Node	Name	Static (psi)	Residual (psi)	@ Flow (gpm)	Available (psi)	@ Total Demand (gpm)	Required Pressure (psi)
13	Water Supply	80.000	68.000	2495.00	78.947	669.63	71.647

Node Analysis					
Node Number	Elevation (Foot)	Node Type	Pressure at Node (psi)	Discharge at Node (gpm)	Notes
13	-5'-0	Supply	71.647	669.63	
55	2'-0	Hydrant	62.130	100.00	
201	13'-6	Sprinkler	7.000	14.82	
202	13'-6	Sprinkler	7.056	14.87	
203	13'-6	Sprinkler	7.190	15.02	
204	13'-6	Sprinkler	7.619	15.46	
205	13'-6	Sprinkler	8.115	15.95	
206	13'-6	Sprinkler	9.264	17.04	
207	13'-6	Sprinkler	10.377	18.04	
208	13'-6	Sprinkler	12.694	19.95	
209	13'-6	Sprinkler	15.837	22.29	
210	13'-6	Sprinkler	20.040	25.07	
211	13'-6	Sprinkler	23.747	27.29	
212	13'-6	Sprinkler	8.131	15.97	
213	13'-6	Sprinkler	8.194	16.03	
214	13'-6	Sprinkler	8.349	16.18	
215	13'-6	Sprinkler	8.842	16.65	
216	13'-6	Sprinkler	9.411	17.18	
217	13'-6	Sprinkler	10.730	18.34	

Node Number	Elevation (Foot)	Node Type	Pressure at Node (psi)	Discharge at Node (gpm)	Notes
218	13'-6	Sprinkler	12.007	19.40	
219	13'-6	Sprinkler	14.664	21.44	
220	13'-6	Sprinkler	18.268	23.94	
221	13'-6	Sprinkler	23.083	26.90	
222	16'-1	Sprinkler	15.763	22.23	
223	16'-1	Sprinkler	15.920	22.34	
224	16'-1	Sprinkler	16.489	22.74	
225	16'-1	Sprinkler	17.710	23.57	
226	16'-1	Sprinkler	19.836	24.94	
227	16'-1	Sprinkler	23.167	26.95	
228	16'-1	Sprinkler	26.846	29.02	
9	10'-10½		54.326		
10	1'-0	Gauge	62.505		
11	-5'-0		65.201		
35	13'-6		30.204		
36	11'-8½		49.920		
37	11'-7		50.073		
38	11'-4½		50.443		
39	13'-6		33.007		
40	16'-1		36.648		
41	12'-3		47.150		
60	-5'-0		71.520		

Pipe Information

Node 1	Elev 1 (Foot)	K-Factor	Flow added this step (q)	Nominal ID	Fittings & Devices	Length (Foot)	C Factor	Total(Pt)	Notes Fitting/Device (Equivalent Length) Fixed Pressure Losses, when applicable, are added directly to (Pf) and shown as a negative value.
	Node 2		Elev 2 (Foot)	Total Flow (Q)		Actual ID	Fitting (Foot)	Pf Friction Loss Per Unit (psi)		Elev(Pe)
		Total (Foot)			Friction(Pf)				
201	13'-6	5.6	14.82	1½	(See Notes)	6'-0	120	7.000	.....Route 1..... Sprinkler
202	13'-6		14.82	1.6100		6'-0	0.009274	0.056	
202	13'-6	5.6	14.87	1½	(See Notes)	4'-0	120	7.056	Sprinkler
203	13'-6		29.69	1.6100		4'-0	0.033556	0.134	
203	13'-6	5.6	15.02	1½	(See Notes)	6'-0	120	7.190	Sprinkler
204	13'-6		44.71	1.6100		6'-0	0.071549	0.429	
204	13'-6	5.6	15.46	1½	(See Notes)	4'-0	120	7.619	Sprinkler
205	13'-6		60.16	1.6100		4'-0	0.123934	0.496	
205	13'-6	5.6	15.95	1½	(See Notes)	6'-0	120	8.115	Sprinkler
206	13'-6		76.12	1.6100		6'-0	0.191493	1.149	
206	13'-6	5.6	17.04	1½	(See Notes)	4'-0	120	9.264	Sprinkler
207	13'-6		93.16	1.6100		4'-0	0.278291	1.113	
207	13'-6	5.6	18.04	1½	(See Notes)	6'-0	120	10.377	Sprinkler
208	13'-6		111.20	1.6100		6'-0	0.386112	2.317	
208	13'-6	5.6	19.95	1½	(See Notes)	6'-0	120	12.694	Sprinkler
209	13'-6		131.15	1.6100		6'-0	0.523963	3.144	
209	13'-6	5.6	22.29	1½	(See Notes)	6'-0	120	15.837	Sprinkler
210	13'-6		153.44	1.6100		6'-0	0.700473	4.203	
210	13'-6	5.6	25.07	1½	(See Notes)	4'-0	120	20.040	Sprinkler
211	13'-6		178.51	1.6100		4'-0	0.926783	3.707	
211	13'-6	5.6	27.29	1½	(See Notes)	1'-4	120	23.747	Sprinkler, E(4'-0)
35	13'-6		205.80	1.6100		4'-0	1.205801	6.456	
						5'-4			

Pipe Information

Node 1	Elev 1 (Foot)	K-Factor	Flow added this step (q)	Nominal ID	Fittings & Devices	Length (Foot)	C Factor	Total(Pt)	Notes Fitting/Device (Equivalent Length) Fixed Pressure Losses, when applicable, are added directly to (Pf) and shown as a negative value.	
										Node 2	Elev 2 (Foot)	Total Flow (Q)	Actual ID	Equiv. Length (Foot)	Fitting (Foot)	Total (Foot)	Pf Friction Loss Per Unit (psi)	Elev(Pe)	Friction(Pf)
35	13'-6			2	(See Notes)	28'-0½	120	30.204		
36	11'-8½		205.80	2.0670		25'-0	0.357116	0.768		
						53'-0½		18.948	E(5'-0), T(10'-0), PO(10'-0)	
36	11'-8½			4		8'-0	120	49.920		
37	11'-7		205.80	4.2600			0.010551	0.069		
						8'-0		0.084		
37	11'-7		171.79	4		9'-0	120	50.073		
38	11'-4½		377.59	4.2600			0.032428	0.078		
						9'-0		0.292	Flow (q) from Route 3	
38	11'-4½		192.04	4	(See Notes)	26'-6	120	50.443		
9	10'-10½		569.63	4.2600		26'-4	0.069387	0.218		
						52'-10		3.665	Flow (q) from Route 2 2E(13'-2)	
9	10'-10½			4	(See Notes)	8'-7	120	54.326		
10	1'-0		569.63	4.0260		34'-0	0.091363	4.286		
						42'-7		3.892	f, sCV(22'-0), BV(12'-0), BOR	
10	1'-0			8	(See Notes)	20'-8½	140	62.505		
11	-5'-0		569.63	8.5500		33'-6	0.001754	2.601		
						54'-2½		0.095	E(33'-6)	
11	-5'-0		100.00	8	(See Notes)	250'-6	140	65.201		
60	-5'-0		669.63	8.5500		306'-11	0.002366			
						557'-5		6.319	Flow (q) from Route 4 7E(33'-6), BFP(-5.000), GV(7'-5½), T(65'-1)	
60	-5'-0			12	(See Notes)	231'-0	150	71.520		
13	-5'-0		669.63	11.3100		6'-11½	0.000533			
						237'-11½		0.127	GV(6'-11½), S	
			0.00					71.647	Hose Allowance At Source	
13			669.63						Total(Pt) Route 1	
212	13'-6	5.6	15.97	1½	(See Notes)	6'-0	120	8.131 Route 2 Sprinkler	
213	13'-6		15.97	1.6100			0.010652			
						6'-0		0.064		
213	13'-6	5.6	16.03	1½	(See Notes)	4'-0	120	8.194	Sprinkler	
214	13'-6		32.00	1.6100			0.038539			
						4'-0		0.154		

Pipe Information

Node 1	Elev 1 (Foot)	K-Factor	Flow added this step (q)	Nominal ID	Fittings & Devices	Length (Foot)	C Factor	Total(Pt)	Notes Fitting/Device (Equivalent Length) Fixed Pressure Losses, when applicable, are added directly to (Pf) and shown as a negative value.
	Node 2		Elev 2 (Foot)	Total Flow (Q)		Actual ID	Fitting (Foot)	Pf Friction Loss Per Unit (psi)		Elev(Pe)
		Total (Foot)			Friction(Pf)				
214	13'-6	5.6	16.18	1½	(See Notes)	6'-0	120	8.349	Sprinkler
215	13'-6		48.18	1.6100		6'-0	0.082167	0.493	
215	13'-6	5.6	16.65	1½	(See Notes)	4'-0	120	8.842	Sprinkler
216	13'-6		64.83	1.6100		4'-0	0.142299	0.569	
216	13'-6	5.6	17.18	1½	(See Notes)	6'-0	120	9.411	Sprinkler
217	13'-6		82.01	1.6100		6'-0	0.219816	1.319	
217	13'-6	5.6	18.34	1½	(See Notes)	4'-0	120	10.730	Sprinkler
218	13'-6		100.35	1.6100		4'-0	0.319332	1.277	
218	13'-6	5.6	19.40	1½	(See Notes)	6'-0	120	12.007	Sprinkler
219	13'-6		119.76	1.6100		6'-0	0.442866	2.657	
219	13'-6	5.6	21.44	1½	(See Notes)	6'-0	120	14.664	Sprinkler
220	13'-6		141.20	1.6100		6'-0	0.600645	3.604	
220	13'-6	5.6	23.94	1½	(See Notes)	6'-0	120	18.268	Sprinkler
221	13'-6		165.14	1.6100		6'-0	0.802462	4.815	
221	13'-6	5.6	26.90	1½	(See Notes)	5'-4	120	23.083	Sprinkler, E(4'-0)
39	13'-6		192.04	1.6100		4'-0	1.060950		
						9'-4		9.924	
39	13'-6			2	(See Notes)	27'-7	120	33.007	E(5'-0), T(10'-0), PO(10'-0)
38	11'-4½		192.04	2.0670		25'-0	0.314216	0.911	
						52'-7		16.525	
								50.443	Total(Pt) Route 2
222	16'-1	5.6	22.23	1½	(See Notes)	8'-0	120	15.763	..... Route 3 Sprinkler
223	16'-1		22.23	1.6100		8'-0	0.019650	0.157	
223	16'-1	5.6	22.34	1½	(See Notes)	8'-0	120	15.920	Sprinkler
224	16'-1		44.58	1.6100		8'-0	0.071165	0.569	

Pipe Information

Node 1	Elev 1 (Foot)	K-Factor	Flow added this step (q)	Nominal ID	Fittings & Devices	Length (Foot)	C Factor	Total(Pt)	Notes Fitting/Device (Equivalent Length) Fixed Pressure Losses, when applicable, are added directly to (Pf) and shown as a negative value.	
										Node 2	Elev 2 (Foot)	Total Flow (Q)	Actual ID	Equiv. Length (Foot)	Fitting (Foot)	Total (Foot)	Pf Friction Loss Per Unit (psi)	Elev(Pe)	Friction(Pf)
224	16'-1	5.6	22.74	1½	(See Notes)	8'-0	120	16.489												Sprinkler
225	16'-1		67.32	1.6100		8'-0	0.152561	1.220		
225	16'-1	5.6	23.57	1½	(See Notes)	8'-0	120	17.710	Sprinkler	
226	16'-1		90.88	1.6100		8'-0	0.265833	2.127		
226	16'-1	5.6	24.94	1½	(See Notes)	8'-0	120	19.836	Sprinkler	
227	16'-1		115.82	1.6100		8'-0	0.416336	3.331		
227	16'-1	5.6	26.95	1½	(See Notes)	6'-0	120	23.167	Sprinkler	
228	16'-1		142.78	1.6100		6'-0	0.613111	3.679		
228	16'-1	5.6	29.02	1½	(See Notes)	7'-4	120	26.846	Sprinkler, E(4'-0)	
40	16'-1		171.79	1.6100		4'-0	0.863328	9.802		
						11'-4				
40	16'-1			2	(See Notes)	29'-6½	120	36.648	E(5'-0)	
41	12'-3		171.79	2.0670		5'-0	0.255688	1.668		
						34'-6½				
41	12'-3			2½	(See Notes)	0'-8	120	47.150	T(16'-5½) PO(16'-5½)	
37	11'-7		171.79	2.6350		32'-11½	0.078382	0.289		
						33'-7½				
								50.073	Total(Pt) Route 3	
55	2'-0		100.00	6	(See Notes)	46'-4½	140	62.130	••••• Route 4 ••••• Hydrant, E(24'-2½), GV(5'-2), T(51'-10)	
11	-5'-0		100.00	6.4000		81'-2½	0.000288	3.035		
						127'-7½				
								0.037		
								65.201	Total(Pt) Route 4	

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

C Value Multiplier

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}} \right)^{4.87} = \text{Factor}$$

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51

Fittings Legend

ALV Alarm Valve	AngV Angle Valve	b Bushing
BaIV Ball Valve	BFP Backflow Preventer	BV Butterfly Valve
C Cross Flow Turn 90°	cplg Coupling	Cr Cross Run
CV Check Valve	DelV Deluge Valve	DPV Dry Pipe Valve
E 90° Elbow	EE 45° Elbow	Ee1 11¼° Elbow
Ee2 22½° Elbow	f Flow Device	fd Flex Drop
FDC Fire Department Connection	fE 90° FireLock(TM) Elbow	fEE 45° FireLock(TM) Elbow
flg Flange	FN Floating Node	fT FireLock(TM) Tee
g Gauge	GloV Globe Valve	GV Gate Valve
Ho Hose	Hose Hose	HV Hose Valve
Hyd Hydrant	LtE Long Turn Elbow	mecT Mechanical Tee
Noz Nozzle	P1 Pump In	P2 Pump Out
PIV Post Indicating Valve	PO Pipe Outlet	PrV Pressure Relief Valve
PRV Pressure Reducing Valve	red Reducer/Adapter	S Supply
sCV Swing Check Valve	SFx Seismic Flex	Spr Sprinkler
St Strainer	T Tee Flow Turn 90°	Tr Tee Run
U Union	WirF Wirsbo	WMV Water Meter Valve
Z Cap		

Hydraulic Calculations

for

Project Name: Phoenix Fire Station No 74: (23250)

Location: NWC 19th Avenue & Chandler, Phoenix, AZ 85045,

Drawing Name: 23250 FP2.0 & 3.0.cad

Calculation Date: 12/14/2023

Design

Remote Area Number: 3
 Remote Area Location: Attic
 Occupancy Classification: Light Hazard
 Commodity Classification: N/A

Density 0.10 gpm/ft²
 Area of Application: 1500 ft² (Actual 1049 ft²)
 Coverage per Sprinkler: 130 ft²
 Type of sprinklers calculated: Upright
 No. of sprinklers calculated: 10
 No. of nozzles calculated: 0

In-rack Demand: N/A gpm at Node: N/A
 Hose Streams: 0.0 gpm at Node: 13 Type: Allowance at Source
 100.00 at Node: 55 Type: Hydrant

Total Water Required (including Hose Streams where applicable):
 From Water Supply at Node 13: 261.62 @ 61.802 (Safety Margin = 18.013)

Type of System: Wet, CMDA
 Volume of Dry/PreAction/Antifreeze/OtherAgent System: N/A

Water Supply Information:

for Node: 13 Date: 05/04/2023
 Location: 1900 W Chandler Blvd, Phoenix, AZ 85045
 Source: COP Water Services Dept. 602.262.5077

Name of Contractor: TBD
 Address:
 Phone Number:
 Name of designer: EJ Engineering, Inc.
 Authority Having Jurisdiction: City of Phoenix Fire Prevention

Notes:

Automatic peaking results Left: N/A Right: N/A



John L. Echeverri, Principal
 NICET Level IV Automatic Sprinklers
 NICET Level III Special Hazards
 NFPA Certified Fire Protection Specialist
 NICET SET Cert. 78493 & CFPS Cert. 1915
 NICET SET Cert. 78493 Exp. 03/2026

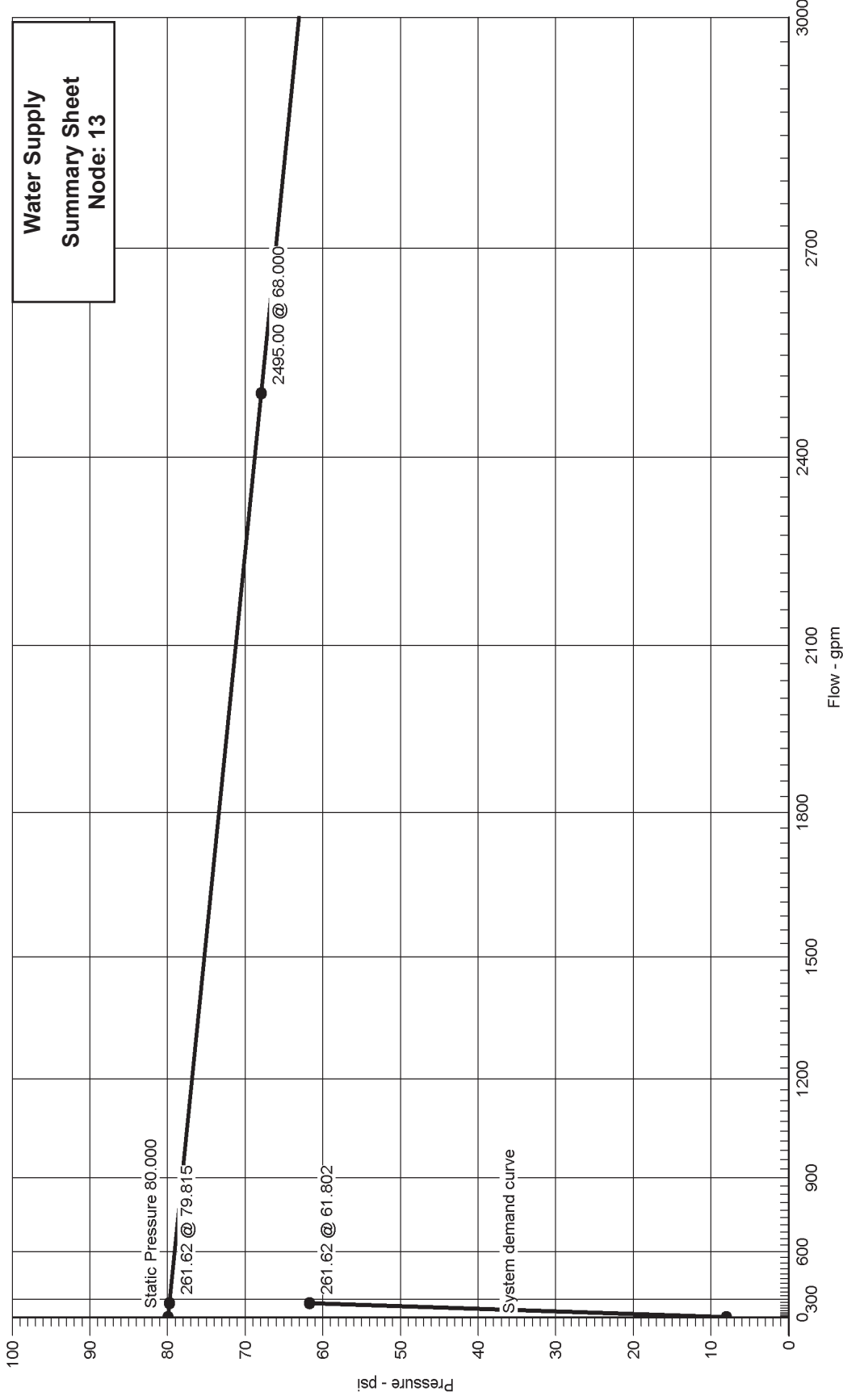


Hydraulic Graph

Job Name: Phoenix Fire Station No 74
Remote Area Number: 3

N 1.85

Date: 12/14/2023



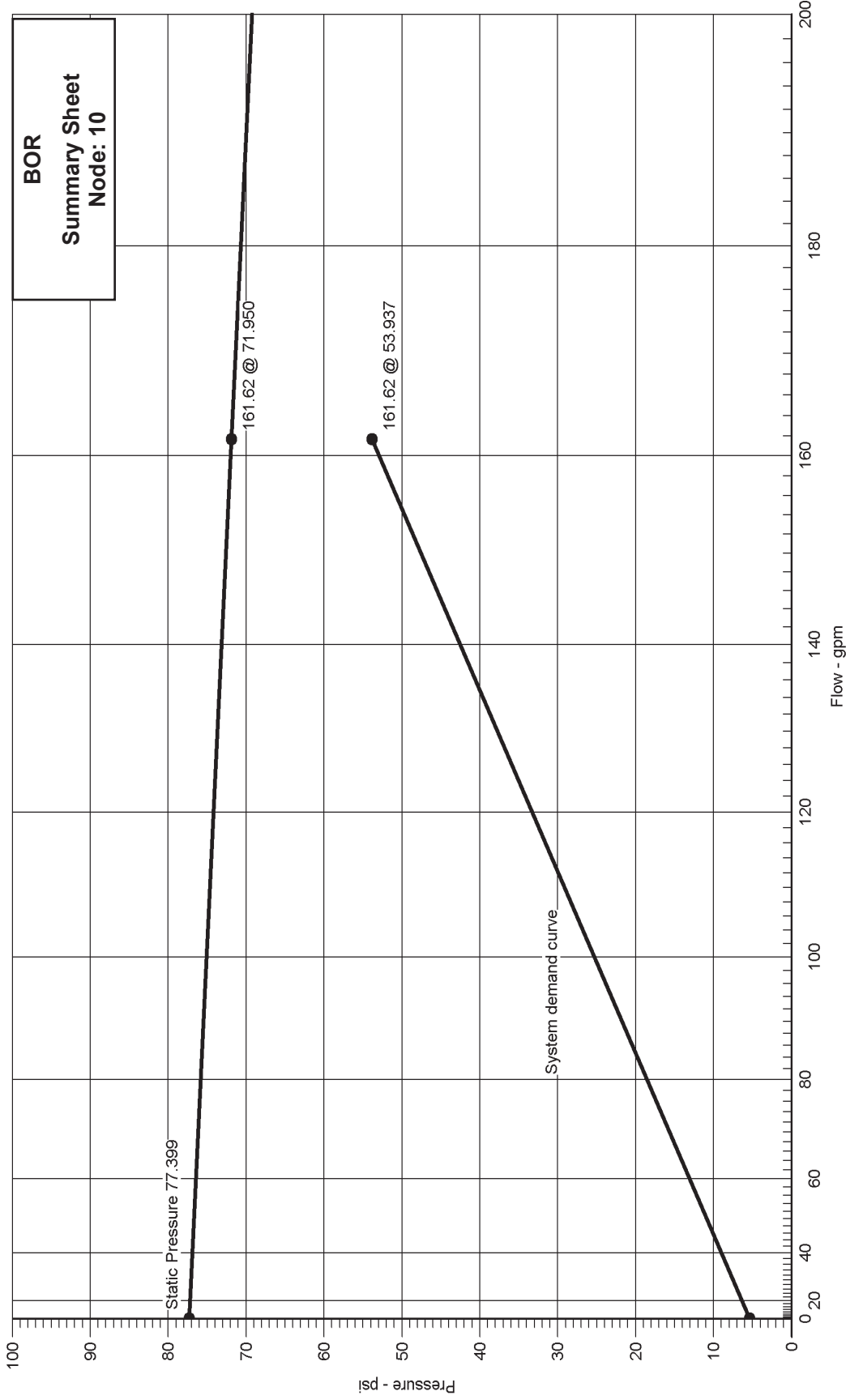
Supply:static:80.000
Residual:68.000
Flowing:2495.00
Available Flow @ 20 PSI:5274.52

Hydraulic Graph

Job Name: Phoenix Fire Station No 74
Remote Area Number: 3

N 1.85

Date: 12/14/2023





Summary Of Outflowing Devices

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Hydrant	55	100.00	100.00	0	53.476		
⇒ Sprinkler	301	14.82	13.00	5.6	7.000		
Sprinkler	302	14.98	13.00	5.6	7.153		
Sprinkler	303	15.26	13.00	5.6	7.423		
Sprinkler	304	15.84	13.00	5.6	8.004		
Sprinkler	305	16.82	13.00	5.6	9.018		
Sprinkler	307	16.08	13.00	5.6	8.241		
Sprinkler	308	16.16	13.00	5.6	8.327		
Sprinkler	309	16.46	13.00	5.6	8.640		
Sprinkler	310	17.09	13.00	5.6	9.310		
Sprinkler	311	18.13	13.00	5.6	10.480		

⇒ Most Demanding Sprinkler Data

Supply Analysis							
Node	Name	Static (psi)	Residual (psi)	@ Flow (gpm)	Available (psi)	@ Total Demand (gpm)	Required Pressure (psi)
13	Water Supply	80.000	68.000	2495.00	79.815	261.62	61.802

Node Analysis					
Node Number	Elevation (Foot)	Node Type	Pressure at Node (psi)	Discharge at Node (gpm)	Notes
13	-5'-0	Supply	61.802	261.62	
55	2'-0	Hydrant	53.476	100.00	
301	13'-4	Sprinkler	7.000	14.82	
302	13'-4	Sprinkler	7.153	14.98	
303	13'-4	Sprinkler	7.423	15.26	
304	13'-4	Sprinkler	8.004	15.84	
305	13'-4	Sprinkler	9.018	16.82	
307	13'-7½	Sprinkler	8.241	16.08	
308	13'-7½	Sprinkler	8.327	16.16	
309	13'-7½	Sprinkler	8.640	16.46	
310	13'-7½	Sprinkler	9.310	17.09	
311	13'-7½	Sprinkler	10.480	18.13	
9	10'-10½		49.272		
10	1'-0	Gauge	53.937		
11	-5'-0		56.548		
42	13'-7½		12.544		
43	10'-3		47.680		
60	-5'-0		61.780		
306	10'-9½	Sprinkler	37.242	Sprinkler	

Pipe Information

Node 1	Elev 1 (Foot)	K-Factor	Flow added this step (q)	Nominal ID	Fittings & Devices	Length (Foot)	C Factor	Total(Pt)	Notes Fitting/Device (Equivalent Length) Fixed Pressure Losses, when applicable, are added directly to (Pf) and shown as a negative value.
	Node 2		Elev 2 (Foot)	Total Flow (Q)		Actual ID	Fitting (Foot)	Pf Friction Loss Per Unit (psi)		Elev(Pe)
		Total (Foot)			Friction(Pf)				
301	13'-4	5.6	14.82	1½	(See Notes)	8'-6	120	7.000		.....Route 1..... Sprinkler, 2E(4'-0)
302	13'-4		14.82	1.6100		8'-0	0.009274		
						16'-6		0.153	
302	13'-4	5.6	14.98	1½	(See Notes)	8'-0	120	7.153	Sprinkler
303	13'-4		29.79	1.6100		8'-0	0.033770	0.270	
303	13'-4	5.6	15.26	1½	(See Notes)	8'-0	120	7.423	Sprinkler
304	13'-4		45.05	1.6100		8'-0	0.072571	0.581	
304	13'-4	5.6	15.84	1½	(See Notes)	8'-0	120	8.004	Sprinkler
305	13'-4		60.89	1.6100		8'-0	0.126728	1.014	
305	13'-4	5.6	16.82	1½	(See Notes)	14'-4	120	9.018	Sprinkler, E(4'-0)
42	13'-7½		77.71	1.6100		4'-0	0.198974	-0.122	
						18'-4		3.648	
42	13'-7½		83.91	1½	(See Notes)	14'-5½	120	12.544	Flow (q) from Route 2 4E(4'-0)
306	10'-9½		161.62	1.6100		16'-0	0.771156	1.222	
						30'-5½		23.476	
306	10'-9½	5.6		2	(See Notes)	24'-8	120	37.242	T(10'-0), PO(10'-0)
43	10'-3		161.62	2.0670		20'-0	0.228389	0.234	
						44'-8		10.204	
43	10'-3			4	(See Notes)	171'-7	120	47.680	8E(13'-2)
9	10'-10½		161.62	4.2600		105'-4	0.006748	-0.276	
						276'-11		1.869	
9	10'-10½			4	(See Notes)	8'-7	120	49.272	f, sCV(22'-0), BV(12'-0), BOR
10	1'-0		161.62	4.0260		34'-0	0.008885	4.286	
						42'-7		0.379	
10	1'-0			8	(See Notes)	20'-8½	140	53.937	E(33'-6)
11	-5'-0		161.62	8.5500		33'-6	0.000171	2.601	
						54'-2½		0.009	
11	-5'-0		100.00	8	(See Notes)	250'-6	140	56.548	Flow (q) from Route 3 7E(33'-6), BFP(-5.000), GV(7'-5½), T(65'-1)
60	-5'-0		261.62	8.5500		306'-11	0.000416		
						557'-5		5.232	

Pipe Information

Node 1	Elev 1 (Foot)	K-Factor	Flow added this step (q)	Nominal ID	Fittings & Devices	Length (Foot)	C Factor	Total(Pt)	Notes Fitting/Device (Equivalent Length) Fixed Pressure Losses, when applicable, are added directly to (Pf) and shown as a negative value.	
										Node 2	Elev 2 (Foot)	Total Flow (Q)	Actual ID	Equiv. Length (Foot)	Fitting (Foot)	Total (Foot)	Pf Friction Loss Per Unit (psi)	Elev(Pe)	Friction(Pf)
60	-5'-0			12	(See Notes)	231'-0	150	61.780												GV(6'-11½), S
13	-5'-0		261.62	11.3100		6'-11½	0.000094			
						237'-11½		0.022		
			0.00					61.802	Hose Allowance At Source	
13			261.62						Total(Pt) Route 1	
307	13'-7½	5.6	16.08	1½	(See Notes)	8'-0	120	8.241	••••• Route 2 ••••• Sprinkler	
308	13'-7½		16.08	1.6100		8'-0	0.010786	0.086		
308	13'-7½	5.6	16.16	1½	(See Notes)	8'-0	120	8.327	Sprinkler	
309	13'-7½		32.24	1.6100		8'-0	0.039070	0.313		
309	13'-7½	5.6	16.46	1½	(See Notes)	8'-0	120	8.640	Sprinkler	
310	13'-7½		48.70	1.6100		8'-0	0.083808	0.670		
310	13'-7½	5.6	17.09	1½	(See Notes)	8'-0	120	9.310	Sprinkler	
311	13'-7½		65.78	1.6100		8'-0	0.146195	1.170		
311	13'-7½	5.6	18.13	1½	(See Notes)	1'-0	120	10.480	Sprinkler,	
42	13'-7½		83.91	1.6100		8'-0	0.229347		T(8'-0)	
								2.064		
								12.544	Total(Pt) Route 2	
55	2'-0		100.00	6	(See Notes)	46'-4½	140	53.476	••••• Route 3 ••••• Hydrant,	
11	-5'-0		100.00	6.4000		81'-2½	0.000288	3.035	E(24'-2½), GV(5'-2), T(51'-10)	
						127'-7½		0.037		
								56.548	Total(Pt) Route 3	

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

C Value Multiplier

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}} \right)^{4.87} = \text{Factor}$$

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51

Fittings Legend

ALV Alarm Valve	AngV Angle Valve	b Bushing
BaIV Ball Valve	BFP Backflow Preventer	BV Butterfly Valve
C Cross Flow Turn 90°	cplg Coupling	Cr Cross Run
CV Check Valve	DelV Deluge Valve	DPV Dry Pipe Valve
E 90° Elbow	EE 45° Elbow	Ee1 11¼° Elbow
Ee2 22½° Elbow	f Flow Device	fd Flex Drop
FDC Fire Department Connection	fE 90° FireLock(TM) Elbow	fEE 45° FireLock(TM) Elbow
flg Flange	FN Floating Node	fT FireLock(TM) Tee
g Gauge	GloV Globe Valve	GV Gate Valve
Ho Hose	Hose Hose	HV Hose Valve
Hyd Hydrant	LtE Long Turn Elbow	mecT Mechanical Tee
Noz Nozzle	P1 Pump In	P2 Pump Out
PIV Post Indicating Valve	PO Pipe Outlet	PrV Pressure Relief Valve
PRV Pressure Reducing Valve	red Reducer/Adapter	S Supply
sCV Swing Check Valve	SFx Seismic Flex	Spr Sprinkler
St Strainer	T Tee Flow Turn 90°	Tr Tee Run
U Union	WirF Wirsbo	WMV Water Meter Valve
Z Cap		

Hydraulic Calculations

for

Project Name: Phoenix Fire Station No 74: (23250)

Location: NWC 19th Avenue & Chandler, Phoenix, AZ 85045,

Drawing Name: 23250 FP2.0 & 3.0.cad

Calculation Date: 12/14/2023

Design

Remote Area Number: 4
 Remote Area Location: Attic
 Occupancy Classification: Light Hazard
 Commodity Classification: N/A

Density 0.10 gpm/ft²
 Area of Application: 1950 ft² (Actual 934 ft²)
 Coverage per Sprinkler: 120 ft²
 Type of sprinklers calculated: Upright
 No. of sprinklers calculated: 22
 No. of nozzles calculated: 0

In-rack Demand: N/A gpm at Node: N/A
 Hose Streams: 0.0 gpm at Node: 13 Type: Allowance at Source
 100.00 at Node: 55 Type: Hydrant

Total Water Required (including Hose Streams where applicable):
 From Water Supply at Node 13: 441.60 @ 72.827 (Safety Margin = 6.685)

Type of System: Wet, CMDA
 Volume of Dry/PreAction/Antifreeze/OtherAgent System: N/A

Water Supply Information:

for Node: 13 Date: 05/04/2023
 Location: 1900 W Chandler Blvd, Phoenix, AZ 85045
 Source: COP Water Services Dept. 602.262.5077

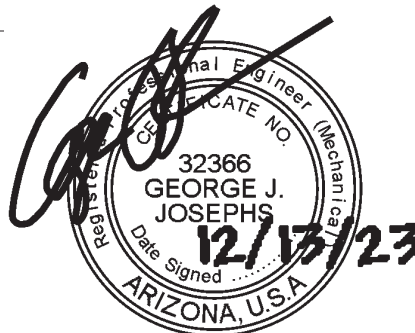
Name of Contractor: TBD
 Address:
 Phone Number:
 Name of designer: EJ Engineering, Inc.
 Authority Having Jurisdiction: City of Phoenix Fire Prevention

Notes:

Automatic peaking results Left: N/A Right: N/A



John L. Echeverri, Principal
 NICET Level IV Automatic Sprinklers
 NICET Level III Special Hazards
 NFPA Certified Fire Protection Specialist
 NICET SET Cert. 78493 & CFPS Cert. 1915
 NICET SET Cert. 78493 Exp. 03/2026

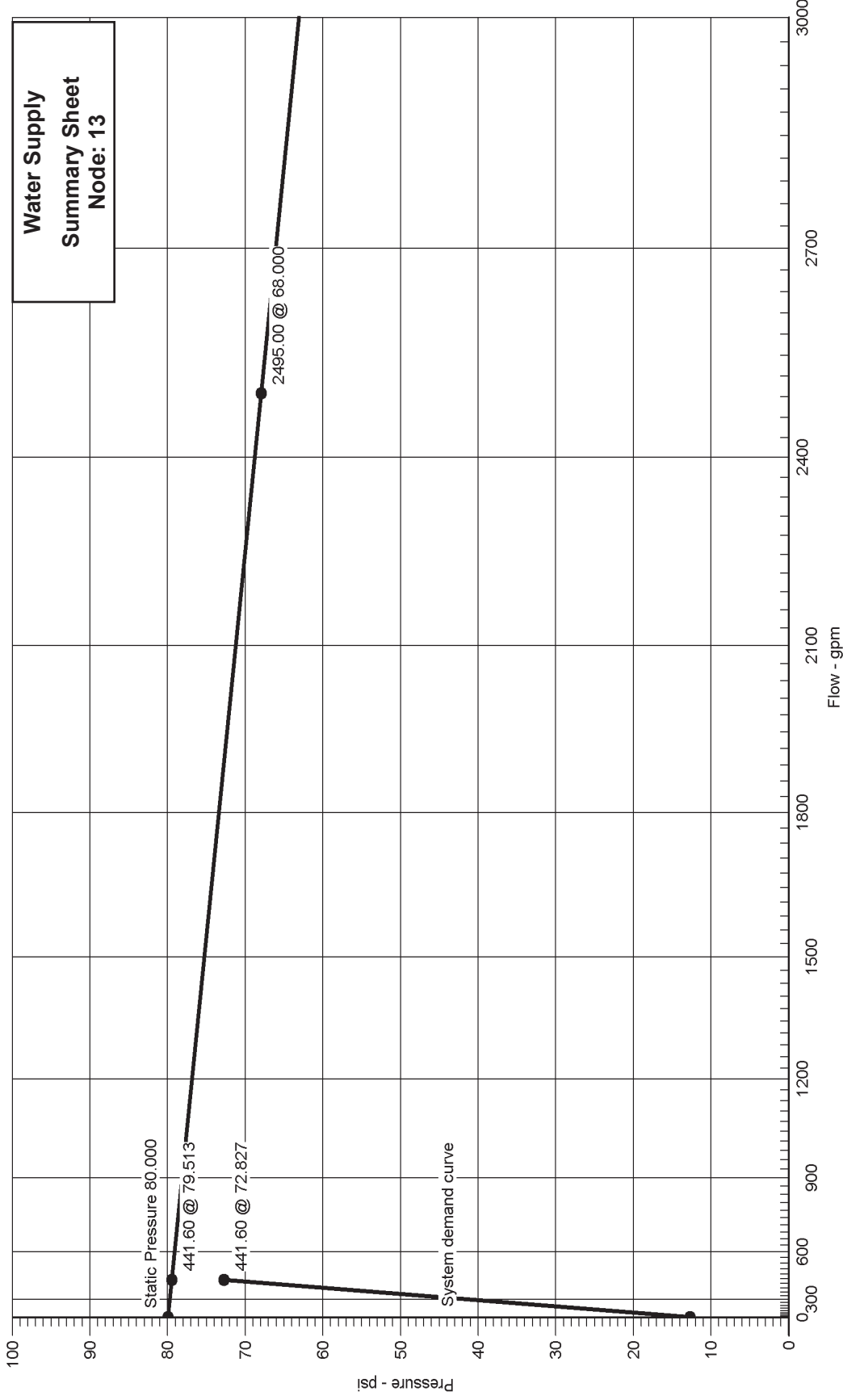


Hydraulic Graph

Job Name: Phoenix Fire Station No 74
Remote Area Number: 4

N 1.85

Date: 12/14/2023



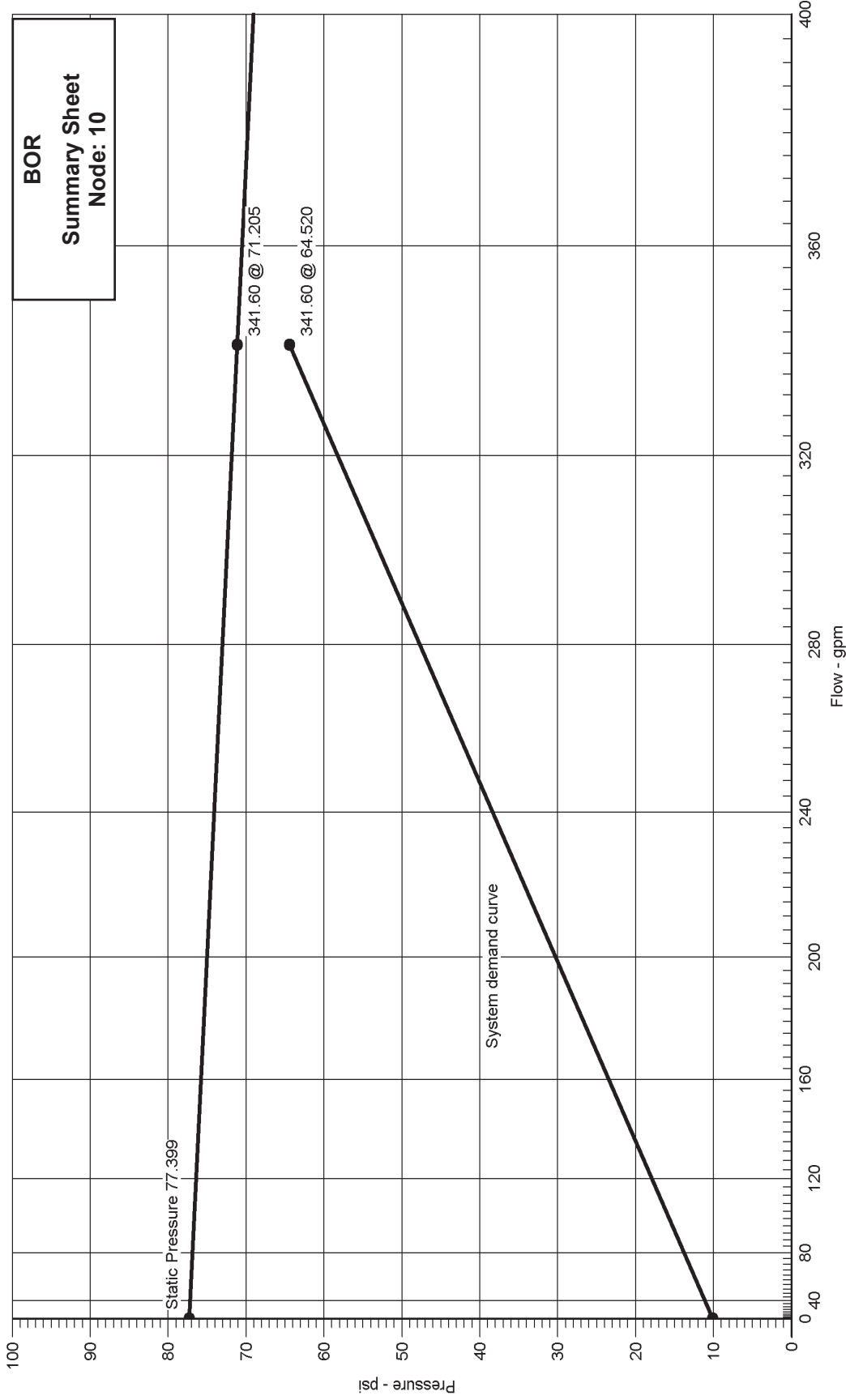
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Residual:68.000
Flowing:2495.00
Available Flow @ 20 PSI:5274.52

Hydraulic Graph

Job Name: Phoenix Fire Station No 74
Remote Area Number: 4

N 1.85

Date: 12/14/2023



BOR
Summary Sheet
Node: 10



Summary Of Outflowing Devices

Job Number: 23250 - Phoenix FS #74
Report Description: Light Hazard (4)

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Hydrant	55	100.00	100.00	0	64.087		
⇒ Sprinkler	401	14.82	12.00	5.6	7.000		
Sprinkler	402	14.84	12.00	5.6	7.022		
Sprinkler	403	14.93	12.00	5.6	7.105		
Sprinkler	404	14.95	12.00	5.6	7.127		
Sprinkler	405	15.03	12.00	5.6	7.208		
Sprinkler	406	15.01	12.00	5.6	7.180		
Sprinkler	407	15.03	12.00	5.6	7.203		
Sprinkler	408	15.11	12.00	5.6	7.284		
Sprinkler	409	15.20	12.00	5.6	7.367		
Sprinkler	410	15.22	12.00	5.6	7.390		
Sprinkler	411	15.31	12.00	5.6	7.473		
Sprinkler	412	15.20	12.00	5.6	7.364		
Sprinkler	413	15.21	12.00	5.6	7.381		
Sprinkler	414	15.23	12.00	5.6	7.396		
Sprinkler	415	15.25	12.00	5.6	7.413		
Sprinkler	416	15.31	12.00	5.6	7.474		
Sprinkler	417	15.33	12.00	5.6	7.491		
Sprinkler	418	16.76	12.00	5.6	8.956		
Sprinkler	419	16.78	12.00	5.6	8.983		
Sprinkler	420	16.88	12.00	5.6	9.083		
Sprinkler	421	17.09	12.00	5.6	9.316		
Sprinkler	422	17.11	12.00	5.6	9.337		

⇒ Most Demanding Sprinkler Data

Supply Analysis							
Node	Name	Static (psi)	Residual (psi)	@ Flow (gpm)	Available (psi)	@ Total Demand (gpm)	Required Pressure (psi)
13	Water Supply	80.000	68.000	2495.00	79.513	441.60	72.827

Node Analysis					
Node Number	Elevation (Foot)	Node Type	Pressure at Node (psi)	Discharge at Node (gpm)	Notes
13	-5'-0	Supply	72.827	441.60	
55	2'-0	Hydrant	64.087	100.00	
401	22'-6½	Sprinkler	7.000	14.82	
402	22'-6½	Sprinkler	7.022	14.84	
403	24'-6	Sprinkler	7.105	14.93	
404	24'-6	Sprinkler	7.127	14.95	
405	24'-6	Sprinkler	7.208	15.03	
406	24'-6	Sprinkler	7.180	15.01	
407	24'-6	Sprinkler	7.203	15.03	
408	24'-6	Sprinkler	7.284	15.11	
409	22'-6½	Sprinkler	7.367	15.20	
410	22'-6½	Sprinkler	7.390	15.22	
411	22'-6½	Sprinkler	7.473	15.31	
412	22'-6½	Sprinkler	7.364	15.20	
413	22'-6½	Sprinkler	7.381	15.21	
414	24'-6	Sprinkler	7.396	15.23	
415	24'-6	Sprinkler	7.413	15.25	
416	24'-6	Sprinkler	7.474	15.31	
417	24'-6	Sprinkler	7.491	15.33	

Node Number	Elevation (Foot)	Node Type	Pressure at Node (psi)	Discharge at Node (gpm)	Notes
418	22'-4½	Sprinkler	8.956	16.76	
419	22'-4½	Sprinkler	8.983	16.78	
420	22'-4½	Sprinkler	9.083	16.88	
421	22'-4½	Sprinkler	9.316	17.09	
422	22'-4½	Sprinkler	9.337	17.11	
9	10'-10½		58.722		
10	1'-0	Gauge	64.520		
11	-5'-0		67.158		
37	11'-7		56.761		
44	22'-6½		7.391		
45	22'-6½		7.819		
46	21'-10½		9.202		
47	21'-10½		9.375		
48	21'-10½		9.461		
49	21'-10½		10.438		
50	24'-6		7.542		
51	24'-6		7.622		
52	22'-4½		9.497		
60	-5'-0		72.769		

Pipe Information

Node 1	Elev 1 (Foot)	K-Factor	Flow added this step (q)	Nominal ID	Fittings & Devices	Length (Foot)	C Factor	Total(Pt)	Notes Fitting/Device (Equivalent Length) Fixed Pressure Losses, when applicable, are added directly to (Pf) and shown as a negative value.
	Node 2		Elev 2 (Foot)	Total Flow (Q)		Actual ID	Fitting (Foot)	Pf Friction Loss Per Unit (psi)		Elev(Pe)
		Total (Foot)			Friction(Pf)				
401	22'-6½	5.6	14.82	2	(See Notes)	8'-0	120	7.000		.....Route 1..... Sprinkler
402	22'-6½		14.82	2.0670		8'-0	0.002747	0.022	
402	22'-6½	5.6	14.84	2	(See Notes)	12'-2½	120	7.022	Sprinkler, 3E(5'-0), T(10'-0)
44	22'-6½		29.66	2.0670		25'-0	0.009916	0.000	
						37'-2½		0.369	
44	22'-6½		30.41	2	(See Notes)	1'-8½	120	7.391	Flow (q) from Route 4 T(10'-0)
45	22'-6½		60.07	2.0670		10'-0	0.036594		
						11'-8½		0.428	
45	22'-6½		45.73	2	(See Notes)	0'-7½	120	7.819	Flow (q) from Route 5 T(10'-0)
46	21'-10½		105.80	2.0670		10'-0	0.104288	0.274	
						10'-7½		1.109	
46	21'-10½			2½		5'-5	120	9.202	
47	21'-10½		105.80	2.6350		5'-5	0.031970	0.173	
47	21'-10½		75.39	2½		1'-0	120	9.375	Flow (q) from Route 2
48	21'-10½		181.19	2.6350		1'-0	0.086494	0.086	
48	21'-10½		75.79	2½		5'-11	120	9.461	Flow (q) from Route 3
49	21'-10½		256.97	2.6350		5'-11	0.165099	0.977	
49	21'-10½		84.62	2½	(See Notes)	59'-1	120	10.438	Flow (q) from Route 8 5E(8'-3), 2T(16'-5½), PO(16'-5½)
37	11'-7		341.60	2.6350		90'-7½	0.279546	4.475	
						149'-8½		41.847	
37	11'-7			4	(See Notes)	35'-6	120	56.761	2E(13'-2)
9	10'-10½		341.60	4.2600		26'-4	0.026942	0.296	
						61'-10		1.666	
9	10'-10½			4	(See Notes)	8'-7	120	58.722	f, sCV(22'-0), BV(12'-0), BOR
10	1'-0		341.60	4.0260		34'-0	0.035475	4.286	
						42'-7		1.511	
10	1'-0			8	(See Notes)	20'-8½	140	64.520	E(33'-6)
11	-5'-0		341.60	8.5500		33'-6	0.000681	2.601	
						54'-2½		0.037	

Pipe Information

Node 1	Elev 1 (Foot)	K-Factor	Flow added this step (q)	Nominal ID	Fittings & Devices	Length (Foot)	C Factor	Total(Pt)	Notes
11	-5'-0		100.00	8	(See Notes)	250'-6	140	67.158	Flow (q) from Route 10 7E(33'-6), BFP(-5.000), GV(7'-5½), T(65'-1)
60	-5'-0		441.60	8.5500		306'-11	0.001095		
						557'-5		5.610	
60	-5'-0			12	(See Notes)	231'-0	150	72.769	GV(6'-11½), S
13	-5'-0		441.60	11.3100		6'-11½	0.000247		
						237'-11½		0.059	
			0.00					72.827	Hose Allowance At Source
13			441.60						Total(Pt) Route 1
403	24'-6	5.6	14.93	2	(See Notes)	8'-0	120	7.105 Route 2 Sprinkler
404	24'-6		14.93	2.0670		8'-0	0.002785	0.022	
404	24'-6	5.6	14.95	2	(See Notes)	8'-0		120	7.127	Sprinkler
405	24'-6		29.88	2.0670		8'-0	0.010054	0.080	
405	24'-6	5.6	15.03	2	(See Notes)	5'-7½		120	7.208	Sprinkler, T(10'-0)
50	24'-6		44.91	2.0670		10'-0	0.021370		
						15'-7½		0.334	
50	24'-6		30.48	2	(See Notes)	2'-7½	120	7.542	Flow (q) from Route 6 T(10'-0)
47	21'-10½		75.39	2.0670		10'-0	0.055713	1.130	
						12'-7½		0.702	
								9.375	Total(Pt) Route 2
406	24'-6	5.6	15.01	2	(See Notes)	8'-0	120	7.180 Route 3 Sprinkler
407	24'-6		15.01	2.0670		8'-0	0.002812	0.022	
407	24'-6	5.6	15.03	2	(See Notes)	8'-0		120	7.203	Sprinkler
408	24'-6		30.04	2.0670		8'-0	0.010152	0.081	
408	24'-6	5.6	15.11	2	(See Notes)	5'-7½		120	7.284	Sprinkler, T(10'-0)
51	24'-6		45.15	2.0670		10'-0	0.021580		
						15'-7½		0.337	

Pipe Information

Node 1	Elev 1 (Foot)	K-Factor	Flow added this step (q)	Nominal ID	Fittings & Devices	Length (Foot)	C Factor	Total(Pt)	Notes Fitting/Device (Equivalent Length) Fixed Pressure Losses, when applicable, are added directly to (Pf) and shown as a negative value.	
										Node 2	Elev 2 (Foot)	Total Flow (Q)	Actual ID	Equiv. Length (Foot)	Fitting (Foot)	Total (Foot)	Pf Friction Loss Per Unit (psi)	Elev(Pe)	Friction(Pf)
51	24'-6		30.64	2	(See Notes)	2'-7½	120	7.622												Flow (q) from Route 7 T(10'-0)
48	21'-10½		75.79	2.0670		10'-0	0.056258	1.130		
						12'-7½		0.709		
								9.461	Total(Pt) Route 3	
412	22'-6½	5.6	15.20	2	(See Notes)	5'-8	120	7.364	••••• Route 4 ••••• Sprinkler	
413	22'-6½		15.20	2.0670			0.002879			
						5'-8			0.016	
413	22'-6½	5.6	15.21	2	(See Notes)	1'-0	120	7.381	Sprinkler	
44	22'-6½		30.41	2.0670			0.010388			
						1'-0			0.010	
								7.391	Total(Pt) Route 4	
409	22'-6½	5.6	15.20	2	(See Notes)	8'-0	120	7.367	••••• Route 5 ••••• Sprinkler	
410	22'-6½		15.20	2.0670			0.002880			
						8'-0			0.023	
410	22'-6½	5.6	15.22	2	(See Notes)	8'-0	120	7.390	Sprinkler	
411	22'-6½		30.42	2.0670			0.010396			
						8'-0			0.083	
411	22'-6½	5.6	15.31	2	(See Notes)	5'-7½	120	7.473	Sprinkler, T(10'-0)	
45	22'-6½		45.73	2.0670			0.022098			
						10'-0				
						15'-7½		0.346		
								7.819	Total(Pt) Route 5	
414	24'-6	5.6	15.23	2	(See Notes)	6'-0	120	7.396	••••• Route 6 ••••• Sprinkler	
415	24'-6		15.23	2.0670			0.002890			
						6'-0			0.017	
415	24'-6	5.6	15.25	2	(See Notes)	2'-4½	120	7.413	Sprinkler, T(10'-0)	
50	24'-6		30.48	2.0670			0.010430			
						10'-0				
						12'-4½		0.129		
								7.542	Total(Pt) Route 6	
416	24'-6	5.6	15.31	2	(See Notes)	6'-0	120	7.474	••••• Route 7 ••••• Sprinkler	
417	24'-6		15.31	2.0670			0.002918			
						6'-0			0.018	

Pipe Information

Node 1	Elev 1 (Foot)	K-Factor	Flow added this step (q)	Nominal ID	Fittings & Devices	Length (Foot)	C Factor	Total(Pt)	Notes Fitting/Device (Equivalent Length) Fixed Pressure Losses, when applicable, are added directly to (Pf) and shown as a negative value.	
										Node 2	Elev 2 (Foot)	Total Flow (Q)	Actual ID	Equiv. Length (Foot)	Fitting (Foot)	Total (Foot)	Pf Friction Loss Per Unit (psi)	Elev(Pe)	Friction(Pf)
417	24'-6	5.6	15.33	2	(See Notes)	2'-4½	120	7.491												Sprinkler, T(10'-0)
51	24'-6		30.64	2.0670		10'-0	0.010532			
						12'-4½		0.130		
								7.622	Total(Pt) Route 7	
418	22'-4½	5.6	16.76	2	(See Notes)	8'-0	120	8.956	..... Route 8 Sprinkler
419	22'-4½		16.76	2.0670		8'-0	0.003450	0.028		
419	22'-4½	5.6	16.78	2	(See Notes)	8'-0		120	8.983	Sprinkler
420	22'-4½		33.54	2.0670		8'-0	0.012454	0.100		
420	22'-4½	5.6	16.88	2	(See Notes)	5'-7½		120	9.083	Sprinkler, T(10'-0)
52	22'-4½		50.42	2.0670		10'-0	0.026471			
						15'-7½		0.414		
52	22'-4½		34.20	2	(See Notes)	0'-6	120	9.497	Flow (q) from Route 9 T(10'-0)	
49	21'-10½		84.62	2.0670		10'-0	0.068994	0.217		
						10'-6		0.724		
								10.438	Total(Pt) Route 8	
421	22'-4½	5.6	17.09	2	(See Notes)	6'-0	120	9.316	..... Route 9 Sprinkler
422	22'-4½		17.09	2.0670		6'-0	0.003578	0.021		
422	22'-4½	5.6	17.11	2	(See Notes)	2'-4½		120	9.337	Sprinkler, T(10'-0)
52	22'-4½		34.20	2.0670		10'-0	0.012912			
						12'-4½		0.160		
								9.497	Total(Pt) Route 9	
55	2'-0		100.00	6	(See Notes)	46'-4½	140	64.087	..... Route 10 Hydrant, E(24'-2½), GV(5'-2), T(51'-10)
11	-5'-0		100.00	6.4000		81'-2½	0.000288	3.035		
						127'-7½		0.037		
								67.158	Total(Pt) Route 10	

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

C Value Multiplier

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}} \right)^{4.87} = \text{Factor}$$

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51

Fittings Legend

ALV Alarm Valve	AngV Angle Valve	b Bushing
BalV Ball Valve	BFP Backflow Preventer	BV Butterfly Valve
C Cross Flow Turn 90°	cplg Coupling	Cr Cross Run
CV Check Valve	DelV Deluge Valve	DPV Dry Pipe Valve
E 90° Elbow	EE 45° Elbow	Ee1 11¼° Elbow
Ee2 22½° Elbow	f Flow Device	fd Flex Drop
FDC Fire Department Connection	fE 90° FireLock(TM) Elbow	fEE 45° FireLock(TM) Elbow
flg Flange	FN Floating Node	fT FireLock(TM) Tee
g Gauge	GloV Globe Valve	GV Gate Valve
Ho Hose	Hose Hose	HV Hose Valve
Hyd Hydrant	LtE Long Turn Elbow	mecT Mechanical Tee
Noz Nozzle	P1 Pump In	P2 Pump Out
PIV Post Indicating Valve	PO Pipe Outlet	PrV Pressure Relief Valve
PRV Pressure Reducing Valve	red Reducer/Adapter	S Supply
sCV Swing Check Valve	SFx Seismic Flex	Spr Sprinkler
St Strainer	T Tee Flow Turn 90°	Tr Tee Run
U Union	WirF Wirsbo	WMV Water Meter Valve
Z Cap		

EJE note: 10-inch, 120 volt electric bells shall be utilized on new construction unless fire alarm system or other requirements exist that would require 12 volt or 24 volt wiring system.

BELLS

PBA-AC & MBA-DC



UL, ULC, and FM Approved

Sizes Available: 6" (150mm), 8" (200mm) and 10" (250mm)

Voltages Available: 24VAC
120VAC
12VDC (10.2 to 15.6) Polarized
24VDC (20.4 to 31.2) Polarized

Service Use: Fire Alarm
General Signaling
Burglar Alarm

Environment: Indoor or outdoor use (See Note 1)
-40° to 150°F (-40° to 66°C)
(Outdoor use requires weatherproof backbox.)

Termination: AC Bells - 4 No. 18 AWG stranded wires
DC Bells - Terminal strip

Finish: Red powder coating

Optional: Model BBK-1 weatherproof backbox
Model BBX-1 deep weatherproof backbox

These vibrating type bells are designed for use as fire, burglar or general signaling devices. They have low power consumption and high decibel ratings. The unit mounts on a standard 4" (101mm) square electrical box for indoor use or on a model BBK-1 weatherproof backbox or BBX-1 deep weatherproof backbox for outdoor applications. Weatherproof backbox model BBK-1, Stock No. 1500001.

Notes:

1. Minimum dB ratings are calculated from integrated sound pressure measurements made at Underwriters Laboratories as specified in UL Standard 464. UL temperature range is -30° to 150°F (-34° to 66°C).
2. Typical dB ratings are calculated from measurements made with a conventional sound level meter and are indicative of output levels in an actual installation.
3. ULC only applies to MBA DC bells.

Size inches (mm)	Voltage	Model Number	Stock Number	Current (Max.)	Typical dB at 10 ft. (3m) (2)	Minimum dB at 10 ft. (3m) (1)
6 (150)	12VDC	MBA126	1750070	.12A	85	76
8 (200)	12VDC	MBA128	1750080	.12A	90	77
10 (250)	12VDC	MBA1210	1750060	.12A	92	78
6 (150)	24VDC	MBA246	1750100	.06A	87	77
8 (200)	24VDC	MBA248	1750110	.06A	91	79
10 (250)	24VDC	MBA2410	1750090	.06A	94	80
6 (150)	24VAC	PBA246	1806024*	.17A	91	78
8 (200)	24VAC	PBA248	1808024*	.17A	94	77
10 (250)	24VAC	PBA2410	1810024*	.17A	94	78
6 (150)	120VAC	PBA1206	1806120*	.05A	92	83
8 (200)	120VAC	PBA1208	1808120*	.05A	99	84
10 (250)	120VAC	PBA12010	1810120*	.05A	99	86

All DC bells are polarized and have built-in transient protection.

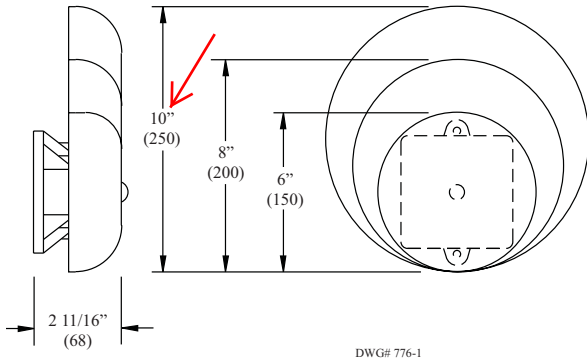
* Does not have ULC listing.

WARNING

In outdoor or wet installations, bell must be mounted with weatherproof backbox, BBK-1 or BBX-1. Standard electrical boxes will not provide a weatherproof enclosure. If the bell and/or assembly is exposed to moisture, it may fail or create an electrical hazard.

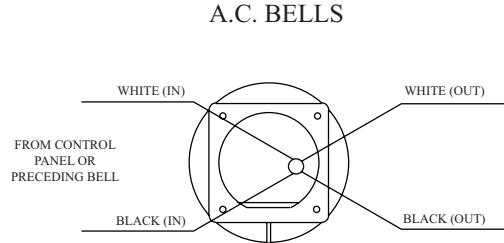
Bells Dimensions Inches (mm)

Fig. 1



Wiring (rear view)

Fig. 3



CAUTION:
WHEN ELECTRICAL SUPERVISION IS REQUIRED USE IN AND OUT LEADS AS SHOWN.

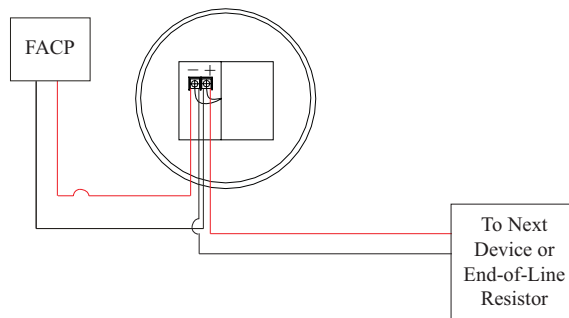
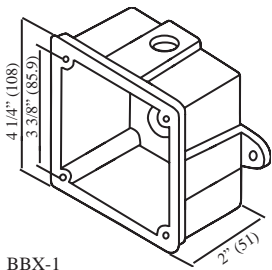
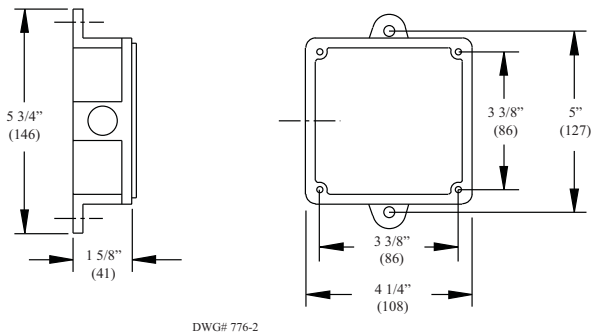
NOTES:

1. WHEN USING AC BELLS, TERMINATE EACH EXTRA WIRE SEPARATELY AFTER LAST BELL.
2. END-OF-LINE RESISTOR IS NOT REQUIRED ON AC BELLS.

Weatherproof Backbox Dimensions Inches (mm)

Fig. 2

Box has one threaded 1/2" conduit entrance



Installation

1. The bell shall be installed in accordance with NFPA 13, 72, or local AHJ. The top of the device shall be no less than 90" AFF and not less than 6" below the ceiling.
2. Remove the gong.
3. Connect wiring (see Fig. 3).
4. Mount bell mechanism to backbox (bell mechanism must be mounted with the striker pointing down).
5. Reinstall the gong (be sure that the gong positioning pin, in the mechanism housing, is in the hole in the gong).
6. Test all bells for proper operation and observe that they can be heard where required (bells must be heard in all areas as designated by the authority having jurisdiction).

⚠ WARNING

Failure to install striker down will prevent bell from operating.



U.S. Pat. No. 3921989
Canadian Pat. No. 1009680
Other Patents Pending
Potter Electric, Rd., 1990

UL, ULC and CSFM Listed, FM and LPCB Approved, NYMEA Accepted, CE Marked

Service Pressure: Up to 450 PSI (31 BAR)

Minimum Flow Rate for Alarm: 10 GPM (38 LPM)

Maximum Surge: 18 FPS (5,5 m/s)

Contact Ratings: Two sets of SPDT (Form C)
15.0 Amps at 125/250VAC
2.0 Amps at 30VDC Resistive

Conduit Entrances: Two knockouts provided for 1/2" conduit

Environmental Specifications:

- Suitable for indoor or outdoor use with factory installed gasket and die-cast housing.
- NEMA 4/IP54 Rated Enclosure - use with appropriate conduit fitting.
- Temperature Range: 40°F/120°F, 4,5°C/49°C
- Non-corrosive sleeve factory installed in saddle.

Caution: This device is not intended for applications in explosive environments.

Sizes Available: Steel Pipe schedules 10 thru 40, sizes 2" thru 8"
BS 1387 pipe 50mm thru 200mm

Note: For copper or plastic pipe use Model VSR-CF.

Service Use:

Automatic Sprinkler	NFPA-13
One or two family dwelling	NFPA-13D
Residential occupancy up to four stories	NFPA-13R
National Fire Alarm Code	NFPA-72

Optional: Cover Tamper Switch Kit, Stock No. 0090018

GENERAL INFORMATION

The Model VSR-F is a vane type waterflow switch for use on wet sprinkler systems. It is UL Listed and FM Approved for use on steel pipe; schedules 10 through 40, sizes 2" thru 8" (50mm thru 200mm).

LPC approved sizes are 2" thru 8" (50mm thru 200mm).

The unit may also be used as a sectional waterflow detector on large systems.

The unit contains two single pole, double throw, snap action switches and an adjustable, instantly recycling pneumatic retard. The switches are actuated when a flow of 10 gallons per minute (38 LPM) or more occurs downstream of the device. The flow condition must exist for a period of time necessary to overcome the selected retard period.

ENCLOSURE: The unit is enclosed in a general purpose, die-cast housing. The cover is held in place with two tamper resistant screws which require a special key for removal. A field installable cover tamper switch is available as an option which may be used to indicate unauthorized removal of the cover. See bulletin no. 5400775 for installation instructions of this switch.

INSTALLATION: See Fig.2

These devices may be mounted on horizontal or vertical pipe. On horizontal pipe they should be installed on the top side of the pipe where they will be accessible. The units should not be installed within 6" (15cm) of a fitting which changes the direction of the waterflow or within 24" (60 cm) of a valve or drain.

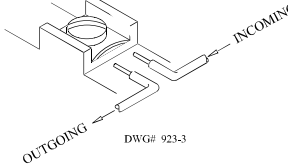
Drain the system and drill a hole in the pipe using a circular saw in a slow speed drill. The 2" (50mm) and 2 1/2" (65mm) devices require a hole with a diameter of 1 1/4" + 1/8" - 1/16" (33mm ±2mm). All other sizes require a hole with a diameter of 2" ±1/8" (50mm ±2mm).

Clean the inside pipe of all growth or other material for a distance equal to the pipe diameter on either side of the hole.

Roll the vane so that it may be inserted into the hole; do not bend or crease it. Insert the vane so that the arrow on the saddle points in the direction of the waterflow. Install the saddle strap and tighten nuts alternately to an eventual 20 ft-lbs. (27 n-m) of torque (see Fig. 2). The vane must not rub the inside of the pipe or bind in any way.

Specifications subject to change without notice.

FIG. 1
SWITCH TERMINAL CONNECTIONS
CLAMPING PLATE
TERMINAL



CAUTION:
An uninsulated section of a single conductor should not be looped around the terminal and serve as two separate connections. The wire must be severed, thereby providing supervision of the connection in the event that the wire becomes dislodged from under the terminal.

FIG. 2

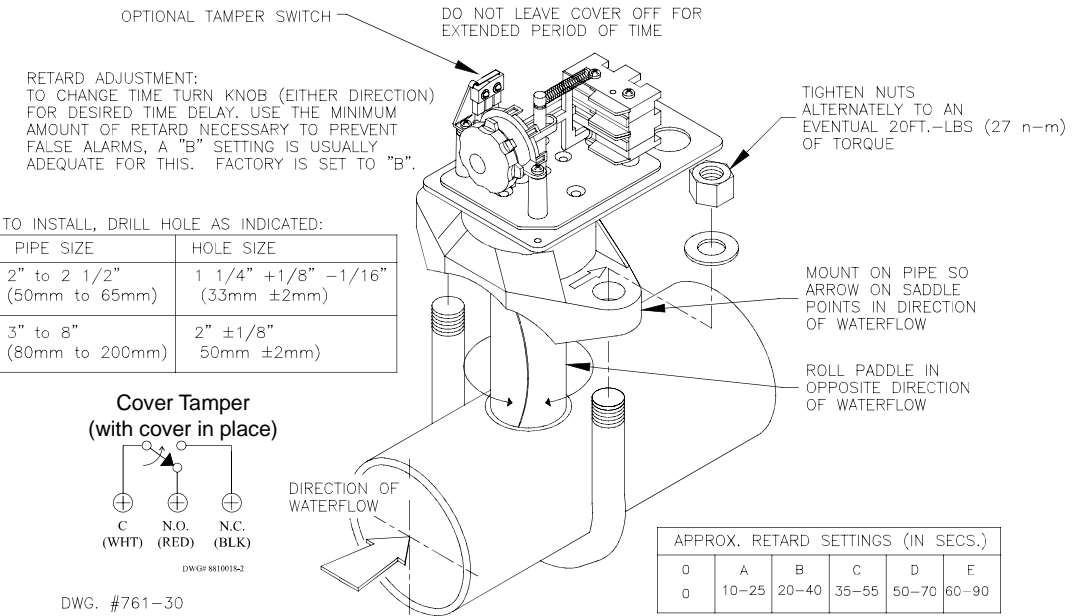
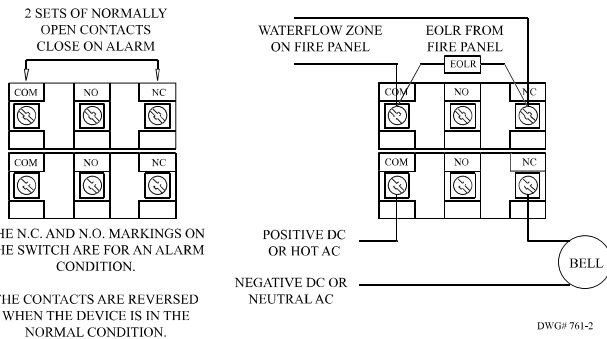


FIG. 3 TYPICAL ELECTRICAL CONNECTIONS

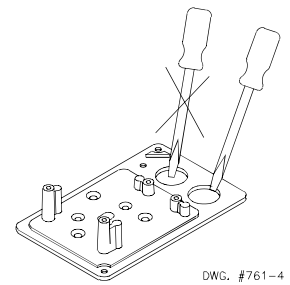


NOTES:

1. The Model VSR-F has two switches, one can be used to operate a central station, proprietary or remote signaling unit, while the other contact is used to operate a local audible or visual annunciator.
2. A condition of LPC Approval of this product is that the electrical entry must be sealed to exclude moisture.
3. For supervised circuits see "Switch Terminal Connections" drawing and caution note (Fig. 1).

FIG. 4

To remove knockouts: Place screwdriver at edge of knockouts, not in the center.



APPLICATION WARNING!

Due to the possibility of unintended discharges caused by pressure surges, trapped air, or short retard times, waterflow switches that are monitoring wet pipe sprinkler systems should not be used as the sole initiating device to discharge AFFF, deluge, or chemical suppression systems.

TESTING

The frequency of inspection and testing for the model VSR-F and its associated protective monitoring system should be in accordance with applicable NFPA Codes and Standards and/or the authority having jurisdiction (manufacturer recommends quarterly or more frequently). If provided, the inspector's test valve, that is usually located at the end of the most remote branch line, should always be used for test purposes. If there are no provisions for testing the operation of the flow detection device on the system, application of the VSR-F is not recommended or advisable.

A minimum flow of 10 gpm (38 Lpm) is required to activate this device.

IMPORTANT NOTICE: Please advise the person responsible for testing of the fire protection system that this system must be tested in accordance with the testing instructions.

Engineering Specification

Job Name _____

Contractor _____

Job Location _____

Approval _____

Engineer _____

Contractor's P.O. No. _____

Approval _____

Representative _____

LEAD FREE*

Series LF709 Double Check Valve Assemblies

2½" – 10"

Series LF709 Double Check Valve assemblies help prevent the reverse flow of polluted water from entering into the potable water system. This series can be applied, where approved by the local authority having jurisdiction, on non-health hazard installations. The series features a modular check design concept to facilitate maintenance. Check with local jurisdictional authority as to installation requirements. The valve body is fused with ArmorTek™ technology to resist corrosion due to microbial induced corrosion (MIC) or exposed metal substrate. The series also features Lead Free* construction to comply with Lead Free* installation requirements.

Smart and Connected technology comes standard on the Series LF709 assembly with NRS gate valves, Model IOT. The model includes sensors integrated at test cocks No. 2, No. 3, and No. 4 to measure pressure fluctuations at the three locations. This technology enables monitoring and assessment of certain aspects of backflow assembly performance and the water supply system.

NOTICE

For Model IOT, an add-on monitoring connection kit is required to collect data from the pressure sensors. Without the connection kit, the sensors are passive components that do not communicate with any other device. The add-on connection kit communicates over wired serial (RS-485) interface and is compatible with most Building Management and Building Automation Systems. (The connection kit and pressure sensors are also available for existing installations. For more information, download RP/IS-709/709DCDA.)

Features

- Simplified modular design concept to facilitate complete maintenance and assembly by retaining the spring load
- Sensors adapted to test cocks on Model IOT for measuring pressure fluctuations; activated with add-on monitoring connection kit (BMS/BAS only)
- Replaceable stainless steel seats
- Maximum flow at low pressure drop
- Advanced ArmorTek™ coating technology to resist corrosion of internals
- No special tools required for servicing
- Captured spring assemblies for safety
- Approved for vertical flow up installation

*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.



Specification

A Double Check Valve assembly shall be installed at referenced cross-connections to prevent the backflow of polluted water into the potable water supply. The cross-connections shall be determined by local inspection authority for use where a high hazard situation does not exist. Valve shall feature modular check assemblies with center stem guiding. Each check module shall have a captured spring and be accessible through a bolted cover plate. Seats shall be replaceable without special tools. It shall be a complete assembly including tight-closing resilient seated shutoff valves, test cocks, and a strainer is recommended. The Lead Free* Double Check assemblies shall comply with state codes and standards, where applicable, requiring reduced lead content. The assembly shall meet the requirements of ASSE No. 1015; AWWA C510-92; CSA B64.5 and UL Classified File No. EX3185. Approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California. The valve body shall use a coating system with built-in electrochemical corrosion inhibitor and microbial inhibitor. Assembly shall be a Watts Series LF709.

NOTICE

Use of integrated pressure sensors on and monitoring connection kit with IOT models does not replace the need to comply with all required instructions, codes, and regulations related to installation, operation, and maintenance of the backflow preventer.

Watts is not responsible for data transmission failures due to power issues.

NOTICE

The information contained herein is not intended to replace the full product installation and safety information available or the experience of a trained product installer. You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product.

Inquire with governing authorities for local installation requirements.

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.

Model/Option

NRS	Non-rising stem resilient seated gate valves
OSY	UL Classified and FM Approved outside stem and yoke resilient seated gate valves
S-FDA	FDA epoxy coated strainer
LF	Without shutoff valves
IOT	With pressure sensing IoT test cocks and NRS gate valves
QT-FDA	FDA epoxy coated quarter-turn ball valve shutoffs

Materials

Check Valve Body:	Epoxy coated cast iron
Seats:	Stainless steel
Coating technology:	Armortek

Pressure — Temperature

Temperatures Range: 33°F – 110°F (0.5°C – 43°C) continuous, 140°F (60°C) intermittent

Maximum Working Pressure: 175 psi (12.1 bar)

Standards

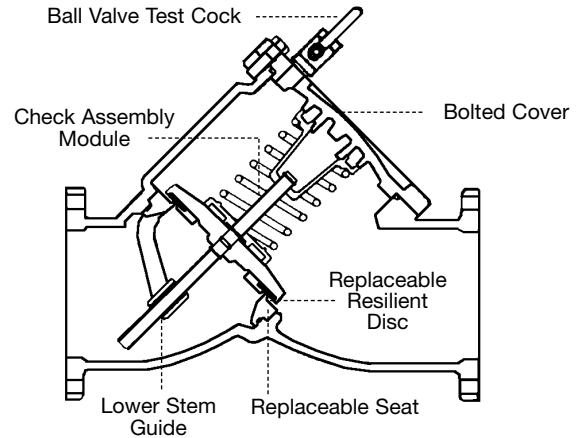
AWWA C510-92
IAPMO PA 31
USC Manual for Cross-Connection Control, 8th Edition

Approvals

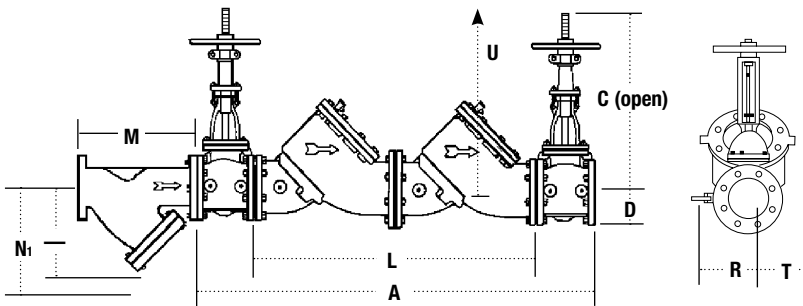


Approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California. Sizes 4" to 10" approved horizontal and vertical "flow up." Sizes 2½" and 3" approved horizontal only.

FM Approved 4" to 10" vertical "flow up" with OSY gate valves only. Note: Model "S" not listed.



Dimensions — Weights



SIZE	DIMENSIONS															
	A		C (OSY)		C (NRS)		D		L		U†		M		N	
in.	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
2½	39 ⁷ / ₁₆	1002	16 ³ / ₈	416	9 ³ / ₈	238	3½	89	24 ⁷ / ₈	613	11	279	10	254	6½	165
3	40 ⁷ / ₁₆	1027	18 ⁷ / ₈	479	10¼	260	3¾	95	24 ¹ / ₈	613	14	356	10 ¹ / ₈	257	7	178
4	52 ³ / ₈	1332	22¾	578	12 ³ / ₁₆	310	4½	114	34 ¹ / ₈	867	14	356	12 ¹ / ₈	308	8¼	210
6	62 ¹⁵ / ₁₆	1599	30 ¹ / ₈	765	16	406	5½	140	41 ⁵ / ₈	1058	16	406	18½	470	13½	343
8	75 ⁷ / ₁₆	1916	37¾	959	19 ¹⁵ / ₁₆	506	6½	165	52 ¹ / ₈	1325	21	533	21 ⁵ / ₈	549	15½	394
10	90 ⁷ / ₁₆	2297	45¾	1162	23 ¹³ / ₁₆	605	8	203	64 ¹ / ₈	1630	25	635	26	660	18½	470

SIZE	DIMENSIONS								WEIGHT				STRAINER			
	N1††		R		R*		T		NRS		OSY		QT		Weight	
in.	in.	mm	in.	mm	in.	mm	in.	mm	lb	kg	lb	kg	lb	kg	lb	kg
2½	10	254	4	102	16	406	3	76	167	76	170	77	154	70	28	13
3	10	254	5	127	16	406	3	76	167	76	170	77	162	73	34	15
4	12	305	6	152	19¼	502	6	152	368	167	383	174	275	125	60	27
6	20	508	11	279	26	660	7½	191	627	284	707	321	611	277	122	55
8	22¾	578	11¼	286	11¼	286	9	229	1201	545	1307	593	1419	644	247	112
10	28	711	12½	318	12½	318	10¼	260	2003	909	2073	940	2466	1119	370	168

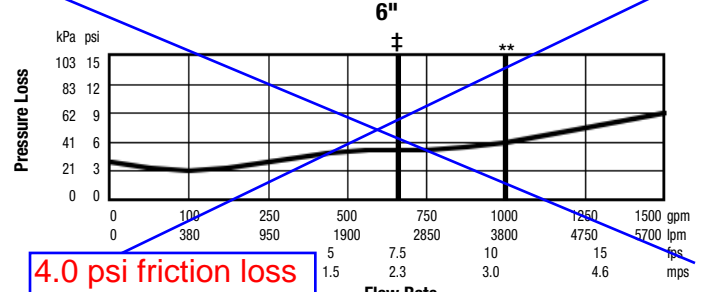
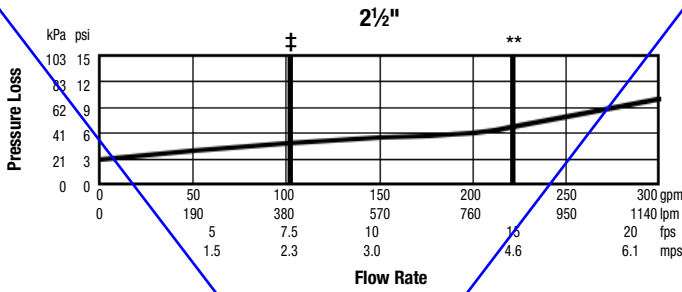
†Service clearance for check assembly from center.

††Dimension required for screen removal.

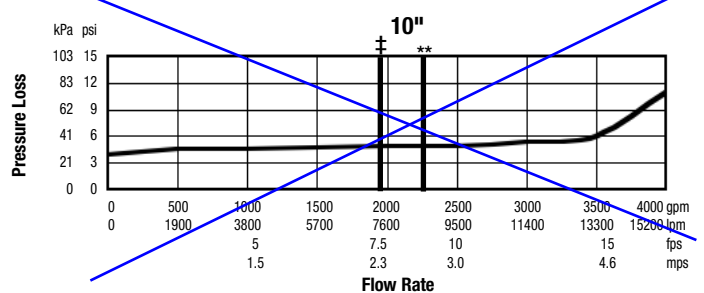
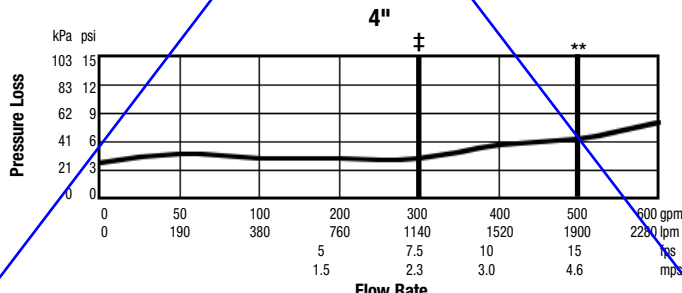
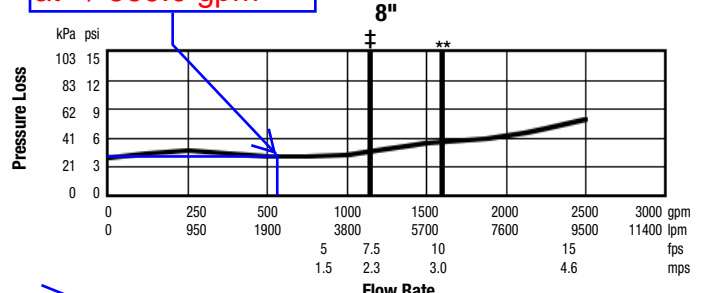
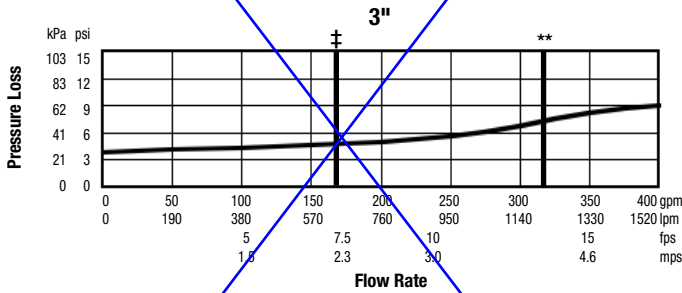
*Quarter-turn (QT) valve dimensions.

Capacity

‡ Typical maximum system flow rate (7.5 ft/sec)
 ** UL rated flow



4.0 psi friction loss at +/-569.0 gpm



USA: T: (978) 689-6066 • Watts.com
 Canada: T: (888) 208-8927 • Watts.ca
 Latin America: T: (52) 55-4122-0138 • Watts.com



LOS ANGELES AREA (800) 366-3473
 NEW YORK AREA (800) 526-4592
 CHICAGO AREA (800) 547-3473
 ATLANTA AREA (800) 762-0542
 MIAMI AREA (866) 961-3473
 DALLAS AREA (866) 664-3473

Call Potter Roemer for current listings and approvals. Dimensions are subject to manufacturer's tolerances, and change without notice. We assume no responsibility for use of superseded or void data.

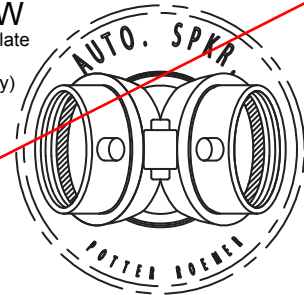


EXPOSED FIRE DEPT. INLET CONNECTION TWO-WAY WITH SINGLE CLAPPER



Model 5710-A-DI
 Back Outlet
 4 x 2-1/2" NPT x NST

TOP VIEW
 Shown with ID Plate
 Model 5962
 (sold separately)

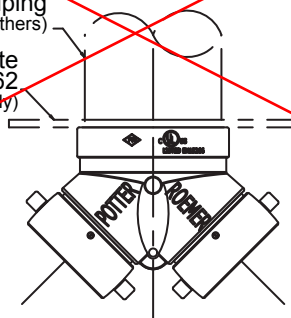


**REGULARLY
 FURNISHED:**

Ductile iron two-way inlet body painted red, swing clapper and brass pin lug swivel. Lettering: AUTO. SPKR. Pressure Rating: 300 psi (2,067 kPa) Compliance: UL Listed, FM Approved Special Thread Available

Specify Thread: _____

Piping (by others)
 ID Plate Model 5962 (sold separately)



BOTTOM VIEW

4" Female NPT Threads

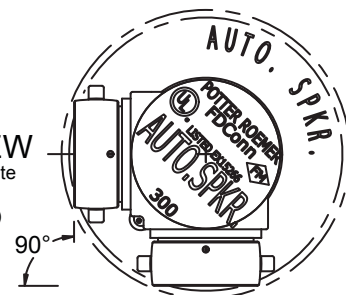
45°

2-1/2" Female NST Threads (Brass Swivel)

TOP VIEW

Model 5715-A-DI
 Angle Outlet
 4 x 2-1/2" NPT x NST

FRONT VIEW
 Shown with ID Plate
 Model 5962
 (sold separately)



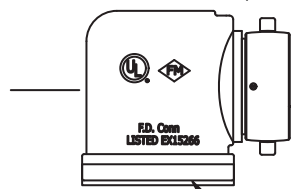
**Optional Finish:
 D-Polished Chrome Plated.**

**REGULARLY
 FURNISHED:**

Ductile iron two-way inlet body painted red, swing clapper and brass pin lug swivel. Lettering: AUTO. SPKR. Pressure Rating: 300 psi (2,067 kPa) Compliance: UL Listed, FM Approved Special Thread Available

Specify Thread: _____

2-1/2" Female NST Threads (Brass Swivel)



SIDE VIEW

4" Female NPT Threads

Piping (by others)

Revised 6/23/08 Reviewed 6/23/08



MODEL NUMBER
5710-A-DI
5715-A-DI

SCHEDULE 10 & 40



Always ready to protect your most valuable assets.

As the leading supplier of steel sprinkler pipe, we understand that there are no second chances in fire suppression. You need products of enduring quality and exceptional strength—plus reliable service. You need Bull Moose.

Bull Moose Fire Sprinkler Pipe Product Information

Nominal Pipe Size (Inches)		1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	6"	8"	NPS (In.)		1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	
SCHEDULE 10	O.D. (in)	1.315	1.660	1.900	2.375	2.875	3.500	4.500	6.625	8.625	SCHEDULE 40	1.315	1.660	1.900	2.375	2.875	3.500	4.500		
	I.D. (in)	1.097	1.442	1.682	2.157	2.635	3.260	4.260	6.357	8.249		1.049	1.380	1.610	2.067	2.469	3.068	4.026		
	Empty Weight (lb/ft)	1.410	1.810	2.090	2.640	3.530	4.340	5.620	9.290	16.940		1.680	2.270	2.720	3.660	5.800	7.580	10.800		
	Water Filled Weight (lb/ft)	1.820	2.518	3.053	4.223	5.893	7.957	11.796	23.038	40.086		2.055	2.918	3.602	5.114	7.875	10.783	16.316		
	C.R.R.	15.27	9.91	7.76	6.27	4.92	3.54	2.50	1.158	1.805		1.00	1.00	1.00	1.00	1.00	1.00	1.00		
	Pieces per Lift	91	61	61	37	30	19	19	10	7		70	51	44	30	30	19	19		
	Lift Weight (lbs) 21' lengths	2,695	2,319	2,677	2,051	2,224	1,732	2,242	1,951	2,490		2,470	2,431	2,513	2,306	3,654	3,024	4,309		
	Lift Weight (lbs) 24' lengths	3,079	2,650	3,060	2,344	2,542	1,979	2,563	2,230	2,848		2,822	2,778	2,872	2,635	4,176	3,456	4,925		
	Lift Weight (lbs) 25' lengths	3,208	2,760	3,187	2,442	2,648	2,062	2,670				2,940	2,894	2,992	2,745	4,350	3,601	5,130		

SCHEDULE 10 & 40 ADVANTAGES:

- UL listed (US & Canada) and FM approved
- ASTM A135 and A795 Type E, Grade A Certified
- Complies with NFPA-13, 13R and 14
- Industry-leading hydraulic characteristics
- CRR of 1.0 and greater
- All pipe NDT weld tested

OTHER BENEFITS/SERVICES:

- We have the most stocking locations in the industry, for best delivery and availability
- Plain end or roll groove
- Eddy Guard II™ bacterial-resistant internal coating
- Custom length options
- Hot dipped galvanization
- Reddi-Pipe® red or black pipe eliminates field painting
- Compatible for use in wet, dry, preaction and deluge sprinkler systems
- The only maker with EPDs (to help earn LEED points).

Exclusive maker of Reddi-Pipe®
RED OR BLACK PAINTED PIPE.



cULUS LISTED



800.325.4467
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BullMooseTube.com

Series TY-FRB — 5.6 K-factor Horizontal and Vertical Sidewall Sprinklers Quick Response, Standard Coverage

General Description

The Series TY-FRB, 5.6 K-factor, Horizontal and Vertical Sidewall Sprinklers described in this data sheet are quick response -standard coverage, decorative 3 mm glass bulb type spray sprinklers designed for use in light and ordinary hazard, commercial occupancies such as banks, hotels, shopping malls, etc. They are designed for installation along a wall or the side of a beam and just beneath a smooth ceiling. Sidewall sprinklers are commonly used instead of pendent or upright sprinklers due to aesthetics or building construction considerations, where piping across the ceiling is not desirable.

The recessed version of the Series TY-FRB Horizontal Sidewall Sprinkler is intended for use in areas with a finished wall. It uses a two-piece Style 10 Recessed Escutcheon with 1/2 in. (12,7 mm) of recessed adjustment or up to 3/4 in. (19,1 mm) of total adjustment from the flush sidewall position, or a two-piece Style 20 Recessed Escutcheon with 1/4 in. (6,4 mm) of recessed adjustment or up to 1/2 in. (12,7 mm) of total adjustment from the flush sidewall position. The adjustment provided by the Recessed Escutcheon reduces the accuracy to which the fixed pipe nipples to the sprinklers must be cut.

Corrosion resistant coatings, where applicable, are utilized to extend the life

of copper alloy sprinklers beyond that which would otherwise be obtained when exposed to corrosive atmospheres. Although corrosion resistant coated sprinklers have passed the standard corrosion tests of the applicable approval agencies, the testing is not representative of all possible corrosive atmospheres. Consequently, it is recommended that the end user be consulted with respect to the suitability of these coatings for any given corrosive environment. The effects of ambient temperature, concentration of chemicals, and gas/chemical velocity, should be considered, as a minimum, along with the corrosive nature of the chemical to which the sprinklers will be exposed.

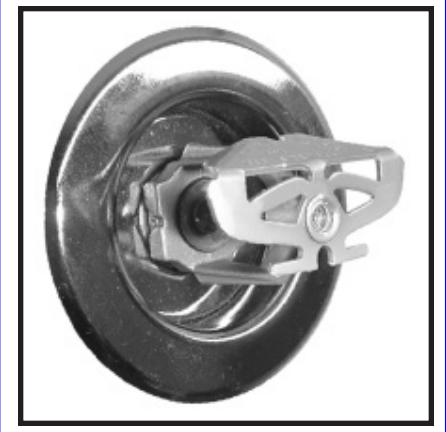
NOTICE

The Series TY-FRB Sprinklers described herein must be installed and maintained in compliance with this document, as well as with the applicable standards of the National Fire Protection Association, in addition to the standards of any other authorities having jurisdiction. Failure to do so may impair the performance of these devices.

The owner is responsible for maintaining their fire protection system and devices in proper operating condition. Contact the installing contractor or product manufacturer with any questions.

Sprinkler Identification Numbers

TY3331..... Horizontal
TY3431..... Vertical



Technical Data

Approvals
UL and C-UL Listed
FM Approved
LPCB Approved
NYC Approved

(Refer to Table A for complete approval information including corrosion resistant status.)

Maximum Working Pressure
Refer to Table B

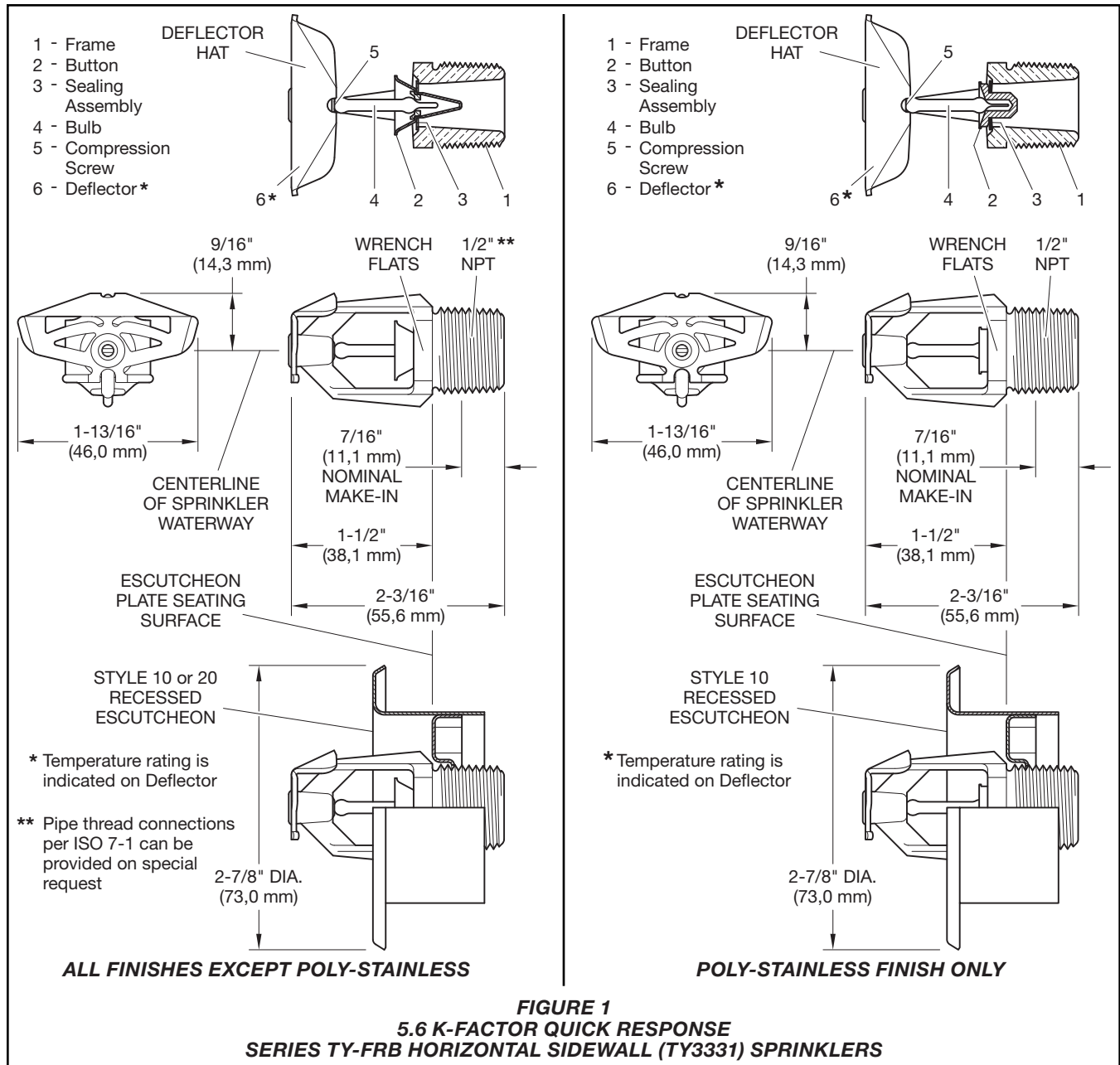
Discharge Coefficient
K=5.6 GPM/psi^{1/2} (80,6 LPM/bar^{1/2})

Temperature Ratings
Refer to Table A

IMPORTANT

Refer to Technical Data Sheet TFP2300 for warnings pertaining to regulatory and health information.

Always refer to Technical Data Sheet TFP700 for the "INSTALLER WARNING" that provides cautions with respect to handling and installation of sprinkler systems and components. Improper handling and installation can permanently damage a sprinkler system or its components and cause the sprinkler to fail to operate in a fire situation or cause it to operate prematurely.



Finishes

Sprinkler: Refer to Table C

Recessed Escutcheon: Signal or Pure White, Jet Black, Grey Aluminum, Chrome Plated, or Brass Plated

Physical Characteristics

Frame	.....	Bronze
Button	.....	Brass/Copper
Sealing Assembly	..	Beryllium Nickel w/TEFLON
Bulb	.....	Glass
Compression Screw	.....	Bronze
HSW Deflector	.....	Bronze
VSW Deflector	.....	Copper

Poly-Stainless

Physical Characteristics

Frame	.....	Bronze
Button	.....	L316 Stainless Steel*
Bulb	.....	Glass
Compression Screw	.....	L316 Stainless Steel*
HSW Deflector	.....	Copper/Bronze
Sealing Assembly	..	Gold Plated Beryllium Nickel w/TEFLON

*Type L316 stainless steel (UNS 31603) per ASTM A479/479M or BS EN 1008 WN1.4404.

Operation

The glass bulb contains a fluid which expands when exposed to heat. When the rated temperature is reached, the fluid expands sufficiently to shatter the glass bulb, allowing the sprinkler to activate and water to flow.

Design Criteria

The Series TY-FRB, 5.6 K-factor, Horizontal and Vertical Sidewall Sprinklers are intended for fire protection systems designed in accordance with the standard installation rules recognized by the applicable Listing or Approval agency (e.g., UL Listing is based on the requirements of NFPA 13, and FM Approval is based on the requirements of FM's Loss Prevention Data Sheets). Only the Style 10 or 20 Recessed Escutcheon, as applicable, is to be used for recessed horizontal installations.

Installation

The Series TY-FRB, 5.6 K-factor, Horizontal and Vertical Sidewall Sprinklers must be installed in accordance with this section.

General Instructions

Do not install any bulb type sprinkler if the bulb is cracked or there is a loss of liquid from the bulb. With the sprinkler held horizontally, a small air bubble should be present. The diameter of the air bubble is approximately 1/16 in. (1,6 mm) for the 135°F (57°C) to 3/32 in. (2,4 mm) for the 286°F (141°C) temperature ratings.

A leak tight 1/2 in. NPT sprinkler joint should be obtained with a torque of 7 to 14 lb-ft (9,5 to 19,0 N·m). Higher levels of torque may distort the sprinkler and cause leakage or impairment of the sprinkler.

Do not attempt to make-up for insufficient adjustment in the escutcheon plate by under-or over-tightening the sprinkler. Readjust the position of the sprinkler fitting to suit.

Series TY-FRB Horizontal and Vertical Sidewall Sprinkler Installation

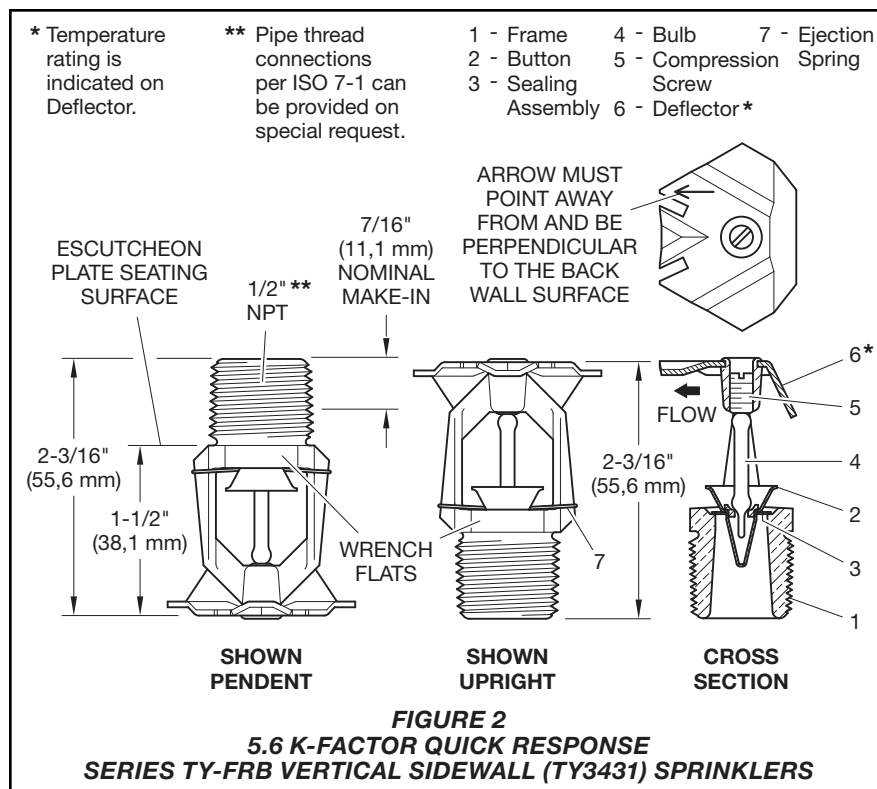
The Series TY-FRB Horizontal and Vertical Sidewall Sprinklers must be installed in accordance with the following instructions.

Step 1. Horizontal sidewall sprinklers are to be installed in the horizontal position with their centerline of waterway perpendicular to the back wall and parallel to the ceiling. The word "TOP" on the Deflector is to face towards the ceiling.

Vertical sidewall sprinklers are to be installed in the pendent or upright position with the arrow on the Deflector pointing away from the wall.

Step 2. With pipe thread sealant applied to the pipe threads, hand tighten the sprinkler into the sprinkler fitting.

Step 3. Tighten the sprinkler into the sprinkler fitting using only the W-Type 6 Sprinkler Wrench (Ref. Figure 5), With reference to Figure 1 or 2, the W-Type 6 Sprinkler Wrench is to be applied to the wrench flats.



Series TY-FRB Recessed Horizontal Sidewall Sprinkler Installation

The Series TY-FRB Recessed Horizontal Sidewall Sprinklers must be installed in accordance with this section.

Step A. Recessed horizontal sidewall sprinklers are to be installed in the horizontal position with their centerline of waterway perpendicular to the back wall and parallel to the ceiling. The word "TOP" on the Deflector is to face towards the ceiling.

Step B. After installing the Style 10 or 20 Mounting Plate over the sprinkler threads, hand tighten the sprinkler into the sprinkler fitting.

Step C. Tighten the sprinkler into the sprinkler fitting using only the W-Type 7 Recessed Sprinkler Wrench (Ref. Figure 6). With reference to Figure 1, the W-Type 7 Recessed Sprinkler Wrench is to be applied to the sprinkler wrench flats.

Step D. After the ceiling has been installed or the finish coat has been applied, slide on the Style 10 or 20 Closure over the Series TY-FRB Sprinkler and push the Closure over the Mounting Plate until its flange comes in contact with the ceiling.

Care and Maintenance

The Series TY-FRB, 5.6 K-factor, Horizontal and Vertical Sidewall Sprinklers must be maintained and serviced in accordance with this section.

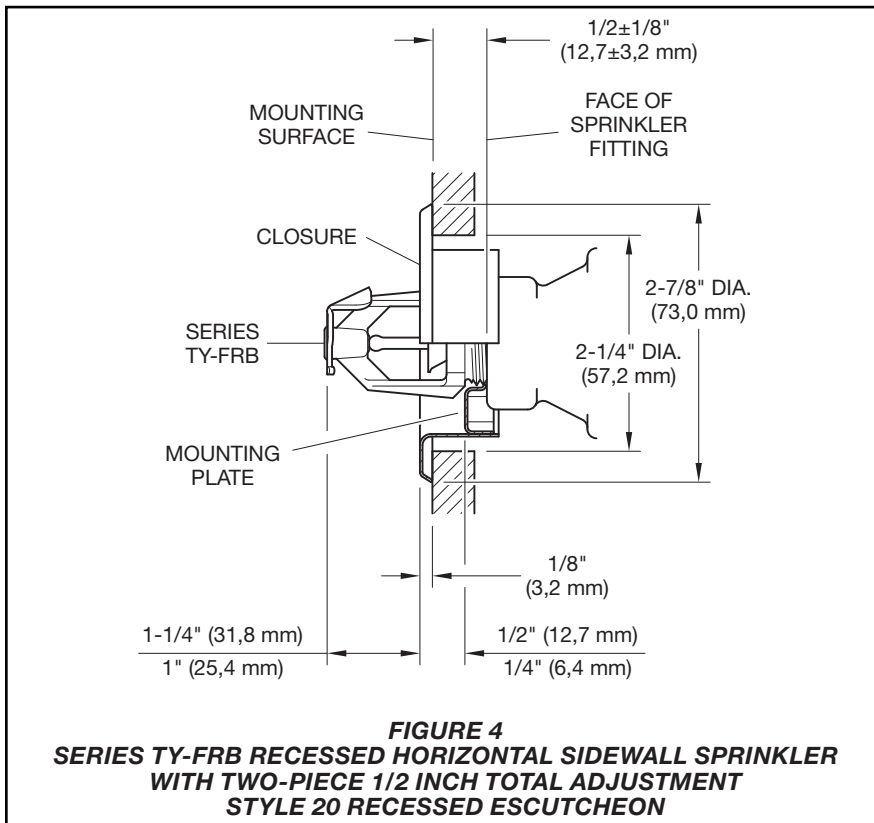
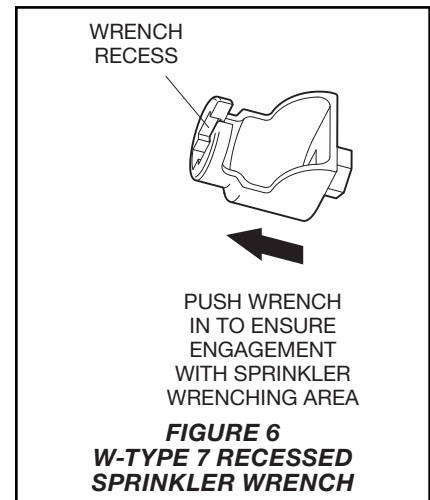
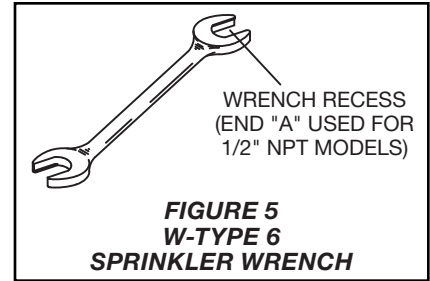
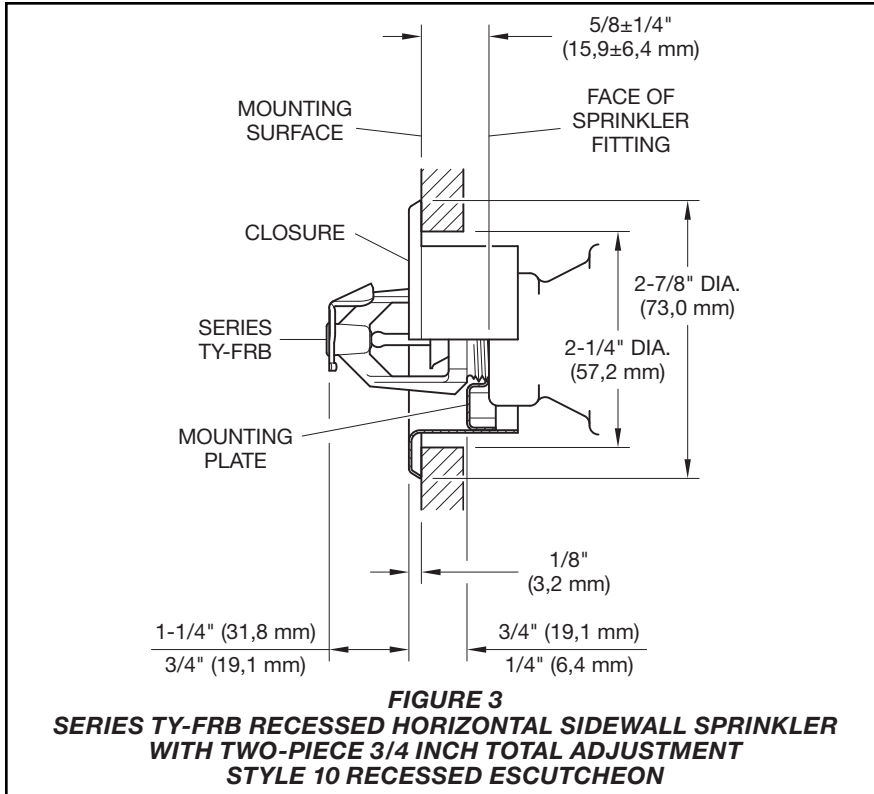
Before closing a fire protection system main control valve for maintenance work on the fire protection system that it controls, permission to shut down the affected fire protection system must be obtained from the proper authorities and all personnel who may be affected by this action must be notified.

Absence of an escutcheon, which is used to cover a clearance hole, may delay the time to sprinkler operation in a fire situation.

Sprinklers that are found to be leaking or exhibiting visible signs of corrosion must be replaced.

Automatic sprinklers must never be painted, plated, coated or otherwise altered after leaving the factory. Modified sprinklers must be replaced. Sprinklers that have been exposed to corrosive products of combustion, but have not operated, should be replaced if they cannot be completely cleaned by wiping the sprinkler with a cloth or by brushing it with a soft bristle brush.

Care must be exercised to avoid damage to the sprinklers before, during, and after installation. Sprinklers



K	TYPE	TEMP.	BULB LIQUID	SPRINKLER FINISH (See Note 11)				
				NATURAL BRASS	CHROME PLATED	POLYESTER ^c	POLY-STAINLESS ^c	LEAD COATED
5.6 1/2 in. NPT	HORIZ. SIDEWALL (TY3331)	135°F (57°C)	Orange	1, 2, 3, 4, 9, 10		1, 2, 3, 9	1, 2	1, 2, 3, 9
		155°F (68°C)	Red					
		175°F (79°C)	Yellow					
		200°F (93°C)	Green					
		286°F (141°C)	Blue					
	RECESSED HORIZ. SIDEWALL (TY3331) ^a Figure 3	135°F (57°C)	Orange	1, 2, 4, 9, 10		1, 2, 9	1, 2	N/A
		155°F (68°C)	Red					
		175°F (79°C)	Yellow					
		200°F (93°C)	Green					
	RECESSED HORIZ. SIDEWALL (TY3331) ^b Figure 4	135°F (57°C)	Orange	1, 2, 3, 4, 9			N/A	N/A
		155°F (68°C)	Red					
		175°F (79°C)	Yellow					
200°F (93°C)		Green						
5.6 1/2 in. NPT	VERTICAL SIDEWALL (TY3431) Installed Pendent or Upright	135°F (57°C)	Orange	5, 6, 7, 8, 9			N/A	5, 6, 7, 9
		155°F (68°C)	Red					
		175°F (79°C)	Yellow					
		200°F (93°C)	Green					
		286°F (141°C)	Blue					

NOTES:

- Listed by Underwriters Laboratories, Inc. (UL) as Quick Response Sprinklers for use in Light and Ordinary Hazard Occupancies at a 4 to 12 in. (100 to 300 mm) top of deflector to ceiling distance.
- Listed by Underwriters Laboratories Inc. for use in Canada (C-UL) as Quick Response Sprinklers for use in Light and Ordinary Hazard Occupancies at a 4 to 12 in. (100 to 300 mm) top of deflector to ceiling distance.
- Approved by Factory Mutual Research Corporation (FM) as Quick Response Sprinklers for use in Light Hazard Occupancies at a 4 to 12 in. (100 to 300 mm) top of deflector to ceiling distance.
- Approved by the Loss Prevention Certification Board (LPCB Ref. No. 007a/04) at a 4 to 6 in. (100 to 150 mm) top of deflector to ceiling distance. The LPC does not rate the thermal sensitivity of horizontal sidewall sprinklers.
- Listed by Underwriters Laboratories, Inc. as Quick Response Sprinklers for use in Light and Ordinary Hazard Occupancies.
- Listed by Underwriters Laboratories for use in Canada (C-UL) as Quick Response Sprinklers for use in Light and Ordinary Hazard Occupancies.
- Approved by Factory Mutual Research Corporation (FM) as Quick Response Sprinklers for use in Light Hazard Occupancies.
- Approved by the Loss Prevention Certification Board (LPCB Ref. No. 094a/06 & 007a/04) as Quick Response Sprinklers.
- Approved by the City of New York under MEA 354-01-E.
- Approved by the Loss Prevention Certification Board (LPCB Ref. No. 094a/06) at a 4 to 6 in. (100 to 150 mm) top of deflector to ceiling distance. The LPC does not rate the thermal sensitivity of horizontal sidewall sprinklers.
- Where Polyester Coated and Lead Coated Sprinklers are noted to be UL and C-UL Listed, the sprinklers are UL and C-UL Listed as Corrosion Resistant Sprinklers. Where Lead Coated Sprinklers are noted to be FM Approved, the sprinklers are FM Approved as Corrosion Resistant Sprinklers.
- Installed with Style 10 (1/2 in. NPT) 3/4 in. Total Adjustment Recessed Escutcheon.
- Installed with Style 20 (1/2 in. NPT) 1/2 in. Total Adjustment Recessed Escutcheon.
- Frame and deflector only.

**TABLE A
LABORATORY LISTINGS AND APPROVALS**

damaged by dropping, striking, wrench twist/slippage, or the like, must be replaced. Also, replace any sprinkler that has a cracked bulb or that has lost liquid from its bulb. (Ref. Installation Section).

The owner must assure that the sprinklers are not used for hanging any objects and that the sprinklers are only cleaned by means of gently dusting with a feather duster; otherwise, non-operation in the event of a fire or inadvertent operation may result.

Frequent visual inspections are recommended to be initially performed for corrosion resistant coated sprinklers, after the installation has been completed, to verify the integrity of the corrosion resistant coating.

Thereafter, annual inspections per NFPA 25 should suffice; however, instead of inspecting from the floor level, a random sampling of close-up visual inspections should be made, so as to better determine the exact sprinkler condition and the long term integrity of the corrosion resistant coating, as it may be affected by the corrosive conditions present.

The owner is responsible for the inspection, testing, and maintenance of their fire protection system and devices in compliance with this document, as well as with the applicable standards of the National Fire Protection Association (e.g., NFPA 25), in addition to the standards of any other authorities having jurisdiction. Contact the install-

ing contractor or product manufacturer with any questions.

It is recommended that automatic sprinkler systems be inspected, tested, and maintained by a qualified Inspection Service in accordance with local requirements and/or national codes.

		SPRINKLER FINISH			
K	TYPE	NATURAL BRASS	CHROME PLATED	POLYESTER	LEAD COATED
5.6 1/2 in. NPT	HORIZONTAL SIDEWALL (TY3331)	250 PSI (17,2 BAR) or 175PSI (12,1 BAR) (SEE NOTE 1)			
	RECESSED HORIZ. SIDEWALL (TY3331)				
	VERTICAL SIDEWALL (TY3431)	175 PSI (12,1 BAR)			

NOTES:

1. The maximum working pressure of 250 psi (17,2 bar) only applies to the Listing by Underwriters Laboratories, Inc. (UL); the Listing by Underwriters Laboratories, Inc. for use in Canada (C-UL); and, the Approval by the City of New York.

TABLE B
MAXIMUM WORKING PRESSURE

P/N 57 - XXX - X - XXX

		SIN	SPRINKLER FINISH		TEMPERATURE RATINGS	
378	HORIZONTAL SIDEWALL	TY3331	1	NATURAL BRASS	135	135°F (57°C)
375	VERTICAL SIDEWALL	TY3431	2	POLY-STAINLESS GREY ALUMINUM (RAL9007) ¹ POLYESTER	155	155°F (68°C)
			3	PURE WHITE (RAL9010) ² POLYESTER	175	175°F (79°C)
			4	SIGNAL WHITE (RAL9003) POLYESTER	200	200°F (93°C)
			5	JET BLACK (RAL9005) ³ POLYESTER	286	286°F (141°C)
			7	LEAD COATED		
			9	CHROME PLATED		

NOTES:
 1. Available for TY3331 only.
 2. Eastern Hemisphere sales only.
 3. Available in 155°F (68°C) or 200°F (93°C) temperature rating only.

TABLE C
PART NUMBER SELECTION
SERIES TY-FRB HORIZONTAL AND VERTICAL SIDEWALL SPRINKLERS

Limited Warranty

For warranty terms and conditions, visit www.tyco-fire.com

Ordering Procedure

Contact your local distributor for availability. When placing an order, indicate the full product name and Part Number (P/N).

Sprinkler Assemblies with NPT Thread Connections:

Specify: Series TY-FRB (specify SIN), (specify K-factor), (specify) Horizontal Sidewall or Vertical Sidewall Sprinkler, Standard Response, Standard Coverage, (specify) temperature rating, (specify) finish or coating, P/N (specify from Table C)

Recessed Escutcheon

Specify: Style (10 or 20) Recessed Escutcheon with (specify*) finish, P/N (specify*)

* Refer to Technical Data Sheet TFP770

Sprinkler Wrench

Specify: W-Type 6 Sprinkler Wrench, P/N 56-000-6-387

Specify: W-Type 7 Sprinkler Wrench, P/N 56-850-4-001

**Series TY-FRB – ~~2.8, 4.2,~~ 5.6, and ~~8.0~~ K-Factor
Upright, Pendent, and Recessed Pendent Sprinklers
Quick Response, ~~Standard Coverage~~**

**General
Description**

The TYCO Series TY-FRB, 2.8, 4.2, 5.6, and 8.0 K-factor, Upright, Pendent, and Recessed Pendent Sprinklers described in this data sheet are quick response, standard coverage, decorative 3 mm glass bulb-type spray sprinklers designed for use in light or ordinary hazard, commercial occupancies such as banks, hotels, and shopping malls.

The recessed version of the Series TY-FRB Pendent Sprinkler, where applicable, is intended for use in areas with a finished ceiling. This recessed pendent sprinkler uses one of the following:

- A two-piece Style 10 (1/2 inch NPT) or Style 40 (3/4 inch NPT) Recessed Escutcheon with 1/2 inch (12,7 mm) of recessed adjustment or up to 3/4 inch (19,1 mm) of total adjustment from the flush pendent position, or a
- A two-piece Style 20 (1/2 inch NPT) or Style 30 (3/4 inch NPT) Recessed Escutcheon with 1/4 inch (6,4 mm) of recessed adjustment or up to 1/2 inch (12,7 mm) of total adjustment from the flush pendent position.

The adjustment provided by the Recessed Escutcheon reduces the accuracy to which the fixed pipe drops to the sprinklers must be cut.

Corrosion-resistant coatings, where applicable, are utilized to extend the life of copper alloy sprinklers beyond that which would otherwise be obtained when exposed to corrosive atmo-

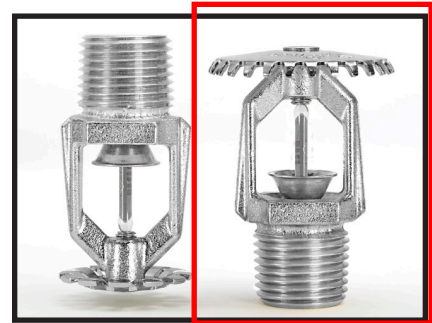
spheres. Although corrosion-resistant coated sprinklers have passed the standard corrosion tests of the applicable approval agencies, the testing is not representative of all possible corrosive atmospheres. Consequently, it is recommended that the end user be consulted with respect to the suitability of these coatings for any given corrosive environment. The effects of ambient temperature, concentration of chemicals, and gas/chemical velocity, should be considered, as a minimum, along with the corrosive nature of the chemical to which the sprinklers will be exposed.

An intermediate level of the Series TY-FRB Pendent Sprinklers is detailed in Technical Data Sheet TFP356, and Sprinkler Guards are detailed in Technical Data Sheet TFP780.

NOTICE

The Series TY-FRB, 2.8, 4.2, 5.6, and 8.0 K-factor, Upright, Pendent, and Recessed Pendent Sprinklers described herein must be installed and maintained in compliance with this document and with the applicable standards of the National Fire Protection Association, in addition to the standards of any authorities having jurisdiction. Failure to do so may impair the performance of these devices.

The owner is responsible for maintaining their fire protection system and devices in proper operating condition. The installing contractor or sprinkler manufacturer should be contacted with any questions.



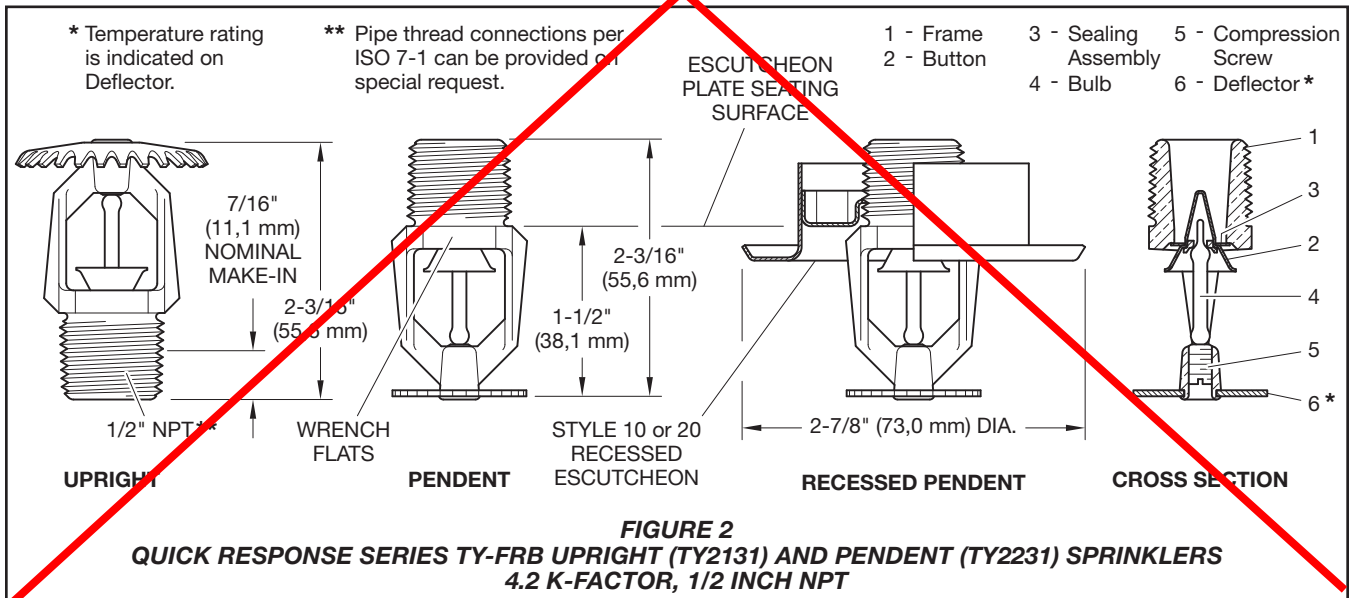
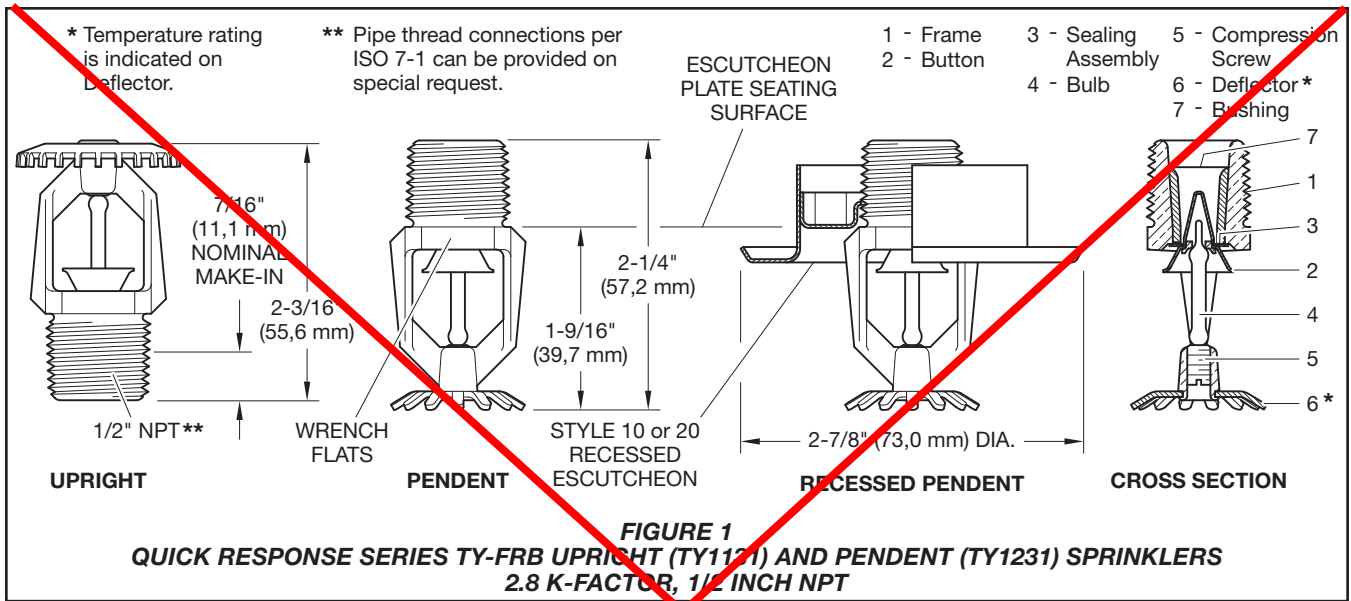
**Sprinkler
Identification
Number (SIN)**

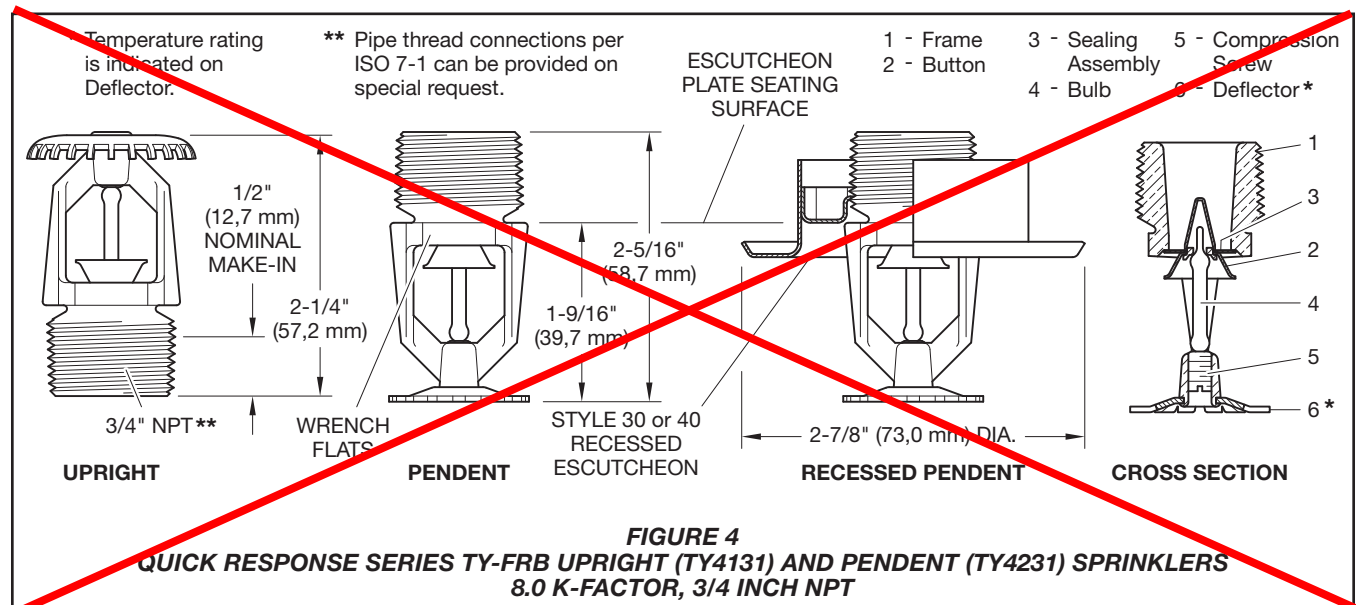
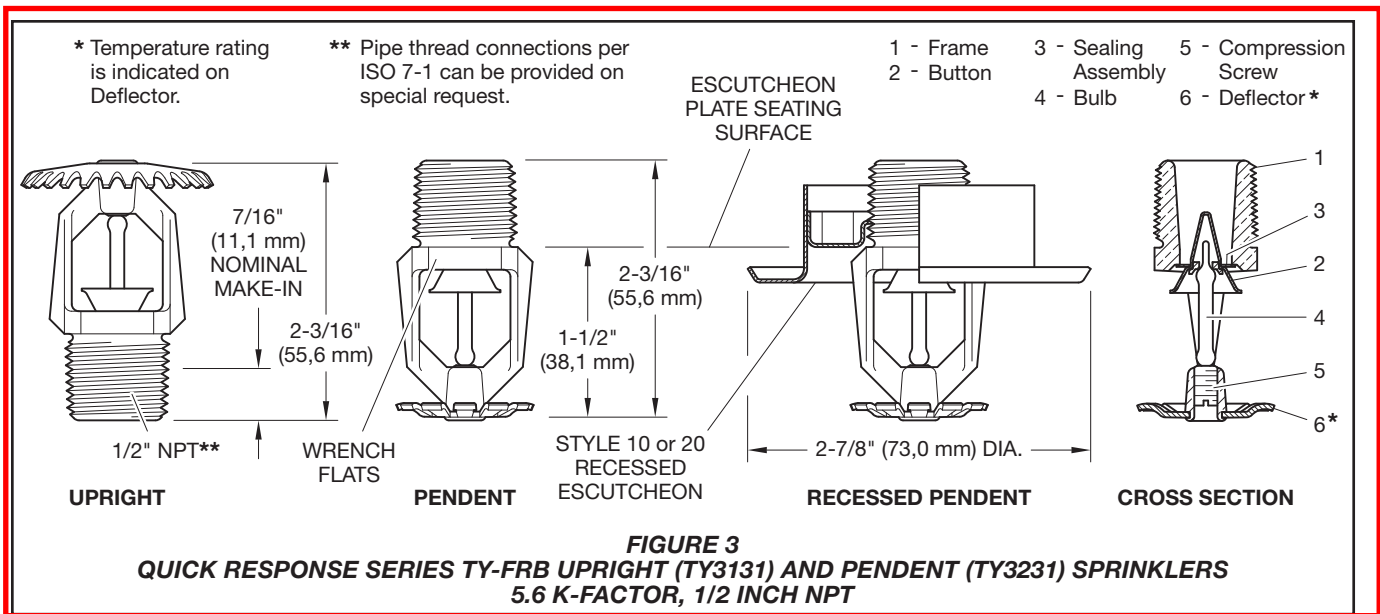
TY1131:	Upright	2.8K, 1/2" NPT
TY1231:	Pendent	2.8K, 1/2" NPT
TY2131:	Upright	4.2K, 1/2" NPT
TY2231:	Pendent	4.2K, 1/2" NPT
TY3131:	Upright	5.6K, 1/2" NPT
TY3231:	Pendent	5.6K, 1/2" NPT
TY4131:	Upright	8.0K, 3/4" NPT
TY4231:	Pendent	8.0K, 3/4" NPT
TY4831:	Upright	8.0K, 1/2" NPT
TY4931:	Pendent	8.0K, 1/2" NPT

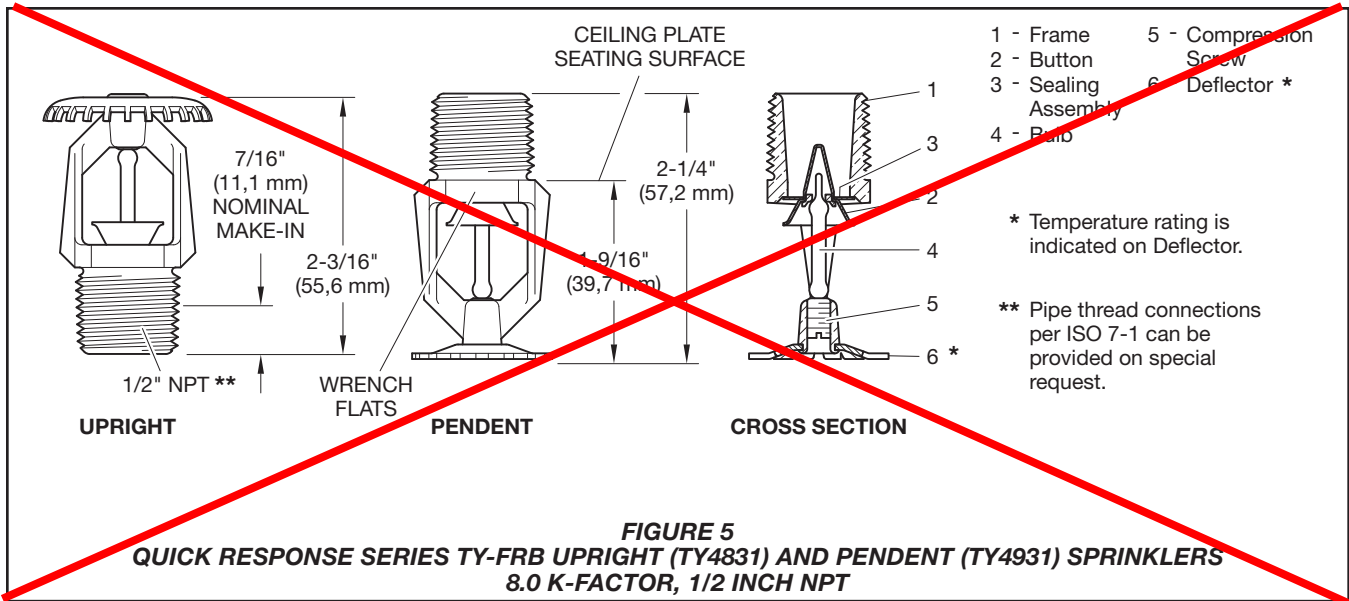
IMPORTANT

Always refer to Technical Data Sheet TFP700 for the "INSTALLER WARNING" that provides cautions with respect to handling and installation of sprinkler systems and components. Improper handling and installation can permanently damage a sprinkler system or its components and cause the sprinkler to fail to operate in a fire situation or cause it to operate prematurely.

At all exterior and rooms subject to humidity. See FP Specs and FP Sheets for locations.







Technical Data

Approvals

UL and C-UL Listed
FM, LPCB, and NYC Approved
Refer to Table A and B for complete approval information including corrosion-resistant status.

Maximum Working Pressure

Refer to Table C.

Discharge Coefficient

K=2.8 GPM/psi^{1/2} (40,3 LPM/bar^{1/2})
K=4.2 GPM/psi^{1/2} (60,5 LPM/bar^{1/2})
K=5.6 GPM/psi^{1/2} (80,6 LPM/bar^{1/2})
K=8.0 GPM/psi^{1/2} (113,2 LPM/bar^{1/2})

Temperature Rating

Refer to Table A and B.

Finishes

Sprinkler: Refer to Table D. Recessed Escutcheon: White Coated, Chrome Plated, or Brass Plated.

Physical Characteristics

Frame Bronze
Button Brass/Copper
Sealing Assembly Beryllium Nickel w/TEFLON
Bulb Glass
Compression Screw Bronze
Deflector Copper/Bronze
Bushing (K=2.8) Bronze

Operation

The glass bulb contains a fluid that expands when exposed to heat. When the rated temperature is reached, the fluid expands sufficiently to shatter the glass bulb, allowing the sprinkler to activate and water to flow.

Design Criteria

The TYCO Series TY-FRB, 2.8, 4.2, 5.6, and 8.0 K-factor, Upright, Pendent, and Recessed Pendent Sprinklers are intended for fire protection systems designed in accordance with the standard installation rules recognized by the applicable Listing or Approval agency (such as, UL Listing is based on the requirements of NFPA 13, and FM Approval is based on the requirements of FM's Loss Prevention Data Sheets). Only the Style 10, 20, 30, or 40 Recessed Escutcheon, as applicable, is to be used for recessed pendent installations.

Installation

The TYCO Series TY-FRB, 2.8, 4.2, 5.6, and 8.0 K-factor, Upright, Pendent, and Recessed Pendent Sprinklers must be installed in accordance with this section.

General Instructions

Do not install any bulb-type sprinkler if the bulb is cracked or there is a loss of liquid from the bulb. With the sprinkler held horizontally, a small air bubble should be present. The diameter of the air bubble is approximately 1/16 inch (1,6 mm) for the 135°F (57°C) and 3/32 inch (2,4 mm) for the 286°F (141°C) temperature ratings.

A leak-tight 1/2 inch NPT sprinkler joint should be obtained by applying a minimum to maximum torque of 7 to 14 ft.-lbs. (9,5 to 19,0 Nm). A leak tight 3/4 inch NPT sprinkler joint should be obtained with a torque of 10 to 20 ft.-lbs. (13,4 to 26,8 Nm). Higher levels of

torque can distort the sprinkler Inlet with consequent leakage or impairment of the sprinkler.

Do not attempt to compensate for insufficient adjustment in the Escutcheon Plate by under- or over-tightening the sprinkler. Re-adjust the position of the sprinkler fitting to suit.

Series TY-FRB Upright and Pendent Sprinklers

The Series TY-FRB Pendent and Upright Sprinklers must be installed in accordance with the following instructions.

Step 1. Install Pendent sprinklers in the pendent position. Install upright sprinklers in the upright position.

Step 2. With pipe-thread sealant applied to the pipe threads, hand-tighten the sprinkler into the sprinkler fitting.

Step 3. Tighten the sprinkler into the sprinkler fitting using only the W-Type 6 Sprinkler Wrench (Figure 14). With reference to Figures 1 through 5, apply the W-Type 6 Sprinkler Wrench to the sprinkler wrench flats.

Series TY-FRB Recessed Pendent Sprinklers

The Series TY-FRB Recessed Pendent Sprinklers must be installed in accordance with the following instructions.

Step A. After installing the Style 10, 20, 30, or 40 Mounting Plate, as applicable, over the sprinkler threads and with pipe-thread sealant applied to the pipe threads, hand-tighten the sprinkler into the sprinkler fitting.

Step B. Tighten the sprinkler into the sprinkler fitting using only the W-Type 7 Recessed Sprinkler Wrench (Figure

K FACTOR	TYPE	TEMPERATURE	SPRINKLER FINISH (See Note 5)			
			BULB LIQUID COLOR	NATURAL BRASS	CHROME PLATED	SIGNAL*** WHITE
2.8 1/2" NPT	PENDENT (TY1231) and UPRIGHT (TY1131)	135°F (57°C)	Orange			
		155°F (68°C)	Red			
		175°F (79°C)	Yellow			
		200°F (93°C)	Green			
		286°F (141°C)	Blue			
	RECESSED PENDENT (TY1231)* Figure 6	135°F (57°C)	Orange			
		155°F (68°C)	Red			
		175°F (79°C)	Yellow			
		200°F (93°C)	Green			
		286°F (141°C)	Blue			
	RECESSED PENDENT (TY1231)** Figure 7	135°F (57°C)	Orange			
		155°F (68°C)	Red			
		175°F (79°C)	Yellow			
		200°F (93°C)	Green			
286°F (141°C)		Blue				
4.2 1/2" NPT	PENDENT (TY2231) and UPRIGHT (TY2131)	135°F (57°C)	Orange			
		155°F (68°C)	Red			
		175°F (79°C)	Yellow			
		200°F (93°C)	Green			
		286°F (141°C)	Blue			
	RECESSED PENDENT (TY2231)* Figure 8	135°F (57°C)	Orange			
		155°F (68°C)	Red			
		175°F (79°C)	Yellow			
		200°F (93°C)	Green			
		286°F (141°C)	Blue			
	RECESSED PENDENT (TY2231)** Figure 9	135°F (57°C)	Orange			
		155°F (68°C)	Red			
		175°F (79°C)	Yellow			
		200°F (93°C)	Green			
286°F (141°C)		Blue				

NOTES:

- Listed by Underwriters Laboratories, Inc., (UL) as Quick Response Sprinklers.
- Listed by Underwriters Laboratories, Inc., for use in Canada (C-UL) as Quick Response Sprinklers.
- Approved by Factory Mutual Research Corporation (FM) as Quick Response Sprinklers.
- Approved by the City of New York under MEA 354-01-E.
- Where Polyester Coated Sprinklers are noted to be UL and C-UL Listed, the sprinklers are UL and C-UL Listed as Corrosion-Resistant Sprinklers.

* Installed with Style 10 (1/2" NPT) or Style 40 (3/4" NPT) 3/4" Total Adjustment Recessed Escutcheon, as applicable.

** Installed with Style 20 (1/2" NPT) or Style 30 (3/4" NPT) 1/2" Total Adjustment Recessed Escutcheon, as applicable.

*** Frame and Deflector only. Listings and approvals apply to color (Special Order).

N/A: Not Available

TABLE A
LABORATORY LISTINGS AND APPROVALS FOR
2.8 AND 4.2 K-FACTOR SPRINKLERS

15). With reference to Figures 1 to 4, apply the W-Type 7 Recessed Sprinkler Wrench to the sprinkler wrench flats.

Step C. After ceiling installation and finishing, slide on the Style 10, 20, 30, or 40 Closure over the Series TY-FRB Sprinkler and push the Closure over the Mounting Plate until its flange comes in contact with the ceiling.

K FACTOR	TYPE	TEMPERATURE	BULB LIQUID COLOR	SPRINKLER FINISH (See Note 8)			
				NATURAL BRASS	CHROME PLATED	SIGNAL*** WHITE	LEAD COATED
5.6 1/2" NPT	PENDENT (TY3231) and UPRIGHT (TY3131)	135°F (57°C)	Orange	1, 2, 3, 4, 5, 6, 7			1, 2, 3, 5
		155°F (68°C)	Red				
		175°F (79°C)	Yellow				
		200°F (93°C)	Green				
		286°F (141°C)	Blue				
	RECESSED PENDENT (TY3231)* Figure 10	135°F (57°C)	Orange	1, 2, 4, 5			N/A
		155°F (68°C)	Red				
		175°F (79°C)	Yellow				
		200°F (93°C)	Green				
	RECESSED PENDENT (TY3231)** Figure 11	135°F (57°C)	Orange	1, 2, 3, 4, 5			N/A
		155°F (68°C)	Red				
		175°F (79°C)	Yellow				
200°F (93°C)		Green					
8.0 3/4" NPT	PENDENT (TY4231) and UPRIGHT (TY4131)	135°F (57°C)	Orange	1, 2, 3, 4, 5, 6, 7			1, 2, 5
		155°F (68°C)	Red				
		175°F (79°C)	Yellow				
		200°F (93°C)	Green				
		286°F (141°C)	Blue				
	RECESSED PENDENT (TY4231)* Figure 12	135°F (57°C)	Orange	1, 2, 5			N/A
		155°F (68°C)	Red				
		175°F (79°C)	Yellow				
		200°F (93°C)	Green				
	RECESSED PENDENT (TY4231)** Figure 13	135°F (57°C)	Orange	1, 2, 3, 5			N/A
		155°F (68°C)	Red				
		175°F (79°C)	Yellow				
200°F (93°C)		Green					
8.0 1/2" NPT	PENDENT (TY4831) and UPRIGHT (TY4831)	135°F (57°C)	Orange	1, 2, 4, 5, 6			1, 2, 5
		155°F (68°C)	Red				
		175°F (79°C)	Yellow				
		200°F (93°C)	Green				
		286°F (141°C)	Blue				

NOTES:

- Listed by Underwriters Laboratories, Inc., (UL) as Quick Response Sprinklers.
 - Listed by Underwriters Laboratories, Inc., for use in Canada (C-UL) as Quick Response Sprinklers.
 - Approved by Factory Mutual Research Corporation (FM) as Quick Response Sprinklers.
 - Approved by the Loss Prevention Certification Board (LPCB Ref. No. 007k/04) as Quick Response Sprinklers. However, LPCB does not rate the thermal sensitivity of recessed sprinklers.
 - Approved by the City of New York under MEA 354-01-E.
 - VdS Approved (For details, contact Tyco Fire Suppression & Building Products, Enschede, Netherlands, Tel. 31-53-428-4444/Fax 31-53-428-3377.)
 - Approved by the Loss Prevention Certification Board (LPCB Ref. No. 094a/06) as Quick Response Sprinklers.
 - Where Polyester Coated and Lead-Coated Sprinklers are noted to be UL and C-UL Listed, the sprinklers are UL and C-UL Listed as Corrosion-Resistant Sprinklers. Where Lead-Coated Sprinklers are noted to be FM Approved, the sprinklers are FM Approved as a Corrosion-Resistant Sprinklers.
- * Installed with Style 10 (1/2" NPT) or Style 40 (3/4" NPT) 3/4" Total Adjustment Recessed Escutcheon, as applicable.
 ** Installed with Style 20 (1/2" NPT) or Style 30 (3/4" NPT) 1/2" Total Adjustment Recessed Escutcheon, as applicable.
 *** Frame and Deflector only. Listings and approvals apply to color (Special Order).

N/A: Not Available

TABLE B
LABORATORY LISTINGS AND APPROVALS FOR
5.6 AND 8.0 K-FACTOR SPRINKLERS

K FACTOR	TYPE	SPRINKLER FINISH			
		NATURAL BRASS	CHROME PLATED	SIGNAL WHITE	LEAD COATED
2.8 1/2" NPT	PENDENT (TY1231) and UPRIGHT (TY1131)	175 PSI (12,1 BAR)			N/A
	RECESSED PENDENT (TY1231)				
4.2 1/2" NPT	PENDENT (TY2231) and UPRIGHT (TY2131)	175 PSI (12,1 BAR)			N/A
	RECESSED PENDENT (TY2231)				
5.6 1/2" NPT	PENDENT (TY3231) and UPRIGHT (TY3131)	250 PSI (17,2 BAR) OR 175 PSI (12,1 BAR) (SEE NOTE 1)			175 PSI (12,1 BAR)
	RECESSED PENDENT (TY3231)				N/A
8.0 3/4" NPT	PENDENT (TY4231) and UPRIGHT (TY4131)	175 PSI (12,1 BAR)			175 PSI (12,1 BAR)
	RECESSED PENDENT (TY4231)				N/A
8.0 1/2" NPT	PENDENT (TY4931) and UPRIGHT (TY4831)	175 PSI (12,1 BAR)			175 PSI (12,1 BAR)

NOTES:
1. The maximum working pressure of 250 psi (17,2 bar) only applies to the Listing by Underwriters Laboratories Inc. (UL); the Listing by Underwriters Laboratories, Inc. for use in Canada (C-UL); and, the Approval by the City of New York.

**TABLE C
MAXIMUM WORKING PRESSURE**

Care and Maintenance

The TYCO Series TY-FRB must be maintained and serviced in accordance with this section.

Before closing a fire protection system main control valve for maintenance work on the fire protection system that it controls, obtain permission to shut down the affected fire protection systems from the proper authorities and notify all personnel who may be affected by this action.

Absence of the outer piece of an escutcheon, which is used to cover a clearance hole, can delay sprinkler operation in a fire situation.

Sprinklers which are found to be leaking or exhibiting visible signs of corrosion must be replaced.

Automatic sprinklers must never be painted, plated, coated, or otherwise altered after leaving the factory. Modified sprinklers must be replaced. Sprinklers that have been exposed to

corrosive products of combustion, but have not operated, should be replaced if they cannot be completely cleaned by wiping the sprinkler with a cloth or by brushing it with a soft bristle brush.

Care must be exercised to avoid damage to the sprinklers - before, during, and after installation. Sprinklers damaged by dropping, striking, wrench twist/slippage, or the like, must be replaced. Also, replace any sprinkler that has a cracked bulb or that has lost liquid from its bulb. (Ref. Installation Section.)

The owner is responsible for the inspection, testing, and maintenance of their fire protection system and devices in compliance with this document, as well as with the applicable standards of the National Fire Protection Association (e.g., NFPA 25), in addition to the standards of any other authorities having jurisdiction. Contact the installing contractor or sprinkler manufacturer regarding any questions.

Automatic sprinkler systems are recommended to be inspected, tested, and maintained by a qualified Inspec-

tion Service in accordance with local requirements and/or national codes.

Care must be exercised to avoid damage to the sprinklers -before, during, and after installation. Sprinklers damaged by dropping, striking, wrench twist/slippage, or the like, must be replaced. Also, replace any sprinkler that has a cracked bulb or that has lost liquid from its bulb. (Ref. Installation Section).

Initial and frequent visual inspections of random samples are recommended for corrosion-resistant sprinklers to verify the integrity of the corrosion-resistant material of construction. Thereafter, annual inspections per NFPA 25 should suffice.

Inspections of corrosion-resistant sprinklers are recommended at close range, instead of from the floor level per NFPA. Inspection at close range can better determine the exact sprinkler condition and the long-term integrity of the corrosion-resistant material, which can be affected by the corrosive conditions present.

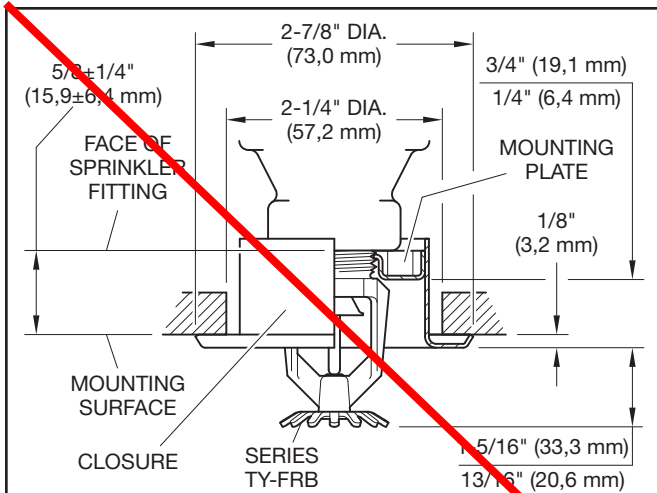


FIGURE 6
SERIES TY-FRB RECESSED PENDENT
WITH TWO-PIECE 3/4 INCH TOTAL ADJUSTMENT
STYLE 10 RECESSED ESCUTCHEON
2.8 K-FACTOR, 1/2 INCH NPT

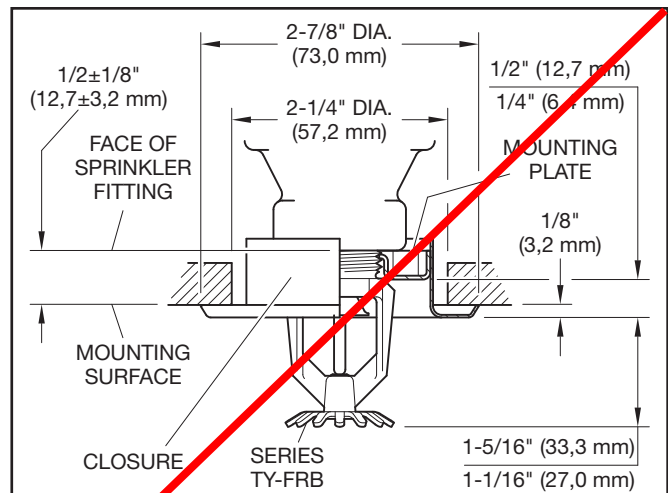


FIGURE 7
SERIES TY-FRB RECESSED PENDENT
WITH TWO-PIECE 1/2 INCH TOTAL ADJUSTMENT
STYLE 20 RECESSED ESCUTCHEON
2.8 K-FACTOR, 1/2 INCH NPT

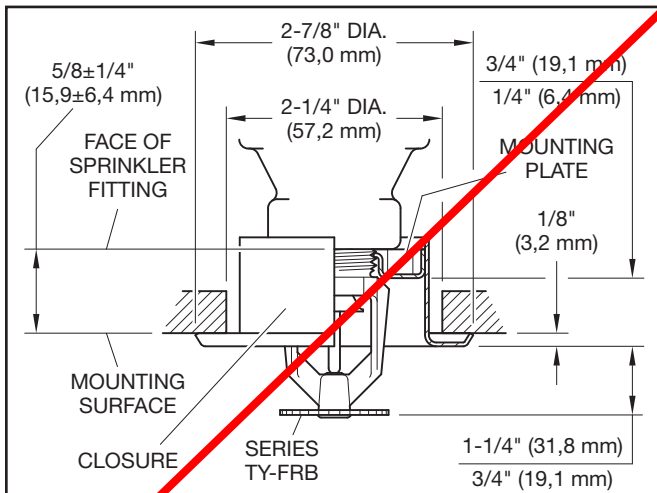


FIGURE 8
SERIES TY-FRB RECESSED PENDENT
WITH TWO-PIECE 3/4 INCH TOTAL ADJUSTMENT
STYLE 10 RECESSED ESCUTCHEON
4.2 K-FACTOR, 1/2 INCH NPT

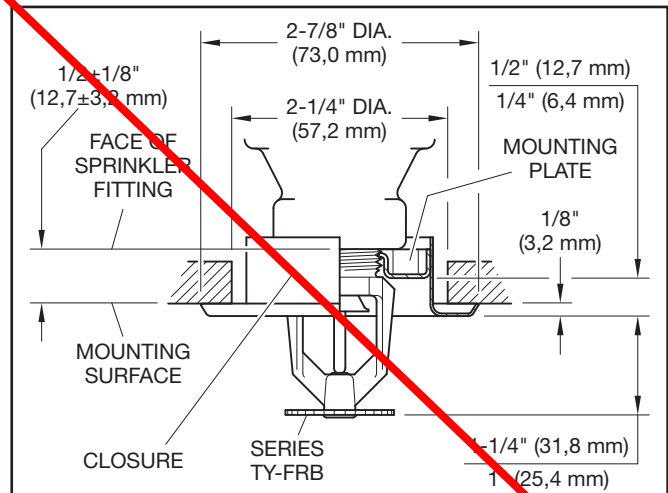
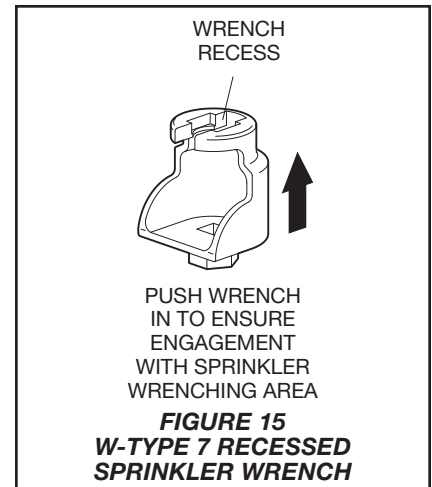
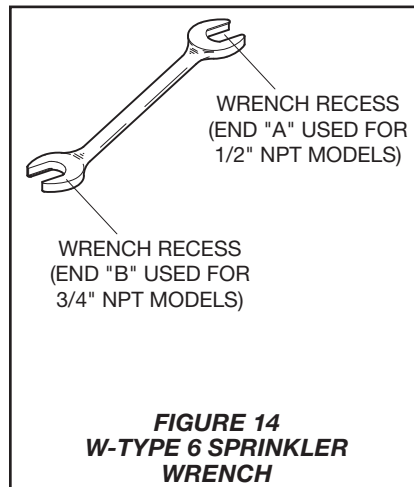
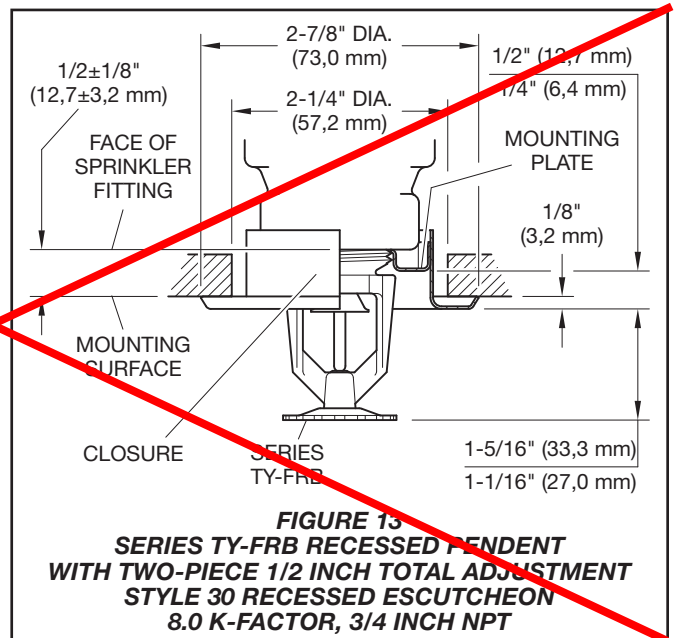
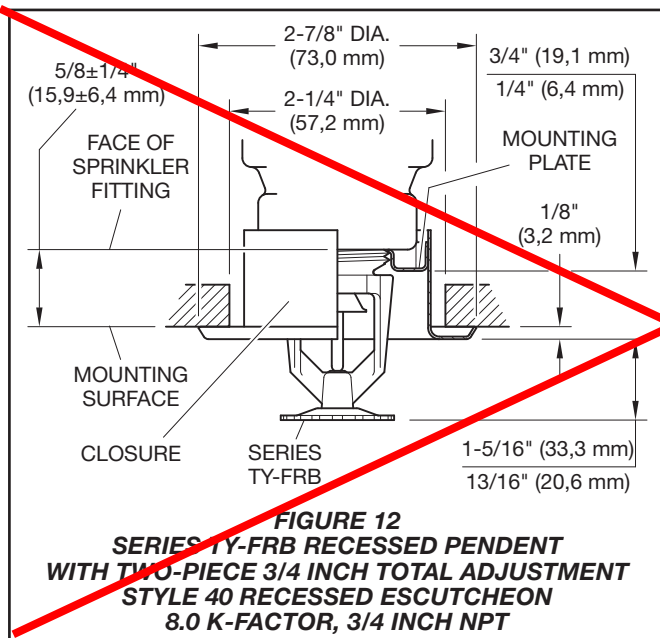
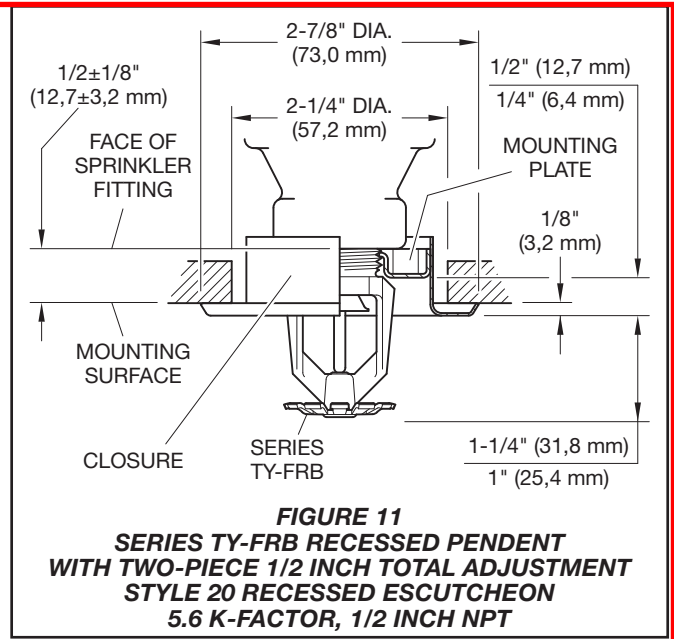
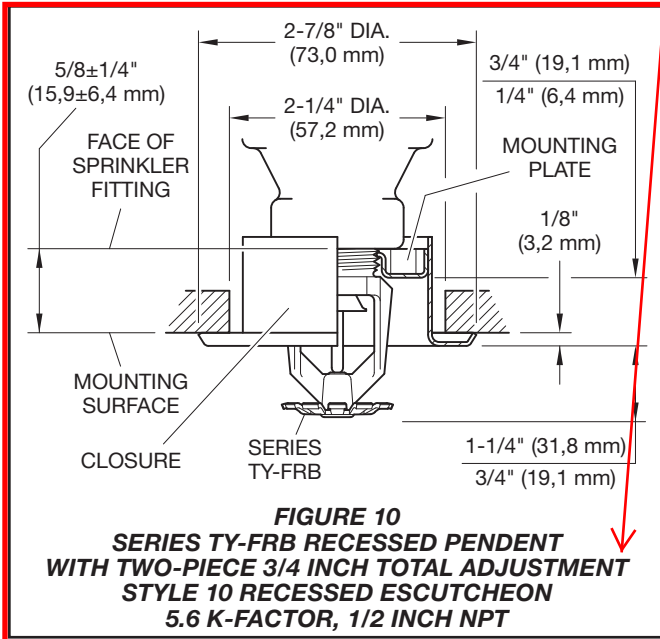


FIGURE 9
SERIES TY-FRB RECESSED PENDENT
WITH TWO-PIECE 1/2 INCH TOTAL ADJUSTMENT
STYLE 20 RECESSED ESCUTCHEON
4.2 K-FACTOR, 1/2 INCH NPT

Verify with
Architect & Owner



P/N 57 - XXX - X - XXX

		SIN	SPRINKLER FINISH		TEMPERATURE RATINGS	
330	2.8K UPRIGHT (1/2"NPT)	TY1131	1	NATURAL BRASS	135	135°F (57°C)
331	2.8K PENDENT (1/2"NPT)	TY1231	3	PURE WHITE (RAL9010)*	155	155°F (68°C)
340	4.2K UPRIGHT (1/2"NPT)	TY2131	4	SIGNAL WHITE (RAL9003)	175	175°F (79°C)
341	4.2K PENDENT (1/2"NPT)	TY2231	5	JET BLACK (RAL9005)**	200	200°F (93°C)
370	5.6K UPRIGHT (1/2"NPT)	TY3131	7	LEAD COATED	286	286°F (141°C)
371	5.6K PENDENT (1/2"NPT)	TY3231	9	CHROME PLATED		
390	8.0K UPRIGHT (3/4"NPT)	TY4131				
391	8.0K PENDENT (3/4"NPT)	TY4231				
360	8.0K UPRIGHT (1/2"NPT)	TY4831*				
361	8.0K PENDENT (1/2"NPT)	TY4931*				

* Eastern Hemisphere sales only.
 ** Available in only 2.8K, 4.2K, and 8.0K, 155°F (68°C) and 200°F (93°C); requires lead time to manufacture.

TABLE D
SERIES TY-FRB PENDENT AND UPRIGHT SPRINKLERS
PART NUMBER SELECTION

Ordering Procedure

Contact your local distributor for availability. When placing an order, indicate the full product name and Part Number (P/N).

Sprinkler Assemblies with NPT Thread Connections

Specify: Series TY-FRB (Specify SIN), (specify K-factor), (specify Pendent or Upright) Sprinkler (specify) temperature rating, (specify) finish or coating, P/N (specify from Table D)

Recessed Escutcheon:

Specify: Style (10, 20, 30, or 40) Recessed Escutcheon with (specify*) finish, P/N (specify*)

Sprinkler Wrench

Specify: W-Type 6 Sprinkler Wrench, P/N 56-000-6-387

Specify: W-Type 7 Sprinkler Wrench, P/N 56-850-4-001

* Refer to Technical Data Sheet TFP770



SECTION 22 00 00

PLUMBING

PART 1 GENERAL

1.01 GENERAL PROVISIONS

A. General Requirements of Plumbing Contractor:

1. Provide all labor, materials, equipment and services necessary for complete and operable installation of the Plumbing system in conformity with requirements of all Authorities having jurisdiction as indicated in the Contract Documents.
2. All Architectural drawings and specifications, fixture specifications, general, special and supplementary conditions, shall be considered a part of these specifications.
3. Prior to submitting bid, become thoroughly familiar with actual existing conditions and of the present installations to which connections must be made or which must be changed or altered. The intent of the work is shown on the drawings and described herein, and no consideration will be granted by reason of lack of familiarity on the part of the Contractor with actual physical conditions, requirements, and practices at the site.
4. Carefully check the documents of other sections to determine the requirements of any related work furnished and/or installed by that section. Provide the proper installation and/or connection.
5. Keep site free from surplus material, tools and rubbish at all times during construction period and, upon completion, leave site in clean condition.
6. Protect materials and equipment from all damage due to fire, theft, vandalism, weather, etc.
7. Repair any damage, at no extra cost to the Owner, caused to work of other sections.
8. Repair any damaged fireproofing, at no extra cost to the Owner, caused to integrity of original construction.
9. Contractor agrees that he and his subcontractors, agents, and employees will provide and maintain a safe place to work and that he and they will comply with all laws and regulations of any governmental authority having jurisdiction thereof. The Contractor agrees to indemnify, defend and hold harmless, Engineer, Owner and Architect from and against any liability, loss, damage or expense, including attorney's fees, arising from a failure or alleged failure on the part of Contractor, his and their agents,

and employees to provide and maintain a safe place to work or to comply with all laws and regulations of any governmental authority having jurisdiction thereof.

10. Transmit all information required for work being performed by other sections in ample time for the proper installation and connection, and for the provision of all openings required in floors and walls.
11. Field drilling and cutting of holes in building structure required for work under this section shall be coordinated through the General Contractor and approved by Owner and Building Structural Engineer. Contractor shall bear all costs for such coordination, drilling, cutting and reinforcing costs.
12. Furnish and set all sleeves for the passage of piping through walls, roof and floors and elsewhere as will be required for the proper protection of each pipe passing through building surfaces. Coordinate this work with the General Contractor in order to properly expedite and perform this work.
13. Check the dimensional requirements of equipment to ensure that equipment can pass through the necessary areas to reach the location for installation. Include in bid costs for all work required, including any work required to move the equipment through the site to this final location.
14. Provide equipment tags per codes and authorities having jurisdiction.
15. Notify the General Contractor and Engineer in writing, within five days of award of contract, of the proposed delivery schedule of any equipment or material that may prevent the installation from being completed by the project completion date.
16. Submit a single guarantee stating that all portions of the work are in accordance with contract requirements. Guarantee all work against faulty and improper material and workmanship for a period of one year from date of final acceptance by Owner. Where guarantees or warranties for longer terms are specified by contract, such longer term shall apply.
17. Correct any deficiencies that may occur during the guarantee period, all to the satisfaction of the Owner, at no additional cost to the Owner within a reasonable time period. The Contractor shall be responsible for any damage caused by such deficiencies and repair thereof and reimburse the Owner for all costs incurred.
18. Carefully coordinate piping in walls with electrical contractor and mechanical contractor for locations of all piping, conduits and ductwork.

B. Major Items of Work include:

1. Domestic hot water, cold water and hot water return distribution systems including all pipe, valves, piping offsets, fittings, unions, inserts, hangers and connections to existing work.
2. Thermal insulation of hot water and hot water return piping.

3. Sanitary waste and vent system including all pipe, piping offsets, connections, flanges, and connections to existing work.
4. Storm water system including all pipe, piping offsets, fittings, hangers, inserts and connections to existing work.
5. Natural gas piping.
6. Plumbing fixtures, drains, equipment and specialties.
7. Pumps.
8. Vibration Isolation.
9. Controls.
10. Testing and balancing of all systems.

C. General Items:

1. Access Doors Panels: Provide concealed controls, valves and equipment requiring access with adequately sized access doors/panels. In removable type ceiling, provide access tile identification only.
2. Cutting and patching for plumbing work.
3. Coordinate all new work with existing installations.

1.02 REFERENCES

A. Published specifications, standards, tests or recommended methods of trade industry or governmental organizations apply to work in this section where cited below:

1. Local Codes
2. State Codes
3. IPC-International Plumbing Code
4. ASME-American Society of Mechanical Engineers
5. UL-Underwriters' Laboratory
6. AGA-American Gas Association
7. ICBO-International Conference of Building Officials
8. IAPMO-International Association of Plumbing and Mechanical Officials

1.03 SUBMITTALS

A. Submit the following to Architect:

Manufacturer's descriptive literature, operating instructions, and maintenance and repair data.

- B. All equipment and accessories shall be the product of a company regularly engaged in the manufacture of that product for at least five years.
- C. All equipment and accessories shall be new and free from defects.
- D. Supply all equipment and accessories in compliance with the applicable standards listed in article 1.02 of this section and with all applicable national, state and local codes.
- E. All items of a given type shall be the products of the same manufacturer.

1.04 DESCRIPTION OF CONTRACT DOCUMENTS

A. Specifications:

1. Specifications, in general, describe quality and character of materials and equipment.
2. Specifications are of simplified form and include incomplete sentences.
3. Words or phrases such as "The Contractor shall," "shall be," "furnish," "provide," "a," "an," "the," and "all" etc. may be omitted for brevity.

B. Drawings:

1. Drawings in general are diagrammatic and indicate scope, sizes, routing, locations, connections to equipment and methods of installation. The Drawings do not necessarily show all required offsets, obstructions or structural conditions. Locations on drawings may be distorted for purposes of clearness and legibility.
2. Scaled and figured dimensions are approximate and are for estimating purposes only, but shall be followed with sufficient accuracy to coordinate with other work and structural limitations. **DO NOT SCALE DRAWINGS.**
3. Before proceeding with work, check and verify all dimensions and carefully check space requirements with other Work to ensure that all equipment and materials can be installed in spaces allotted.
4. The Contractor shall assume all responsibility for fitting of materials and equipment to other parts of equipment and structure.
5. The Contractor is responsible for installing the work in such a manner that it will conform to the structure and architectural elements, avoid obstructions, maintain headroom, leave adequate clearance for proper maintenance and repairs, and provide clearances and access required by codes.

6. Make adjustments that may be necessary or requested in order to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.
 7. Above items to be performed at no additional cost to the Owner.
- C. Immediately and formally notify the Architect requesting his interpretation and decision, including during bidding period, if any part of the Contract Documents appears unclear or contradictory. Do not proceed with such work without Architect's decision.
- D. At all locations where piping is installed in masonry walls: coordinate piping locations with rebar and structural reinforcing. Metal piping installed in masonry walls shall be protected with a listed wrap. Plastic piping installed in masonry walls shall have clearance between piping and masonry cells.

1.05 PERMITS AND INSPECTIONS

- A. The contractor shall secure all approvals and pay all fees for all work installed. Certificate shall be delivered to owner before final payment will be made.

1.06 PROJECT CONDITIONS NOT USED.

1.07 QUALITY ASSURANCE

- A. Materials shall be new and free from defects and listed by Underwriters' Laboratories, Inc., (or other approved testing and listing agency) or bearing their label. Conform to codes, standards and publications listed in paragraph 1.02 References.

1.08 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Ship equipment in original packages, to prevent damaging or entrance of foreign matter.
- B. Handle and ship in accordance with manufacturer's recommendations.
- C. Provide protective coverings during construction.
- D. Replace at no expense to Owner, equipment or material damaged during storage or handling, as directed by Architect.
- E. Tag all items with weatherproof tag, identifying equipment by name and purchase order number.

- F. Include packing and shipping lists.
- G. Accessibility:
 - 1. For operation, maintenance and repair.
 - 2. Minor deviations are permissible.
 - 3. Changes of magnitude or involving extra cost are not permissible without review.
 - 4. Group concealed mechanical equipment requiring access with equipment freely accessible through access doors.

1.09 SUBMITTALS

- A. One bound pdf of submittal material with descriptive data for all products and materials prior to purchase and installation, including but not limited to the following:
 - 1. Water heaters.
 - 2. Insulation.
 - 3. Piping materials
 - 4. Piping accessories.
 - 5. Pumps.
 - 6. Expansion tanks.
 - 7. Drains, interceptors and specialties.
 - 8. Fixtures.
 - 9. Controls.
 - 10. Vibration isolation.

1.10 MAINTENANCE MANUALS AND RECORD DRAWINGS

- A. Provide four (4) copies of operating and maintenance manual for Owner's use for each piece of equipment. Each item shall be cross-referenced and numbered with as-built drawing descriptions.
- B. Deliver to Owner, two sets of pdf blueprints showing work as actually installed. Label drawings "RECORD DRAWINGS."

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Plumbing Fixtures:
 - 1. American Standard
 - 2. Kohler

3. Prior Approved Equivalent.

B. Faucets

1. American Standard
2. Kohler
3. Chicago

C. Gas Water Heaters

1. Lochinvar
2. A.O. Smith
3. P.V.I

D. Valves

1. Stockham
2. Nibco
3. Milwaukee

2.02 MATERIALS

A. Domestic Water

1. Pipe:

- a. Seamless copper tubing, type L, cold drawn, hard temper, ASTM B88 for all plumbing risers and public mains and PEX or other Code approved plastic piping only in living area corridors.
- b. PEX piping (Wirsbo or similar) for individual living units.
- c. Exposed to view at plumbing fixtures, satin finish CP brass pipe with threaded cast bronze fittings.

2. Fittings:

- a. Wrought copper solder sweat type, ANSI B16.22 or brass castings, ANSI B16.18.

3. Control Valves:

- a. 125 PSI WWP, bronze non rising stem gate type.
- b. Threaded ends similar to Stockham B-103.
- c. Solder joint type ends, similar to Stockham B-104.

4. Insulation:

- a. All hot water and hot water return minimum R value per the 2018 International Energy Conservation Code. Fiberglass insulation with kraft paper vapor barrier. Cover with PVC jacketing where exposed. All hot water and hot water return piping complete, including fittings, from water heater through to fixtures (including within walls). Exception: piping within building construction insulation with a minimum R3.
5. Testing and Disinfection:
- a. Pressure test in accordance with City of Phoenix requirements.
 - b. Disinfect all hot and cold water systems.
- B. Soil, Waste and Vent (note: Plastic pipe will be approved with owner's approval).
1. Pipe:
 - a. 2 in. and larger: CISPI 301 standard weight cast iron no-hub type soil pipe.
 - b. 1-1/2 in. and smaller: Schedule 40 galvanized steel pipe.
 - c. Plastic solid core PVC or ABS for all drain, waste, vent and rainwater piping. Note provide for expansion and contraction at roof drain piping connections. Plastic pipe within masonry or concrete walls shall be sleeved or otherwise protected from damage.
 - d. Foam Core Piping shall not be used on this project.
 2. Fittings:
 - a. 2 in. and larger CISPI 301 standard weight cast iron no-hub type soil fittings and neoprene gasket and stainless steel bands and shield, no-hub couplings.
 - b. 1-1/2 in. and smaller: galvanized cast iron drainage type screwed fittings.
 - c. PVC or ABS glued fittings, service weight with no-hub couplings where required for connection to metallic drain outlets.
- C. Rainwater and drainage System (note: Plastic pipe will be approved with owner's approval).
1. Pipe:

- a. Piping below grade or slab-on-grade shall be service weight cast iron, no-hub pipe conforming to CISPI Standard 301-95 and ASTM Standard A-888.
- b. Piping above slab on grade shall be either service weight cast iron, no-hub pipe conforming to CISPI Standard 301-95 and ASTM Standard A-888.
- c. All piping solid core PVC or ABS with appropriate service weight glued fittings. Note: provide for expansion and contraction at roof drain connections. Foam Core Piping shall not be used on this project. Plastic pipe within masonry or concrete walls shall be sleeved or otherwise protected from damage.

D. Natural Gas Piping:

1. Pipe:

- a. Schedule 40, ASTM A53 or ANSI B16.3, black steel with 150 psi, malleable iron, banded thread fittings for 2” diameter and smaller, welded for larger than 2” diameter. Provide corrosion protection as required by code.
- b. Extend gas line to all equipment and connections requiring gas. Provide gas pipe with suitable drip legs on all mains and risers, and at equipment connections. Provide AGA approved gas-rated valves at all equipment connections.

E. Compressed Air Piping:

1. Pipe:

- a. Schedule 40, ASTM A53 type E or S, Grade B, black steel with 150 psi, malleable iron, banded thread fittings for 2” diameter and smaller. Provide corrosion protection as required by code.
- b. Seamless copper tubing, type K, cold drawn, hard temper, ASTM B88.

Fittings:

- a. Unless otherwise specified, install fittings of the same material and finish as piping.
- b. Pipe 1-1/2" and smaller, 150 psi black malleable iron conforming to ANSI B16.3, 150 psi SWP.
- c. For copper, wrought copper solder fittings conforming to ASTM B16.24. Lead free flux ASTM B813, BCup series brazing filler.
- d. Unions: Black malleable iron, screwed connections, ground iron-to-bronze seat, conforming to ASTM A147, 250 psi SWP.

E. Plumbing fixtures:

- 1. See Plumbing Plans.

PART 3 EXECUTION

3.01 TESTS

- A. In accordance with the requirements City of Phoenix

END OF SECTION

SECTION 23 00 00

MECHANICAL



PART 1 GENERAL

1.01 GENERAL PROVISIONS

A. General Requirements of Mechanical Contractor:

1. Provide all labor, materials, equipment and services necessary for complete and operable installation of the Heating, Ventilating, Air Conditioning (HVAC) system in conformity with requirements of all Authorities having jurisdiction as indicated in the Contract Documents.
2. All Architectural drawings and specifications, fixture specifications, general, special and supplementary conditions, shall be considered a part of these specifications.
3. Prior to submitting bid, become thoroughly familiar with actual existing conditions and of the present installations to which connections must be made or which must be changed or altered. The intent of the work is shown on the drawings and described herein, and no consideration will be granted by reason of lack of familiarity on the part of the Contractor with actual physical conditions, requirements, and practices at the site.
4. Carefully check the documents of other sections to determine the requirements of any related work furnished and/or installed by that section. Provide the proper installation and/or connection.
5. Keep site free from surplus material, tools and rubbish at all times during construction period and, upon completion, leave site in clean condition.
6. Protect materials and equipment from all damage due to fire, theft, vandalism, weather, etc.
7. Repair any damage, at no extra cost to the Owner, caused to work of other sections.
8. Repair any damaged fireproofing, at no extra cost to the Owner, caused to integrity of original construction.
9. Contractor agrees that he and his subcontractors, agents, and employees will provide and maintain a safe place to work and that he and they will comply with all laws and regulations of any governmental authority having jurisdiction thereof. The Contractor agrees to indemnify, defend and hold harmless, Engineer, Owner and Architect from and against any liability, loss, damage or expense, including attorney's fees, arising from a

failure or alleged failure on the part of Contractor, his and their agents, and employees to provide and maintain a safe place to work or to comply with all laws and regulations of any governmental authority having jurisdiction thereof.

10. Transmit all information required for work being performed by other sections in ample time for the proper installation and connection, and for the provision of all openings required in floors and walls.
11. Field drilling and cutting of holes in building structure required for work under this section shall be coordinated through the General Contractor and approved by Owner and Building Structural Engineer. Contractor shall bear all costs for such coordination, drilling, cutting and reinforcing costs.
12. Furnish and set all sleeves for the passage of piping through walls, roof and floors and elsewhere as will be required for the proper protection of each pipe passing through building surfaces. Coordinate this work with the General Contractor in order to properly expedite and perform this work.
13. Check the dimensional requirements of equipment to ensure that equipment can pass through the necessary areas to reach the location for installation. Include in bid costs for all work required, including any work required to move the equipment through the site to this final location.
14. Provide equipment tags per codes and authorities having jurisdiction.
15. Notify the Owner, Architect, General Contractor and Engineer in writing, within five days of award of contract, of the proposed delivery schedule of any equipment or material that may prevent the installation from being completed by the project completion date.
16. Submit a single guarantee stating that all portions of the work are in accordance with contract requirements. Guarantee all work against faulty and improper material and workmanship for a period of one year from date of final acceptance by Owner. Where guarantees or warranties for longer terms are specified by contract, such longer term shall apply. Provide (5) five-year compressor warranty for all air conditioning equipment.
17. Correct any deficiencies that may occur during the guarantee period, all to the satisfaction of the Owner, at no additional cost to the Owner within a reasonable time period. The Contractor shall be responsible for any damage caused by such deficiencies and repair thereof and reimburse the Owner for all costs incurred.

B. Major Items of Work include:

1. Air conditioning systems: Supply, return and exhaust air distribution systems, including equipment, ductwork, supply air diffusers, return air grilles, exhaust air registers, controls and connections to existing work.
2. Thermal and acoustical insulation.
3. Pipe and piping accessories.
4. Vibration Isolation.
5. Controls.
6. Testing and balancing of all systems.

C. General Items:

1. Access Doors Panels: Provide concealed controls, dampers, valves and equipment requiring access with adequately sized access doors/panels. In removable type ceiling, provide access tile identification only with permanent label identifying piece of equipment.
2. Cutting and patching for mechanical work.
3. Insulation: Furnish insulation for all piping, equipment and ducts that permit heat loss or gain or will form condensation.
4. Coordinate all new work with existing installations.
5. Condensate lines shall have no less than 1% minimum slope.

D. Make-up water for any industrial equipment shall first pass through an approved backflow prevention unit.

1.02 REFERENCES

A. The following published standards, codes, and specifications apply to all work within DIVISION 15.

1. AABC - Associated Air Balance Council.
2. ADC - Air Diffuser Council.
3. AMCA - Air Moving and Conditioning Association.
4. ANSI - American National Standards Institute.
5. ARI - Air-Conditioning and Refrigeration Institute.
6. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers.
7. ASME - American Society of Mechanical Engineers.
8. ASTM - American Society for Testing and Materials.
9. FM - Factory Mutual.
10. NEMA - National Electrical Manufacturer's Association.
11. NFPA - National Fire Protection Association.
12. OSHA - Occupational Safety and Health Act.

13. IBC – International Building Code.
14. UL - Underwriters' Laboratories, Inc.
15. IMC- International Mechanical Code.
16. IPC - International Plumbing Code.
17. National, State and Local Codes of all authorities having jurisdiction.
18. Local Utility Authorities.

1.03 QUALITY ASSURANCE

- A. All equipment and accessories shall be the product of a company regularly engaged in the manufacture of that product for at least five years.
- B. All equipment and accessories shall be new and free from defects.
- C. Supply all equipment and accessories in compliance with the applicable standards listed in article 1.02 of this section and with all applicable national, state and local codes.
- D. All items of a given type shall be the products of the same manufacturer.

1.04 DESCRIPTION OF CONTRACT DOCUMENTS

- A. Specifications:
 1. Specifications, in general, describe quality and character of materials and equipment.
 2. Specifications are of simplified form and include incomplete sentences.
 3. Words or phrases such as "The Contractor shall," "shall be," "furnish," "provide," "a," "an," "the," and "all" etc. may be omitted for brevity.
- B. Drawings:
 1. Drawings in general are diagrammatic and indicate scope, sizes, routing, locations, connections to equipment and methods of installation. The Drawings do not necessarily show all required offsets, obstructions or structural conditions. Locations on drawings may be distorted for purposes of clearness and legibility.
 2. Scaled and figured dimensions are approximate and are for estimating purposes only, but shall be followed with sufficient accuracy to coordinate with other work and structural limitations. **DO NOT SCALE DRAWINGS.**

3. Before proceeding with work, check and verify all dimensions and carefully check space requirements with other Work to ensure that all equipment and materials can be installed in spaces allotted.
 4. The Contractor shall assume all responsibility for fitting of materials and equipment to other parts of equipment and structure.
 5. The Contractor is responsible for installing the work in such a manner that it will conform to the structure and architectural elements, avoid obstructions, maintain headroom, leave adequate clearance for proper maintenance and repairs, and provide clearances and access required by codes.
 6. Make adjustments that may be necessary or requested in order to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.
 7. Above items to be performed at no additional cost to the Owner.
- C. Immediately and formally notify the Architect requesting his interpretation and decision, including during bidding period, if any part of the Contract Documents appears unclear or contradictory. Do not proceed with such work without Architect's decision.
- D. Accessibility:
1. Provide for operation, maintenance and repair.
 2. Minor deviations are permissible.
 3. Changes of magnitude or involving extra cost are not permissible without review.
 4. Group concealed mechanical equipment requiring access with equipment freely accessible through access doors.

1.05 PERMITS AND INSPECTIONS

- A. The contractor shall secure all approvals and pay all fees for all work installed. Certificate shall be delivered to owner before final payment will be made.

1.06 PROJECT CONDITIONS NOT USED.

1.07 QUALITY ASSURANCE

- A. Materials shall be new and free from defects and listed by Underwriters' Laboratories, Inc., (or other approved testing and listing agency) or bearing their

label. Conform to codes, standards and publications listed in paragraph 1.02 References.

1.08 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Ship equipment in original packages, to prevent damaging or entrance of foreign matter.
- B. Handle and ship in accordance with manufacturer's recommendations.
- C. Provide protective coverings during construction.
- D. Replace at no expense to Owner, equipment or material damaged during storage or handling, as directed by Architect.
- E. Tag all items with weatherproof tag, identifying equipment by name and purchase order number.
- F. Include packing and shipping lists.

1.09 SUBMITTALS

Provide one bound pdf copy of submittal material with descriptive data for all products and materials prior to purchase and installation, including but not limited to the following:

- 1. Rooftop Packaged air conditioning units.
- 2. Ductless split systems.
- 3. Exhaust fans.
- 4. Evaporative coolers.
- 5. Valves.
- 6. Ductwork materials and methods of fabrication.
- 7. Ductwork accessories.
- 8. Flexible ducting.
- 9. Dampers.
- 10. Insulations and linings.
- 11. Pipe and piping accessories.
- 12. Diffusers, grilles and registers.
- 13. Air test and balance. (Complete forms proposed for use in compiling and recording test and balance data.)
- 14. Control devices and systems.
- 15. Vibration isolation.

16. Provide manufacturer's written guarantee that no asbestos materials are used in any proposed materials or equipment.

1.10 MAINTENANCE MANUALS AND RECORD DRAWINGS

- A. Provide four (4) copies of operating and maintenance manual for Owner's use for each piece of equipment. Each item shall be cross-referenced and numbered with as-built drawing descriptions.
- B. Deliver to Owner, two sets of redlined drawings in pdf format. Label drawings "RECORD DRAWINGS."

1.11 SEISMIC SUPPORT

- A. Contractor shall support and brace all new HVAC, plumbing and fire protection systems in accordance with seismic code requirements.

1.12 WARRANTY

- A. See General Condition of the Contract for Construction for general warranty provisions. Provide a (5) five year warranty on compressors for air conditioning equipment.

1.13 INDEMNIFICATION

- A. See General Conditions of the Contract for Construction for indemnification provisions.

PART 2 PRODUCTS

2.01 PACKAGED AIR CONDITIONING UNITS

- A. Carrier
- B. Trane
- C. Ruud
- D. Prior approved equivalents

2.02 EXHAUST FANS

- A. Greenheck

- B. Twin City Fan
- C. Cook
- D. Prior approved equivalent

2.03 DUCTLESS SPLIT SYSTEM UNITS

- A. Mitsubishi
- B. LG
- C. Daikin
- D. Prior approved equivalent

2.04 EVAPORATIVE COOLERS

- A. Phoenix Manufacturing
- B. United Metal Products
- C. Prior approved equivalent

2.05 DUCTWORK

- A. All ductwork, dampers, access doors, joints, hangers, stiffeners, fire/smoke dampers and fire retarding materials shall be in accordance with requirements of SMACNA (or UMC latest edition) "HVAC Duct Construction Standards." and all other authorities having jurisdiction. All sheet metal work shall have a pressure classification as follows:
 - 1. Supply duct between main loop and inlet to terminal air unit - 4 inches W.G.
 - 2. Supply ducts downstream of terminal air units, air handling units and fans -2 inches W.G.
 - 3. Return and exhaust air ducts - 2 inches W.G.
- B. Ductwork: Unless otherwise specified.
 - 1. Cold rolled "commercial" quality hot dipped galvanized in accordance with ASTM No. M525-67.
 - 2. Dimensions shown on drawings are clear inside dimensions.

3. Fittings: Same gauge and construction as ducts. Elbows shall have centerline radius not less than 1.5 times width.
4. Ducts with transverse and longitudinal bracings in accordance with SMACNA (or IMC adopted edition).
5. Evaporative cooler ductwork shall be commercial lock forming quality aluminum in accordance with SMACNA standards. Duct shall be prepared to receive paint (coordinate with architect).
6. Type 1 grease duct shall be welded steel minimum 16 gage or welded stainless steel minimum 18 gage tested and approved per the 2018 International Mechanical code. Cover with approved manufactured grease duct wrap, installed per manufacturer's directions with thickness as indicated in the 2018 IMC. Alternate: approved factory fabricated grease duct systems may be used as an alternate upon approval by the owner, architect and engineer.

C. Flexible Ductwork:

1. The flexible duct for connection of ceiling air diffusers to sheet metal duct shall be factory fabricated and assembly consisting of an inner sleeve, insulation and an outer moisture barrier. The inner sleeve shall be an elastomeric compound reinforced with woven fiberglass banded to a vinyl coated spring steel wire supporting helix. A minimum 1 inch thick fiberglass insulating blanket shall encase the inner sleeve and be sheathed with an outer moisture barrier of a reinforced metalized Mylar/neoprene laminate, or equivalent.
2. Acoustical performance of the flexible duct shall be in accordance with Air Diffusion Council Flexible Air Duct Test FD72R1, paragraph 3.2.1, Sound Attenuation.
3. Installation of the flexible duct shall be in accordance with the manufacturer's instructions and recommended procedures.
4. Flexible ductwork to be a maximum of 14 ft. in length. On runs requiring over 14 ft., install balance of duct run in sheet metal with standard sheet metal fittings. Residential unit flexible duct lengths may exceed 14 feet provided final air quantities can be achieved.
5. All connections shall be airtight joints, fastened with clamps and sealed with sealing compound and tape.
6. Flexible duct bends shall be installed with centerline radius not less than 1.5 time diameter and shall not be crushed to fit limited clearance.

D. Access Doors:

1. Furnish access door of sufficient size as required, for access, inspection, maintenance, and replacement to all instruments, controls and equipment.
- E. Dampers:
1. Furnish all dampers necessary for proper control and balancing of air distribution as follows:
 - a. All ducts which split in 2 or more branches to serve supply diffusers.
 - b. At each supply and return branch duct, as far away from each outlet and inlet as possible.
 - c. Where indicated on the Drawings.
 - d. Field fabricated dampers are not acceptable.
- F. Fire/smoke dampers shall be designed and constructed in accordance with NFPA Standard 90A and UL Standard 555 and UL Standard 555S and shall be so labeled with a permanent identification. Fire/smoke dampers shall be out-of-air stream type with a factory supplied sleeve.
- G. Turning vanes shall be galvanized steel, single thickness turning vanes with 2 in. inside radius for all square elbows of main trunks and branches unless noted otherwise. Provide turning vanes at all elbows greater than 8"x8".

2.06 AIR OUTLETS AND INLETS

- A. All diffusers, grilles and registers shall be of type and capacity as indicated on drawings. Diffusers shall have no visible screw heads or connectors.
- B. Balancing dampers shall be provided in the branch duct as far as possible from all supply and return air devices and shall be adjustable and accessible.
- C. Supply air diffuser plenums shall be lined with 1/2" lining unless otherwise noted.

2.07 ROOM THERMOSTATS

- A. Thermostats shall be *programmable, 24/7 electronic with battery backup*.

2.08 ESCUTCHEONS

- A. Provide exposed piping with escutcheons where passing through walls, ceilings or partitions.

B. Provide sleeving for all piping that penetrates floor slabs.

2.09 HVAC WATER AND REFRIGERANT PIPING (Fan coil connections, condensate)

A. Pipe shall be seamless copper tubing, Type L, cold drawn, hard temper, ASTM B88. ACR will be accepted for fan coil connections within the individual living units and all 8th floor and first floor systems. Risers extending more than 20 feet vertically shall be rigid copper tubing.

B. Fittings shall be wrought copper solder sweat type. ANSI B16.22 or brass castings, ANSI B16.18.

C. Joints shall be 95-5 (tin and antimony) solder.

D. Connection between dissimilar metals shall be isolated by means of approved dielectric fittings.

E. Testing:

1. HVAC:

a. Condensate systems.

1) Test hydrostatically to 15 feet.

b. Refrigerant systems Test and Evacuation:

1) Test piping using dry and oil free nitrogen to 300 psi on high side, 150 psi on low side. Maintain pressure for 2 hours with no leakage.

2) Evacuate using high vacuum pump and certified micron gage. Reduce absolute pressure to 300 microns. Charge system with proper refrigerant until pressure of 0 psi is obtained. Repeat procedure two more times. On fan evacuation keep at 300 microns for 2 hours before final charge.

3) Never exceed test pressure ANSI B16.1 basis.

c. Leaks and defects:

1) Repair or replace as directed.

2) Without additional cost.

- d. Notify the Architect in writing one week before test.
- e. Furnish written report and certification that tests have been satisfactorily completed.

2.10 SUPPORTS AND ANCHORS

A. Pipe Hangers, Supports, and Guides:

1. General:

- a. Assure adequate support for pipe and contents.
- b. Prevent vibration or swaying.
- c. Provide for expansion and contraction.
- d. Supports of wire, rope, wood, chain, strap perforated bar or any other makeshift device not permitted.
- e. Comply with applicable requirements at ANSI B31.1.0 and B31.2 for piping.
- f. Support piping so that equipment is not stressed by piping weight **or** expansion.
- g. Hangers and supports shall have minimum safety factor of three (3), based on ultimate tensile or compressive strength, as applicable, of material used.
- h. Prime coat exposed steel hangers and supports:
 - 1) Hangers and supports located in crawl spaces, pipes shafts and suspended ceiling spaces are not considered exposed.

2. Horizontal piping, except as noted:

- a. Adjustable clevis type and rod:
 - 1) All services at or below 250 deg F.
- b. Rollers or slide bases:
 - 1) Pipe stand, bracket, trapeze or other equivalent structural support.
 - 2) Rollers not required where spring hangers are called for.
- c. Trapeze hangers:

1) Guide individual pipes on trapezes with 1/4 inch U-bolt or Superstrut 702 pipe clamp.

a) Install thermal hanger shield at each support point.

d. Threaded steel rods:

1) 2 in vertical adjustment with 2 nuts each end for positioning and locking.

2) Size to 12 in IPS:

Pipe, IPS	Rod
To 2 in.	3/8 in.
2-1/2 in. and 3 in.	1/2 in.
4 in.	5/8 in.

3. Install Pipe isolators between hangers and:

a. Uninsulated copper tubing.

b. Wherever any pipe requires sound and vibration isolation.

4. Steel support components shall be separated from copper piping with plastic tape.

5. Spring Supports for Piping:

a. Minimum static deflection shall be 1 inch unless noted otherwise.

6. Miscellaneous Steel:

a. Provide miscellaneous steel members, beams, brackets, etc., for support of work in this division unless specifically included in other divisions.

B. Pipe Support Spacing:

1. Maximum spacing for horizontal piping:

Type of Pipe	Size	Maximum Spacing

Steel	1-1/2 in. and smaller 2 in. and larger	7 ft 10 ft
Brass or copper	3/4 in. and smaller 1- 1-1/4 in. 1-1/2 to 3 in. 4 in. and larger	5 ft 6 ft 8 ft 10 ft
Bell and Spigot (Notes 1, 2, 3)	All	10 ft
Hubless C.I. (Notes 2, 3, 4)	All	10 ft

Spacing Notes:

- Note 1. Typical of cast iron and duriron.
- Note 2. Two supports per joint.
- Note 3. Support to be within 18 inches of hub or joint.
- Note 4. Support to be placed on or immediately adjacent to coupling.
- Note 5. Additional supports at:
- a. Changes in direction.
 - b. Branch piping and runouts over 5 ft.
 - c. Concentrated loads due to valves, strainers and other similar items.
 - d. At valves 4 in. and larger in horizontal piping.
 - e. Support piping on each side of valve.
2. Brace hubless piping to prevent horizontal and/or vertical movement.
 3. Parallel piping on trapezes:
 - a. Maximum spacing to be that of pipe requiring closest spacing.
 4. Support standpipes and fire sprinkler piping in accordance with NFPA.

C. Attachment to Structure:

1. Steel Beam Anchors:

- a. Approved beam or channel clamps.
- b. Do not cut or weld to structural steel without written approval of Owner and Structural Engineer.
- c. Other methods as detailed on drawings.

2. Steel Deck Anchors: No attachment to metal deck permitted without written approval of Owner's representative.

- a. Concrete filled: as specified above.

3. Side Wall Supports:

- a. Concrete walls: As specified for hangers.
- b. Stud Walls:
 - 1) Toggle bolts.
 - 2) Studs welded to structural studs.
 - 3) Lag screws into wood backing.
 - 4) Other methods.

4. Support Spreaders:

- a. Install spreaders spanning between structural members when hangers fall between them, and hanger load is too great for slab or deck attachment.
- b. Spreaders may be one of methods listed below, or combination of both as required:
 - 1) Fabricated from structural channel:
 - a) End fittings bolted or welded.
 - b) Secure to structural members:
 - (1) As required by construction.
 - (2) As approved by Structural Engineer.
 - 2) Formed channels with fittings, similar to Superstrut:

- a) Submit manufacturer's calculations for installation.

D. Duct Hangers and Supports:

1. General:

- a. Support horizontal ducts with hangers of size and spacing as indicated in pertinent SMACNA Duct Construction Standards.

2. Horizontal Duct Supports:

- a. Install hangers at each change in direction of duct.
- b. Strap hangers:

- 1) Extend strap down both sides of ducts.
- 2) Turn under bottom one inch minimum.
- 3) Metal screw hangers to :

- a) Bottom of duct.
- b) Upper and lower sides of ducts.
- c) Not more than 12 inches on center.

- c. Angle hangers:

- 1) Provide angle hangers formed by extended vertical bracing angles.

2.11 ACCESS DOORS

- A. Provide equipment and concealed valve access, except in removable tile ceilings and approved by local code, with adequate size access doors for inspection and maintenance.

2.12 INSULATION AND LINING

A. Materials:

- 1. Insulation, jackets, facings, adhesives, coatings, and accessories shall have a fire hazard rating by Underwriters Laboratories, Inc. Steiner tunnel test method for fire hazard classification of building materials, standard UL 723, ASTM E-84, NFPA-225.

- a. Flamespread: Maximum 25.
 - b. Fuel contributed and smoke developed: Maximum 50.
 - c. Flameproofing treatments subject to deterioration due to moisture or humidity not acceptable.
 2. Insulation shall be Johns Manville, or equal.
 3. Label as required by code.
- B. All insulation applied according to manufacturer's published recommendations.
- C. Insulate all piping, ductwork and equipment, except as follows:
 1. Vents, overflow, cold water, drain and relief piping except where indicated on the plans. Condensate drains shall be insulated with a minimum of ½" thick insulation from the unit through the first 10 feet of piping.
 2. Return air ducts in conditioned spaces and exhaust air ducts, except where indicated.
- D. Type of Insulation:
 1. Duct insulation: 3/4 lb. density, glass fiber insulation, with aluminum foil facing. Manville R-Series Microlite, except for exposed duct in air conditioned areas. Minimum of R6 for duct within insulated but unconditioned portion of the building, minimum of R8 for ductwork located not within the insulated portion of the building. Ductwork outside shall be additionally covered with a minimum of 28 ga. aluminum jacketing, sloped for drainage and seams sealed water tight.
 2. Duct lining: 1/2-inch thick, 1-1/2 lb. density coated on air side with a fire resistant black neoprene coating for living areas, 1" thick (same material) for common spaces. Manville Linacoustic first 15' of new ductwork, except exposed duct in air conditioned areas. For exposed duct, line first 10 feet with 1" liner and balance of ductwork with 1/2" liner.
 3. Piping:
 - a. Refrigerant piping:
 - 1) ½" Armaflex or equivalent cellular foam insulation with all fittings covered. All taped or hot-glued sections shall be banded with stainless steel bands. Outdoor insulated piping shall have embossed aluminum jacketing.

2.13 IDENTIFICATION

A. An identification label shall be provided for the following types of equipment:

1. Rooftop units.
2. Evaporative coolers.
3. Condensing units.
4. Split ductless units
5. Exhaust fans.
6. Damper Motors.
7. Valves.

B. Identification labels shall be by Seton, or equivalent.

2.14 ASBESTOS

A. Absolutely no asbestos shall be allowed on the project site.

2.15 CURBS

A. All air conditioning equipment curbs shall be provided by unit manufacturer and shall be welded or bolted. Any substitutions shall have written approval from the unit manufacturer and the Owner prior to purchase or installation.

2.16 FILTER ACCESS

A. Filters shall be mounted fully within the unit cabinet and accessible without removal of any screws (cam lock or similar is OK).

PART 3 EXECUTION

3.01 INSTALLATION OF THE WORK

1. It is the responsibility of the Contractor to install the work in such a manner that it will be at the highest elevation possible, conform to the structure, avoid obstructions, maintain headroom, leave adequate clearances for light fixtures, return air pathways, maintenance and repairs, and provide clearance and access as required by codes. Nothing shall be installed below ceiling level without Architect's written consent.
2. Above items to be performed at no additional cost to the Owner.
3. Proceed as rapidly as the building construction will permit.

4. Thoroughly clean items before installation. Cap openings to exclude dirt until final connections have been made.
5. Cut materials accurately, work into place without springing or forcing, properly clear windows, doors and other openings. Excessive cutting or other weakening of the building structure will not be permitted.
6. Manufacturer's drawings and instructions shall be followed in all cases where the makers of devices and equipment furnish directions or details not shown on the drawings or described in the specifications.
7. Drawings are not intended to be scaled, but shall be followed with sufficient accuracy to coordinate with other work and structural limitations.
8. All work shall be properly supported from building structure and/or framing in an approved manner, independent of the ceiling support system. Where overhead construction does not permit direct fastening of supports, furnish additional framing.
9. All equipment shall be securely fastened to building construction with approved supports.
10. Refer to architectural drawings for exact location of diffusers, grilles, registers, and thermostats (if depicted). If thermostats are not depicted specifically on Architect's drawings, obtain Architect's approval for locations prior to installation.
11. Coordinate the work of this section with the work of other sections in ample time for proper installation and connection.
12. Carefully check space requirements, including servicing space requirements, with other sections to ensure that all equipment and materials can be installed in the spaces allotted thereto.
13. Prepare drawings, attend meetings, obtain all approvals required by all authorities having jurisdiction, conduct required tests and obtain required permits.
14. Paint ductwork visible through grilles, registers, diffusers or ceiling flat black.

B. General:

1. Painting:

a. Paint:

- 1) Best grade for its purpose.
- 2) Deliver in original sealed containers.
- 3) Apply in accordance with manufacturer's instructions.
- 4) Colors: As selected by Architect.

- b. Galvanized iron primer.
 - c. Hot dipped galvanized or dipped in zinc chromate.
 - d. Zinc chromate with finish to match surroundings.
2. Cleaning:
- a. Brush and clean work prior to concealing, painting and acceptance.
 - b. Painted exposed work soiled or damaged: Clean and repair to match adjoining work before final acceptance.
 - c. Remove debris from inside and outside of material and equipment.
3. Cutting and Patching: As required for new work.

3.02 CONTROL DEVICES

- A. All control devices not specified to be furnished and installed under the Electrical sections shall be provided under this section.

3.03 TESTING AND BALANCING

A. General:

- 1. Adjustment: Each piece of equipment and all of the systems shall be adjusted to insure proper functioning of all controls, and shall be left in operating condition.
- 2. Preliminary Operation: The Owner reserves the right to operate any systems or equipment prior to final completion and acceptance of the work. Such preliminary operation shall not be construed as an acceptance of any work.

B. Air Distribution Systems:

- 1. Balance and adjust air distribution system to quantities indicated on drawings in accordance with Associated Air Balance Council (AABC) manual, latest edition.
- 2. Balancing and testing shall be performed and supervised by a certified independent firm specializing in testing and balancing. Firm shall be a member of AABC. Test reports shall be submitted in bound folders and on AABC type report forms. All diffusers shall be identified by designations on drawings.

3. Diffuser air delivery shall not be less than nor exceed by more than 5% the air delivery indicated on the plans.
4. Upon completion of the installation, Contractor shall rebalance any air distribution system affected by the renovation, including terminal air units and air outlets.

3.04 PROJECT CLOSE-OUT

- A. After final operation for inspection and acceptance, deliver all copies of operation instructions, maintenance manuals and parts descriptions to the Architect.
- B. All tools supplied with the equipment for maintenance shall be tagged and temporarily secured to the unit or turned over to the Owner.

END OF SECTION

December 14, 2023 – 100% CD

Phoenix Fire Station No. 74

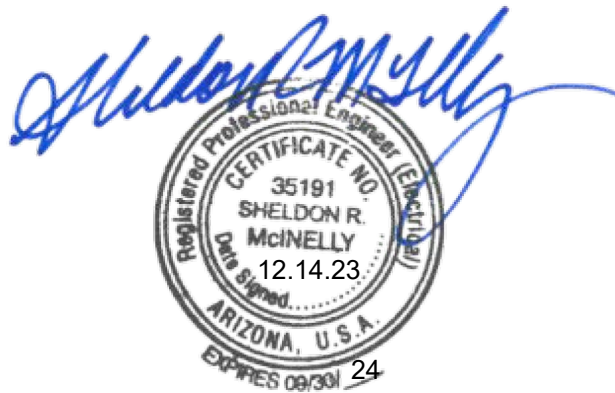
SPECIFICATIONS

DIVISION 26 - ELECTRICAL

- 26 00 01 GENERAL ELECTRICAL REQUIREMENTS
- 26 01 26 ELECTRICAL TESTING
- 26 05 00 BASIC ELECTRICAL MATERIALS AND METHODS
- 26 05 19 CONDUCTORS AND CABLES
- 26 05 26 GROUNDING AND BONDING
- 26 05 33 RACEWAYS AND BOXES
- 26 08 08 COMMISSIONING OF ELECTRICAL SYSTEMS (Provided by Others)
- 26 24 13 SWITCHBOARDS
- 26 24 16 PANELBOARDS
- 26 27 26 WIRING DEVICES
- 26 28 13 FUSES
- 26 32 13 ENGINE GENERATOR SET
- 26 36 00 AUTOMATIC TRANSFER SWITCH
- 26 51 00 INTERIOR LIGHTING
- 26 56 00 EXTERIOR LIGHTING

DIVISION 28 - SPECIAL SYSTEMS

- 28 40 00 FIRE STATION DISPATCH INFRASTRUCTURE (BY OTHERS)



ASECTION 26 00 01

GENERAL ELECTRICAL REQUIREMENTS NEW CONSTRUCTION

PART 1 - GENERAL REQUIREMENTS

- 1.1 Provide all necessary labor, materials, and equipment for completion of all work in this specification and as detailed and required by Drawings.
- 1.2 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - SCOPE

- 2.1 The work under this Section shall include the furnishing and installation of all materials, tools, equipment, labor, etc. which are required for the complete installation of the Electrical work, as indicated on the Drawings and/or the Specifications. Coordination with other trades shall be considered a part of the Electrical herein required.
- 2.2 Work or equipment not indicated or specified which is necessary for the complete and proper operation of the Electrical systems shall be accomplished without additional cost to the Owner.
- 2.3 The Electrical work shall include, but not be limited to, the following units, systems, and components, furnished and installed in a completely workable installation:
 - A. Electrical Service Equipment, including coordination with the local Power Company serving the facility.
 1. Electrical Distribution Equipment.
 2. Grounding System.
 3. Lighting system.
 4. Wiring and connection for all equipment and devices.
 5. Empty Raceway Systems.

PART 3 - MATERIALS

- A. STANDARDS OF MATERIALS. All materials shall be new and shall bear the label of the Underwriter's Laboratories, Inc. All materials shall be factory assembled with U.L. labeling.
- B. All material shall be new and of the best grade and latest pattern of manufacture as specified. All work shall be performed in a neat, workmanlike manner and shall present a neat mechanical appearance when completed.

PART 4 - INSTALLATION

- 4.1 CODES AND PERMITS
 - A. All work shall be executed in accordance with OSHA and the local, state, and national codes, ordinances and regulations governing the particular class or work involved. This Contractor shall be responsible for the final execution of the work under this heading to suit these requirements. Upon completion of the various parts of the work, the installation shall be tested by the constituted authorities and approved, and, in completion of the work, this Contractor shall obtain and deliver to the Owner final certificates of acceptance. This Contractor shall furnish copies of each certificate to the Engineer upon request. The following specifications and standards shall form a part of these specifications:
 1. National Fire Protection Associates Standards
 2. National Electrical Code (Current Edition) NFPA 70
 3. National Electrical Manufacturer's Association (NEMA)

- B. This Contractor shall secure all permits and licenses required for his work and shall pay all fees in connection with such permits and licenses.

4.2 DRAWINGS

- A. Drawings and specifications shall be considered as complimentary, and work or materials called for by one and not mentioned in the other, or vice versa, shall be done and furnished as though treated by both.
- B. In the case of discrepancies in figures, drawings, or specifications, the Engineer shall be notified immediately and his decision shall determine the necessary adjustment. Without such decision, said discrepancies shall not be adjusted by the Contractor save only at his expense; and, in case of any settlement or any complication arising from such adjustment by the Contractor, he shall bear all extra expense involved.
- C. Should it appear that the work intended to be done, or any of the matters relative thereto, are not sufficiently detailed or explained on the drawings or specifications, the Contractor shall apply to the Engineer for such further drawings or explanations as may be necessary, allowing a reasonable time for the Engineer to supply the same and the Contractor shall conform to same as part of the Contract.
- D. Should any doubt or question arise in respect to the true meaning of the drawings or specifications, reference shall be made to the Engineer whose decision shall be final and conclusive. No alleged oral admission, condonation, or inadvertent neglect on the part of the Engineer, Architect or Owner will be accepted as an excuse for inferior work.
- E. In all spaces, such as ceiling spaces and equipment rooms, all conduits shall be run to a continuous grade and square to the building.
- F. This Contractor shall thoroughly acquaint himself with the details of the building plans and construction before submitting his bid as no allowance will be made because of this Contractor's unfamiliarity with these details. He should inspect the existing site conditions carefully before submitting his Bid.
- G. The plans do not give exact details of all elevations of conduits, exact locations, etc. and do not show all offsets, bends, junction boxes, and other installation details. The Contractor shall carefully lay out his work at this site to conform to details of installation supplied by the manufacturers of the equipment to be installed, and thereby to provide an integrated, satisfactorily operating installation.
- H. The equipment is laid out with respect to available space. The Contractor shall be responsible for all equipment clearances and dimensions. If the equipment which any Contractor or utility company proposes to install require other space conditions than those indicated on the drawings, the Contractor shall submit to the Engineer for approval, a drawing showing proposed locations for equipment. Should changes become necessary due to failure of Contractor to provide adequate space, the Contractor shall bear all cost for such changes.
- I. All equipment shall be installed in accordance with the manufacturer's recommendations.
- J. The Electrical Plans are diagrammatic, but shall be followed as closely as actual construction and the work of other trades will allow. Prior to rough in, this Contractor shall verify exact locations with all other trades, all equipment connections, and adjust locations as required. Such minor changes as are necessary to make the electrical work conform to the work of other trades and to the building shall be made without cost to the Owner.
- K. Circuits and feeders shall be as shown and no deviations from the indicated outlet circuit grouping will be permitted, except by permission of the Engineer. Branch circuit numbers are mandatory and shall be changed only on written permission from the Engineer. Any changes in layout or circuit numbering shall be accurately recorded on the "as built" drawings by the Contractor, and reflected in the panel schedules.

4.3 PROTECTION OF MATERIALS AND EQUIPMENT

- A. This Contractor shall be responsible for the protection of all work, materials, and equipment under this section of the work whether incorporated into the building or not.
- B. The Contractor shall provide protection for all work where necessary and will be responsible for all damage done to property during the construction. The above protection shall be maintained while the work is in progress. In no case shall dirt, grit, etc. be ground into the floor finish or coverings.
- C. The Contractor shall provide space for storage of materials and equipment.

4.4 EXCAVATION AND BACKFILLING

- A. This Contractor shall do all necessary excavation and backfill for the installation of the systems as may be required. Curb cuts, asphalt and concrete patching, etc. shall be part of this Contractor's responsibility. Any retrenching will be done by hand and all existing utilities avoided. Damage done to existing utilities will be repaired by this Contractor with no additional payment for the work. In addition to the above, trenches shall be backfilled with dirt, free from debris, rocks, and other foreign matter. Backfill shall be replaced in the trenches in 6 inch layers and each 6 inch layer shall be wetted down and adequately and properly tamped. Remove surplus dirt, debris, pavement, etc. and leave premises clean.

4.5 CUTTING AND REPAIRING. Any cutting and/or repairing shall be the responsibility of the Contractor. Coordinate to prevent unnecessary cutting and repairing. Lay out and locate equipment openings and chases, install sleeves, inserts, and supports. Repairing of surfaces shall be the responsibility of the Contractor, and surfaces, equipment, etc. shall be restored to their original condition.

4.6 CHANGES/SUBSTITUTIONS AND PRIOR APPROVALS

- A. No changes or substitutions shall be made in the electrical equipment, materials or work as shown on the Drawings and herein specified, unless such changes are authorized in writing by the Engineer and/or Architect. All substitutions shall be requested in letters from the Contractor to the Engineer and/or Architect in accordance with the GENERAL CONDITIONS of these Specifications or as noted in this Section. Request for prior approvals shall be in the hands of the Engineer and/or Architect at least 7 calendar days prior to bid opening. Equipment, materials or work shall be considered as authorized for substitution only upon written permission from the Engineer or Architect. Where materials are proposed to be substituted in lieu of the specific items specified, substitutions shall be equal in quality, workmanship, and design. The burden of proof of equality of materials shall be placed upon the Contractor or Supplier. Samples of equipment or materials proposed for substitution shall be submitted to the Engineer for examination at Engineer's request. Substitutions based on catalog data only may not be permitted.
- B. Requests for prior approval shall be in the form of catalog cuts for all proposed materials or equipment to be substituted. The catalog cuts shall contain all pertinent information highlighted on the proposed substitute materials or equipment. The request for prior approval shall have a cover letter stating the name of the project, bid date, etc. and shall have the names and catalog numbers of the equipment specified with their appropriate specification section, and similar information for the proposed substitute. Prior approval may be submitted in either of two formats: hard copy or PDF format, unless PDF format is prohibited by the Architect. Hard copy prior approval requests shall be bound. Loose sheets will not be accepted. All information for comparison of the proposed equipment shall be included in the request for prior approval. Failure to provide all pertinent information before the deadline may result in not receiving approval of equipment. Transmission of prior approval requests via a facsimile machine is not acceptable. Additional requirements for prior approvals may be stated in the section in which the particular equipment or materials are specified. Those requirements shall be as though repeated herein. PDF format requests for prior approval shall contain all information for similar equipment in a single PDF file.
- C. If changes and/or substitutions are made under this Division of the Specification, the Contractor shall assume all responsibility for such changes and/or substitutions. This shall include coordination with all trades associated with the modification, and all costs incurred by all trades involved. All costs associated with substitution and/or change in the electrical work under this Division or any other Division of this Specification, shall be the responsibility of the Contractor.

4.7 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals and shop drawings shall be furnished for equipment and materials to be furnished for the Project. They shall be furnished by the Contractor as required in the General Conditions of the specifications and as specified herein.
- B. Within TWO WEEKS after being awarded the Contract, the Electrical Contractor shall submit complete sets of submittals and shop drawings to the Engineer for review. This review will be for the purpose of checking compliance with contract documents. The review will not include review of dimensions or quantities. Notwithstanding this review, the Contractor shall be responsible for all equipment and materials.
- C. Shop Drawings and Submittals for equipment shall include manufacturer's name, trade name, place of manufacture, catalog data, model number, nameplate data, size, layout dimensions, capacity and other information necessary to establish compliance with contract for each item of equipment. Submittal sheets shall be 8½" by 11". Shop drawings and submittals shall be in the form of catalog cuts for all materials or equipment. The catalog cuts shall contain all pertinent information on the materials or equipment, including optional equipment and accessories included with equipment. All catalog sheets shall be identified in such a manner as to relate to the specific project. Shop drawings and submittals shall have a cover letter stating the name and address of the project, contractor name, address, telephone number, name of contact, etc. and shall have the names and catalog numbers of the equipment specified with their appropriate specification section number. Shop drawings and submittals shall be bound in orderly fashion. Loose sheets will not be acceptable. Shop drawings may be submitted at PDF format. Additional requirements for shop drawings and submittals may be stated in the section in which the particular equipment or materials are specified. Those requirements shall be as though repeated herein.
- D. Shop drawings shall be 8½" by 11" in size, except as specified otherwise. Drawings shall include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories and other items that must be shown to assure a coordinated installation. Larger drawings shall be folded and bound with other information.
- E. Submittals required include, but are not limited to, the following:
1. Electrical Service Entrance Section
 2. Panelboards
 3. Circuit Breakers
 4. Fuses
 5. Devices
 6. Safety Switches
 7. Lighting Fixtures
 8. Fire Alarm System Components
 9. Engine Generators
 10. Transfer Switch
 11. Wire and Cable
 12. Vehicle bay exhaust / make-up air system controls.
- F. Shop drawings required include, but are not limited to, the following:
1. Service Entrance Section
 2. Panelboards
 3. Switchboards
 4. Engine Generator
 5. Fire Alarm System
- G. All descriptive and technical data, submittals and shop drawings shall bear signed certification to the effect that they have been carefully examined by the Contractor, and found to be correct with respect to dimensions, space available, non interference with other trades, and that the equipment complies with all the requirements of these specifications. Failure to provide such certification shall cause for immediate rejection of all shop drawings and submittals. Submittals must be made for all items of material to be furnished by the Contractors. Shop drawings shall be made for all systems furnished by the Contractor. Partial submission of submittals or shop drawings is not acceptable and will be rejected on that basis without review. Submittals and shop drawings shall be bound in complete sets in portfolio binders and shall be dated, shall have the project title, contractor company name, address, telephone number, superintendent and/or contact on the front cover. The total number of shop drawing submittals shall be in

accordance with the GENERAL CONDITIONS, but not less than six complete sets. Lighting fixture, fire alarm, intercom, sound system or other special systems may be bound in separate binders. Shop drawings may be submitted at PDF format. Additional requirements for shop drawings may be stated in the respective specification section. Those requirements shall be as though repeated herein.

- H. Should shop drawings or submittals be required for resubmittal, the entire set shall be resubmitted with the appropriate new sheets inserted in the proper place. The Contractor shall affix his certification to any and all new sheets of the resubmission as required in the previous paragraph.
- I. After review of submittals and shop drawings, the Contractor shall order such materials in sufficient time so that no delay or changes will be caused. This is to facilitate progress on the job. Failure on the part of the Contractor to comply shall render him liable for the expense of any and all delays occasioned by this failure.

4.8 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. It shall be the responsibility of this Contractor to furnish two (2) complete sets, properly bound in a portfolio binder or three ring note book, of operating and maintenance instructions for all Contractor furnished equipment. This Contractor shall instruct the Owner's representative in the operation of all equipment. All pertinent information on the complete operation and maintenance of all equipment shall be furnished in the Operating and Maintenance Manuals. At the option of the Owner, Operating and Maintenance manuals may be submitted in PDF format on a CD.
- B. The first section of the Operating and Maintenance Manual shall be a section which shall contain maintenance schedules for all equipment. Each piece of equipment shall be listed, complete with manufacturer and catalog number or model number. Information shall include frequency of all maintenance items and description of all such maintenance. List the piece of equipment and then all maintenance items under the equipment with the most frequently required maintenance items followed by the less frequently required maintenance items.
- C. The second section of the Operating and Maintenance Manual shall be a section containing all descriptive data on all equipment. Information shall include, but not be limited to the following: complete operating instructions, detailed information on maintenance, warranty information, service instructions, wiring diagrams, and all other information on each piece of equipment. Systems shall be grouped in logical order, and shall have tabbed dividers. For example, service entrance equipment shall be separated from lighting fixtures.
- D. The Operating and Maintenance Manuals shall have an index which shall provide easy referencing for each section. The index tabs shall be for each system. Each section shall be arranged so that the most technical information is toward the back of the section.
- E. Other criteria for the Operating and Maintenance Manuals may be included in subsequent sections of this Electrical Specification, and shall be included, as though printed herein.

4.9 SITE VISIT

- A. The Contractor shall visit the site prior to bidding and satisfy himself as to the conditions under which the systems are to be installed. No subsequent allowance shall be made on his behalf for failure to make such a visit or to determine for himself, all existing conditions.

4.10 FIELD MEASUREMENTS

- A. The Contractor shall verify the dimensions covering the work. No extra compensation shall be claimed or allowed due to difference between actual dimensions and those indicated on the drawings. No waiver of responsibility for defective work shall be claimed or allowed due to failure to report unfavorable work conditions affecting this work.

4.11 CLEANUP

- A. In addition to general cleanup, thoroughly clean all parts of the equipment. Where exposed parts are to be painted, thoroughly clean off any spattered construction materials and remove from all cracks and corners.
- B. During the progress of the work, keep the premises clean and free of debris.

4.12 IDENTIFICATION OF EQUIPMENT

- A. All electrical equipment shall be labeled, with engraved plastic laminated nameplates, as shown on plans or as directed by the Owner.

4.13 RECORD DRAWINGS

- A. Maintain, at the project site, a set of prints on which a daily record of changes and deviations from contract drawings and specifications are recorded. A set of Record drawings shall be done with Red pencil, and shall show all changes as well as all buried or concealed conduit, size 1" and larger, both inside and outside the building. Conduits shall be dimensioned and located with reference to Architectural drawings by dimensions on prints. Include all other pertinent information necessary for future renovation.
- B. Upon completion of the project submit the "red line as built" drawings to the Architect for review.
- C. After review by Architect and/or Engineer the "red line as built" drawings will be returned to the Contractor for production of "as built" reproducible plans. The Contractor shall be responsible for obtaining an erasable mylar set of sepias of the Contract plans. These are printed at no additional cost to the Owner or the Architect/Engineer. The Contractor shall modify the mylar sepias to reflect all the changes to show "as built" conditions. Modifications shall be produced on the sepias in the same quality of workmanship as the original drawings were reproduced.

4.14 PAINTING

- A. Scratched or marred surfaces of electrical equipment shall be painted with factory supplied paint prior to final inspection. Items which are not, or cannot be satisfactorily touch up painted shall be replaced at no additional cost to the Owner.
- B. Items to be painted as shown on the drawings or as specified herein shall be painted in accordance with the Painting section of this Specification when included. All items to be painted shall be first painted with a factory applied prime coating. Coordinate with all other trades to assure that all items to be painted are properly covered. If a Painting section is not included in the specification, the painting shall be the responsibility of this section of the Specification. The paint shall be as specified on the plans, or as recommended by the manufacturer or Architect/Engineer.

4.15 FINAL COMPLETION AND TEST

- A. Independent testing may be required by other sections of this Specification. Provide independent testing as described elsewhere on the Drawings and/of Specifications.
- B. Upon completion of the work, all systems shall be tested for short circuit conditions prior to energizing circuits.
- C. The complete system shall operate satisfactorily in every respect. Make any repairs or adjustments necessary to this end to the satisfaction of the Engineer.
- D. Furnish all instruments and labor for testing.

4.16 GUARANTEE

- A. All equipment and workmanship to be furnished under this Contract shall be guaranteed in writing for a period of one year from the date of final acceptance thereof against defective materials, design, and workmanship. Upon receipt of notice from the Owner of failure of any part of the guaranteed equipment

during the guarantee period, the affected part or parts shall be replaced promptly with new parts by and at the expense of the Contractor. The labor incident to the installation of these replacements shall be furnished by the Contractor.

4.17 MISCELLANEOUS ITEMS

- A. Miscellaneous items not covered in these specifications shall be as indicated on the drawings, installed and connected in the proper manner and as recommended by the manufacturer.

4.18 ENGINEER'S LIABILITY

- A. The Engineer's liability shall be limited to acts caused directly by his negligence. The Engineer shall assume no responsibility for acts of negligence caused by Contractor or others.

END OF SECTION 26 00 01

SECTION 26 01 26
ELECTRICAL TESTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes general requirements for electrical field testing and inspecting. Detailed requirements are specified in each Section containing components that require testing. General requirements include the following:
 - 1. Qualifications of testing agencies and their personnel.
 - 2. Suitability of test equipment.
 - 3. Calibration of test instruments.
 - 4. Coordination requirements for testing and inspecting.
 - 5. Reporting requirements for testing and inspecting.

1.3 QUALITY ASSURANCE Testing Agency Qualifications: As specified in each Section containing electrical testing requirements and in subparagraph and associated subparagraph below.

- 1. Independent Testing Agencies: Independent of manufacturers, suppliers, and installers of components to be tested or inspected.
 - a. Testing Agency's Field Supervisor for Power Component Testing: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Division 26 power component Sections.
- B. Test Equipment Suitability: Comply with NETA ATS, Section 5.2.
- C. Test Equipment Calibration: Comply with NETA ATS, Section 5.3.

PART 2 - NOT USED

PART 3 - EXECUTION

3.1 GENERAL TESTS AND INSPECTIONS

- A. If a group of tests are specified to be performed by an independent testing agency, prepare systems, equipment, and components for tests and inspections, and perform preliminary

tests to ensure that systems, equipment, and components are ready for independent agency testing. Include the following minimum preparations as appropriate:

1. Perform insulation-resistance tests.
2. Perform continuity tests.

B. Test and Inspection Reports: In addition to requirements specified elsewhere, report the following:

1. Manufacturer's written testing and inspecting instructions.
2. Calibration and adjustment settings of adjustable and interchangeable devices involved in tests.
3. Tabulation of expected measurement results made before measurements.
4. Tabulation of "as-found" and "as-left" measurement and observation results.

END OF SECTION 26 01 26

SECTION 26 05 00

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 1. Supporting devices for electrical components.
 2. Electrical identification.
 3. Concrete equipment bases.
 4. Cutting and patching for electrical construction.
 5. Touchup painting.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

1.4 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- C. Coordinate electrical service connections to components furnished by utility companies.
 1. Coordinate installation and connection of exterior underground utilities and services, including provision for electricity-metering components.
 2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

- D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors."
- E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) on center, in webs.
 - 1. Channel Thickness: Selected to suit structural loading.
 - 2. Fittings and Accessories: Products of the same manufacturer as channel supports.
- D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
- E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- F. Expansion Anchors: Carbon-steel wedge or sleeve type.
- G. Toggle Bolts: All-steel springhead type.
- H. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 ELECTRICAL IDENTIFICATION

- A. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.
- B. Raceway and Cable Labels: Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size.
 - 1. Type: Pretensioned, wraparound plastic sleeves. Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the item it identifies.
 - 2. Legend: Indicates voltage.
- C. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
 - 1. Not less than 6 inches wide by 4 mils thick (150 mm wide by 0.102 mm thick).

2. Compounded for permanent direct-burial service.
 3. Embedded continuous metallic strip or core.
 4. Printed legend that indicates type of underground line.
- D. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- E. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- F. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch (1.6-mm) minimum thickness for signs up to 20 sq. in. (129 sq. cm) and 1/8-inch (3.2-mm) minimum thickness for larger sizes. Engraved legend in black letters on white background.
- G. Interior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Preprinted, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.
- H. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers or rivets.
- I. Label ALL switches, receptacles, junction boxes, panelboards and disconnect switches with source and circuit number.
1. Switches and receptacles shall be with label maker on clear label with black lettering.
 2. Visible junction boxes shall be with label maker on clear label with black lettering.
 3. Hidden junction boxes shall be labeled with permanent marker.
 4. Disconnects switches and panelboards shall be labeled with laminated engraved nameplate shall be riveted in place. Identification shall include name of device/panel as well as source and circuit number(s).

2.3 CONCRETE BASES

- A. Concrete: 3000-psi (20.7-MPa), 28-day compressive strength.

2.4 TOUCHUP PAINT

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Steel materials.
- C. Support Clamps for PVC Raceways: Click-type clamp system.
- D. Selection of Supports: Comply with manufacturer's written instructions.
- E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.3 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
- E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- F. Install 1/4-inch- (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.
- G. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- H. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.
- I. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
- J. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

- K. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
1. Wood: Fasten with wood screws or screw-type nails.
 2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
 3. New Concrete: Concrete inserts with machine screws and bolts.
 4. Existing Concrete: Expansion bolts.
 5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
 6. Steel: Welded threaded studs or spring-tension clamps on steel.
 - a. Field Welding: Comply with AWS D1.1.
 7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
 8. Light Steel: Sheet-metal screws.
 9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 IDENTIFICATION MATERIALS AND DEVICES

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Identify raceways and cables with color banding as follows:
1. Bands: Pretensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches (51 mm) wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
 2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (8-m) maximum intervals in congested areas.
 3. Colors: As follows:
 - a. Fire Alarm System: Red.
 - b. Security System: Blue and yellow.
 - c. Telecommunication System: Green and yellow.
- E. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches (150 to 200 mm) below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm), overall, use a single line marker.
- F. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:

1. Phase A: Black.
2. Phase B: Red.
3. Phase C: Blue.

- G. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

3.5 FIRESTOPPING

- A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."

3.6 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.7 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.8 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
1. Raceways.
 2. Building wire and connectors.
 3. Supporting devices for electrical components.
 4. Electrical identification.
 5. Concrete bases.
 6. Electrical demolition.
 7. Cutting and patching for electrical construction.
 8. Touchup painting.

3.9 REFINISHING AND TOUCHUP PAINTING

- A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.10 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 26 05 00

SECTION 26 05 19
CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CONDUCTORS AND CABLES

- A. Manufacturers:
 - 1. Alcan Aluminum Corporation; Alcan Cable Div.
 - 2. American Insulated Wire Corp.; a Leviton Company.
 - 3. General Cable Corporation.
 - 4. Senator Wire & Cable Company.
 - 5. Southwire Company.
- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.
- C. Conductor Material: Copper complying with NEMA WC 5 or 7; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- D. Conductor Insulation Types: Type THHN-THWN or XHHW complying with NEMA WC 5 or 7.
- E. Multiconductor Cable: Metal-clad cable, Type MC with ground wire (for use only as noted in Section 3.1.H).

2.3 CONNECTORS AND SPLICES

- A. Available Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. AMP Incorporated/Tyco International.
 - 3. Hubbell/Anderson.
 - 4. 3M Company; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated. Wire caps shall be twist type only.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

- A. Service Entrance: Type XHHW, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, or XHHW single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- H. 6' Whips (maximum length) to Lighting Fixtures: Metal-clad cable, Type MC.
- I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.
- J. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- K. Class 2 Control Circuits: Power-limited cable, concealed in building finishes.

3.2 INSTALLATION

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

- E. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."
- F. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."
- G. Identify and color-code conductors and cables according to Division 16 Section "Basic Electrical Materials and Methods."

3.3 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 9 inches of slack.

3.4 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.

END OF SECTION 26 05 19

SECTION 26 05 26

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 1. Comply with UL 467.

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."
- B. Material: Copper.
- C. Equipment Grounding Conductors: Insulated with green-colored insulation.
- D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- E. Grounding Electrode Conductors: Stranded cable.

- F. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- G. Bare Copper Conductors: Comply with the following:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Assembly of Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
- H. Copper Bonding Conductors: Refer to plans for sizes.
- I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.2 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel.
- B. Ground Rods: Sectional type; copper-clad steel.
 - 1. Size: 3/4 by 120 inches (19 by 3000 mm) or 5/8 by 96 inches (16 by 2400 mm) in diameter.

PART 3 - EXECUTION

3.1 APPLICATION

- A. In raceways, use insulated equipment grounding conductors.
- B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.
- C. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

3.2 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and circuits.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
- C. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- D. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
 - 1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
 - 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to grounding electrode external to concrete.

3.4 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

- F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
 - 1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
 - a. Equipment Rated 500 kVA and Less: 10 ohms.

3.6 GRADING AND PLANTING

- A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Division 2 Section "Landscaping." Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION 26 05 26

SECTION 26 05 33

RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
 - 1. Division 7 Section "Through-Penetration Firestop Systems" for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
 - 2. Division 26 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.
 - 3. Division 26 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. FMC: Flexible metal conduit.
- D. IMC: Intermediate metal conduit.
- E. LFMC: Liquidtight flexible metal conduit.
- F. LFNC: Liquidtight flexible nonmetallic conduit.
- G. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

- A. Product Data: For floor boxes, hinged-cover enclosures, and cabinets.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Aluminum Rigid Conduit: ANSI C80.5.
- C. IMC: ANSI C80.6.
- D. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.
- E. Plastic-Coated IMC and Fittings: NEMA RN 1.
- F. EMT and Fittings: ANSI C80.3.
 - 1. Fittings: Set-screw or compression type.
- G. FMC: Utility, Electrical or Mechanical (or similar applications) use zinc coated steel, other applications use aluminum.
- H. LFMC: Flexible steel conduit with PVC jacket.
- I. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.2 NONMETALLIC CONDUIT AND TUBING

- A. ENT: NEMA TC 13.
- B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- C. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.
- D. LFNC: UL 1660.

2.3 METAL WIREWAYS

- A. Material and Construction: Sheet metal sized and shaped as indicated on plans.

- B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- D. Wireway Covers: As indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.
- B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1. Minimum size: 4" square, 2.25" deep.
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- C. Floor Boxes:
 - 1. Refer to plans for device type and conduit requirements.
- D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- E. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- F. Hinged-Cover Enclosures: NEMA 250, Type 1 or 3R (per plans), with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- G. Cabinets: NEMA 250, Type 1 or 3R (per plans), galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.6 FACTORY FINISHES

- A. Finish: For raceways, enclosures, and cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R.

B. Indoors:

1. Exposed: RNC to 24 inches (610 mm) above finished floor, EMT otherwise.
2. Concealed: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
4. Damp or Wet Locations: Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel or nonmetallic.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

E. Do not install aluminum conduits embedded in or in contact with concrete.

3.2 INSTALLATION

A. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in Division 26 Section "Basic Electrical Materials and Methods."

D. Install temporary closures to prevent foreign matter from entering raceways.

E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

- H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover.
 - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 - 2. Space raceways laterally to prevent voids in concrete.
 - 3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above the floor.
- I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
 - 1. Run parallel or banked raceways together on common supports.
 - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- J. Join raceways with fittings designed and approved for that purpose and make joints tight.
 - 1. Use insulating bushings to protect conductors.
- K. Tighten set screws of threadless fittings with suitable tools.
- L. Terminations:
 - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 18 inches of slack at each end of pull wire.
- N. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- O. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used

6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

- Q. Flexible Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- R. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- S. Set floor boxes per type and as required by device manufacturer.
- T. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

- A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 26 05 33

SECTION 26 24 13

SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes service and distribution switchboards rated 600 V and less.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. SPDT: Single pole, double throw.
- D. DPST: Double pole, single throw.

1.4 SUBMITTALS

- A. Product Data: For Service Entrance Section and each type of switchboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each switchboard and related equipment.
 - 1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details.
 - b. Bus configuration, current, and voltage ratings.
 - c. Short-circuit current rating of switchboards and overcurrent protective devices.
 - d. Utility company's metering provisions with indication of approval by utility company.
 - e. UL listing for series rating of installed devices.
 - f. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
- C. Maintenance Data: For switchboards and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Contract Closeout," include the following:

1. Routine maintenance requirements for switchboards and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
3. Time-current curves, including selectable ranges for each type of overcurrent protective device.

D. Shop Drawing and Submittal Requirements: Shop drawings and submittals shall be bound in 8½" by 11" notebook form. Sheets larger than notebook size shall be folded into notebook size. Include title sheet with project information, owner information, contractor information and supplier information. Shop drawing and submittal package shall contain complete submittal information. Incomplete submittals shall be cause for rejection. Generate a PDF file of the complete set of shop drawings and submittals and email to the power company.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency that is a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA PB 2.

D. Comply with NFPA 70.

E. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards, including clearances between switchboards, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver in sections of lengths that can be moved past obstructions in delivery path.

B. Store indoors in clean dry space with uniform temperature to prevent condensation. Protect from exposure to dirt, fumes, water, corrosive substances, and physical damage.

C. If stored in areas subjected to weather, cover switchboards to provide protection from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside switchboards.

D. Handle switchboards according to NEMA PB 2.1.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following, unless otherwise indicated:

1. Ambient Temperature: Not exceeding 120 deg F.
2. Altitude: Not exceeding 1100 feet.

B. Service Conditions: NEMA PB2, usual service conditions, as follows:

1. Altitude not exceeding 1100 feet.
2. Ambient temperatures within limits specified.

1.8 COORDINATION

- A. Coordinate layout and installation of switchboards and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.

PART 2 - PRODUCT

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton Corp.; Cutler-Hammer Products.
 2. Siemens.
 3. Square D.

2.2 MANUFACTURED UNITS

- A. Front- and Side-Accessible Switchboard: Fixed, individually mounted main device, group-mounted branches, and sections rear aligned.
 1. Main Devices: Fixed mounted.
 2. Branch Devices: Group mounted. Refer to plans for additional branch device information.
- B. Nominal System Voltage: 208 Y/120 V.
- C. Main-Bus Continuous: Refer to plans for size.

2.3 FABRICATION AND FEATURES

- A. Enclosure: Steel: NEMA 250, Type 3R.
- B. Enclosure Finish for Outdoor Units: Factory-applied finish in manufacturer's standard color, including undersurfaces treated with corrosion-resistant undercoating.
- C. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.

- D. Utility Metering Compartment: Fabricated compartment and section complying with utility company's requirements. If separate vertical section is required for utility metering, match and align with basic switchboard.
- E. Bus Transition and Incoming Pull Sections: Complete switchboard shall be front and rear aligned.
- F. Buses and Connections: Three phase, four wire, unless otherwise indicated. Include the following features:
 - 1. Main Phase Buses, Neutral Buses, and Equipment Ground Buses: Buses shall be current density rated.
 - 2. Main Phase Buses and Vertical Section Buses: Vertical buses shall be equal to main.
 - 3. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity with feeder circuit-breaker line connections.
 - 4. Load Terminals: Insulated, rigidly braced, silver-plated, copper runback bus extensions equipped with pressure connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full ampere rating of circuit-breaker position.
 - 5. Ground Bus: 1/4-by-2-inch (6-by-50-mm) minimum size, drawn-temper copper of 98 percent conductivity, equipped with pressure connectors for feeder and branch-circuit ground conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.
 - 6. Contact Surfaces of Buses: Silver plated.
 - 7. Main Phase Buses, Neutral Buses, and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions at ends.
 - 8. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.
 - 9. Neutral Buses: 100 percent of the ampacity of the phase buses, unless otherwise indicated, equipped with pressure connectors for outgoing circuit neutral cables.
- G. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of compartment.

2.4 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Electronic Trip Unit Circuit Breakers (main SES circuit breaker): RMS sensing; field-replaceable rating plug; with the following field-adjustable settings.
- B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
 - 1. Lugs: Mechanical or Compression style, suitable for number, size, trip ratings, and material of conductors.
- C. Fusible Switches.
 - 1. All switches shall have switch blades which are visible when the switch is OFF and the cover is open.

2. Lugs shall be front removable and UL Listed for 75° C copper conductors.
3. All current carrying parts shall be plated to resist corrosion.
4. Switches shall have removable arc suppressors to facilitate easy access to line side lugs.
5. Switches shall have provisions for a field installable electrical interlock.
6. Switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started.
7. The operating handle shall be an integral part of the box, not the cover.
8. Provisions for padlocking the switch in the OFF position with at least three padlocks shall be provided.
9. The handle position shall travel at least 90° between OFF and ON positions to clearly distinguish and indicate handle position.
10. All switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is ON and prevent turning the switch ON when the cover is open. The cover interlock mechanism shall have an externally operated override but the override shall not permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.
11. Switches shall be horsepower rated for alternating current.
12. The UL Listed short circuit current rating of the switches shall be: 200,000 rms symmetrical amperes when used with or protected by Class R or Class J or Class L fuses.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install switchboards and accessories according to NEMA PB 2.1.
- B. Support switchboards on concrete bases, minimum 4-inch (100-mm) nominal thickness.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."
- B. Switchboard Nameplates: Label each switchboard compartment with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.4 CONNECTIONS

- A. Install equipment grounding connections for switchboards with ground continuity to main electrical ground bus.
- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486.

3.5 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Provide hi-pot testing by independent testing agency for each switchboard bus, component, connecting supply and feeder.
 - 2. Test continuity of each circuit.
- B. Testing Agency: Engage a qualified independent testing agency to perform specified testing.
- C. Testing: After installing switchboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Sections 7.1, 7.5, 7.6, 7.9, 7.10, 7.11, and 7.14 as appropriate. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.6 ADJUSTING

- A. Coordination Study: Manufacturer or Contractor shall provide full coordination study.
- B. Set field-adjustable switches and circuit-breaker trip ranges.

3.7 CLEANING

- A. On completion of installation, inspect interior and exterior of switchboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 26 24 13

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes load centers and panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:
 - 1. Lighting and appliance branch-circuit panelboards.
 - 2. Distribution panelboards.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RMS: Root mean square.
- D. SPDT: Single pole, double throw.

1.4 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details.
 - b. Bus configuration, current, and voltage ratings.
 - c. Short-circuit current rating of panelboards and overcurrent protective devices.
 - d. UL listing for series rating of installed devices.
 - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.7 EXTRA MATERIALS

- A. Keys: Two spares of each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
 - a. Eaton Corp.; Cutler-Hammer Products.
 - b. Siemens Energy and Automation, Inc.
 - c. Square D.

2.2 FABRICATION AND FEATURES

- A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1, to meet environmental conditions at installed location.
 - 1. Outdoor Locations: NEMA 250, Type 3R.
 - 2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
- B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
- C. **HINGED FRONT COVER: ENTIRE FRONT TRIM HINGED TO BOX AND WITH STANDARD DOOR WITHIN PIANO-HINGED TRIM COVER.**
- D. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
- E. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.
- F. Bus: Hard-drawn copper, 98 percent conductivity.

- G. Main and Neutral Lugs: Mechanical type suitable for use with conductor material.
- H. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
- I. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.
- J. Isolated Equipment Ground Bus: Where indicated on drawings. Adequate for branch-circuit equipment ground conductors; insulated from box.
- K. Extra-Capacity Neutral Bus: Where indicated on drawings. Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
- L. Feed-through Lugs: Where indicated on drawings. Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

2.3 PANELBOARD SHORT-CIRCUIT RATING

- A. UL label indicating series-connected rating with integral or remote upstream devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.
- B. Where indicated on drawings. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 LOAD CENTERS

- A. Not Acceptable.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.6 DISTRIBUTION PANELBOARDS

- A. Doors: Front mounted, secured with vault-type latch with tumbler lock; keyed alike.
- B. Main Overcurrent Protective Devices: Circuit breaker.
- C. Branch overcurrent protective devices shall be one of the following:
 1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
 2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers where individual positive-locking device requires mechanical release for removal.

2.7 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.
 - 3. AFCI Circuit Breakers: Provide manufacturer's standard Arc Fault Circuit Interrupter circuit breaker in residential sleeping units.

- B. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.
 - 1. Lugs: Compression style, suitable for number, size, trip ratings, and material of conductors.
 - 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 - 3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - 4. Shunt Trip: 120-V trip coil energized from separate circuit.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Mounting Heights: Top of trim 76 inches (1880 mm) above finished floor, unless otherwise indicated.
- C. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- D. Circuit Directory: Create a directory for each panelboard. Use a computer or typewriter to create directory cards; handwritten directories are not acceptable. Directory card shall include date, panelboard designation, load descriptions and/or room numbers.
- E. Install filler plates in unused spaces.
- F. Provision for Future Circuits at Flush Panelboards: Stub six 3/4-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.
- G. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."
- B. Panelboard Nameplates: Label each panelboard with engraved metal nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

- A. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.
- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486.

3.4 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.5 CLEANING

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 26 24 16

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Single and duplex receptacles, ground-fault circuit interrupters, and isolated-ground receptacles.
 - 2. Single- and double-pole snap switches and dimmer switches.
 - 3. Device wall plates.
 - 4. Floor service outlets, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. PVC: Polyvinyl chloride.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.
- B. Coordinate service pole connection requirements to modular furniture.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Wiring Devices:
 - a. Hubbell
 - b. Eagle
 - c. Leviton Mfg. Company Inc.
 2. Multioutlet Assemblies:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Wiremold Company (The).
 3. Telephone/Power Poles:
 - a. Hubbell
 - b. Thomas & Betts Corporation.
 - c. Wiremold Company (The).

2.2 RECEPTACLES

- A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.
- B. Straight-Blade and Locking Receptacles: Heavy-Duty grade.
- C. GFCI Receptacles: Straight blade, non-feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter.
- D. Isolated-Ground Receptacles: Straight blade, Heavy-Duty grade, duplex receptacle, with equipment grounding contacts connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap.
1. Devices: Listed and labeled as isolated-ground receptacles.
 2. Isolation Method: Integral to receptacle construction and not dependent on removable parts.

2.3 PENDANT RECEPTACLES

- A. Description: Industrial Cord Reel size and type as called out on electrical and/or architectural plans.

2.4 CORD AND PLUG SETS

- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
 - 1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
 - 2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.5 SWITCHES

- A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.
- B. Snap Switches: Heavy-Duty grade, quiet type.
- C. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.
 - 1. Control: Continuously adjustable slider with single-pole or three-way switching to suit connections.
 - 2. LED Lamp Dimmers: Dimmers shall be compatible with LED diver/fixture.

2.6 OCCUPANCY SENSORS

- A. Manufacturer and types as noted on plans.

2.7 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Stainless steel.
 - 3. Material for Unfinished Spaces: Stainless steel or nylon.
 - 4. Material for Wet Locations: Taymac (or equal), recessed weather proof receptacle cover that is weatherproof with plug inserted and compliance to 2002 NEC 406.8 (B) (1).

2.8 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush or flap type (refer to plans), dual-service units suitable for wiring method used. Refer to drawing for final device type model or series number.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Rectangular, solid brass with satin finish (verify with Architect). Refer to drawings for final device type model or series number.
- D. Floor Boxes Ground Floor: Manufacturer and type(s) as noted on plans.

- E. Power Receptacle: NEMA WD 6, Configuration 5-20R, finish per Architect, unless otherwise indicated.
- F. Voice and Data Communication Outlet: bushed cable opening. REFER TO CITY OF GOODYEAR SPECIFICATIONS FOR WIRING AND COVER PLATE.

2.9 MULTIOUTLET ASSEMBLIES

- A. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- B. Raceway Material: Metal, with manufacturer's standard finish.
- C. Wire: Per plans.

2.10 SERVICE POLES

- A. Description: Factory-assembled and -wired units to extend power and voice and data communication from distribution wiring concealed in ceiling to devices or outlets in pole near floor.
 - 1. Poles: Nominal 2.5-inch- (65-mm-) square cross section, with height adequate to extend from floor to at least 6 inches (150 mm) above ceiling, and with separate channels for power wiring and voice and data communication cabling.
 - 2. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports; with pole foot and carpet pad attachment.
 - 3. Finishes: Per architectural specification.
 - 4. Wiring: Sized for minimum of eight No. 10 AWG power and ground conductors; and a minimum of twelve, 4-pair, Category 5e voice and data communication cables.
 - 5. Voice and Data Communication Outlets: Blank insert with bushed cable opening.

2.11 FINISHES

- A. Color:
 - 1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70.
 - 2. Isolated-Ground Receptacles: Orange.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. Install wall dimmers to achieve indicated rating after derating for ganging according to manufacturer's written instructions.
- C. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instructions.

- D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- E. Remove wall plates and protect devices and assemblies during painting.
- F. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

- A. Comply with Division 26 Section "Basic Electrical Materials and Methods."
 - 1. Label all switches, receptacles, junction boxes, panelboards and disconnect switches.

3.3 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding."
- B. Connect wiring according to Division 26 Section "Conductors and Cables."
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections:
 - 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
 - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 26 27 26

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes cartridge fuses, rated 600 V and less, for use in switches, panelboards, switchboards, controllers, and motor-control centers; and spare fuse cabinets.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Provide fuses from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NEMA FU 1.
- D. Comply with NFPA 70.

1.4 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (4.4 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.5 COORDINATION

- A. Coordinate fuse ratings with HVAC and refrigeration equipment nameplate limitations of maximum fuse size.

1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged in original cartons or containers and identified with labels describing contents.
 - 1. Fuses: Quantity equal to 10 percent of each fuse type and size, but not fewer than 3 of each type and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Industries, Inc.; Busmann Div.
 - 2. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

- A. Motor Branch Circuits: Class RK1, time delay.
- B. Other Branch Circuits: Class RK1, time delay.

3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating and fuse part number information are readable without removing fuse.

3.4 IDENTIFICATION

- A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 26 28 13

SECTION 26 32 13

ENGINE/GENERATOR SET

PART 1.0 - GENERAL

1.1. DESCRIPTION:

- A. This section of the specification includes the furnishing, installation, connection and testing of the engine/generator, controller and associated equipment.
- B. The engine/generator shall comply with requirements as stated below.
- C. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein.

1.2. SCOPE:

- A. A new engine/generator with sound-attenuated weatherproof housing, silencer, fuel tank, annunciator, controller, output circuit breaker and associated equipment shall be installed in accordance with the project specifications and drawings.

1.3. SUBMITTALS

A. General:

- 1. PDF copies of all shop drawings and submittals shall be submitted to the Architect/Engineer for review.
- 2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
- 3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Shop Drawings:

- 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
- 2. Include manufacturer's name(s), model numbers, ratings, requirements, equipment layout, device arrangement, wiring diagrams, battery information, charger information, jacket water heater information, annunciator information, conduit layouts and any other pertinent information affecting layout of equipment and installation.
- 3. Show annunciator layout, configurations, and terminations.
- 4. All shop drawings shall be submitted to the City of Phoenix for review and approval. Include all permit costs.

C. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.

1.4. GUARANTY:

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.5. POST CONTRACT MAINTENANCE:

- A. Complete maintenance and repair service for the engine/generator shall be available from a factory trained authorized representative of the manufacturer of the equipment for a period of five (5) years after expiration of the guaranty.
- B. As part of the bid/proposal, include a *quote* for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period.
- C. Maintenance and testing shall be on a semiannual basis or as required by the AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance.

1.6. CODES AND STANDARDS

- A. The generator set shall conform to the requirements of the following codes and standards:
 - i) CSA C22.2, No. 14 – M91 Industrial Control Equipment.
 - ii) EN50082-2, Electromagnetic Compatibility – Generic Immunity Requirements, Part 2: Industrial.
 - iii) EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
 - iv) IEC8528 part 4. Control Systems for Generator Sets
 - v) IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.
 - vi) IEEE446 – Recommended Practice for Emergency Power Systems for Commercial Applications.
 - vii) NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Articles 445, 700, 701, and 702.
 - viii) NFPA110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.
 - ix) UL2200. The generator set shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed

- x) EPA Compliance: Comply with all local applicable emissions control standards
 - (1) The engine shall be EPA Tier 3 certified for 2007

1.7 TESTING

- A. To assure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.
 - i) Design Prototype Tests: Components of the emergency system such as the engine/generator set, transfer switch, and accessories shall not be subjected to prototype tests since the tests are potentially damaging. Rather, similar design prototypes and preproduction models shall be subject to the following tests.
 - (2) Maximum power (kW).
 - (3) Maximum motor starting (kVA) at 35% instantaneous voltage dip.
 - (4) Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-32.40.
 - (5) Governor speed regulation under steady-state and transient conditions.
 - (6) Voltage regulation and generator transient response.
 - (7) Harmonic analysis, voltage waveform deviation, and telephone influence factor.
 - (8) Three-phase short circuit tests.
 - (9) Alternator cooling air flow.
 - (10) Torsional analysis to verify that the generator set is free of harmful torsional stresses.
 - (11) Endurance testing.

B. Production Tests

- xi) Final Production Tests: Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:
- xii) Single-step load pickup.
- xiii) Transient and steady—state governing.
- xiv) Safety shutdown device testing.
- xv) Voltage regulation.
- xvi) Rated Power @ 0.8 PF
- xvii) Maximum Power.
- xviii) Upon request, arrangements to either witness this test will be made, or a certified test record will be sent prior to shipment.

C. Site Tests

- xix) Site Tests: An installation check, start-up, and building load test shall be performed by the manufacturer's local representative. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:
 - (1) Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.
 - (2) Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery charger, alternator strip heaters, remote annunciator, etc.
 - (3) Start-up under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage and frequency, and phase rotation.

- (4) Automatic start-up by means of simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test. An external load bank shall be connected to the system if sufficient building load is unavailable to load the generator set to the nameplate kW rating.
- (5) On-site Testing Requirements
 - (a) The engine-generator shall be run continuously for not less than 4 hours at 100% rated load with a load bank. The following readings shall be performed at 15 minute intervals:
 - (i) Engine oil temperature
 - (ii) Coolant temperature
 - (iii) Outdoor temperature
 - (iv) Generator voltage phase-to-phase and phase-to-neutral
 - (v) Amperage, each phase
 - (vi) Frequency
 - (vii) Automatic transfer and manual retransfer 2 complete operations (minimum)
 - (viii) Remote starting of generator, transfer, and retransfer 2 complete operations (minimum).

2) WARRANTY AND MAINTENANCE

- a) A two year warranty for the generator set shall be included to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from date of start-up. The engine/generator warranty shall complement and supplement the automatic transfer switch warranty to provide owner with comprehensive warranty coverage of the emergency generation system equipment as a whole. Optional warranties shall be available upon request.
- b) The generator set manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall be regularly engaged in a maintenance contract program to perform preventive maintenance and service on equipment similar to that specified. A service agreement shall be available and shall include system operation under simulated operating conditions, adjustment to the generator set, transfer switch, and switchgear controls as required, and certification in the owner's maintenance log of repairs made and proper functioning of all systems.

3) EQUIPMENT

- a) Acceptable Engine/Generator Manufacturers
 - i) Kohler Power Systems, CAT Power Systems, Onan-Cummins.
- b) Basis of design: Kohler model KG200 (natural gas) with a 4UA9 alternator. Generator shall provide 250 kVA and 200 kW when operating at 120/208 volts, 60 Hz, 0.80 power factor. The generator set shall be capable of a 130°C Standby rating while operating in an ambient condition of less than or equal to 122 °F and a maximum elevation of 2000 ft above sea level. The standby rating shall be available for the duration of the outage.
- c) Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

4) ENGINE

- a) The minimum 10.3 liter displacement V-8 engine shall deliver a minimum of 150 minimum BHP at a governed engine speed of 1800 rpm, and shall be equipped with the following:
 - i) Electronic isochronous governor capable of 0.25% steady-state frequency regulation
 - ii) 24-volt positive-engagement solenoid shift-starting motor
 - iii) Automatic battery charging alternator with a solid-state voltage regulation

- iv) Positive displacement, full-pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain
 - v) Dry-type replaceable air cleaner elements for normal applications
 - vi) The engine shall be liquid-cooled
 - vii) The engine shall be EPA certified from the factory
 - viii) The generator must accept rated load in one-step.
- b) EPA Compliance: Comply with all local applicable emissions control standards

5) ALTERNATOR

- a) The alternator shall be a 4 pole revolving field type.
- b) The alternator shall be salient-pole, brushless, 12-lead reconnectable, self-ventilated of drip-proof construction with amortisseur rotor windings and skewed stator for smooth voltage waveform. The insulation shall meet the NEMA standard (MG1-33.40) for Class H and be insulated with epoxy varnish to be fungus resistant per MIL 1-24092. Temperature rise of the rotor and stator shall be limited to 130°C. The excitation system shall be of brushless construction controlled by a solid- state voltage regulator capable of maintaining voltage within +/- 2% at any constant load from 0% to 100% of rating. The regulator must be isolated to prevent tracking when connected to SCR loads, and provide individual adjustments for voltage range, stability and volts-per-hertz operations; and be protected from the environment by conformal coating.
- c) Insulation: Material Class H
- d) Insulation: Temperature Rise 130°C, Standby
- e) Bearing: quantity, type 1, Sealed
- f) Coupling: Flexible Disc
- g) Amortisseur windings: Full
- h) Voltage regulation, no-load to full-load Permanent magnet (PM) alternator: Controller Dependent
- i) One-Step Load Acceptance 100% of rating
- j) Unbalanced load capability 100% of Rated Standby Current
- k) NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- l) Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- m) Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- n) Self-ventilated and dripproof construction.
- o) Superior voltage waveform from two-thirds pitch windings and skewed stator.
- p) Windings are vacuum-impregnated with epoxy varnish for dependability and long life

1) CONTROLLER

- a. Codes and Standards
 - i) The generator set controller shall meet NFPA 110 Level 1 requirements and shall include an integral alarm horn as required by NFPA.
 - ii) The controller shall meet NFPA 99 and NEC requirements.
 - iii) The controller shall be UL 508 listed.
- b. Applicability
 - i) The controller shall support 12-volt and 24-volt starting systems.
 - ii) The controller's environmental specification shall be: =40degrees C to 70 degrees C operating temperature range and 5-95% humidity, non-condensing.
- c. Hardware Requirements
 - i) A run-off/reset-auto three position selector switch and three pushbuttons for OFF, AUTO and RUN.
 - ii) A controller mounted, latch type emergency stop pushbutton

- iii) Indicating lights (LED)
 - iv) Minimum 6" touchscreen.
 - v) A sixteen snap action button, sealed, keypad for menu selection and data entry.
 - vi) For ease of use, and operating guide shall be printed on the controller faceplate.
 - vii) An audible alarm with alarm silence capability.
 - viii) A keyed switch shall be supplied for locking and unlocking of controller function.
 - ix) An integral Emergency stop switch.
- d. Control Function Requirements
- i) Field-programmable time delay for engine start. Adjustment range 0-5 minutes in 1 second increments.
 - ii) Field-programmable time delay engine cool down. Adjustment range 0-10 minutes in 1 second increments, with override option.
 - iii) Capability to start and run at user-adjustable idle speed during warm-up for a selectable time period (0-10 minutes), until engine reaches pre-programmed temperature, or as supported by ECM-equipped engine.
 - iv) The idle function including engine cool down at idle speed.
 - v) Real-time clock and calendar for time stamping of events.
 - vi) Output with adjustable timer for an ether injection starting system. Adjustment range, 0-10 seconds.
 - vii) Programmable cyclic cranking that allows up to six crank cycles and up to 35 seconds of crank time per crank cycle.
 - viii) The capability to reduce controller current battery draw, for applications where no continuous battery charging is available. The controller vacuum fluorescent display should turn off automatically after the controller is inactive for 5 minutes. Display automatically awakes on keypad entry.
 - ix) Control logic with alternator protection for overload and short circuit matched to each individual alternator and duty cycle.
 - x) Control logic with RMS digital voltage regulation. A separate voltage regulator is not acceptable. The digital voltage regular shall be applicable to single-or three-phase systems.
 - xi) The capability to exercise the generator set by programming a running time into the controller. This feature shall also be programmable through the PC software.
 - xii) Control function shall include output voltage adjustment.
 - xiii) Battle switch function selection to override normal fault shutdown, except emergency stop and overspeed shutdown.
 - xiv) The control shall detect the following conditions and display on control panel:
 - (1) Coolant Temperature Signal Loss
 - (2) Customer programmed digital auxiliary input ON (any of the 21 inputs available).
 - (3) Customer programmed digital auxiliary input ON (any of 7 inputs for ECM equipped engines and five inputs for non ECM based engines).
 - (4) Emergency Stop
 - (5) Exceed Alternator Thermal Limit
 - (6) High Battery Voltage
 - (7) High Coolant Temperature
 - (8) High Oil Temperature
 - (9) Controller Internal Fault
 - (10) Locked Rotor – Fail to Rotate
 - (11) Loss of ECM Communications
 - (12) Loss of Speed Sensor Signal
 - (13) Low Battery Voltage
 - (14) Low Coolant Level
 - (15) Low Coolant Temperature
 - (16) Low Fuel Level
 - (17) Low Oil Pressure

- (18) Master Switch Error
- (19) NFPAQ Common Alarm
- (20) Oil Pressure Gauge Signal Loss
- (21) Overcrank
- (22) Overcurrent
- (23) Overspeed – with user adjustable level, range 65-70 Hz on 60 Hz systems and 55-70 Hz on 50 Hz systems.
- (24) Over voltage with user adjustable level, range 105% to 135%
- (25) Overfrequency with user adjustable level, range 102% to 140%
- (26) Underfrequency with user adjustable level, range 80% to 90%
- (27) Undervoltage with user adjustable level, range 70% to 95%

xv) Conditions resulting in generator shutdown:

- (1) Alternator Protection
- (2) Controller Setup Error
- (3) Critical Overvoltage
- (4) Defined Common Fault
- (5) Emergency Stop
- (6) EEPROM Write Failure
- (7) Field Overvoltage
- (8) Frequency Selection Error
- (9) High Coolant Temperature
- (10) High Oil Temperature
- (11) Internal Fault
- (12) kW Selection Error
- (13) Locked Rotor
- (14) Loss of AC Sensing
- (15) Loss of ECM Communication
- (16) Loss of Field
- (17) Low Coolant Level
- (18) Low Coolant Temperature
- (19) Low Oil Pressure
- (20) Master Switch Error
- (21) Master Switch Open
- (22) Master Switch to Off
- (23) NFPA 100 Fault
- (24) No Coolant Temperature Signal
- (25) No Oil Pressure Signal
- (26) Overcrank
- (27) Overspeed
- (28) Overcurrent
- (29) Overcurrent Voltage Regulator
- (30) Overfrequency
- (31) Overpower
- (32) Overvoltage
- (33) Phase Selection Error
- (34) Remote Shutdown
- (35) Reverse Power
- (36) Reverse kVAR
- (37) Underfrequency
- (38) Undervoltage
- (39) Volt Switch Error

xvi) Control Monitoring Requirements

- (1) All output voltages – single phase, three phase, line to line, and line to neural, 0.25% accuracy.

- (2) All single phase and three phase currents, 0.25% accuracy.
- (3) Output frequency, 0.25% accuracy.
- (4) Power factor by phase with leading/lagging indication.
- (5) Total instantaneous kilowatt loading and kilowatts per phase, 0.5% accuracy.
- (6) kVARS total and per phase, 0.5% accuracy
- (7) kVA total and per phase, 0.5% accuracy
- (8) kW hours
- (9) A display of percent generator set duty level (actual kW loading divided by the kW rating).

xvii) Operational records shall be stored in the control beginning at system startup.

- (1) Run time hours
- (2) Run time loaded hours
- (3) Run time unloaded hours
- (4) Number of starts
- (5) Factory test date
- (6) Last run data including date, duration, and whether loaded or unloaded
- (7) Run time kilowatt hours

xviii) The following operational records shall be a resettable for maintenance purposes:

- (1) Run time hours
- (2) Run time loaded hours
- (3) Run time unloaded hours
- (4) Run time kilowatt hours
- (5) Days of operation
- (6) Number of Starts
- (7) Start date after reset

e. Inputs and Outputs

i) Inputs

- (1) There shall be 21 dry contact inputs that can be user configured to shut down the generator set or provide a warning (number of inputs free for user assignment is subject to engine and NFPA requirements)
- (2) There shall be 7 user-programmable analog inputs for ECM-equipped engines (5 for non-ECM engines) for monitoring and control.
- (3) Each analog input can accept 0-5 volt analog signals.
- (4) Resolution shall be 1:10,000 for analog input measurement
- (5) Each input shall include range settings for 2 warnings (high and low) and 2 shutdowns (high and low)
- (6) All warning and shutdown values shall be accessible and adjustable on the control panel display.
- (7) All free input assignments (digital and analog) shall be user selectable.
- (8) Additional standard inputs required: Digital Input (1 of 21) for an external ground fault detector. Digital display shall show "ground fault" upon detection of a ground fault.
- (9) Digital input for reset of system faults
- (10) Separate, dedicated input for remote two-wire start.
- (11) Separate, dedicated input for Remote emergency stop
- (12) Digital input (1 of 21) Utility Circuit Breaker, auxiliary closed position contacts.

ii) Outputs

- (1) All NFPA 110 Level 1 outputs shall be available.

f. Communications

- i) If the generator set engine is equipped with an ECM (engine control module), the controller shall communicate with the ECM for control, monitoring, diagnosis, and meet SAE J1999 standards utilizing CAN based hardware.
 - ii) Industry standard Modbus communication shall be supported.
 - iii) A Modbus master shall be able to monitor and alter parameters, and/or remotely start or stop a generator.
 - iv) Generator and transfer switch controls shall be equipped with communication modules capable of connecting to the same communication network.
 - v) The capability to monitor up to 128 controllers (any combination of generator sets and transfer switches) on a single network shall be supported.
 - vi) Cabling shall not be limited to the controller location.
 - vii) The communications network shall be self-powered.
 - viii) The controller shall be capable of communicating with a master control panel that provides generator and load management capability.
 - ix) The controller shall have been factory prototype tested as part of the complete paralleling system.
- g. Synchronization
- i) The controller shall monitor the voltage on two phases at the output side of the generator circuit breaker.
 - ii) The controller shall recognize a dead bus.
 - iii) The controller shall communicate with all other controllers and use first-on logic to determine which generator will close to the dead bus first.
 - iv) The controller shall recognize a live bus.
 - v) The controller shall be configurable for automatic synchronization to a live bus.
 - vi) The controller shall support 3 common forms of synchronizing, automatic (synch and close breaker), Test-Check (synch – no closure), and Permissive (no active synch, allow manual closure if in synch).
 - vii) The controller shall have adjustable parameters for acceptable synchronization.
 - viii) The controller shall have adjustable control parameters for achieving synchronization; voltage match gain, frequency match gain, phase match gain.
 - ix) The controller shall have integral speed and voltage, raise/lower control for manual synchronizing.
 - x) The controller shall be capable of accepting digital inputs (contact closure) for speed and voltage raise/lower.
 - xi) The controller shall have front panel input capability for speed and voltage, raiser and lower.
 - xii) The controller shall have a programmable synchronizing time delay, 10 to 600 seconds.
 - xiii) The controller shall announce a fail to synch fault when synchronization is not achieved within the programmed time delay.
 - xiv) The controller shall actively maintain synchronizing efforts to achieve synchronization even after the time delay has expired.
 - xv) The controller shall have a control means to disable a generator from closing to a dead bus (first on enable) when such operation is desired (i.e., an similar emergency generator).
 - xvi) The controller shall be capable of actively displaying the synchronizing parameter values for both the generator and the bus when synchronizing; voltage, frequency and phase.
 - xvii) The controller shall be capable of displaying the phase rotation (ABC or CBA) for both the generator and the bus.
 - xviii) The controller shall be capable of paralleling generators that are of different kW rating, fuel type and/or alternator.
 - xix) The controller shall prevent closure to the bus when phase rotation does not match the generator.

- xx) The controller shall communicate to all other controllers the status of its generator breaker (closed or open) to prevent closure to a dead bus when a breaker is closed.
 - xxi) The controller shall communicate to all other controllers the status of the utility breaker (closed or open) to prevent closure to a dead bus when the utility breaker is closed.
- h. Load Sharing
- i) The controller shall actively share real power amongst all generators on the common bus, on a per-unit or percentage basis.
 - ii) The controller shall actively share reactive power amongst all generators on the common bus, on a per-unit or percentage basis.
 - iii) The controller shall have adjustable control parameters to maintain sharing amongst all generators on the bus, kW sharing plan kVAR sharing gain.
 - iv) The controller shall support utility paralleling applications using fixed kW, kVAR or PF control, on demand by use of a digital input (hardware) and/or software communication.
 - v) The controller shall support soft load and unload the generator on demand, by use of a load enable input (hardware digital input and/or software communication input).
 - vi) The load/unload ramp rate shall be adjustable between 0 and 25% per sec.
 - vii) The controller shall have a programmable disconnect point (kW) below which point the controller shall automatically trip the generator circuit breaker.
 - viii) The disconnect level shall be adjustable between 0 and 25% of rated kW.
 - ix) The controller shall support digital input to raise or lower kW, kVAR and/or PF set point in fixed point control applications (i.e. utility parallel).
 - x) The controller shall have voltage and frequency trim functions to maintain overall voltage and frequency within range of nominal rated values.
 - xi) The controller shall be capable to fixed VAR control or PF control.
 - xii) The controller shall have a programmable dead band for kW and kVAR sharing.
 - xiii) The controller shall have a programmable dead band from voltage and frequency trim.
 - xiv) The controller shall have programmable dead band for fixed kW, kVAR and/or PF control.
 - xv) The controller shall be capable of operating with programmable kW droop control.
 - xvi) The controller shall be capable of operating with programmable kVAR droop control.
 - xvii) The controller shall have programmable raise/lower rates for kW, kVAR and/or PF.
- i. Circuit Breaker Control
- i) The controller shall be capable of operating the circuit breaker to apply electricity to the parallel electrical bus.
 - ii) The controller system shall have a normally closed contact (fail safe) that will keep the generator breaker tripped until such conditions are met to allow closure.
 - iii) The controller system shall have a normally open contact to provide an energizing signal to close the generator circuit breaker.
 - iv) The controller system shall have normally open contact for control of a contactor.
 - v) The energizing time, for breaker closure, shall be user programmable between 0.1 and 10 seconds.
 - vi) There shall be a programmable re-close time delay, 0.5 to 10 seconds.
 - vii) The controller shall allow a programmable, 1-100, number of closure attempts.
 - viii) The controller will announce a Fail to Close warning when closure is not detected after 1 closure attempt.
 - ix) The controller will announce a Fail to Close warning when closure is not detected after 1 closure attempt when closing to a dead bus.
 - x) The controller will announce a Close Attempts Fault when the number of attempts exceeds the setting (max attempts).
 - xi) The controller will monitor current to detect a failure to open the generator circuit breaker.

- xii) The controller will keep the generator running until the generator circuit breaker is seen open in order to keep the bus live to prevent other devices from closing to this bus without synchronizing.
 - xiii) The controller shall accept open commands (digital input or front panel button) to trip the generator breaker on demand.
 - xiv) The controller shall accept close commands (digital input or front panel button) to close the generator breaker on demand, when synchronized and/or a dead bus is detected.
- j. Protective Relays
- i) The Controller shall provide a standard set of protective relay functions with programmable limits and time delays.
 - (1) Over Voltage (59)
 - User Adjustable Range, 100% to 130%
 - User Adjustable Range Time Delay, 0-120 seconds
 - (2) Under Voltage (27)
 - User Adjustable Range, 70% to 100%
 - User Adjustable Time Delay, 0-120 seconds
 - (3) Over Frequency (81O)
 - User Adjustable Range, 100% to 140%
 - User Adjustable Time Delay, 0-120 seconds
 - (4) Under Frequency (81U)
 - User Adjustable Range, 80% to 100%
 - User Adjustable Time Delay, 0-120 seconds
 - (5) Reverse Power (32R)
 - User Adjustable Range, 0% to 50%
 - User Adjustable Time Delay, 0-120 seconds
 - (6) Over Power (32O)
 - User Adjustable Range, 90% to 150%
 - User Adjustable Time Delay, 0-120 seconds
 - (7) Loss of Field (40 reverse VARS)
 - User Adjustable Range, 10% to 100%
 - User Adjustable Time Delays, 0-120 seconds
 - (8) Over Current with Voltage Range
 - User Adjustable Range, 100% to 200%
 - User Adjustable Time Delay, 0-120 seconds

6) ACCESSORIES

- a) Main Line Circuit Breaker
 - i) Engine generator shall be equipped with the following a circuit breakers as shown on the electrical single line drawing installed in a Nema 1 enclosure. It shall operate both manually for normal switching function or automatically during overload or short circuit.
 - ii) A 100% rated line circuit breaker of 800 amperes LSI (800ampere frame) 250 volt rated, molded case type, generator mounted.
- b) Engine block heater.
 - i) Thermostatically controlled and sized to maintain manufacturers recommended engine coolant temperature to meet the start-up requirements of NFPA-99 and NFPA-110, Level 1.
- c) Generator Mounted Breaker
 - i) A resettable line current sensing circuit breaker with inverse time versus current response shall be furnished which protects the generator from damage due to its own high current capability. This breaker shall not trip within the 10 seconds specified above to allow selective tripping of down-stream fuses or circuit breakers under a fault condition. This breaker shall not automatically reset, preventing restoration of

voltage if maintenance is being performed. a field current-sensing breaker will not be acceptable.

- d) Sound Attenuated Weatherproof Enclosure
 - i) The engine generating set shall be factory installed in a sound attenuated weatherproof outdoor enclosure. The enclosure shall provide year round generating set protection against adverse weather and environmental conditions.
 - ii) The sound attenuated weatherproof enclosure shall be rated at 75DBA @ 23 feet (7 meters) with 1" insulation through with a perforated liner.
 - iii) The sound attenuated weatherproof enclosure shall be constructed or welded and bolted reinforced sheet steel, 14 gauge and 14 gauge floor plate. All metal parts shall be prime coated and finish painted.
 - iv) The enclosure assembly shall have fixed air intake louver with interior sound baffles.
 - v) The enclosure shall enclosure an interior mounted critical silencer with exhaust blankets.
 - vi) The enclosure assembly shall have a vertical discharge plenum.
 - vii) The Enclosure shall have) hinged doors on each side, located on the side of enclosure to allow for access to main line circuit breaker, and the rear of the enclosure shall allow easy access to engine generator and controls. All door handles shall be key lock design.
 - viii) Electrical Package: One (1) single phase, 120/208 volt branch circuit panel with main circuit breaker and with individual load breakers wired to engine block heater, battery charger and electrical receptacles package (2 electrical receptacle).
- e) Battery System
 - i) Each genset requires a BCI group 31 batteries which must meet the engine manufactures' specifications for the ambient conditions specified in Part 1 Project Conditions and shall comply with the NFPA requirements for engine cranking cycles. Each battery shall be rated according to SAE Standards J-537 with a minimum cold cranking amp of 950 amps and a minimum reserve capacity of 185 Minutes at 80F. The battery plates shall be constructed of a Calcium-Lead alloy to provide long waterless operation and extended battery life. The battery elements must be anchor-locked with full-frame grids and tight-packed commercial plates to resist the effects of vibration. The battery must contain a handle to aid in lifting and the case must be constructed of polypropylene to resist breakage and extend service life. Removable cell covers shall be provided to allow for checking of electrolyte specific gravity.
 - ii) Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.
- f) Exhaust Systems
 - i) The engine exhaust silencer shall be coated to be temperature and rust resistance, rated for critical application. The silencer will reduce total engine exhaust noise by 25-35 dB(A).
 - (1) Silencer shall be mounted within the generator set enclosure
 - ii) Gas-proof, seamless, stainless steel, flexible exhaust bellows with threaded NPT connection.
- g) Two flexible fuel lines rated at a minimum of 257°F and 100 psi ending in pipe thread.

7) REMOTE SERIAL ANNUNCIATOR

- a) Annunciator must meet the following specifications:
 - i) Operating temperature range: -20° to 70°C (-4° to 158°F)
 - ii) Storage temperature range: -40° to 85°C (-40° to 185°F)
 - iii) Humidity range: 5-95% noncondensing
 - iv) Enclosure: NEMA 2
 - v) Power supply: 12- or 24-VDC
 - vi) Power draw: 200 mA
- b) Standards:

- i) NFPA 110, Level 1
- ii) NFPA 99
- iii) UL 508 Recognized
- iv) CE Directive (Voltage and EMC)
- v) EN61000-4-4 Fast Transient Immunity
- c) Hardware Requirements
 - i) Front panel--
 - ii) Up to (24) Light-emitting diode (LED) indicators for shutdowns, warnings (pre-alarms), and status
 - iii) Up to (19) Light-emitting diode (LED) indicators, an audible horn, an alarm silence button, and a lamp test button required by NFPA 110, Level 1.
 - iv) LEDs must be activated to indicate: shutdowns, warnings (pre-alarms), or status
 - v) Must have a minimum of (3) LED colors to define function
 - vi) Must have LEDs with blinking functions to indicate status
 - vii) LEDs required to activate for the following shutdown and/or warning conditions:
 - (1) Overcrank
 - (2) Low Coolant Temperature
 - (3) High Engine Temperature
 - (4) Low Oil Pressure
 - (5) Overspeed
 - (6) Emergency Stop
 - (7) Low Fuel
 - (8) Low Coolant Level
 - (9) Not-In-Auto
 - (10) High Battery Voltage
 - (11) Low Battery Voltage
 - (12) Battery Charger Failure
 - (13) Common Fault
 - viii) LEDs required to activate upon the following status conditions:
 - (1) Lamp test
 - (2) Alarm silence
 - (3) System ready
 - (4) Generator running
 - (5) Communications
 - (6) EPS Supplying Load
- d) Up to (3) user-defined inputs shall each activate an LED and an audible horn for shutdowns, warnings, or status conditions.
- e) Annunciator shall have removable text inserts for assigning user-defined inputs, assigning generator identification, and replacement.
- f) Front panel of annunciator shall be a sealed membrane and shall be capable of both surface-mounting and flush-mounting.
- g) Network Communication
 - i) Provide an RS-485 connection at the annunciator from the generator controller. Maximum distance shall be 1220 m (4000 ft.) from the generator controller to the furthest annunciator.
 - ii) No other external wiring required, except power, to activate the LEDs and horn.
 - iii) Provide up to (4) annunciators per generator. Multiple annunciators shall communicate via RS-485 serial bus.

- h) Generator pre-alarm senders to provide signals for local and/or remote annunciation for engine conditions approaching critical/shutdown parameters.

END OF SECTION

SECTION 26 36 00

AUTOMATIC TRANSFER SWITCH

PART 1 – GENERAL REQUIREMENTS

- 1) Furnish and install a generator automatic transfer switch and docking station system (referred to as the 'automatic transfer switch' within the following document. The automatic transfer switch shall be a 4-Pole/4-Wire - switched neutral, 800 Amps, 208 Volt-60Hz. Automatic transfer shall consist of an inherently double throw power transfer switch mechanism and a microprocessor controller to provide automatic operation.
- 2) SUBMITTAL
 - a) The submittal shall include prototype test certification and specification sheets showing all standard and optional accessories to be supplied, schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number, each required interconnection between the generator set and the transfer switch if it is included elsewhere in these specifications.
- 3) CODES AND STANDARDS
 - a) UL 1008 - Standard for Transfer Switch Equipment
 - b) IEC 947-6-1 Low-voltage Switchgear and Control gear; Multifunction equipment; Automatic Transfer Switching Equipment
 - c) NFPA 70 - National Electrical Code
 - d) NFPA 110 - Emergency and Standby Power Systems
 - e) ETL/UL Listed
 - f) UL 50 Listed enclosure

PART 2 – PRODUCT

- 4) TESTING
 - a) To assure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.
 - i) Design Prototype Tests: Components of the emergency system such as the engine/generator set, transfer switch, and accessories shall not be subjected to prototype tests since the tests are potentially damaging. Rather, similar design prototypes and preproduction models, which will not be sold, shall have been used for the following tests.
 - b) Production Tests
 - i) Final Production Tests: Each transfer switch shall be tested under load with all guards in place. Tests shall include:
 - (1) The complete automatic transfer switch shall be tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency, and time delay settings are in compliance with the specification requirements.
 - (2) The complete automatic transfer switch shall be subjected to a dielectric strength test per NEMA Standard ICS 1-109.05.
 - (3) The control panel shall meet or exceed the voltage surge withstand capability in accordance with ANSI C37.90a-2978 and the impulse withstand voltage test in accordance with NEMA Standard ICS 1-109.
 - ii) Upon request, arrangements to either witness this test will be made, or a certified test record will be sent prior to shipment.
 - c) Site Tests

- i) Site Tests: **Include commissioning** by the manufacturer's factory authorized local representative, which shall include:
 - (1) Review and verify the installation of all Trystar components and verify the correct electrical flow as depicted on the one-line drawings.
 - (2) (If Applicable) The Manufacturer's authorized technician will set the long time, short time, instantaneous and ground fault protection settings on the Generator Docking Station circuit breaker(s) in accordance with the engineers specifications or as provided as part of the coordination study.
 - (3) Factory training for on-site personnel to educate them on how to connect the GDS to a portable generator
 - (4) The Manufacturer's factory authorized technician shall, upon completion of the commissioning provide a written report to the electrical contractor and electrical engineer indicating the completion of the work.
 - (5) Any issue that is found during the start-up that is determined at that time to be a warranty issue will be covered by Manufacturer. Any issues that are specific to the scope for the electrical installing contractor are the sole responsibility of the installing contractor.
 - (6) Upon successful completion of the commissioning, Trystar will provide a complimentary 12-month warranty extension, above and beyond the 12-month manufacturer warranty
- ii) The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test.

5) WARRANTY AND MAINTENANCE

- a) A two year warranty for the automatic transfer switch shall be included to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from date of start-up.
- b) The automatic transfer switch manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall be regularly engaged in a maintenance contract program to perform preventive maintenance and service on equipment similar to that specified. A service agreement shall be available and shall include system operation under simulated operating conditions, adjustment to the generator, transfer switch, and switchgear controls as required, and certification in the owner's maintenance log of repairs made and proper functioning of all systems.

6) ELECTRICAL REQUIREMENTS

- a) The automatic transfer switch shall be rated in amperes for total system transfer including control of motors, electric-discharge lamps, electric heating, and tungsten-filament lamp load.
- b) The automatic transfer switch shall be rated to withstand the rms symmetrical short circuit current available at the automatic transfer switch terminals, with the type of overcurrent protection shown on the plans.
- c) The transfer switch shall be electrically operated and mechanically held with double throw construction, and operated by a momentarily energized solenoid-driven mechanism. Main operators shall include overcurrent disconnect devices; linear motors or gears shall not be acceptable.
- d) The switch shall be positively locked and unaffected by momentarily outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.
- e) All main contacts shall be silver composition. Switches shall have segmented, blow-on construction for high withstand and close-on capability and be protected by separate arcing contacts.
- f) Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. Switches shall have front removable and replaceable contacts. All stationary and

- moveable contacts shall be replaceable without removing power conductors and/or bus bars.
- g) Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources, are not acceptable.
- h) For four pole switches with a switching neutral, where neutral conductors must be switched as shown on the plans, the contractor shall be provided with fully rated switched neutral transfer contacts. Overlapping neutral contacts may be used as an alternative.

7) EQUIPMENT

- a) Basis of design: Trystar TATS-08-3-P(PAD)-LL-LF-H-S (SPECIAL=MAIN BREAKER)-W with ABB ATS TruOne Automatic Transfer Switch and Level 3 controller.
 - i) TATS shall have two source positions – Normal and Emergency Line
 - ii) TATS shall be located behind pad lockable door to prevent any tampering by unauthorized personnel
- b) The transfer switch shall have the following characteristics:
 - i) 800 amp current rating with 100% 800amp main breaker
 - (1) Must be UL 489 Listed Breaker
 - (2) Breakers shall be removable for service and maintenance
 - ii) 4 Poles, switch neutral
 - iii) 4 wire, 3 phase
 - iv) 208 Volt-60Hz
 - v) Switched Neutral
 - vi) Short Circuit & Withstand Rating shall be 65,000 Amps
 - vii) Phase, Neutral, and Ground Busbar
 - (1) Material: Silver-plated Copper
 - (2) Equipment Ground Bus: bonded to box.
 - (3) Ground Bus: 100% of phase size.
 - (4) Neutral Bus: Neutral bus rated 100 percent of phase bus.
 - viii) J. Additional accessories shall be included in submittal drawing as follows:
 - (1) SCADA Terminal Port
 - (2) Service Entrance Rated
- c) Load Bank connection
 - i) Load Bank connectors shall be Camlok style mounted on gland plate.
 - ii) Camlok shall be 16 Series model and color coded according to system voltage requirements.
 - iii) Camlok connections shall be Bus Bar Style, Cabling or Double Set Screw is not acceptable
 - iv) Camlok connection shall be protected against accidental contact while not in use
- d) Factory Installed Phase Rotation Monitor Device:
 - i) Phase monitoring relay to be Siemens 3U4512-1AR20 or equal and factory installed
- e) Enclosure
 - i) NEMA 3R Rain-Tight Aluminum Enclosure
 - ii) Pad-lockable front door shall include a hinged access plate at the bottom for entry of temporary cabling that prevents unauthorized tampering while in use.
 - iii) NEMA 3R Integrity shall be maintained while temporary cabling is connected during use
 - iv) Front and Side shall be accessible for maintenance
 - v) Top, Side, and Bottom shall be accessible for permanent cabling
 - vi) Powder coat
 - (1) Paint after fabrication shall be Hammer tone Gray
- f) Provide quantity and size of lugs as required for normal power and generator feeders shown on plans.

8) MECHANICAL REQUIREMENTS

- a) All main contacts shall be of silver alloy composition. All contacts, coils, springs, and control elements shall be conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors.
- b) The contact transfer time shall not exceed one-sixth of a second.
- c) All moveable parts of the operating mechanism shall remain in positive mechanical contact with the main contacts during the transfer operation without the use of separate mechanical interlocks.
- d) All contacts, coils, springs, and control elements shall be conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors.

9) TRANSFER SWITCH CONTROL SYSTEMS

- a) The control module shall direct the operation of the transfer switch. The module's sensing and logic shall be a built-in microprocessor-based system for maximum reliability, minimum maintenance, and inherent digital communications capability.
- b) The control module shall be mounted separately from the transfer mechanism unit for safety and ease of maintenance. Interfacing relays shall be industrial control grade plug-in type with dust cover.
- c) The control module shall include a user interface keypad with tactile feedback pushbuttons and light-emitting diode status indication. These features shall be user accessible when the enclosure door is closed:
 - i) Keypad pushbuttons:
 - (1) Start/end system test
 - (2) Set/end exercise
 - (3) End time delay
 - (4) Lamp test/service reset
 - ii) Light-emitting diode status indicators:
 - (1) Contactor Position: Normal, Off, Emergency
 - (2) Source Available: Normal, Emergency
 - (3) Service required: immediate, maintenance
 - (4) Not in automatic mode
 - (5) Four stage time delay remaining
 - (6) Exercise: load, no load, set/disabled
 - (7) Test: load, no load
 - (8) Load control active: peak shave, load shed, pre/post-transfer signal
 - (9) In-phase monitor/Off delay active
- d) Outputs:
 - i) Generator engine start gold flashed contact rated 2 amps @ 30 VDC/250VAC.
 - ii) Pre-transfer load control, one normally open contact rated 10 amps @ 30 VDC/250 VAC
 - iii) One Programmable output, factory-set to load bank control rated 2 amps @ 30 VDC/250 VAC.

10) OPERATION

- a) Voltage (all phases) and frequency on both the normal and emergency sources shall be continuously monitored. Voltage on both normal and emergency sources and frequency on the emergency sources shall be adjustable with the following pickup, dropout, and trip setting capabilities (values shown as % of nominal unless otherwise specified):

b) Parameter	c) Dropout/Trip	d) Pickup/Reset

e) Under voltage	f) 75 to 98%	g) 85 to 100%
h) Over voltage	i) 106 to 135%	j) 95 to 100% of trip
k) Under frequency	l) 95 to 99%	m) 80 to 95%
n) Over frequency	o) 101 to 115%	p) 105 to 120%
q) Voltage unbalance	r) 5 to 20%	s) 3 to 18%

- b) Repetitive accuracy of all settings shall be within $\pm 0.5\%$ over an operating temperature range of -20°C to 70°C .
- c) An adjustable dropout time for transient voltage and frequency excursions shall be provided. The time delays shall be 0.1 to 9.9 seconds for voltage and .1 to 15 seconds for frequency.
- d) Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad, remotely via the communications interface port or USB.
- e) The controller shall be capable of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or BAC). Unacceptable phase rotation shall be indicated on the LCD; the service required LED and the annunciation through the communication protocol and dry contacts. In addition, the phase rotation sensing shall be capable of being disabled, if required.
- f) The controller shall be capable of detecting a single phasing condition of a source, even though a voltage may be regenerated by the load. This condition is a loss of phase and shall be considered a failed source.
- g) Source status screens shall be provided for both normal & emergency to provide digital readout of voltage on all 3 phases (phase to phase and phase to neutral), frequency, and phase rotation.

11) TIME DELAYS

- a) An adjustable time delay of 0 to 6 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals. Capability shall be provided to extend this time delay to 60 minutes by providing an external 12 or 24 VDC power supply.
- b) A time delay shall be provided on transfer to the emergency source, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.
- c) A time delay shall be provided on re-transfer to normal. The time delays shall be

adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.

- d) A time delay activated output signal shall also be provided to drive external relay(s) for selective load disconnect and reconnect control. The controller shall be capable of controlling a maximum of 9 individual output time delays to step loads on after a transfer occurs. Each output may be individually programmed for their own time delay of up to 60 minutes. Each sequence shall be independently programmed for transferring from normal to emergency and transferring from emergency to normal.

The controller shall also include the following built-in time delays for the following operations:

1. 0 to 60 minute time delay on failure to acquire the acceptable electrical parameters from the emergency source.
2. 10 seconds to 15 minute time delay for a failure to synchronize on an in-phase operation.

- e) All time delays shall be adjustable in 1 second increments.
- f) All time delays shall be adjustable by using the display and keypad, with a remote device connected to the communications interface port or USB.
- g) Each time delay shall be identified and a dynamic countdown shall be shown on the display. Active time delays can be viewed with a remote device connected to the communications interface port or USB.

12) MONITORING, PROGRAMMING AND COMMUNICATIONS

- a) The display shall provide for the test functions, allowed through password security. The test function shall be load, no load or auto test. The auto test function shall request an elapsed time for test. At the completion of this time delay the test shall be automatically ended and a retransfer sequence shall commence. All loaded tests shall be immediately ended and retransfer shall occur if the emergency source fails and the normal source is acceptable.
- c) A contact closure shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.
- d) Auxiliary contacts shall be provided consisting of a minimum of two contacts, closed when the ATS is connected to the normal source and two contacts closed, when the ATS is connected to the emergency source.
- e) LED indicating lights shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).

- f) LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal (green) and emergency sources (red), as determined by the voltage, frequency and phase rotation sensing trip and reset settings for each source.
- g) A membrane switch shall be provided on the membrane panel to test all indicating lights and display when pressed.
- h) Provide the ability to select "commit/no commit to transfer" to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.
- i) Terminals shall be provided for a remote contact which opens to signal the ATS to transfer to emergency and for remote contacts which closes to inhibit transfer to emergency and/or retransfer to normal. Both of these inhibit signals can be activated through the keypad, communications interface port or USB. A "not-in-auto" LED shall indicate anytime the controller is inhibiting transfer from occurring.
- j) An in-phase monitor shall be a standard feature in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The in-phase monitor shall be specifically designed for and be the product of the ATS manufacturer. The in-phase monitor shall be capable of being enabled or disabled from the user interface, communications interface port or USB.
- k) A time based load control feature shall be available to allow the prioritized addition and removal of loads based during transfer. This feature may be enabled for either or both sources. The user shall be able to control up to nine loads with independent timing sequences for pre and post transfer delays in either direction of transfer.
- l) The controller shall provide 2 inputs for external controls that can be programmed from the following values:
 - Common fault -Remote test
 - Inhibit transfer -Low battery voltage
 - Peak shave -Time delay bypass
 Load shed forced to OFF position (Programmed transition only)

The controller shall provide two from "C" contact outputs rated for up to 12A @ 240VAC or 2A @ 480VAC that can be programmed from the following values:

- | | |
|-------------------------|------------------------------------|
| -Aux switch open | -Transfer switch aux contact fault |
| -Alarm silenced | -Alarm active |
| -I/O communication loss | -Contactor position |
| -Exercise active | -Test mode active |
| -Fail to transfer | -Fail to acquire standby source |
| -Source available | -Phase rotation error |
| -Not in automatic mode | -Common alarm |
| -In phase monitor sync | -Load bank control active |
| -Load control active | -Maintenance mode active |
| -Non-emergency transfer | -Fail to open/close |
| -Loss of phase | -Over/under voltage |
| -Over/under frequency | -Voltage unbalance |

- Start signal
- Preferred source supplying load
- Peak shave active
- Standby source supplying load

The controller shall be capable of expanding the number of inputs and outputs with additional modules.

- Optional input/output modules shall be furnished with mount on the inside of the enclosure to facilitate ease of connections.

- m) *Engine Exerciser* - The controller shall provide an internal engine exerciser. The engine exerciser shall allow the user to program up to 21 different exercise routines based on the calendar mode. For each routine, the user shall be able to:
1. Enable or disable the routine
 2. Enable or disable transfer of the load during routine.
 3. Set the start time, time of day, time of week, week of month (1st, 2nd, 3rd, 4th, alternate or every)
 4. Set the duration of the run.
 5. At the end of the specified loaded exercise duration the switch shall transfer the load back to normal and run the generator for the specified cool down period. All loaded exercises shall be immediately ended and retransfer shall occur if the standby source fails. The next exercise period shall be displayed on the main screen with the type of exercise, time and date. The type of exercise and the time remaining shall be display when the exercise is active. It shall be possible of ending the exercise event with a single button push.
- n) *Date and time* - The date shall automatically adjust for leap year and the time shall have the capability of automatically adjusting for daylight saving and standard times.
- o) *Systems Status* - The controller shall have a default display the following on:
1. System status
 2. Date, time and type of the next exercise event
 3. Average voltage of the preferred and standby sources

Scrolling through the displays shall indicate the following:

1. Line of line and lone to neutral voltages for both sources
 2. Frequency of each source
 3. Load current for each phase
 4. Single or three phase operation
 5. Type of transition
 6. Preferred source
 7. Commit or no commit modes of operation
 8. Source/source mode
 9. In phase monitor enable/disable
 10. Phase rotation
 11. Date and time
- p) Controllers that require multiple screens to determine system status or display "coded" system status messages, which must be explained by references in the operator's manual, are not permissible.
- q) *Self Diagnostics* - The controller shall contain a diagnostic screen for the purpose of

detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.

- r) *Communications Interface* - The controller shall be capable of interfacing, through a standard communications with a network of transfer switches and generators. It shall be able to be connected via an RS-485 serial communication (up to 4000 ft. direct connect or multi-drop configuration). This module shall allow for seamless integration of existing or new communication transfer devices and generators.
- s) The transfer switch shall also be able to interface to 3rd party applications using Modbus RTU open standard protocols utilizing Modbus register maps. Proprietary protocols shall not be acceptable.
- t) The controller shall contain a USB port for use with a software diagnostic application available to factory authorized personnel for downloading the controller's parameters and settings; exercise event schedules; maintenance records and event history. The application can also adjust parameters on the controller.
- u) *Data Logging* - The controller shall have the ability to log data and to maintain the last 2000 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non-volatile memory. The controller shall be able to display up to the last 99 events. The remaining events shall be accessible via the communications interface port or USB.
 - 1. Event Logging
 - Data, date and time indication port or USB
 - 2. Statistical Data
 - Total number of transfers*
 - Total number of fail to transfers*
 - Total number of transfers due to preferred source failure*
 - Total number of minutes of operation*
 - Total number of minutes in the standby source*
 - Total number of minutes not in the preferred source*
 - Normal to emergency transfer time
 - Emergency to normal transfer time
 - System start date
 - Last maintenance date
- *The statistical data shall be held in two registers. One register shall contain data since start up and the second register shall contain data from the last maintenance reset.
- v) *External DC Power Supply* - An optional provision shall be available to connect up to two external 12/24 VDC power supply to allow the LCD and the door mounted control indicators to remain functional when both power sources are dead for extended periods of time. This module shall contain reverse battery connection indication and circuit protection.

13) TEST AND CERTIFICATIONS

- a) Upon request, the manufacturer shall provide a notarized letter certifying compliance

with all of the requirements of this specification including compliance with the above codes and standards. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.

- b) The ATS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001.

14) SERVICE REPRESENTATION

- a) The manufacturer shall maintain a national service organization of employing personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.
- b) The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

END SECTION 26 36 00

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Interior lighting fixtures with lamps and ballasts.
- 2. Lighting fixtures mounted on exterior building surfaces
- 3. Lighting control system.
- 4. Exit lights.

- B. Related Sections include the following:

- 1. Division 26 Section "Wiring Devices" for manual wall-box dimmers.
- 2. Division 26 Section "Wiring Devices" for occupancy sensors.

1.3 DEFINITIONS

- A. BF: Ballast factor. Ratio of light output of a given lamp(s) operated by the subject ballast to the light output of the same lamp(s) when operated on an ANSI reference circuit.
- B. CRI: Color rendering index.
- C. CU: Coefficient of utilization.
- D. LER: Luminaire efficiency rating, which is calculated according to NEMA LE 5. This value can be estimated from photometric data using the following formula:
 - 1. LER is equal to the product of total rated lamp lumens times BF times luminaire efficiency, divided by input watts.
- E. RCR: Room cavity ratio.
- F. Driver - the power supply used to power LED luminaires, modules, or arrays.
- G. L70, L70, or L70% - The reported life of an LED component or system to reach 70% lumen maintenance, or 70% of the LED's original light output. This test is being developed by the IES and is currently described by TM-21-11.
- H. LED's - Broadly defined as complete luminaire with light emitting diode (LED) packages, modules, light bars or arrays, complete with driver.

- I. LED luminaire failure - Negligible light output from more than 10 percent of the LED's constitutes luminaire failure

1.4 SUBMITTALS

- A. Product Data: Provide product data sheets for each type of lighting fixture scheduled, arranged in order of fixture designation. Partial submittals are not acceptable and will be rejected. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of fixture, including dimensions and verification of indicated parameters, including voltage and wattage.
 - 2. Emergency lighting unit battery and charger.
 - 3. Lamps.
 - 4. Lighting control system.
- B. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.
- D. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs and emergency lighting requirements for paths of egress.

1.6 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.7 WARRANTY

- A. Special Warranty for Emergency Lighting Unit Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 5 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining four years.
- B. Special Warranty for Fluorescent Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Electronic Ballasts: Five years from date of Substantial Completion.
 2. Warranty Period for Electromagnetic Ballasts: Five years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for T8 Fluorescent Lamps: Manufacturer's standard form, made out to Owner and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
1. Warranty Period: One year from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least two of each type.
 2. Battery and Charger Data: 10 percent for each emergency lighting unit type. Furnish at least two of each type.
 3. Ballasts: 1 for every 75 of each type and rating installed. Furnish at least two of each type.
- B. Provide one (1) of each type of LED module, light bar, or array (if applicable). If the LED's are integrated into the luminaire and are not separate components, then extra LED's are not required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Products: Subject to compliance with requirements, provide the products specified or equal.

2.2 FIXTURES AND COMPONENTS, GENERAL

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
- C. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.
- D. Metal Parts: Free of burrs and sharp corners and edges.
- E. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- G. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
 - 4. Laminated Silver Metallized Film: 90 percent.
- H. Plastic Diffusers, Covers, and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless different thickness is scheduled.
 - b. UV stabilized.
 - 2. Glass: Annealed crystal glass, unless otherwise indicated.

2.3 LIGHTING FIXTURES

- A. Refer light fixture schedule on plans for fixture specification.
- B. LED LUMINAIRES
 - 1. LED Luminaires shall meet all DesignLights Consortium® (DesignLights.org) Product Qualification Criteria. This does not require that the luminaire be listed on the DesignLights Consortium's® Qualified Products List, but they must meet the Product Qualification Criteria. The technical requirements that the luminaire shall meet for each Application Category are:
 - a. Minimum Light Output.
 - b. Zonal Lumen Requirements.
 - c. Minimum Luminaire Efficacy.
 - d. Minimum CRI.
 - e. L70 Lumen Maintenance.
 - f. Minimum Luminaire Warranty of 5 years (not pro-rated) to include LED driver and all LED components.
 - 2. Additional requirements:
 - a. Color Temperature of 3000K-4100K for interior luminaires as listed in the Luminaire Schedule on the plans. The color temperature of exterior LED luminaires should not exceed 4100K (nominal).
 - b. Color Consistency: LED manufacturer shall use a maximum 3-step MacAdam Ellipse binning process to achieve consistent luminaire-to-luminaire color for interior luminaires. Exterior luminaires shall use a maximum 5-step MacAdam Ellipse binning process.
 - c. Glare Control: Exterior luminaires shall meet DesignLights Consortium's® criteria for Zonal Lumen Distribution requirements or Backlight-Uplight-Glare (BUG) standards for exterior luminaires.
 - d. Luminaire shall be mercury-free, lead-free, and RoHS compliant.

- e. Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
 - f. Light output of the LED system shall be measured using the absolute photometry method following IES LM-79 and IES LM-80 requirements and guidelines.
 - g. Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.
 - h. Driver shall have a rated life of 50,000 hours, minimum.
 - i. Lumen output shall not depreciate more than 20% after 10,000 hours of use.
 - j. Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.
 - k. Luminaire Color Rendering Index (CRI) shall be a minimum of 80 for interior luminaires, and a minimum of 70 for exterior luminaires.
 - l. LED luminaire shall be thermally designed as to not exceed the maximum junction temperature of the LED for the ambient temperature of the location the luminaire is to be installed. Rated case temperature shall be suitable for operation in the ambient temperatures typically found for the intended installation. Exterior luminaires to operate in ambient temperatures of -20°F to 122°F (-29°C to 50°C).
 - m. LED driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at full input power and across specified voltage range.
 - n. Luminaire shall operate normally for input voltage fluctuations of plus or minus 10 percent.
 - o. Luminaire shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
 - p. Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.
 - q. All connections to luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
 - r. Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected as per Class 2 UL listing.
 - s. All luminaires shall be provided with knockouts for conduit connections.
 - t. The LED luminaire shall carry a limited 5-year warranty minimum for LED light engine(s)/board array, and driver(s).
3. Provide all of the following data on submittals:
- a. Delivered lumens
 - b. Input watts
 - c. Efficacy
 - d. Color rendering index.
4. The failure of one LED shall not affect the operation of the remaining LEDs.
5. Dimming:
- a. LED driver shall be compatible with dimming controls where dimming is indicated on the plans. Dimmable drivers shall use Dimming Constant Current (DCC) or Pulse Width Modulation (PWM) operation.
 - b. LED luminaires shall dim to (20%, 15%, 10%, 5%, or 0.1%) as specified in the Luminaire Schedule on the plans without visible flicker or “popcorn effect”. “Popcorn effect” is defined as the luminaire being on a pre-set dimmed level (less than 100%), and going to 100% prior to returning to the pre-set level when power is returned to the luminaire

2.4 EXIT SIGNS

- A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum of rated lamp life.
- C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - 1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
 - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

2.5 EMERGENCY LIGHTING UNITS

- A. General: Self-contained units complying with UL 924.
 - 1. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum 10-year nominal life and special warranty.
 - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

2.6 FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "Basic Electrical Materials and Methods" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, 12 gage (2.68 mm).
- E. Rod Hangers: 3/16-inch- (5-mm-) minimum diameter, cadmium-plated, threaded steel rod.
- F. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- G. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

2.7 FINISHES

- A. Fixtures: Manufacturers' standard, unless otherwise indicated.
 - 1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
 - 2. Metallic Finish: Corrosion resistant.

2.8 LIGHTING CONTROL DEVICES

- A. Dimming Ballast Controls: Push button or sliding-handle type with on/off control; compatible with ballast and having light output and energy input over the full dimming range.

2.9 SOURCE QUALITY CONTROL

- A. Provide services of a qualified, independent testing and inspecting agency to factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.
- B. Factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Support for Fixtures in or on Grid-Type Suspended Ceilings:
 - 1. Install a minimum of two independent ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from fixture corners.
 - 2. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
 - 3. Install at least two independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- C. Suspended Fixture Support: As follows:
 - 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
 - 4. Continuous Rows: Suspend from cable.
- D. Adjust aimable fixtures to provide required light intensities.

3.2 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Verify normal operation of each fixture after installation.
- C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.

3.4 PROGRAMMING AND INSTRUCTION.

- A. Provide initial programming of control system. Discuss programming with owner to determine optimum programming control for interior and exterior lighting.
- B. Provide one 4 hour training session for owner's representatives. Provide four instruction manuals for control system.

END OF SECTION 26 51 00

SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes exterior lighting units with luminaires, lamps, ballasts, poles/support structures, and accessories.
- B. Related Sections include the following:
 - 1. Division 26 Section "Interior Lighting" for interior fixtures, lamps, ballasts, emergency lighting units, and accessories; and for exterior luminaires normally mounted on buildings.
 - 2. Division 26 Section "Lighting Control Equipment" for programmable lighting control systems, time switches, additional photoelectric relays, power relays, and contactors.

1.3 DEFINITIONS

- A. Lighting Unit: A luminaire or an assembly of luminaires complete with a common support, including pole, post, or other structure, and mounting and support accessories.
- B. Luminaire (Light Fixture): A complete lighting device consisting of lamp(s) and ballast(s), when applicable, together with parts designed to distribute light, to position and protect lamps, and to connect lamps to power supply.
- C. Driver - the power supply used to power LED luminaires, modules, or arrays.
- D. L70, or L70% - The reported life of an LED component or system to reach 70% lumen maintenance, or 70% of the LED's original light output. This test is being developed by the IES and is currently described by TM-21-11.
- E. LED's - Broadly defined as complete luminaire with light emitting diode (LED) packages, modules, light bars or arrays, complete with driver.

1.4 SUBMITTALS

- A. Product Data: For each type of lighting unit indicated, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
 - 1. Materials and dimensions of luminaires and poles.
 - 2. Certified results of independent laboratory tests for fixtures and lamps for electrical ratings and photometric data.

3. Certified results of laboratory tests for fixtures and lamps for photometric performance.
 4. High-intensity-discharge luminaire ballasts.
- B. Shop Drawings: Anchor-bolt templates keyed to specific poles and certified by manufacturer.
- C. Submittal and Shop Drawing Requirements: Shop drawings and submittals shall be bound in 8½” by 11” notebook form. Sheets larger than notebook size shall be folded into notebook size. Include title sheet with project information, owner information, contractor information and supplier information. Shop drawing and submittal package shall contain complete submittal information. Incomplete submittals shall be cause for rejection.
- D. Product Certificates: Signed by manufacturers of lighting units certifying that products comply with requirements.
- E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- F. Maintenance Data: For lighting units to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

- A. Luminaires and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use, location, and installation conditions by a testing agency acceptable to authorities having jurisdiction
- B. Comply with ANSI C2.
- C. Comply with NFPA 70.
- D. FM Compliance: Units for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM.

1.6 DELIVERY, STORAGE, AND HANDLING OF POLES

- A. Package aluminum poles for shipping according to ASTM B 660.
- B. Store poles on decay-resistant treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- C. Retain factory-applied pole wrappings on fiberglass poles until just before pole installation. Handle poles with web fabric straps.
- D. Retain factory-applied pole wrappings on metal poles until just before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.7 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

- B. Special Warranty: Written warranty, signed by manufacturer and Installer agreeing to replace external parts of luminaires and poles exhibiting a failure of finish as specified below. This warranty is in addition to, and not a limitation of, other rights and remedies Owner may have under requirements of the Contract Documents.
 - 1. Protection of Metal from Corrosion: Warranty against perforation or erosion of finish due to weathering.
 - 2. Color Retention: Warranty against fading, staining, and chalking due to effects of weather and solar radiation.
 - 3. Warranty Period: Manufacturer's standard, but not less than three years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least two of each type.
 - 2. Ballasts: 1 for every 75 of each type and rating installed. Furnish at least two of each type.
- B. Provide one (1) of each type of LED module, light bar, or array (if applicable). If the LED's are integrated into the luminaire and are not separate components, then extra LED's are not required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in the Lighting Fixture Schedule on the drawings. Being listed in the Lighting Fixture Schedule does not exempt Fixtures compliance with this specification.

2.2 LUMINAIRES

- A. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- B. Metal Parts: Free from burrs, sharp corners, and edges.
- C. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.
- D. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- E. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and

when secured in operating position. Provide for door removal for cleaning or replacing lens. Arrange to disconnect ballast when door opens.

- F. Exposed Hardware Material: Stainless steel.
- G. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
- H. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- I. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor in luminaire doors.
- J. Lamps: Comply with the standard of the ANSI C78 series that is applicable to each type of lamp. Provide luminaires with indicated lamps of designated type, characteristics, and wattage. Where a lamp is not indicated for a luminaire, provide medium wattage lamp recommended by manufacturer for luminaire.
- K. LED LUMINAIRES
 - 1. LED Luminaires shall meet all DesignLights Consortium® (DesignLights.org) Product Qualification Criteria. This does not require that the luminaire be listed on the DesignLights Consortium's® Qualified Products List, but they must meet the Product Qualification Criteria. The technical requirements that the luminaire shall meet for each Application Category are:
 - a. Minimum Light Output.
 - b. Zonal Lumen Requirements.
 - c. Minimum Luminaire Efficacy.
 - d. Minimum CRI.
 - e. L70 Lumen Maintenance.
 - f. Minimum Luminaire Warranty of 5 years (not pro-rated) to include LED driver and all LED components.
 - 2. Additional requirements:
 - a. Color Temperature of 3000K-4100K as listed in the Luminaire Schedule on the plans. The color temperature of exterior LED luminaires should not exceed 4100K (nominal).
 - b. Color Consistency: LED manufacturer shall use a maximum 3-step MacAdam Ellipse binning process to achieve consistent luminaire-to-luminaire color for interior luminaires. Exterior luminaires shall use a maximum 5-step MacAdam Ellipse binning process.
 - c. Glare Control: Exterior luminaires shall meet DesignLights Consortium's® criteria for Zonal Lumen Distribution requirements or Backlight-Uplight-Glare (BUG) standards for exterior luminaires.
 - d. Luminaire shall be mercury-free, lead-free, and RoHS compliant.
 - e. Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
 - f. Light output of the LED system shall be measured using the absolute photometry method following IES LM-79 and IES LM-80 requirements and guidelines.
 - g. Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.
 - h. Driver shall have a rated life of 50,000 hours, minimum.
 - i. Lumen output shall not depreciate more than 20% after 10,000 hours of use.

- j. Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.
 - k. Luminaire Color Rendering Index (CRI) shall be a minimum of 80 for interior luminaires, and a minimum of 70 for exterior luminaires.
 - l. LED luminaire shall be thermally designed as to not exceed the maximum junction temperature of the LED for the ambient temperature of the location the luminaire is to be installed. Rated case temperature shall be suitable for operation in the ambient temperatures typically found for the intended installation. Exterior luminaires to operate in ambient temperatures of -20°F to 122°F (-29°C to 50°C).
 - m. LED driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at full input power and across specified voltage range.
 - n. Luminaire shall operate normally for input voltage fluctuations of plus or minus 10 percent.
 - o. Luminaire shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
 - p. Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.
 - q. All connections to luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
 - r. Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected as per Class 2 UL listing.
 - s. All luminaires shall be provided with knockouts for conduit connections.
 - t. The LED luminaire shall carry a limited 5-year warranty minimum for LED light engine(s)/board array, and driver(s).
3. Provide all of the following data on submittals:
- a. Delivered lumens
 - b. Input watts
 - c. Efficacy
 - d. Color rendering index.

2.3 LUMINAIRE SUPPORT COMPONENTS

- A. Description: Comply with AASHTO LTS-3 for pole or other support structures, brackets, arms, appurtenances, base, and anchorage and foundation.
- B. Wind-Load Strength of Total Support Assembly: Adequate to carry support assembly plus luminaires at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of 100 mph with a gust factor of 1.3. Support assembly includes pole or other support structures, brackets, arms, appurtenances, base, and anchorage and foundation.
 - 1. Strength Analysis: For each pole type and luminaire combination, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.
- C. Finish: Match finish of pole/support structure for arm, bracket, and tenon mount materials.
- D. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
 - 1. Materials: Will not cause galvanic action at contact points.
 - 2. Mountings: Correctly position luminaire to provide indicated light distribution.

3. Anchor Bolts, Nuts, and Washers: Hot-dip galvanized after fabrication unless stainless-steel items are indicated.
 4. Anchor-Bolt Template: Plywood or steel.
- E. Pole/Support Structure Bases: Anchor type with anchor bolts, leveling nuts, and bolt covers.
- F. Steel Poles: Tubing complying with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig (317 MPa); one-piece construction up to 40 feet (12 m) in length with access handhole in pole wall.
- G. Aluminum Poles: Fabricated from seamless, extruded structural tube complying with ASTM B 429, 6063-T6 alloy with access handhole in pole wall.
- H. Prestressed Concrete Poles: Centrifugally cast, hollow-shaft type. Cure with wet steam and age for a minimum of 15 days before installation. Fabricate poles with a hard, nonporous surface that is resistant to water, frost, and road and soil chemicals and that has a maximum water-absorption rate of 3 percent.
- I. Aluminum Mast Arms: Tapered oval arms continuously welded to pole attachment plate with span and rise as indicated.
- J. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

2.4 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Color selection by Architect.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Concrete Foundations: Construct according to Division 3 Section "Cast-in-Place Concrete." Pole base diameter, height, burial depth and steel reinforcement shall be designed by an Arizona registered structural engineer as part of the requirements for this specification.
1. Comply with details for reinforcement and for anchor bolts, nuts, and washers. Verify anchor-bolt templates by comparing with actual pole bases furnished.
 2. Finish for Parts Exposed to View: Trowel and rub smooth. Comply with Division 3 Section "Cast-in-Place Concrete" for exposed finish.
- B. Install poles as follows:
1. Use web fabric slings (not chain or cable) to raise and set poles.
 2. Mount pole to foundation with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
 3. Secure poles level, plumb, and square.
 4. Grout void between pole base and foundation. Use nonshrinking or expanding concrete grout firmly packed in entire void space.
 5. Use a short piece of 1/2-inch- (13-mm-) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

- C. Luminaire Attachment: Fasten to indicated structural supports.
- D. Luminaire Attachment with Adjustable Features or Aiming: Attach luminaires and supports to allow aiming for indicated light distribution.
- E. Lamp luminaires with indicated lamps according to manufacturer's written instructions. Replace malfunctioning lamps.

3.2 CONNECTIONS

- A. Ground equipment.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Ground metal poles/support structures according to Division 26 Section "Grounding."
 - 1. Nonmetallic Poles: Ground metallic components of lighting units and foundations. Connect luminaires to grounding system with No. 6 AWG conductor.

3.3 FIELD QUALITY CONTROL

- A. Inspect each installed unit for damage. Replace damaged units.
- B. Advance Notice: Give dates and times for field tests.
- C. Provide instruments to make and record test results.
- D. Tests and Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source, and as follows:
 - 1. Measure light intensities at night if specific illumination performance is indicated. Use photometers with calibration referenced to NIST standards.
 - 2. Check intensity and uniformity of illumination.
 - 3. Check excessively noisy ballasts.
- E. Prepare a written report of tests, inspections, observations and verifications indicating and interpreting results.
- F. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

3.4 CLEANING AND ADJUSTING

- A. Clean units after installation. Use methods and materials recommended by manufacturer.
- B. Adjust amiable luminaires and luminaires with adjustable lamp position to provide required light distributions and intensities.

END OF SECTION 26 56 00

SECTION 31 00 00

EARTHWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Site clearing, preparation and grading.
 - 2. Building excavating and backfilling.
 - 3. Trenching, backfilling and compacting for building and site utilities.
 - 4. Excavation and grading for site paving, curbs and sidewalks.
 - 5. Finish grading.
- B. Related Sections:
 - 1. Section 03 30 00 - Cast-in-Place Concrete: Subslab vapor retarder membrane.

1.02 DEFINITIONS

- A. Native or natural soils: Undisturbed soils present at site in their natural state or conditions. Materials which are essentially free of vegetation or organic matter and do not include trash or other deleterious materials.
- B. Existing fill soils: Materials present at site that have been disturbed, possibly transported, and are not in their natural undisturbed state.
- C. Imported fill soils: Materials transported onto site.
- D. Granular material: A sandy type of soil whose particles are coarser than cohesive material and which do not stick to each other.
- F. Finished Grade: Floor level for interior footings, and the lowest adjacent grade (either floor level or outside grade) within 5'-0" of foundations for perimeter wall or exterior column footings.
- G. Building Perimeter: The extreme outer edge of footing. This location of the building perimeter is to be used in determining the required lateral extent of engineered fill.
- H. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.03 SUBMITTALS

- A. Test Reports:
 - 1. Submit test results for imported fill materials to be used (if required), directly to the testing laboratory with a copy to Architect in accordance with Section 01 45 00.
 - 2. Test results shall clearly indicate:
 - a. Types of materials and composition.
 - b. Hardness
 - c. Compactability.
 - d. Presence of organic contaminants, whether or not below EPA action levels.

- e. Presence of hazardous and/or regulated wastes and contaminants, whether or not below EPA action levels.
- f. Suitability for proposed usage.
- 3. Testing laboratory shall notify Architect of non-conforming fill material submittals.

B. As-Built Drawings:

- 1. Maintain previously recorded utilities and accurately record location of:
 - a. Newly encountered utilities remaining.
 - b. Rerouted utilities.
 - c. New utilities by horizontal dimensions, elevations or inverts, and slope gradients.
- 2. Submit in accordance with Section 01 77 00.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with applicable Federal, State and local ordinances, including Arizona Highway Department Standard Specifications, City of Phoenix, and MAG Specifications. Where geotechnical report, General Structural Notes, or notes on drawings state more restrictive requirements, the requirements of the geotechnical report, General Structural Notes, or notes on drawings shall govern.
- B. Staking: Staking shall be performed by a Civil Engineer or Land Surveyor currently registered in the state where the Project is located. One person only shall be responsible for staking the Project, however, additional staff may be used (under direct supervision of responsible person) for larger projects.
- C. Observation of Geotechnical Engineer: Every phase of the earthwork shall be performed under observation and testing directed by the Geotechnical Engineer.

1.05 SITE CONDITIONS

A. Soil Report:

- 1. Soil Report (Report on Geotechnical Investigation) provided by the Owner for design of this Project was prepared by Speedie and Associates Geotechnical – Environmental – Materials Engineers; is referenced in Section 00 31 32 and is entitled: Report on Geotechnical Investigation, Phoenix Fire Station No. 74, NWC 19th Avenue & Chandler Boulevard, Phoenix, Arizona; Speedie Project No. 230668SA dated June 7, 2023.
- 2. Neither the Owner or Architect guarantees the accuracy of the report nor the continuity of the soil conditions indicated at boring locations.
- 3. Portions of the soil report incorporated, either by reprint or reference, into these Specifications are those which relate to the quality of materials and workmanship and become a part of the Contract Documents. Quantities of excavation and fill materials shall be as indicated on Drawings, or as required by actual conditions as depicted by the soil borings presented in the Soil Report.

B. Existing Conditions:

- 1. Bidders are expected to visit the site to form their own conclusions as to the character of the Work under this Section.
- 2. Due to previous use, special attention shall be given to locating and removing existing subsurface remnants of former facilities, backfilled zones, and disturbed soils.

- C. Environmental Requirements: Place, spread or roll fill materials during favorable weather conditions. When the Work is interrupted by rain, do not resume fill operations until evidence is furnished which establishes that moisture content and density of the previously placed fill are as specified.
1. Surface drainage: Provide and maintain positive surface drainage during excavation. Prevent infiltration of water into utility or foundation excavations from whatever sources as may exist.
 2. Dust control: Comply with requirements of governing authorities. Use whatever means necessary to control dust on and near the Work and on and near off-site borrow, storage and spoil areas, if such dust is caused by the Contractor's operations during performance of the Work, or if resulting from the conditions in which the Contractor leaves the site. Thoroughly moisten surfaces as required to prevent dust being a nuisance to the public, neighbors, and concurrent performance of other Work on the site.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Fill Materials: In accordance with recommendations of the Report on Geotechnical Investigation.
- B. Under-Slab Fill: Aggregate Base (ABC) conforming with material requirements of MAG Section 702.
- C. Pipe Bedding Fill: Material used for pipe bedding shall comply with MAG Section 601.4.1
- D. Warning Tape:
1. Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility.
 2. Provide detectable warning tape with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 2'-6" deep for non-metallic utility pipes, conduit or other underground services outside of building line.
 3. Tape Colors: Provide tape colors to utilities as follows:
 - a. Red: Electric.
 - b. Yellow: Gas, oil, steam, and dangerous materials.
 - c. Orange: Telephone and other communications.
 - d. Blue: Water systems.
 - e. Green: Sewer systems.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify survey data. Stake out work and verify as to location and elevation. Carefully maintain bench marks, monuments, and other reference points; if disturbed or destroyed, replace as directed.

- B. Site Clearing: Strip and remove all vegetation, debris, rubble, undocumented fills, and obviously loose surface soils from the entire area to be occupied by proposed construction in accordance with recommendations of the Report on Geotechnical Investigation.
- C. The upper 12 inches minimum of native soils shall be recompacted prior to placing fills in accordance with recommendations of the Report on Geotechnical Investigation.
- D. Subsoils shall be further over-excavated at least 2 feet below proposed footing bottom elevation, or existing grade, whichever is deeper, extending at least 5 feet beyond footing edges within all footing areas. The entire building pad does not require over-excavation provided footing lines can be accurately located during earthwork operations.
- E. The Geotechnical Engineer shall examine subgrade once sub-excavation is complete and prior to backfilling to ensure removal of deleterious materials.
- F. Refer to the Report on Geotechnical Investigation for alternative recommendations for footing excavation.
- G. Prior to placing structural fill below footing bottom elevation, exposed grade shall be scarified, moisture conditioned, and properly compacted in accordance with recommendations of the Report on Geotechnical Investigation.
- H. Pavement areas shall be scarified, moisture-conditioned, and properly compacted in a similar manner.
- I. Existing Utilities:
 - 1. Identify known below grade utilities. Stake and flag locations.
 - 2. Identify and flag above grade utilities.
 - 3. Maintain, re-route, extend and protect as required existing utilities remaining which pass through Work area as indicated.
 - 4. Notify utility company to remove and relocate utilities obstructing the Work.
 - 5. Pay costs for this Work, except that covered by utility company.
- J. Unknown Utilities and Concealed Conditions:
 - 1. Upon discovery of unknown utility or concealed conditions which are unrecorded on the Contract Documents, discontinue affected Work and notify Architect in writing.
 - 2. Should additional work be required to remove, maintain, re-route, extend or protect unknown utilities or other conditions, the Contractor will be paid for the Work in accordance with the provisions of the General Conditions.

3.02 SUBGRADE

- A. Prepare subgrade at building areas to proper elevation to receive under-slab fill.
- B. Prepare subgrade at paved areas to proper elevation to receive base course materials. See Division 32 paving Sections.
- C. Grade as required to bring entire remainder of site to finished grade as indicated on drawings.

3.03 EXCAVATION - GENERAL

- A. Excavate for foundations and footings to provide vertical walls and corners square. Keep entire excavation free from loose material. Conform to dimensions and elevations indicated with allowances for erection of forms, shoring, waterproofing, and inspection of footings.
- B. Material to be excavated shall be non-classified and shall include earth or other materials encountered in excavating.
- C. The use of explosives will not be permitted.
- D. Drawings show predetermined elevations or depths for bottoms of footings. Should additional depth of excavation be necessary, the Contractor will be paid for the Work in accordance with the provisions of the General Conditions.
- E. Shore and brace excavations if necessary to prevent cave-ins. Remove shoring before backfilling is completed, but not until permanent supports are in place.
- F. If excavation is carried below depth indicated, backfill with properly placed and compacted fill material (material as specified) over properly prepared subgrade, or increase foundation depth as required without extra compensation.
- G. Remove excess excavated material from the grounds and legally dispose of same.
- H. Protect utility services uncovered by excavation.
 - 1. Remove abandoned utility service lines from areas of excavation; cap, plug or seal such lines and identify at grade.
 - 2. Accurately locate and record abandoned and active utility lines rerouted or extended, on Project Record Documents.

3.04 EXCAVATION - UTILITIES

- A. Trenching:
 - 1. General:
 - a. Perform trenching required for the installation of items where the trenching is not specifically described in other Sections of these Specifications.
 - b. Excavate for underground utilities, including water, steam, condensate, natural gas pipe lines, fire protection lines, sewers, electrical lines, cables, ducts and other electrical items.
 - 2. Width:
 - a. Make trenches open vertical construction with sufficient width to provide free working space at both sides of the trench and around the installed item as required for caulking, joining, backfilling, and compacting.
 - b. Provide for a minimum net clearance of 6 inches and a maximum net clearance of 12 inches on each side of the barrel of the pipe and to allow the backfill to be placed and properly compacted. Exceptions to these clearances will occur at encasement or special construction.
 - 3. Depth:
 - a. Trench as required to provide the elevations shown on the Drawings.
 - b. Where elevations are not shown on the Drawings or specified in other sections of the specifications, trench to sufficient depth to give a minimum of 18" of fill above the top of the pipe, measured from the adjacent finished grade.

- c. Where the bottom of excavation is found to be soft and cannot support the pipe, the depth shall be extended until solid bearing is reached. Backfill to pipe foundation grade with granular material or earthfill and thoroughly compact to assure a firm foundation for the pipe.
 - d. Where excavation is in rock, or caliche, cut to depth of at least 8 inches below pipe invert elevations.
 4. Trench Bottoms:
 - a. Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit.
 - b. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
 - c. Remove stones and sharp objects to avoid point loading.
 - d. For pipes or conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - e. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
 5. Do not disturb any portion of or remove support from a piping system that has thrust blocks or other constraints against movement while the system is in service.
 6. Correction of faulty grades: Where trench excavation is inadvertently carried below proper elevations, backfill with pipe bedding material and compact to provide a firm and unyielding subgrade or foundation without additional compensation.
 7. Trench bracing:
 - a. Properly brace and support trenches in accordance with requirements of governing authorities.
 - b. Brace, sheet, and support trench walls in such a manner that the ground alongside the excavation will not slide or settle, and that existing improvements of every kind, whether on public or private property, will be protected from damage.
 - c. Arrange bracing, sheeting, and shoring so as not to place stress on portions of the completed Work until the general construction thereof has proceeded far enough to provide sufficient strength.
 8. Repairs and replacement: In the event of damage to such improvements, immediately make repairs and replacements necessary to the approval of the Architect without additional compensation.
 9. Removal of trench bracing: Exercise care in the drawing and removal of sheeting, shoring, bracing, and timbering to prevent collapse and caving of the excavation faces being supported.
 10. Grading and stockpiling trenched material: Control the stockpiling of trenched material in a manner to prevent water running into the excavations. Do not obstruct surface drainage, but provide means whereby storm water is diverted into existing gutters, other surface drains, or temporary drains.
- B. Crossing Protection
 1. Provide adequate temporary crossover for pedestrian and vehicular traffic including guard rails, lamps and flags, as required by agencies having jurisdiction and as directed.
 2. Remove provisions for crossing protection when they are no longer needed.
- C. Underpinning: Where excavation work is required under or adjacent to existing footings, under-pin as required to prevent damaging existing construction.

3.05 FOUNDATION FOR PIPES

- A. General: Grade the trench bottoms to provide a smooth, firm, and stable foundation free from rockpoints throughout the length of the pipe.
- B. Foundation material: Place a minimum of 6" of the specified pipe bedding fill material in the bottom of the trench.
- C. Subsurface conditions: In areas where soft, unstable materials are encountered at the surface upon which cohesionless material is to be placed, remove the unstable material and replace it with material approved by the Architect. Make sufficient depth to develop a firm foundation for the item being installed.
- D. Overexcavation: If the need for such overexcavation has been occasioned by an act or failure to act on the part of the Contractor, make the overexcavation and replacement without additional compensation.
- E. Bearing: At each joint in pipe, recess the bottom of the trench as required into the firm foundation in such a manner as to relieve the bell of the pipe of all load and to ensure continuous bearing of the pipe barrel on the firm foundation.
- F. Shaping: Accurately shape pipe subgrade and fit the bottom of the trench to the pipe shape. Use a drag template shaped to conform to the outer surface of the pipe if other methods do not produce satisfactory results.

3.06 BEDDING FOR PIPES

- A. General: Place the specified pipe bedding fill material in the trench, simultaneously on each side of the pipe for the full width of the trench, to a maximum depth of 3 feet and a minimum depth of one foot above the outside diameter of the pipe barrel. Water consolidation shall not be allowed
- B. Densification: Take special care to provide firm bedding support on the underside of the pipe and fittings for the full length of the pipe.
- C. Alternate bedding: Other bedding procedures and materials may be used if prior written approval has been obtained from the Civil Engineer through the Architect.

3.07 UNDER-SLAB FILL

- A. Place under-slab fill to the thickness and grade indicated, smooth and even, free of voids. Compact to specified density. Grade to a tolerance of 1/4 inch in 10 feet.

3.08 BACKFILLING - GENERAL

- A. After completion of the foundations, walls and other construction, and removal of forms, clean the excavations of trash and debris.
- B. Place the backfill symmetrically against each side of the walls to prevent eccentric loading. Place backfill in horizontal 6 inch (150mm) layers with the proper moisture content for the required degree of compaction.

3.09 BACKFILLING - UTILITIES

- A. Backfill pipe and conduit trenches in a manner to prevent disturbance to the pipes or conduits. Fill under and around pipes thoroughly to a point approximately 12 inches above the top of the pipe and compact. Backfill remainder of trench in 6 inch layers and compact.
- B. Backfill utility trenches in accordance with MAG Section 601.
 - 1. Delete references to compaction methods specified in paragraph 6.01.2.5 and 6.01.4.4 of MAG Section 601 and insert the following:
 - a. The compacted density of the trench backfill shall be 95% of ASTM D-1557 (Method A or D) with the percent of density adjusted to compensate for the rock content larger than that which will pass a #4 sieve, by the method provided in the City of Phoenix Chart, Detail No. 35.
 - b. At least one density and moisture content test shall be taken in per 500 lineal feet of trench backfill per layer of backfill. The test must be made prior to any additional formation of backfill
 - 2. Revise paragraph 6.01.4.3, Backfill, as follows: "All backfill shall be granular material. Water settling is not permitted. Backfill for electrical direct burial or concrete encased duct in paved areas under roadway shoulder shall be wet sand slurry.
- C. Backfilling prior to approvals: Do not allow or cause portions of the work performed or installed to be covered up or enclosed by work of this Section prior to required inspections. Should any of the work be so enclosed or covered up before it has been inspected, uncover such work at no additional compensation.
- D. Backfill simultaneously on both sides of utility to prevent displacement.
- E. Concrete backfill trenches that carry below or pass under footings and that are excavated within 18 inches of footings. Place concrete to level of bottom of footings.
- F. Provide 4-inch-thick concrete base slab support for piping or conduit less than 2'-6" below surface of roadways. After installation and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.
- G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 COMPACTION

- A. Place and compact fills in accordance with recommendations of the Report on Geotechnical Investigation.
- B. Utilize mechanical compaction equipment in grading operations. In no case shall water settling or "jetting" be employed. Vibratory compaction equipment employed shall be subject to the approval of the Architect to ensure that vibrations will not be created that will affect existing construction or slopes.

3.11 FINISH GRADING

- A. After construction and final clean-up of exterior, and removal of debris, grade building site to slopes and elevations directed.

- B. Leave graded areas raked smooth.
- C. Remove excess material from the site.

3.12 FIELD QUALITY CONTROL

- A. Earthwork, footings depths, and excavations for foundations shall be inspected by the Geotechnical Engineer to verify allowable soil bearing and low settlement and swell potential, and to make any additional recommendations.
- B. Tests: Inspection and testing of earthwork shall be performed by a testing laboratory in accordance with Section 01 45 00.
 - 1. Provide free access to Work and cooperate with appointed firm.
 - 2. Tests of materials may be performed to ensure conformance with specified requirements.
 - 3. Provide one field density test of under-slab fill for every 2,000 square feet of building area.
 - 4. Provide two field density tests of backfill at locations and elevations directed.
 - 5. Provide one field density test of prepared subgrade for every 2,000 square feet of site and building area.
 - 6. Soil compaction which does not meet the specified requirements shall be recompact and reworked as directed by the Geotechnical Engineer through the Architect.

3.13 PROTECTION

- A. Protect newly graded areas from traffic and erosion, keep areas free of trash and debris. Repair and establish grades in any areas settled, rutted or eroded.

END OF SECTION

SECTION 31 31 00

SOIL TREATMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Pretreatment to provide chemical barrier to protect buildings and contents against attack by subterranean termites.
 - 2. Treatment of site and areas as indicated to remove vegetation growth.

1.02 SUBMITTALS

- A. Product Data: Submit label indicating Manufacturer's chemical analysis of treatment materials prior to application. Submit evidence of EPA approval and State registration.
- B. Test Reports: Submit reports of field tests for termite treatment.

1.03 QUALITY ASSURANCE

- A. Applicator Qualifications: Registered applicator with 5 years experience and licensed by the Arizona Structural Pest Control Commission.
- B. Regulatory Requirements: Chemicals shall be approved for use and registered by Environmental Protection Agency (EPA) and the Arizona Structural Pest Control Commission.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Conform to Manufacturer's instructions and Governmental Agencies' requirements.
- B. Deliver materials to Project in original sealed and labeled containers of Manufacturer.

1.05 SITE CONDITIONS

- A. Do not apply chemicals in inclement weather or when there is a possibility of rain.

1.06 WARRANTY

- A. Upon completion of soil treatment, and as a condition of final acceptance, provide Owner with written unlimited warranty providing:
 - 1. Application was made at concentration, rate, and method in compliance with Specifications contained herein.
 - 2. Warrants effectiveness of the soil treatment against subterranean termite infestation for a period of not less than 5 years from acceptance and completion date of Project.
 - 3. Warrants effectiveness of soil treatment against vegetation growth for a period of six (6) months.

- B. Upon evidence of subterranean termite activity within warranty period, re-treat area to stop infestation of affected areas and repair termite caused damage to building at no cost to Owner.
 - 1. Re-treatment under warranty sufficient to prevent termites from attacking building or its contents during remainder of initial warranty period, plus one additional year for each time re-treatment under warranty is required.
 - 2. Complete re-treatment of the building shall be as specified herein and shall be rendered upon the third recurrence of subterranean termites in the same structure within 5-year period from the date of project acceptance.
 - 3. Damage caused by infestations and by re-treatment shall be repaired at no cost to the Owner.
- C. Upon evidence of vegetation growth re-treat area at no cost to Owner.
- D. Draft warranty in favor of Owner, successors or assigns.
 - 1. Pre-printed FHA or VA guarantee forms shall not be acceptable.
 - 2. The Owner and the applicator reserve the option to renew termite protection on an annual basis after the expiration of the warranty.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Termite Treatment: Apply one of the following chemicals as a water emulsion (no oil solutions permitted):
 - 1. Altriset (Chlorantraniliprole) Syngenta www.syngentaprofessionalproducts.com
 - 2. Demon Max (Cypermethrin) Syngenta www.syngentaprofessionalproducts.com
 - 3. Dominion 2L (Imidacloprid), Control Solutions Incorporated (CSI) www.controlsolutionsinc.com
 - 4. Dragnet SFR (Permethrin), FMC Corporation www.fmc.com
 - 5. Phantom (Chlorfeapyr) BASF - www.termidorhome.com.
 - 6. Premise (Imidacloprid), or Premise 75, or Premise Pre-Construction; Bayer Environmental Science www.bayerprocentral.com
 - 7. Prelude (Permethrin); AMVAC www.amvac-chemical.com
 - 8. Prevail FT (Cypermethrin); FMC Corporation www.fmc.com
 - 9. Talstar (Bifenthrin), FMC Corporation. www.fmc.com
 - 10. Termidor HE (Fipronil) BASF - www.termidorhome.com.
 - 11. Transport (Acetamiprid and Befenthrin); FMC Corporation www.fmc.com
 - 12. Other commercially available termiticide registered for use by the State of Arizona.
- B. Vegetation Treatment:
 - 1. Pre-Emergent:
 - a. Oryzalin (Surflan).
 - 2. Post-Emergent:
 - a. Roundup; Monsanto www.roundup.com
 - b. Season Long or Ground Clear; ORTHO www.ortho.com
 - c. SeasonPlus Grass and Weed Killer Plus Preventer; Spectracide www.spectracide.com
- C. Mix solutions in accordance with Manufacturer's directions to highest concentration allowable by label.

PART 3 EXECUTION

3.01 APPLICATION - TERMITE CONTROL

- A. Time of Application:
 - 1. Notify Architect to be present during application, at least 24 hours prior to application of materials.
 - 2. Apply chemical treatment during normal working hours in order to be subject to observation.
 - 3. Do not treat soil and fill areas that are excessively wet or after heavy rains to avoid surface flow of toxicants.
- B. Application: In accordance with Manufacturer's recommendations, and local codes and regulations.
 - 1. Provide applicator trucks with approved measuring flow meters.
 - 2. Apply chemicals on soils and compacted ABC fill materials under entire subsurfaces of concrete floor slabs and slabs abutting building walls in quantities and locations stated on label.
- C. Do not disturb aggregate base course and treated soil between application of poison and pouring of concrete.
 - 1. Re-treat soil or compacted fill which has been disturbed after soil poisoning, due to plumbing and electrical changes or omissions.
 - 2. Should rainy weather occur prior to pouring concrete slab over treated ABC, re-treat the complete area at the discretion of Architect, and at no additional cost to Owner.

3.02 APPLICATION - VEGETATION CONTROL

- A. Apply chemical to on-site landscape areas and landscaped portions of public street right-of-ways of site.
- B. Chemical Control: Prior to planting operations, provide 2 applications over unwanted vegetation.
- C. Pre-emergent: Post landscape planting operations. Comply with manufacturers label for application and protection of existing landscape planting.

3.03 FIELD QUALITY CONTROL

- A. Tests: Chemical analysis tests shall be made of materials used on the basis of one test for each 10,000 square feet of treated area. Samples and test may be taken of both concentrates and the dilute materials as being applied. See Section 01 45 00 for provisions covering payment for testing.

3.04 PROTECTION

- A. Adjacent property, trees and plants shall be protected from injury and damage as result of operations in this Section.

END OF SECTION

SECTION 32 12 16

ASPHALTIC CONCRETE PAVING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes asphaltic concrete paving as indicated on Drawings, including cutting and patching of existing asphaltic concrete paving at street right-of-ways where existing pavement is removed to accommodate new construction.

1.02 SUBMITTALS

- A. Design Mix: Submit design mix-formula for asphalt concrete not less than 7 days in advance of actual placement of material.
- B. Certificates: Submit Certificate of Compliance indicating that materials to be incorporated in Work meet Specification requirements.

1.03 QUALITY ASSURANCE

- A. Comply with Maricopa Association of Governments (MAG) Specifications, except as specified otherwise.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Transport bituminous mixtures to site in clean trucks and in manner to prevent segregation of materials or inclusion of foreign substances.
- B. Mix to consist of specified aggregate and bitumen.
- C. Asphalt surface course mixture to have minimum temperature of 285 degrees F. and maximum temperature of 350 degrees F.

1.05 SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Conform to applicable requirements of MAG Section 321.
 - 2. Place asphaltic concrete when surface is dry, when the ambient temperature in shade is 40 degrees F. and rising, or above 50 degrees F. if falling.
 - 3. Do not place asphaltic concrete when weather is foggy, rainy, or when base on which material is to be placed is wet or frozen.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Aggregate Base Course:
 - 1. Base materials: Conform to MAG Sections 310 and 702 and requirements specified herein. Material to be crushed rock product with a plasticity index not exceeding 5 and comply with grading requirements shown in Table 702.

2. Aggregate: Clean and free of organic matter and of such a nature that it can be compacted to a dense and firm layer capable of supporting loaded trucks and self-propelled pavers without rutting.
 3. Deliver aggregate to site in thoroughly blended condition and handle in manner to prevent excessive segregation. Do not mix underlying soil or subbase with aggregate base material. Do not mix underlying soil or subbase with aggregate base material.
- B. Tack Coat: Mixing type emulsion SS-I-H, as specified in MAG Section 713, diluted in proportion of approximately 50 percent water and 50 percent emulsion. See MAG Section 321.
- C. Asphaltic Concrete Paving:
1. Refer to MAG Section 710.
 2. Asphalt concrete shall be Type 1/2 inch or 3/4-inch single course mix as indicated on Drawings. Percentage asphalt range: 5.0 to 6.0.
 3. When test procedures determine aggregate is subject to stripping, add dry hydrated lime conforming to requirements of ASTM C207, Type N; portland cement conforming to Section 725 of MAG Specifications; or other approved anti-strip agent.
- D. Composition and Grading: Comply with MAG Section 710.3. Aggregates and mix to be incorporated into Work shall show loss in L.A. Rattler (ASTM C131) (after 500 revolutions) of 40 percent max.

2.02 EQUIPMENT

- A. Spreading and Finishing Equipment: Comply with MAG Section 321.5.2.
1. Equipment to be of good condition and capable of performing Work specified in satisfactory manner.
 2. Start finish rolling after pavement has cooled sufficiently to permit removal of roller marks and continue in whatever direction is necessary to produce a pavement surface free of indentations. See MAG Section 321.
 3. Leveling Course: Comply with MAG Section 321.5.3.

2.03 MIXES

- A. Job-mix formula shall indicate percentage passing for each specified sieve size of mineral aggregate and percent of asphalt to be used for each asphalt concrete mixture to be incorporated on Project. Job-mix formula (gradation), with allowable tolerances for a single test, to be used for job control. Single test variation tolerance is shown in following table. In no event shall less than 2 percent of mineral aggregate pass a No. 200 sieve.
1. No. 4 and larger : ± 7
 2. No. 30: ± 5
 3. No. 200: ± 2
 4. Asphalt, percent by weight of mix: ± 4

PART 3 EXECUTION

3.01 PREPARATION

- A. Backfill curbs prior to paving.
- B. Base Preparation: Comply with MAG Section 321.5.1.

3.02 CUTTING AND PATCHING OF ASPHALT CONCRETE PAVING

- A. Cut existing asphalt pavement back a minimum of 4 inches into stable, sound pavement material with stable, undisturbed bases.
 - 1. Remove and recompact existing subgrades and/or base course materials necessarily disturbed, that are loose, or un-bound.
 - 2. Saw-cut existing asphalt vertically to full depth.
 - 3. Saw-cut and remove areas in square, rectangular or trapezoidal shapes. Do not leave irregular or fractured faces of any size.
- B. At patched areas, provide aggregate base course materials to match existing depth and tie into existing. Compact level to existing.

3.02 APPLICATION

- A. Base Course:
 - 1. Construct aggregate base course on subgrade and compact to a minimum of 95 percent of maximum density in accordance with ASTM D1557.
 - 2. Thickness: Place base course materials in minimum compacted thickness indicated on Drawings, or to match existing at patched areas.
- B. Tack Coat:
 - 1. Apply tack coat to vertical surfaces of existing pavement, curbs, gutters and construction joints, against which additional material is to be placed, to a new or old pavement to be overlaid, and to other surfaces as designated by Architect.
 - 2. Tack coat to be slow setting type emulsion as specified. If emulsion is applied undiluted, apply at rate of 0.02 to 0.10 gallons per square yard; if emulsion is applied diluted 1:1 with water, apply at rate of 0.05 to 0.10 gallons per square yard, as directed by Architect.
 - 3. Clean surfaces of loose and foreign material prior to application of tack coats.
- C. Asphaltic Concrete:
 - 1. Construct asphalt pavement in accordance with applicable requirements of MAG Section 321.
 - 2. Thickness: Place asphalt concrete in minimum compacted thickness indicated on Drawings, or to match existing at patched areas.
 - 3. If pavement is constructed in lifts using an asphalt concrete base in the first lifts, base to be thoroughly cleaned by whatever means necessary prior to application of tack coat and placement of surface layer.
- D. Compaction: Comply with requirements of MAG Section 321.5.4.
 - 1. Compact asphalt concrete surfacing to a density of 95 percent of 75 blows (ASTM D6926).
 - 2. Measure asphalt density by means of a nuclear density gauge, or core testing. Nuclear gauge method will be preferred.
- E. Upon completion, pavement surface to be smooth, dense and of uniform texture and appearance.
 - 1. All areas to properly drain and be free of standing water.
- F. Tolerances:
 - 1. Thickness: Compacted thickness shall be within the following tolerances from thickness indicated.
 - a. Base Course: Plus or minus 1/2 inch .
 - b. Surface Course: Plus or minus 1/4 inch .

2. Surface Smoothness:
 - a. Base Course: Plus or minus 1/2 inch, measured using a 10 foot straight-edge placed in any position on finished surface, except across flow lines.
 - b. Asphalt Concrete Surface Finish: Minus 1/4 inch from the lower edge of a 25 foot straight-edge laid on the finished surface of the asphalt and parallel with the center line of the road or drive.
 - c. Asphalt Concrete Crowned Surface Finish: Plus or minus 1/4 inch, measured with a crowned template.

G. Corrective Requirements for Deficiencies: Comply with MAG Section 321.6.

H. Paving Termination:

1. Provide thickened edge at paving terminations that do not have wood header forms or concrete curbs.
2. Pavement termination to be minimum 12 inches wide x 8 inches deep or as shown on Drawings.

3.03 FIELD QUALITY CONTROL

A. Smoothness Tests:

1. Test conformance of crown and grade of pavement as indicated. Finished surface to be smooth and finished within specified tolerances.
2. Immediately after initial rolling, correct variations by adding or removing material as required. Cut out and replace any spots deficient in thickness with fresh mixture which is properly bonded to existing pavement.
3. After final rolling, retest surface and correct irregularities in excess of specified tolerance by removing defective Work and replacing with new material.

B. Water Testing: Perform water testing of streets per MAG Section 321.

3.04 CLEANING

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises.

END OF SECTION

SECTION 32 13 13 CONCRETE PAVING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes portland cement concrete paving and accessories.
- B. Related Sections:
 - 1. Section 07 92 00 – Joint Sealers, for joint sealants within concrete pavement and at isolation joints of concrete pavement with adjacent construction.
 - 2. Section 32 16 00 - Concrete Curbs, Gutters, Sidewalks, and Driveways for concrete curbs, gutters, sidewalks, and drive entrances.

1.02 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.03 SUBMITTALS

- A. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Mix designs are subject to approval of the Owner's testing laboratory of record for compliance with requirements.
- B. Material certificates.
- C. Pavement Joint and Placement Plan - indicate location of all pavement joints and their type, a detailed sequence and schedule of concrete placement operations including, but not necessarily limited to; width and area of pavement to be placed, proposed equipment, production rates, working hours, concrete hauling and access location, placement methods, curing, sawing and sealing methods. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Pavement shall not be opened to traffic less than seven days after placement, and until all joints are sealed and the concrete has attained a compressive strength of at least 3,000 psi, unless otherwise approved by the Architect.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with applicable Federal, State and local ordinances, including Arizona Highway Department Standard Specifications (ADOT) and MAG Specifications. Where geotechnical report or notes on drawings state more restrictive requirements, the requirements of the geotechnical report or notes on drawings shall govern.
- B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.
- C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.

- D. Concrete Testing Service: Engage a qualified independent testing agency to design concrete mixes.

PART 2 PRODUCTS

2.01 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves of a radius 100 feet or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.02 REINFORCING MATERIALS

- A. Grade 40 Reinforcing Bars, Wire Fabric and Plain Wire: Comply with Section 03 32 00.
 - 1. Wire Fabric: Flat sheets, not rolls.
- B. Joint Dowel Bars: Plain steel bars conforming to Section 03 32 00. Cut bars true to length with ends square and free of burrs.
- C. Bar Supports: Comply with Section 03 32 00.
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
- D. Synthetic Fiber: Fibrillated or monofilament polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.

2.03 CONCRETE MATERIALS

- A. General:
 - 1. Concrete materials shall conform to MAG Specifications, Sections 324, 725, and 726; and ADOT Section 401 and City of Phoenix Supplements.
 - 2. Use the same brand and type of cementitious material from the same manufacturer throughout the Project.
- B. Portland Cement: ASTM C 150, Type II, unless otherwise indicated on Drawings, low alkali, conforming to MAG Specifications.
 - 1. Supplementary Cementitious Materials (Pozzolans): In accordance with MAG Section 725.2.1 and as specified in Section 03 05 05.
 - 2. Aggregate: Crushed rock or gravel conforming to the requirements of ASTM C33. Course aggregate gradation shall conform to the requirements of Size No. 57. Fine aggregates shall have an average sand equivalent of not less than 75 when tested in accordance with the requirements of AASHTO T-176 or ASTM D2419.
- C. Water: ASTM C1602.

2.04 ADMIXTURES AND ADDITIVES

- A. General:
 - 1. Admixtures or additives of any type, except as otherwise specified, shall not be used unless identified in the approved mix design or authorized by the Civil Engineer.
 - 2. Admixtures shall be certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.
- B. Air-Entraining Admixture: ASTM C260.
- C. Water-Reducing Admixture: ASTM C494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
- E. Water-Reducing and Accelerating Admixture: ASTM C494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C494, Type D.

2.05 ACCESSORIES

- A. Expansion Joint Filler: MAG Section 729.
- B. Epoxy Resin: Sta-Crete Epoxy Resin No. 15-J or 20.
- C. Curing Compound: Concrete curing materials shall in conformance with MAG Section 726.
- D. Joint Sealant: One-component, hot-poured type, conforming to the requirements of ASTM D3406. Where approved by the Civil Engineer, other pour-type joint sealants conforming to the requirements of MAG Section 729.2 may be used.

2.06 CONCRETE MIXES

- A. Mix design proportioning shall be in accordance with MAG Section 725.6.
- B. Proportion mixes to provide concrete with the following properties:
 - 1. Compressive Strength (28 Days): MAG Class AA (4,000 psi), unless otherwise indicated on Civil Drawings.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45 maximum at point of placement.
 - 3. Slump Limit: 4 inches.
 - a. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than 8 inches after adding admixture to plant- or site-verified, 2- to 3-inch slump.
- C. Supplementary Cementitious Materials (Pozzolans): Limit percentage, by weight, of cementitious materials other than Portland cement according to MAG Section 725.2.1.
- D. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd..

2.07 CONCRETE MIXING

- A. Mixing shall be in accordance with MAG Section 725.7.

PART 3 EXECUTION

3.01 PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.02 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.03 CONSTRUCTION METHODS

- A. Pavement shall be constructed with mechanical equipment utilizing stationary side forms or by the use of slipform paving equipment without stationary side forms in accordance with MAG Section 324. Manual methods of placing and finishing concrete with stationary side forms may be permitted by the Engineer for areas inaccessible for mechanical equipment.

3.04 SUBGRADE PREPARATION

- A. Comply with comply with the recommendations set forth in the Geotechnical Evaluation Report, prepared by Speedie and Associates, and MAG Section 324.3.3. Subgrade shall conform to the compaction and elevation tolerances specified for the material involved, shall be kept smooth and compacted, and shall be free of all loose and extraneous material when concrete is placed.

3.05 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.06 PLACING, SPREADING AND COMPACTING

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- C. Do not add water to concrete during delivery, at Project site, or during placement.
- D. Comply with requirements of MAG Section 324.3.5 for placing, spreading and compacting Portland cement concrete paving.
- E. Shaping and Initial Finishing: In accordance with MAG Section 324.3.6.
- F. Utility manholes and valves shall be adjusted in accordance with MAG Section 345.

3.07 FINAL FINISHING

- A. General: Wetting of concrete surfaces to assist in finishing operations is not permitted unless approved by the Civil Engineer. When allowed, it shall be applied as a fog spray with approved equipment.
- B. Final finishing shall be in accordance with MAG Section 324.3.7.
 - 1. Texture: As indicated on Drawings or as directed by Architect and/or Civil Engineer.

3.08 CURING

- A. Curing shall begin immediately following surface texturing and edging. Cure concrete paving in accordance with MAG Section 324.3.8.

3.09 JOINTS

- A. Portland cement concrete paving joints and dowels shall conform to ACI 330R-87.
- B. Joints shall be provided in the pavement of the type, dimensions and at the locations as indicated in the plans or as specified in MAG Section 324.3.9.
- C. Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
 - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- D. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
 - 1. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 - 2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

- E. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 - 1. Locate expansion joints as indicated on approved Pavement Joint and Placement Plan.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Terminate joint filler less than 1/2 inch or more than 1 inch below finished surface.
 - 4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 - 5. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- F. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint for all epoxy-coated dowels installed in expansion joints.
- G. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 - a. Radius: 1/4 inch.
- H. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.
 - 1. Radius: 1/4 inch.
- I. Sealing of Joints: In accordance with MAG Section 324.3.9.5.4.

3.10 REPAIR OF NEW CONCRETE PAVING

- A. Contractor shall be responsible for replacing or repairing all areas of pavement containing uncontrolled cracking, surface spalls, or other types of surface defects as directed by the Architect and/or Civil Engineer. Repairs shall be made by methods acceptable to the Architect and/or Civil Engineer and the repair shall be completed to the satisfaction of the Architect and/or Civil Engineer.

3.11 FIELD QUALITY CONTROL

- A. Testing:
 - 1. Field Sampling and cylinder strength testing shall be conducted in accordance with MAG Section 725.8.
 - 2. Testing of concrete smoothness and pavement thickness shall be conducted in accordance with MAG Section 324.4.

3.12 PROTECTION

- A. Provide protection of finished concrete paving in accordance with MAG Section 324.5.

3.13 CLEANING

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises.

END OF SECTION

SECTION 32 14 13
CONCRETE PAVERS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Sand set exterior concrete unit pavers.
 - 2. Sand set exterior permeable unit pavers.

1.02 SUBMITTALS

- A. Manufacturer's literature: Submit manufacturer's literature, showing product data, including test reports, certificates, and installation instructions.
- B. Samples: Submit two samples of each paver indicated on the Drawings to be supplied on the Project.

1.03 QUALITY ASSURANCE

- A. Manufacturer qualifications: Company specializing in the manufacturing of solid concrete interlocking pavers for a period of 20 years.
- B. Installer Qualifications: The firm executing the Work of this Section shall have 5 years experience in work of similar scope and nature to that specified.
- C. Regulatory Requirements:
 - 1. ANSI A117.1, 2009 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
 - 3. 2010 ADA Accessibility Guidelines (ADAAG).
 - 4. The Arizonans with Disabilities Act (AzDA) (ARS Section 41-1492.03).
- D. Standards: Comply with the following:
 - 1. National Concrete Masonry Association (NCMA): TEK 87 – "Construction of Concrete Masonry Pavements".

1.04 DELIVERY, STORAGE AND HANDLING

- A. Acceptance: Concrete pavers shall be delivered and unloaded at the job site on pallets and bound in such a manner that no damage occurs to the product during hauling, handling or unloading.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of the following manufacturer, except as otherwise approved by the Architect, subject to compliance with specifications requirements:
 - 1. Acker-Stone Industries, Inc. www.ackerstone.com
 - 2. Oldcastle Architectural, Inc. www.belgard.biz.
 - 3. Pavestone Supply Company, Inc. www.pavestone.com
 - 4. As otherwise approved by Architect.

2.02 MATERIALS

- A. Permeable Unit Pavers: Precast permeable concrete unit pavers of type, size and pattern indicated on Landscape Drawings or as otherwise selected by Architect and or Landscape Architect.
- B. Concrete Pavers: In accordance with ASTM C902 or C936 and as follows.
 - 1. Concrete Pavers: Provide standard duty and heavy duty pavers as scheduled on Drawings.
 - 2. Sizes/Profiles: As indicated on Drawings.
 - 3. Thickness: Nominal 2-3/8 inch, or thickness as standard with unit type selected.
 - 4. Color(s): As selected by Architect.
 - 5. Composition:
 - a. Portland cement: ASTM C150
 - b. Aggregates: ASTM C 33 for Normal Weight Concrete Aggregate (no expanded shale or lightweight aggregates), except that grading requirements shall not necessarily apply.
 - c. Other Materials: Coloring pigments, air integral agents, integral water repellents, finely ground silica, etc., shall conform to ASTM standards as applicable, or shall be previously established as suitable for use in concrete as standard with manufacturer.
 - 6. Physical properties:
 - a. Compressive strength: At time of delivery to Project Site, average compressive strength shall not be less than 8,000 psi with no individual unit strength less than 7,200 psi, with testing procedures in accordance with ASTM C140.
 - b. Absorption: The average absorption shall not be greater than 5 percent with no individual unit absorption greater than 7 percent.
 - c. Resistant to 50 freeze-thaw cycles when tested in accordance with ASTM C67.
 - d. Joint Spacer Bars: Provide one 1/16 inch spacer bar per vertical face to facilitate a uniform nominal 1/8 inch joint dimension upon installation.
 - e. Efflorescence: Units shall be tested in accordance with ASTM C67 and shall have no efflorescence.
 - 7. Method of Manufacturing:
 - a. Individual layers on production pallets.
 - b. Produce a homogeneous matrix in the produced unit (face mix/surface mix product not allowed.)
 - 8. Tolerances:
 - a. Permissible Variations in Dimension: Length or width of units shall not differ by more than plus or minus 1/16 inch from approved samples. Heights of units shall not differ by more than plus or minus 1/8 inch from standard specified dimensions.
 - b. Defects: Minor cracks incidental to the usual methods of manufacture, or chipping resulting from customary methods of handling in shipment and delivery, shall not be deemed ground for rejection.

2.03 SETTING MATERIALS AND ACCESSORIES

- A. Aggregate Base Course: Clean mineral aggregate with particle size grading within limits as determined by ASTM C136. Plasticity index of the fraction of material passing the No. 40 sieve should be nonplastic when tested by ASTM D4318. Coarse aggregate should have a percent of wear, when subjected to the Los Angeles abrasion test (ASTM C 131), of no greater than 40.

- B. Stone Base Course for Permeable Unit Pavers:
 - 1. Bottom Layer: 1-1/2 inch to 3 inch open graded stone with no fines (AASHTO #2).
 - 2. Intermediate Layer: 3/4 inch to 1 inch open graded stone with no fines (AASHTO #57).
 - 3. Top Leveling Course: 1/4 inch open graded stone (AASHTO #8).
- C. Filter Fabric for Sand Set and Permeable Unit Pavers: Non-woven filter fabric, Tencate Mirafi 140N or equivalent from one of the following manufacturers:
 - 1. Tencate Mirafi Products www.tencate.com .
 - 2. Typar Geotextiles, Boddingtons USA a Fiberweb Company www.boddingtonsonline.com
 - 3. Geotextile Systems; Propex www.geotextile.com
 - 4. US Fabrics, Inc. www.usfabricsinc.com
 - 5. Colbond Building Products www.colbond-usa.com.
- D. Sand Laying Course: Clean washed Concrete sand, limestone screening, or similar with 100 percent passing a 3/8 inch sieve and a maximum of 3 percent passing a No. 200 sieve, containing no more than 10 percent of acid soluble material. Do not use Mason R4 sand.
- E. Sand Laying Course for Sand Set Permeable Pavers: Clean washed Concrete sand, limestone screening, or similar with 100 percent passing a 3/8 inch sieve and a maximum of 3 percent passing a No. 200 sieve, containing no more than 10 percent of acid soluble material. Do not use Mason R4 sand.
- F. Polymeric Joint Filling Sand for Sand Set Pavers: Provide polymer modified joint sand with uniformly blended mixture of joint filling sand with a polymeric additive.

PART 3 EXECUTION

3.01 PREPARATION

- A. Compacted Subgrade and Aggregate Base Course for Sand Set Pavers:
 - 1. Compacted fill beneath aggregate base course, including recompacted existing fill and backfill shall be minimum 90 percent compaction.
 - 2. Compact the aggregate base course to a minimum 95 percent compaction.
 - 3. Shape to grade and cross section with an allowable tolerance of 0-1/4" within a 10'-0" straight edge.
 - 4. Provide compacted thickness of aggregate base course as indicated on Drawings or as recommended by paver manufacturer for type of traffic.
- B. Surface Preparation for Sand Set pavers: In accordance with NCMA TEK 11-2 and as follows:
 - 1. Filter Fabric: Place filter fabric over prepared subgrade as indicated on Drawings and in accordance with manufacturer's instructions prior to placement of sand laying course. Maintain a minimum 1 foot overlap at all filter fabric joining seams.
 - 2. Over installed filter fabric, spread sand laying course as indicated on Drawings evenly over the area to be paved, in compacted thickness as indicated on Drawings.
 - 3. Screed the sand to a level that shall produce a 2 inch thickness when the pavers have been placed and vibrated.
 - 4. Pull a striking board over the screeds, several times and reseed low porous spots with additional sand to produce a smooth, firm and even setting bed.

5. Provide proper level of sand such that the final elevation of pavers is nominally 1/8 inch higher than the adjacent curb, gutters, or other paving to allow for free drainage from chamfers on block edges.
 6. Do not disturb the laying course once screeding and leveling to the desired elevation is achieved.
- C. Surface Preparation for Permeable Unit Pavers: In accordance with NCMA TEK 11-2 and as follows:
1. Filter Fabric: Place filter fabric over prepared subgrade as indicated on Drawings and in accordance with manufacturer's instructions prior to placement of sand laying course. Maintain a minimum 1 foot overlap at all filter fabric joining seams.
 2. Stone Base Course Layers (Drainage Layers):
 1. Over installed filter fabric, spread bottom layer of 1-1/2 inch to 3 inch open graded stone to depth required by civil engineer.
 2. Intermediate Layer: Spread intermediate layer of 3/4 inch to 1 inch open graded stone to depth required by civil engineer.
 3. Top Leveling Course: Spread top leveling course of 1/4 inch stone to total depth of 1 inch to 1-1/2 inches evenly over the area to be paved.
 3. Screed the top leveling course to produce a flat level surface for pavers.
 4. Pull a striking board over the screeds, several times and reseed low porous spots with additional 1/4 inch stone to produce a smooth, firm and even setting bed.
 5. Provide proper level of stone such that the final elevation of pavers is nominally 1/8 inch higher than the adjacent curb, gutters, or other paving to allow for free drainage from chamfers on block edges.
 6. Do not disturb the laying course once screeding and leveling to the desired elevation is achieved.

3.02 INSTALLATION

- A. Placement: In accordance with NCMA TEK 11-2 and as follows:
1. Pattern shall be as indicated on the Drawings.
 2. Pavers shall be placed in such a manner that the desired pattern is maintained and the joints between the pavers are nominally 1/8 inch with no individual gap exceeding 3/16 inch.
 3. Use string lines to hold pattern true. Lines shall not deviate more than plus or minus 1/2 of an inch in 100 linear feet.
 4. Gaps at the edge of the paver surface shall be filled with standard pavers or with pavers cut to fit.
 5. Alternately selected pavers from at least 3 pallets, working from top to bottom of each pallet stack.
- B. Cutting:
1. Adjust bond pattern at pavement edges such that cutting of edge pavers is minimized.
 2. The cutting of pavers, using a doubleheaded breaker or a masonry saw shall leave a maximum 1/4" underbite.
 3. Masonry saw shall be used when cutting Precision designed area(s).
- C. Sand-Set Unit Pavers and Stone-Set Pervious Unit Pavers:
1. Vibrate pavers into the sand or stone laying course using a vibrator capable of 3,000 to 5,000 pounds compaction force with the surface clean and the joints open.
 2. After vibration, joint filling sand shall be spread over the paving stone surface, allowed to dry, and vibrated into the joints with additional vibrator passes and brushing so as to completely fill the joints.
 3. Surplus material shall be swept from the surface.

- D. The finished elevation of pavers shall not deviate more than 1/4 inch within a 10'-0" straightedge, except as indicated otherwise on Drawings for drive and pavement slopes and for sloping to drainage areas.
- E. Provide additional sanding of sand set paver joints for a period of 90 days after completion of work, including joint stabilization sealer as necessary for new sand.

3.03 ADJUSTING AND CLEANING

- A. Adjusting: Adjust any misaligned or out of level pavers by removing and resetting to the correct position.
- B. Cleaning: Upon completion of this portion of the work, wash down and clean exposed portions to provide a clean finished installation.

END OF SECTION

SECTION 32 16 00

CONCRETE CURBS, GUTTERS, SIDEWALKS, AND DRIVEWAYS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Concrete curbs, gutters, sidewalks and driveways as shown on the Drawings, including cutting and patching of existing concrete curbs, gutters, walks and driveways where removed or modified to accommodate new construction.
- B. Related Sections:
 - 1. Section 31 13 13 – Concrete Paving, for portland cement concrete paving and accessories.

1.02 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with applicable Federal, State and local ordinances, including MAG Specifications. Where geotechnical report, General Structural Notes, or notes on drawings state more restrictive requirements, the requirements of the geotechnical report, General Structural Notes, or notes on drawings shall govern.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Concrete for Curbs, Gutters, Sidewalks, and Sidewalk Ramps: Class B, complying with applicable requirements of MAG Section 725.
- B. Concrete for Drives: Comply with Section 1006 of the ADOT Standard Specifications and recommendations of the Report on Geotechnical Investigation.
- C. Expansion Joint Filler: MAG Section 729.
- D. Epoxy Resin: Sta-Crete Epoxy Resin No. 15-J or 20.
- E. Curing Compound: ASTM C309, Type 1, Class B; acrylic type.
- F. Traffic Joint Sealant: As specified in Section 07 92 00.

PART 3 EXECUTION

3.01 PREPARATION

- A. Cut existing pavements and concrete joined by new construction in accordance with MAG Sections 336 and 350. Saw-cut and remove existing concrete at stable undisturbed material to remain or extend removal to construction joint.
 - 1. Do not disturb existing base course materials at concrete to remain.
 - 2. Remove and recompact existing subgrades and/or base course materials necessarily disturbed, that are loose, or un-bound.
 - 3. Saw-cut existing concrete vertically to full depth.

4. Saw-cut and remove areas in square, rectangular or trapezoidal shapes. Do not leave irregular or fractured faces of any size.
 5. Remove existing walks and/or drives as indicated or as necessary to tie into and match finished elevations of new Work.
- B. Construct subgrade and compact true to grades and lines shown on Drawings and as specified in MAG Section 301.
- C. Do not disturb previously prepared subgrades and subbase course. Where loose soils are encountered beneath pavements, scarify, moisture condition and properly recompact soils in compliance with Section 32 00 00.
- D. Material displaced during construction shall not be placed on base or surfacing material already in place on roadway. Do not place excavated material in manner as to interfere with access to property or traffic flow in street.
- E. Remove existing walks and/or drives as indicated and as required to tie into and match finished elevations of new Work.

3.02 CONCRETE CONSTRUCTION

- A. Construct concrete curbs, gutters and sidewalks by conventional use of forms, or by means of a curb and gutter machine when approved by Architect.
1. If machines designed specifically for such work and approved by the Architect are used, results must be equal to or better than that produced by use of forms.
 2. If the results are not satisfactory to Architect, discontinue use.
 3. Requirements applicable to use of forms shall apply to use of machines.
- B. Extruded Concrete Curbs Without Gutter: Provide extruded concrete formed-in-place curbs to cross section and locations as shown on Drawings and as specified.
- C. Concrete for Curbs, Gutters and Sidewalks: 40 percent stone by weight and extruded in a zero slump condition.
- D. Jointing: Finish all joint fillers in continuous one-piece lengths.
1. Construct expansion and control joints vertical, and at right angles to centerline of drive and match joints in adjacent pavement or sidewalks.
 2. Concrete drives: Provide expansion joints at maximum 15 feet o.c., unless otherwise indicated on Drawings.
 3. Curbs, Gutters and Walks: Provide expansion joints at maximum 20 feet o.c., unless otherwise indicated on Drawings.
 4. Provide construction joints at all side and end terminations.
 5. Provide isolation joints at all areas abutting curbs, catch basins, manholes and similar civil structures, walks, buildings, and other fixed objects.
 6. Construct expansion joints at radius points, driveways, alley entrances and at adjoining structures.
 7. Construct contraction joints as detailed.
 8. Fill expansion and contraction joints with traffic joint sealant as specified in Section 07 92 00.
- E. Bonding:
1. Bond extruded concrete curbing to asphalt surfacing by use of SS-1-H or CSS-1-H cutback asphalt tack coat conforming to requirements of MAG Section 713.
 2. Apply tack coat in a manner approved by Architect to provide a uniform continuous coating 1/8 to 3/16 inch in thickness and a width one inch less than the base width of curbing.

3. Take care to prevent spills or running of tack coat over surface of finished asphalt pavement.
 4. Bond extruded concrete curbing to concrete surfaces by use of an epoxy resin.
- F. Forms:
1. Carefully set forms to line and grade, securely staked in position and conforming to dimensions of curbs, gutters, sidewalks, driveways and alley intersections.
 2. Moisten forms and subgrade immediately in advance of placing concrete.
 3. Clean forms thoroughly each time they are used, and coated with a light oil, or other releasing agent of a type which will not discolor concrete.
 4. Thoroughly spade concrete away from forms so that there will be no rock pockets next to forms.
 5. Concrete may be compacted by mechanical vibrators approved by Architect.
 6. Continue tamping or vibrating until mortar flushes to surface, and coarse aggregate is below concrete surface.
- G. Shape edges with tool formed to round edges to radius indicated on standard details.
- H. Form Removal:
1. Do not remove front face form before concrete has taken initial set and has sufficient strength to carry its own weight.
 2. Do not remove gutter forms and rear forms until concrete has hardened sufficiently to prevent damage to the edges.
 3. Take special care to prevent damage.
 4. Repair any portion of concrete damaged while stripping forms. If damage is severe, replace at no additional cost to Owner.
- I. Finishing and Curing:
1. Comply with MAG Section 505 and Specifications Section 03 30 00 for finishes and special finishes, and as indicated on Drawings.
 2. Take care in extruding radiuses and corners to prevent cracking and breaking of concrete curbing.
 3. Finish extruded curbs immediately after placing to achieve a surface comparable to a uniform broom finish.
 4. Spray extruded curbs with curing agent sealer immediately after placing.
 5. Thoroughly fill, bond, and finish breaks or cracks to match remaining installation in manner approved by Architect.
 6. Curbing found unacceptable by Architect to be replaced at Contractor's expense.
- J. Backfilling: Unless otherwise specified, backfill behind curbs or sidewalk with native soil to lines and grades shown on Drawings.

3.03 FIELD QUALITY CONTROL

- A. Testing:
1. Test face, top, back and flow line of curb and gutter with a 10-foot straightedge or curved template, longitudinally along surface.
 2. Correct deviations in excess of 1/4 inch.
 3. Test surface of concrete sidewalks with a 5-foot straight edge. Correct deviations in excess of 1/8 inch.
 4. Gutters:
 - a. When required by Architect, water test gutters having a slope of 0.8 foot per 100 feet or less, and where unusual or special conditions indicate gutter may not drain satisfactorily.
 - b. Water testing consists of establishing flow in length of gutter to be tested by supplying water from a hydrant, tank truck or other source.

- c. One hour after supply of water is shut off, inspect gutter for evidence of ponding or improper shape.
 - d. In the event water is found ponded in gutter to a depth greater than 1/2 inch, or on the adjacent pavement, correct defect or defects in a manner acceptable to Architect.
5. Remove and replace sections of Work deficient in depth or not conforming to Drawings or Specifications.

3.04 CLEANING

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises.

END OF SECTION

SECTION 32 17 13

WHEEL STOPS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes precast concrete wheel stops and anchoring devices.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Wheel Stops: Provide wheel stops conforming to one of the following:
 - 1. Comply with MAG Standard Detail 150, Type B-3, and MAG Uniform Standard Specifications Section 410.
 - 2. Precast concrete, 3-1/2 percent minimum air-entrained concrete, 4,000 psi minimum compressive strength. Each stop shall be reinforced with two No. 4 deformed steel reinforcing bars, minimum. Provide chamfered corners and drainage slots on underside, and provide holes for dowel-anchoring to substrate. Half octagonal configuration, 72 inches length.
- B. Adhesive for Bonding Dowel to Wheel Stop: As proposed by Contractor and approved by the Engineer, suitable for application.
- C. Steel Bar Hold Down Pins: Galvanized 5/8 inch diameter steel dowels or galvanized No. 5 steel reinforcing bars.
- D. Anchoring Adhesive: 2-component epoxy adhesive complying with MAG standard Specifications.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install bumpers at locations indicated on Drawings.
- B. Concrete Pavement Areas: Install each unit with epoxy adhesive. Use adhesive in accordance with manufacturer's printed instructions.
- C. Asphalt Pavement Areas: Install each unit with hold-down pins driven through pavement.

END OF SECTION

SECTION 32 17 23
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Traffic marking and striping for pavement and curbs as shown on Drawings.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's specifications for paint.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Traffic Surface Paint: Approved products include, but are not limited to the following:
1. Sherwin-Williams, Pro-Park www.sherwin-williams.com Waterborne Traffic Marking Paint B97 Series, or STAR-Brite Latex Traffic Line Paint S11 Series.
 2. PPG Architectural, Ennis www.ppg.com Waterborne Traffic Paint Lead Free Yellow 445017, Waterborne Traffic Paint White 445018, or Zoneline Traffic & Zone Marking Paint 11-53.
 3. Kelly-Moore, Traffic Marking Paint www.kellymoore.com Curb Marking Paint waterborne Semi-Gloss 1473, Zone Marking Paint Lead Free Waterborne 1472.
 4. Benjamin Moore www.benjaminmoore.com, Coronado Super Kote Quick Dry Acrylic Traffic Paint 1406 Line, or Insi-x Traffic Paint Acrylic Latex TP-2200.
 5. Lanco www.lancopaints.com Super traffic waterborne, Super Traffic TL Line, or Painters Marking Coat, Painters traffic VA Line.
 6. Ennis-Flint www.ennisflint.com EF Series Standard Dry Waterborne traffic paint.
 7. Professional Pavement Products, Inc. www.pppcatalog.com Prostripe Plus Waterborne Traffic Paint.
 8. Sealmaster Pavement Products and Equipment www.sealmaster.net Sealmaster Acrylic Traffic Paint.
 9. Products listed in the MAG Uniform Standard Specifications.
- B. Traffic Surface Paint Colors: As follows, unless otherwise indicated on Drawings:
1. Stall Striping and Traffic Markings: Traffic White
 2. Handicap Markings: Traffic Yellow.
 3. Fire Lanes: Red.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Prepare chalk layout and obtain Architect's approval prior to start of marking and striping.

3.02 PREPARATION

- A. Thoroughly clean surfaces of substances which may inhibit bonding.

3.03 APPLICATION

- A. Apply paint with equipment suited for that purpose in accordance with Manufacturer's directions.
 - 1. Paint lines straight and true to pattern layout. Correct errors by sandblasting. Apply paint at manufacturer's recommended rates to obtain a dry film thickness of 8 mils minimum in a minimum of two (2) coats.
 - 2. Stall Divisions: Provide between standard size parking stalls, a single 4 inch wide stripe, stall width as shown on Drawings.
 - 3. Arrows and Pavement Signs: Paint directional arrows with stencils or other approved method. Strokes of letters, islands and "No Parking" areas to have 3 inch wide strips.
 - 4. Handicap Stalls: Provide symbol and other markings as approved by Architect.
 - 5. Fire Lanes: Provide red painted curbs as required.
 - 6. Protect completed Work until dry.

END OF SECTION

SECTION 32 17 26

DETECTABLE/TACTILE WARNING SURFACES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Modular tactile/detectable warning surface paver tiles and setting materials.
- B. Related Sections:
 - 1. Section 32 16 00 – Concrete Curbs, Gutters Sidewalks and Driveways, for concrete walk ramps where detectable warning tiles will be installed.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's literature describing products, installation procedures and routine maintenance.
- B. Samples for Verification Purposes: Submit three (3) tile samples minimum 6 inches by 8 inches of the kind proposed for use.

1.03 QUALITY ASSURANCE

- A. Provide Modular Paver Tactile Tile and accessories as produced by a single manufacturer.
- B. Installer's Qualifications: Engage an experienced Installer certified in writing by tactile manufacturer as qualified for installation, who has successfully completed tile installations similar in material, design, and extent to that indicated for Project.
- C. Americans with Disabilities Act (ADA): Provide Detectable/Tactile Warning Surface Panels which comply with the detectable warnings on walking surfaces section of the Americans with Disabilities Act (Title III Regulations, 28 CFR Part 36 ADA STANDARDS FOR ACCESSIBLE DESIGN, Appendix A, Section 4.29.2 DETECTABLE WARNINGS ON WALKING SURFACES).

1.04 DELIVERY, STORAGE AND HANDLING

- A. Tiles shall be suitably packaged or crated to prevent damage in shipment or handling. Finished surfaces shall be protected by sturdy wrappings. And tile type shall be identified by part number.
- B. Tiles shall be delivered to location at building site for storage prior to installation.

1.05 SITE CONDITIONS

- A. Environmental Conditions and Protection: Temperature shall be minimum of 40 degrees F at location to receive tactile tiles for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation.
- B. Water used for work, cleaning or dust control, etc. shall be contained and controlled and shall not be allowed to come into contact with the public. Provide barricades or screens as required to protect public.

- C. Disposal of any liquids or other materials of possible contamination shall be made in accordance with federal state and local laws and ordinances.
- D. Cleaning materials shall have code acceptable low VOC solvent content and low flammability if used on the site.

1.06 EXTRA STOCK

- A. Deliver extra stock to storage area designated by Architect. Furnish new materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identification for modular paver tiles. Furnish not less than 2 percent of the supplied materials for each type, color and pattern installed, but not less than 2 tiles.

1.07 GUARANTEE

- A. Modular Paver Tactile Tile shall be guaranteed in writing for a period of five years from date of final completion. The guarantee includes defective work, breakage, deformation, and loosening of tiles.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Available Products: Subject to compliance with ADA and other specified requirements, provide one of the following, subject to approval by Architect:
 - 1. Armor-Tile Vitrified Polymer Composite (VPC) Modular Paver Tactile Tile as manufactured by Engineered Plastics Inc. (800-682-2525) www.armor-tile.com .
 - 2. Tekway Detectable Warning concrete panels as manufactured by StrongGo LLC, Tucson, Arizona www.stronggo.com
 - 3. As approved by the Architect.
- B. Tactile/Detectable Warning Surface Tiles:
 - 1. Precast Concrete Lightweight Panels: High compressive strength lightweight precast concrete containing salt river aggregate and proprietary additives.
 - a. Thickness: 5/8 inch.
 - b. Size: As scheduled on Drawings.
 - 2. Vitrified Polymer Composite (VPC) Modular Paver Tactile Tile: Epoxy polymer composition with ultraviolet stabilized coating employing aluminum oxide particles in the truncated domes.
 - a. Thickness: 1.4 inch.
 - b. Size: As scheduled on Drawings.
- C. Where available from the manufacturer, provide tiles with integral anchors cast into pavers for wet installation into concrete walk.
- D. Color(s): As selected by Architect from manufacturer's full line of colors.
- E. Installation Materials: Provide paver manufacturers recommended thin-set acrylic modified Portland cement thin set mortar and joint grout.
- F. Sealants: Traffic bearing sealant as recommended by paver manufacturer and complying with section 07 92 00.
 - 1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install tiles/pavers in accordance with manufacturer's setting and finishing instructions.
- B. During tile installation procedures ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.
- C. Install sealant and related materials shall be in accordance with paver manufacturer's recommendations and the guidelines of sealant manufacturers.
- D. Layout Modular Pavers/Tiles and joints to fit existing spacing as detailed on the project drawings, or as approved on shop/layout drawings.
- E. Use electronic level or other acceptable devices to verify that the required slope is achieved. Tiles shall be placed true and square to the curb edge in accordance with the contract drawings.
- F. Set tiles into wet concrete or by thin-setting onto cured concrete as recommended by the tile manufacturer, as follows:
 - 1. Setting into Wet Concrete: The Modular Paver/Tiles shall be tamped into substrate to ensure that the field level of tile is flush to the adjacent surfaces and set to permit proper water drainage and eliminate tripping hazards between adjacent finishes.
 - 2. Thin-Set Tile: Set tile into position using manufacturer's recommended mortar and grout materials.
- G. Elevation differences between tiles and between tile and adjacent surfaces shall not exceed 1/16 inch.
- H. Vacuum clean, mechanically abrade and solvent wipe the joints between Modular Paver Tactile Tiles.
- I. Place 3/8 inch diameter foam rope at bottom of all sealant joints.
 - 1. Tape off each side of leading edge groove in preparation for the self leveling urethane sealant.
 - 2. Apply urethane sealant in joints filling flush to top of tiles, then remove tape prior to curing.

3.02 CLEANING AND PROTECTING

- A. Protect Modular Tactile Pavers against damage during construction period to comply with tactile tile manufacturer's specification.
- B. Clean Modular Tactile Pavers prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Clean Pavers by method specified by the manufacturer.

END OF SECTION

SECTION 32 31 19

DECORATIVE METAL FENCES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes decorative welded tube steel fencing as shown on Drawings and as specified herein.
- B. Related Sections:
 - 1. Division 03 Concrete Sections for fence footings.
 - 2. Division 04 Masonry Sections for concrete unit masonry walls.
 - 3. Section 05 50 00 – Metal Fabrications, for steel framed rolling gates and man gates.

1.02 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer: Provide certification that manufacturer has been in business for a minimum of 5 years fabricating and finishing decorative metal fencing comparable to that specified in this Section and as detailed on Drawings.
 - 2. Subcontractor Qualifications: Fabricate and install the work of this Section using a subcontractor having a minimum of 3 years experience and trained in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance and desired aesthetic affect of the work of this Section.
- B. Welder Qualifications: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."
- C. Reference standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following.
 - 1. NAAMM Metal Finishes Manual
 - 2. AWS Structural Welding Code

1.03 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings showing layouts, dimensions, construction details and installation, including fastening devices and connection to adjoining construction and relationship with other work.
- B. Submit manufacturer's color charts or color sample units showing full range of available powder coated finish colors and finishes for initial selection purposes.
- C. Submit samples for verification purposes of powder coated finish in color selected by Architect.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Coordinate delivery of fencing from Fencing Manufacturer.
- B. Storage: Store off ground and under cover, protected from damage in accordance with fencing manufacturer's instructions.

- C. Handling: Handle materials so that surfaces are protected. Prevent distortion or damage to fabricated pieces.

1.05 WARRANTY

- A. Provide manufacturers standard 20-year warranty covering defects in material finish, including cracking, peeling, chipping, blistering or corroding, covering all structural fence components (i.e. rails, pickets, and posts), for a period of 20 years. Warranty covers reimbursement of labor necessary to restore or replace components found to be defective for a period of 5 years.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Steel material for fence panels and posts shall conform to the requirements of ASTM A653, with a minimum yield strength of 45,000 psi and a minimum zinc (hot-dip galvanized) coating weight of 0.60 oz/ sq. ft., Coating Designation G-60.
- B. Material for pickets shall be 3/4-inch square x 18 Ga. tubing. The rails shall be steel channel, 1-1/2 inches x 1.4375 inches x 14 Ga. Picket holes in the rail shall be spaced 3-1/2 inches on center for 3-inch air space. Fence posts and gate posts shall meet the following minimum size requirements:

Minimum Posts Sizes		
Fence Posts	Panel Height	
2-1/2" x 16 Ga.	Up to & Including 6' Height	
Gate Leaf	Gate Height	
	Up to & Including 4'	Over 4' Up to & Including 6'
Up to 4'	2-1/2" x 14 Ga.	3" x 12 Ga.
4'1" to 6'	3" x 12 Ga.	3" x 12 Ga.
6'1" to 8'	3" x 12 Ga.	4" x 12 Ga.

- C. Rail Attachment Brackets:
- 90-degree design for straight (plumb and level) fence applications.
 - Adjustable Bracket: Provide ball and socket design capable of 30-degree swivel (up/down – left/right) for angled installations as necessary.
- D. Picket Tops/Caps/Adornments: Provide types and design as indicated on Drawings, matching fence posts and pickets in finish and color. If not indicated, provide manufacturer's standard cap designed for insertion into top of open pickets and posts.
- E. Anchor and Expansion Bolts: ASTM A307 anchor bolts with hot-dipped galvanized finish, unless otherwise noted. Expansion bolts to have I.C.B.O. rating for material into which the installation takes place. Furnish anchor and expansion bolts with steel washers.
- F. Concrete Footings: Normal weight 3,000 psi 28-day compressive strength, 3 inch slump, 1 inch maximum aggregate size concrete complying with Division 03 Concrete Sections, unless otherwise noted on Drawings.
- G. Touch-Up Primer and Finish: Provide manufacturers spray cans or paint pens to touch-up prime and finish exposed surfaces.

2.02 COMPONENTS AND HARDWARE

- A. Pickets, Rails, Curved Security Tops, and Posts: Sizes and designs indicated on Drawings.

2.03 FABRICATION

- A. Fabricate fencing and gates to configurations shown on Drawings.
- B. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.
- C. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by fusion welding process, thus completing the rigid panel assembly.
- D. Manufactured panels and posts shall be subjected to an inline electrode position coating (E-Coat) process consisting of a multi-stage pretreatment/wash (with zinc phosphate), followed by duplex application of epoxy primer and acrylic topcoat. Minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils.
 - 1. Color: As selected by Architect from manufacturer's standard available colors.
 - 2. Coated panels and posts shall be capable of meeting or exceeding coating performance criteria of ASTM F2408.
- E. Manufactured fence system shall be capable of meeting vertical load, horizontal load, and infill performance requirements for Industrial weight fences under ASTM F2408.
- F. Post Bases at CMU Walls: Where indicated on CMU stem walls, fabricate posts with welded steel base plates for attachment to concrete unit masonry walls, or with extended post length for embedment into CMU wall construction.
- G. Post Base for Footings: Fabricate posts of length indicated with concrete stud anchors for embedment into concrete footings as detailed.
- H. Insulate contact joints between dissimilar materials to prevent electrolytic or corrosive action.

2.04 FINISHES

- A. Powder Coat Finish: Provide multi-step oven cured TGIC powder coated finish consisting of thorough cleaning, pretreatment, powder coat primer and Ultra polyester finish (TGIC) at 2-4 mils.
 - 1. Color: As selected by Architect from Fence Manufacturer's full range of colors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
 - 1. Verify areas to receive fencing are completed to final grades and elevations.

- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Posts:
 - 1. Space posts uniformly as shown on Drawings.
 - 2. Anchor post bases to supporting concrete masonry wall construction with anchor bolts set into CMU wall construction as detailed. Check each post for vertical and top alignment and maintain in position during placement of anchor bolts.
 - 3. Where embedded in concrete, check each post for vertical and top alignment, and maintain in position during placement and concrete curing.
 - 4. Align fence panels between posts. Firmly attach rail brackets to posts.
- B. Posts shall be set in concrete footers having a minimum depth of 36 inches. Provide footing sizes of the following minimum diameter, but not less than diameters and depth of embedment recommended by the fence manufacturer.
 - 1. Refer to Section 31 00 00 – Earthwork and Division 03 Concrete Sections for forming, reinforcement and cast-in-place concrete for footings.
 - 2. Footing Diameters – Minimum:
 - a. End and Corner Posts: 12 inches diameter.
 - b. Line Posts: 10 inches diameter.
 - c. Gate Posts: Size and depth as required by size and weight of gate, 12 inches diameter.
 - 3. Footing Tops: Shall be troweled smooth and beveled or crowned to drain moisture away from posts. Lower edge of bevel shall meet established finish grade.
- C. Install posts and vertical members plumb within 1/8 inch of vertical. Install longitudinal members parallel with each other and level to within 1/8 inch per 10 running feet.
- D. Comply with the following steps when cutting/drilling rails or posts:
 - 1. Remove all metal shavings from cut area.
 - 2. Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole and allow to dry.
 - 3. Apply 2 coats of custom finish paint matching fence color
 - 4. Failure to seal exposed surfaces per steps 1-3 above will negate warranty.

3.03 ADJUSTMENT

- A. Touch up pre-finished surfaces damaged by installation to perfectly match powder coated finish using compatible touch-up paint recommended by Manufacturer.

3.04 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 32 31 40

GATE OPERATOR

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Prewired, self-contained gate operators for steel framed horizontal sliding/rolling entrance gates specified in Section 05 50 00.
 - 2. Attachments and accessory equipment.
- B. Related Documents: The following Documents contain requirements that may relate to this Section:
 - 1. Section 05 50 00 – Metal Fabrications, for steel framed horizontal sliding gates.
 - 2. Section 03 30 00 – Cast-In-Place Concrete.
 - 3. Division 26 - Electrical: Electrical service and connection.

1.02 SUBMITTALS

- A. Submit manufacturer's catalog data with applicable information and notations, installation instructions and operation and maintenance manuals.
- B. Shop drawings shall include:
 - 1. Connections to all conditions of adjacent construction and gate types.
 - 2. Complete gate information indicating type and size of operator unit, range of travel, and electrical requirements.
 - 3. All electrical wiring diagrams for power and control.
 - 4. Size, location of concrete mounting pads.
- C. Test Reports:
 - 1. Submit affidavits from the manufacturer demonstrating that the gate mechanism has been tested to 200,000 cycles without breakdown.
 - 2. Each operator shall bear a label indicating that the operator mechanism has been tested for full power and pressure of all hydraulic components, full stress tests of all mechanical components and electrical tests of all overload devices.

1.03 QUALITY ASSURANCE

- A. Manufacturer's Qualification: Company specializing in the manufacture of security gate operators of the types specified with a minimum of five years experience. Manufacturer shall have a factory trained and authorized dealer in the metropolitan area of this project.
- B. Installer Qualifications: Company approved by the operator manufacturer and with a minimum of 3 years experience installing equipment similar to the equipment specified.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Store products upright in the original shipping containers, covered, ventilated and protected from all weather conditions.

1.05 WARRANTY

- A. Provide five-year limited warranty against all defects in materials or workmanship; except batteries, which are covered under a one-year warranty. Defective materials shall be replaced with comparable materials furnished by the manufacturer, at no cost to the owner. Freight, labor and other incidental costs are not covered under the factory warranty, but may be covered by a separate service agreement between installing company and the owner.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

- A. Gate Operator: HySecurity gate operators model SlideDriver 40 (222 E ST) with Smart Touch Controller, or as otherwise required for size, weight and control requirements of gate.
- B. Gate operators shall be sized by the manufacturer to perform in conformance with scheduled and specified requirements for gate size, weight, function, design, and electrical and control requirements.

2.02 HORIZONTAL SLIDING GATE OPERATOR

- A. Operation: Operation shall be by means of a metal rail passing between a pair of solid metal wheels with polyurethane treads. Operator motors shall be hydraulic, geroller type, and system shall not include belts, gears, pulleys, roller chains or sprockets to transfer power from operator to gate panel. The operator shall generate a minimum horizontal pull of 300 (136 kg) pounds without the drive wheels slipping and without distortion of supporting arms. Operator shall be capable of handling gates weighing up to 4000 pounds (1,814 kg). Gate panel velocity shall not be less than 1.0 feet (.30 m) per second and shall be stopped gradually to prevent shock loads to the gate and operator assembly. The “soft stop” feature of the gate operator shall be controlled by two adjustable hydraulic brake valves (one for each direction).
- B. Standard mechanical components shall include as a minimum:
 - 1. Supporting arms: Cast aluminum channel. Arms shall incorporate a fully bushed, 1-1/2 inch bronze bearing surface, acting on arm pivot pins.
 - 2. Arm pivot pins: 3/4 inch diameter, stainless steel, with integral tabs for ease of removal.
 - 3. Tension spring: 2-1/2 inch heavy duty, 800 pound capacity.
 - 4. Tension adjustment: Finger tightened nut, not requiring the use of tools.
 - 5. Drive release: Must instantly release tension on both drive wheels, and disengage them from contact with drive rail in a single motion, for manual operation.
 - 6. Limit switches: Fully adjustable, toggle types, with plug connection to control panel.
 - 7. Electrical enclosure: Oversized, metal, with hinged lid gasketed for protection from intrusion of foreign objects, and providing ample space for the addition of accessories.
 - 8. Chassis: 1/4 inch steel base plate, and 12 Gauge sides and back welded and ground smooth.
 - 9. Cover: 16 Ga. zinc plated steel with textured TGIC polyester powder coat finish. All joints welded, filled and ground smooth. Finished corners square and true with no visible joints.

10. Finish: Zinc plated steel with textured TGIC polyester powder coat finish, proven to withstand 1000-hour salt spray test.
 11. Drive wheels: Two 6 inch diameter high-strength composite hub with polyurethane over mold.
 12. Drive rail: Shall be extruded 6061 T6, not less than 1/8 inch thick. Drive rail shall incorporate alignment pins for ease of replacement or splicing. Pins shall enable a perfect butt splice.
 13. Hydraulic hose: Shall be 1/4 inch synthetic, rated to 2750 PSI.
 14. Hydraulic valves: Shall be individually replaceable cartridge type, in an integrated hydraulic manifold.
 15. Hose fittings: At manifold shall be quick-disconnect type, others shall be swivel type.
 16. Hydraulic fluid: High performance type with a viscosity index greater than 375 and temperature range minus 40 deg. F to 167 deg. F.
 17. A zero to 2000 PSI pressure gauge, mounted on the manifold for diagnostics, shall be a standard component.
 18. The hydraulic fluid reservoir shall be formed from a single piece of metal, non-welded, and shall be powder painted on the inside and the outside, to prevent fluid contamination.
- C. Minimum standard electrical components:
1. Pump motor: Shall be minimum 2 HP, 56C, 24 V DC motor.
 2. All components shall have overload protection.
 3. Controls: Smart Touch Controller Board with 256K of program memory containing:
 - a. inherent entrapment sensor;
 - b. built in “warn before operate” system;
 - c. built in timer to close;
 - d. liquid crystal display for reporting of functions;
 - e. 26 programmable output relay options;
 - f. anti-tailgate mode;
 - g. built-in power surge/lightning strike protection;
 - h. menu configuration, event logging and system diagnostics easily accessible with a PC and HySecurity’s free START software;
 - i. RS232 port for connection to laptop or other computer peripheral and RS485 connection of Master/Slave systems or network interface.
 4. Control circuit: 24VDC.
- D. Required external sensors: Photo eyes to be installed such that the gate is capable of reversing in either direction upon sensing an obstruction.
- E. Control devices: Card reader, vehicle loop detectors, and connections to Owners Opta-Com control system.
- F. Options:
1. Lock for operator cover.
 2. Drive wheel manual release indicator switch.
 3. Through Beam or Reflective type photo eyes, open and close direction.
 4. HY-5A plug in loop detectors.
 5. Key operated cable manual release (secure side of gate).
 6. HySecurity factory drive rail.

PART 3 EXECUTION

3.01 SITE EXAMINATION

- A. Locate concrete mounting pad in conformance with approved shop drawings.
- B. Determine that gate operates smoothly under manual conditions prior to installation of gate operator.
- C. Verify electrical service for operator is properly installed and is at least 20 AMPS (operator wattage is 1000).

3.02 INSTALLATION

- A. Install gate operator in accordance with the manufacture's printed Instructions, current at the time of installation.
- B. Coordinate locations of operators with approved shop drawings, electrical and control connections.

3.03 FIELD QUALITY CONTROL

- A. Test gate operator though ten full cycles and adjust for operation without binding, scraping, or uneven motion.
- B. Test limit switches for proper gate position.
- C. Anchors bolts shall be fully concealed in finished installation.

3.04 SERVICE AND DOCUMENTATION

- A. Train Owner's personnel in the general maintenance of the gate operators and accessories.
- B. Provide Operation and Maintenance manuals as specified elsewhere, including VHS videotape showing all the components of the gate operator. Identify all pads and systems. Show in detail how parts are installed and serviced in the field.

END OF SECTION

SECTION 32 80 00

IRRIGATION



PART 1 GENERAL

Work for this Section includes the provision of an underground drip irrigation system, including the following:

- A. Trenching, stockpiling excavation materials, and refilling trenches.
- B. Complete system including but not limited to backflow preventer, piping, valves, fittings, emitters, controllers and wiring, and final adjustments to ensure comprehensive coverage.
- C. Water connections.
- D. Replacement of defective materials.
- E. Clean up, inspection, and approval.
- F. Tests.

1.01 REFERENCES

Perform Work per requirements of Conditions of the Contract and Division 1 - General Requirements as well as provisions of all applicable laws, codes, ordinances, rules, and regulations.

Conform to requirements of reference information listed below except where more stringent requirements are shown or specified in Contract Documents.

- A. American Society for Testing and Materials (ASTM) - Specifications and Test Methods are specifically referenced in this Section.
- B. Underwriters Laboratories (U.L.) - U.L. Wires and Cables.

1.02 RELATED SECTIONS

- A. SECTION 01 81 00 SUSTAINABLE DESIGN REQUIREMENTS contains requirements for Work that may affect this Work.
- B. SECTION 02 41 00 DEMOLITION contains requirements for Work that may affect this Work.
- C. SECTION 31 00 00 EARTHWORK contains requirements for Work that may affect this Work.
- A. Section 32 90 00, PLANTING, may contain requirements for irrigation.

1.03 SUBMITTALS

- A. Prepare and make submittals per the conditions of the Contract.
 1. Operation Instructions - Submit three written operating instructions, including start-up with cut sheets of products, and coordinate controller/watering operation with the City of Phoenix's maintenance personnel.

2. Do not prepare charts until the City of Phoenix's Representative has reviewed the record (as-built) drawings.
3. Provide one controller chart for each automatic controller installed.
 - a. The chart may be a reproduction of the record drawing if scale permits. Attach the chart to the inside of the controller door. If photo reduction prints are required, keep the reduction to the maximum size possible to retain complete legibility.
 - b. The chart shall be a blueline print of the actual "as-built" system, showing the area covered by that controller.
 - c. Identify the area of coverage of each remote control valve, using a distinctly different pastel color, drawing over the entire area of coverage.
 - d. Following a review of charts by the City of Phoenix's Representative, they shall be hermetically sealed between two layers of 20 mm thick plastic sheet.
 - e. Charts shall be completed and reviewed before the final review of the irrigation system.
4. Record Drawings (as-builts): At the onset of irrigation installation, secure reproducible copies of the original irrigation design from the City of Phoenix's Representative. Make blueline or blackline prints as required. As-built blueprints shall be brought up to date at the close of the working day on every Friday by a qualified draftsman. A print of the record plan(s) shall be available at the project site. Indicate zoning changes on weekly as-built drawings. Indicate non-pressure piping changes on as-builts. Upon completion of the Project, submit for review before final acceptance of the final set of as-built blueprints. Dimension, from two permanent points of reference (building corners, sidewalks, road intersections, or permanent structures), the location of the following items:
 - a. Point of connection, backflow prevention assembly
 - b. Routing of irrigation pressure lines (dimension maximum 100 feet along with routing)
 - c. Remote control valves
 - d. Dripline blow-out stubs
 - e. All gate valves
 - f. Controllers
 - g. Control wire routing if not in the mainline trench
 - h. Other related equipment, as directed

The city of Phoenix's Representative will not certify any payment request submitted by the Contractor if the record drawings are not current, and processing of pay requests will not occur until record drawings are updated and current.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications - Installer shall have had considerable experience and demonstrate ability in the installation of the irrigation system(s) of the specified type(s) in a neat, orderly and responsible manner per recognized standards of quality with five (5) consecutive years of documented service.
- B. Special Requirements
 1. Licensed and bonded plumber(s) shall execute Work involving substantial plumbing for the installation of copper piping, backflow preventer(s), and related Work. Secure a permit at least 48 hours before the start of installation.
 2. Tolerances - Specified depths of mains and laterals and pitch of pipes are minimums. Settlement of trenches is cause for removal of finish grade treatment, refilling, compaction, and repair of finish grade treatment.

3. Coordination With Other Contracts - Protect, maintain, and coordinate Work with Work under other Sections.
 4. Damage to Other Improvements – The Contractor shall replace or repair damage to grading, soil preparation, seeding, or planting done under other Sections during Work associated with the installation of the irrigation system at no additional cost to the City of Phoenix.
- C. Pre-Construction Conference - Contractor shall schedule and conduct a conference to review in detail quality control and construction requirements for equipment, materials, and systems used to perform Work. The conference shall be scheduled not less than ten (10) days before the commencement of Work. All parties required to attend shall be notified no later than seven (7) days before the conference date. The Contractor shall notify qualified representatives of each party concerned with that portion of Work to attend the conference, including but not limited to the City of Phoenix's Representative and Installer. Minutes of the conference shall be recorded and distributed by the Contractor to all parties in attendance within five days of the conference.

As part of the pre-construction conference, the Contractor shall meet with the City of Phoenix's Representative to identify the process and schedule for completing the Work. A field review of the areas of Work and equipment will be conducted as part of the conference. The Contractor shall identify in the field review his proposed approach to completing the Work and indicate coordination with other Work on the Project. The Contractor will accept comments from the others on the proposed activities. Within three days of the meeting, the Contractor shall provide a written schedule of the proposed Work for the City of Phoenix's Representative to review. Once a strategy and schedule are agreed upon, amend the schedule only as approved by the City of Phoenix's Representative.

1.05 DELIVERY, STORAGE, AND HANDLING

Deliver, unload, store and handle materials, packaging, bundling, and products in a dry, weatherproof, waterproof condition to prevent damage, breakage, deterioration, intrusion, ignition, and vandalism. Deliver original unopened packaging containers prominently displaying manufacturer name, volume, quantity, contents, instructions, and conformance to local, state, and federal law. Remove and replace cracked, broken, or contaminated items or elements prematurely exposed to moisture, inclement weather, temperature extremes, fire, and job site damage.

- A. Handling of P.V.C. Pipe - Exercise care in handling, loading, and storing P.V.C. pipe. All P.V.C. pipe shall be transported in a vehicle that allows the length of the pipe to lie flat so as not to subject it to undue bending or concentrated external loads. All pipe sections dented or damaged shall be discarded and, if installed, replaced with new piping.

1.06 JOB SITE CONDITIONS

- A. Protection of Property:

Preserve and protect all monuments, structures, and paved areas from damage due to Work of this Section and as noted in Section 31 10 00 SITE CLEARING. If damage occurs, all damage to inanimate items shall be completely repaired or replaced to the satisfaction of the City of Phoenix's Representative. All costs of such repair shall be charged to and paid by the Contractor.

Protect buildings, walks, walls, and other property from damage—flare and barricade open ditches. Damage caused to asphalt, concrete, or other building material surfaces shall be repaired or replaced at no cost to the City of Phoenix. Restore disturbed areas to their original condition.

- B. Protection and Repair of Underground Lines

Request the proper utility company to stake the exact location (including depth) of all underground electric, gas, or telephone lines. Take whatever precautions are necessary to protect these underground lines from damage, and, in the event damage does occur, the Contractor shall repair all damages. The Contractor shall pay all costs of such repairs unless other arrangements have been made.

The Contractor is to request the City of Phoenix, in writing, to locate all private utilities (i.e., electrical service to outside lighting) before proceeding with excavation. If, after such request and necessary staking, private utilities that were not staked are encountered and damaged by the Installer, the City of Phoenix shall repair them at no cost to Installer. If the Contractor damages staked or located utilities, the Contractor shall repair them unless other arrangements have been made.

C. Replacement of Paving and Curbs

Where trenches and lines cross existing roadways, paths, curbing, etc., damage to these shall be kept to a minimum and restored to its original condition.

1.07 WARRANTY

- A. The manufacturer shall provide warranty materials against defects for one year from the date of Substantial Completion. Installer(s) shall guarantee workmanship through the one (1) year Plant Establishment and Maintenance Period.
- B. Settling of backfilled trenches that may occur during the warranty period shall be repaired at no expense to the City of Phoenix, including complete restoration of the damaged property.
- C. Expenses due to vandalism before substantial completion shall be borne by the Contractor.
- D. The City of Phoenix will not maintain planting areas until after the one (1) year Plant Establishment and Maintenance Period.

1.08 MAINTENANCE

- A. Furnish the following maintenance items to the City of Phoenix's Representative before Final Acceptance:
 - 1. Two sets of special tools are required for removing, disassembling, and adjusting each type of valve supplied in this Project.
 - 2. Two keys for each automatic controller.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General Piping: Used pipe shall not be reused on the Project. All components and practices must meet the requirements and standards stipulated by Pinal County and these Special.
 - 1. The pressure supply line (from the point of connection through the backflow prevention unit) is Type 'K' hard Copper.
 - 2. Pressure Supply Lines (downstream of backflow prevention units) – per plans.
 - 3. Non-pressure Lines - Per plans.
 - 4. Emitter Tubing - As recommended by the emitter manufacturer.

B. Copper Pipe and Fittings:

1. Copper Pipe - Type K, hard tempered
2. Fittings - Wrought copper, solder joint type
3. Joints - Soldered with solder, 45% silver, 15% copper, 15% zinc, and 24% cadmium and solids at 1125°F and liquids at 1145°F

C. Brass Pipe and Fittings:

1. Brass Pipe - 85% red brass, ANSI Schedule 40 screwed pipe.
2. Fittings - Medium brass, screwed 125-pound class

D. Plastic Pipe and Fittings:

Identification Markings:

1. Identify all pipes with the following indelible markings:
 - a. Manufacturer's name
 - b. Nominal pipe size
 - c. Schedule of class
 - d. Pressure rating psi
 - e. N.S.F. (National Sanitation Foundation) seal of approval
 - f. Date of extrusion
2. Solvent Weld Pipe - Manufactured from virgin polyvinyl chloride (P.V.C.) compound per ASTM D2241 and ASTM D1784; cell classification 12454-B, Type 1, Grade 1.
 - a. Fittings - Standard weight, Schedule 40, injection-molded P.V.C.; complying with ASTM D1784 and D2466, cell classification 12454-B.
 - i. Threads - Injection-molded type (where required)
 - ii. Tees and ells - Side gated
 - b. Threaded Nipples - ASTM D2464, Schedule 40 with molded threads.
 - c. Joint Cement and Primer - type as the pipe and fittings manufacturer recommends.

E. Low Pressure/Volume Systems:

F. Drip Tubing - Manufactured of flexible polyvinyl chloride compound conforming to ASTM D1248, Type 1, Class C, Category 4, P14, and ASTM D3350 for P.E. 122111C.

G. Fittings - Type and make recommended by the tubing manufacturer.

H. Drip Valve Assembly-type and size are shown on Drawings.

1. Wye Strainer – Per Plans.
2. Control Valve – 2-way, solenoid pilot-operated type made of synthetic, non-corrosive material; diaphragm activated and slow closing. Include a freely pivoted seat seal, retained (mounted) without attachment to the diaphragm.
3. Pressure Reducing Valve – Per Plans.
4. Emitter - Per plans.

- I. Gate Valves - Brass construction; solid wedge, I.P.S. threads, and non-rising stem with brass cross handle.
- J. Valve Boxes:
 - 1. Gate Valves, Drip Line Blow-out Stubs, and Wire Stub Box – Carson #910-12.
 - 2. 3/4 Inch through 2 Inch Control Valves - Per plans.
 - 3. Drip Valve Assemblies - Per plans.
 - 4. Control Wiring Splices - Carson #910-12, or as shown on the plans.
- K. Electrical Control Wiring:
 - 1. Low Voltage:
 - a. Electrical Control Wire – shall be single conductors, type U.F. solid copper conductor, and P.V.C. insulation. The wires shall be listed for direct burial in irrigation systems.
 - b. Control wire connections and splices shall be made with 3M direct bury splice, Rainbird Petite connectors, or a similar dry splice method.
 - 2. High voltage - Type required by local codes and ordinances of the proper size to accommodate the needs of equipment services.
- L. Automatic Controller - Size and type are shown on Drawings; installed per manufacturer.
- M. Backflow Preventer - Size and type as shown on plans; installed per manufacturer.

PART 3 EXECUTION

3.01 INSPECTION

- A. Staking shall occur as follows:
 - 1. Mark, with powdered lime, the pressure supply line routing and flag heads for the first few zones. Contact the City of Phoenix's Representative 48 hours in advance and request a review of staking. The City of Phoenix's Representative will advise Installer on how much staking to be prepared. The City of Phoenix's Representative will review staking and immediate changes if required. Review does not relieve Installer from coverage problems due to improper placement of heads after staking.
 - 2. If Project has significant topography, free-form planting beds, or other amenities that could require alteration of irrigation equipment layout as deemed necessary by the City of Phoenix's Representative, do not install irrigation equipment in these areas until the City of Phoenix's Representative has reviewed equipment staking.
 - 3. Install sleeving under asphalt paving and concrete walks before concreting and paving operations to accommodate piping and wiring. Compact backfill around sleeves to 95% Modified Proctor Density within 2% of optimum moisture content per ASTM D1557.
 - 4. Trenching - Trench excavation shall follow, as much as possible, the layout shown on drawing. Dig trenches straight and support pipe continuously on the bottom of the trench. Trench bottom shall be clean and smooth, with all rock and organic debris removed.
 - a. Clearances:

- i. Piping Smaller than 3 Inches - Trenches shall have a minimum width of 7 inches.
 - ii. Line Clearance - Provide not less than 6 inches of clearance between each line and not less than 12 inches of clearance between lines of other trades.
- b. Pipe and Wire Depth
- i. Pressure Supply Piping - 18 inches from the top of the pipe.
 - ii. Control Wiring - Side of pressure main

3.02 INSTALLATION

- A. Locate other equipment as near as possible to locations designated. The City of Phoenix's Representative shall review any deviations to plans before installation.
- B. P.V.C. Piping - Snake pipe in the trench as much as possible to allow for expansion and contraction. Do not install the pipe when the air temperature is below 40°F. When pipe laying is not in progress, or at the end of each day, close the pipe ends with a tight plug or cap. Perform Work per good practices prevailing in piping trades.
- C. Solvent Weld P.V.C. Pipe - Lay pipe and make all plastic-to-plastic joints per manufacturer's recommendations.
- D. Drip Tubing:
1. Install all drip tubing per the plans before the installation of mulch.
 2. Install drip line end caps at all dead ends of emitter laterals.
- E. Control Wiring
1. Low Voltage Wiring:
 - a. Bury wires between the controller and electric valves in pressure supply line trenches are installed as close as possible to mainline wires to be consistently located below and to one side of the pipe or in separate trenches.
 - b. Provide an expansion loop at every pressure pipe angle fitting, every electric control valve location (in the valve box), and every 500 feet. Form an expansion loop by wrapping wire at least eight times around a 3/4-inch pipe and withdrawing the pipe.
 - c. Make all splices and E.V.C. connections using 3M direct bury splice, Rainbird Petite connectors, or a similar dry splice method.
 - d. Install all control wire splices not occurring at the control valve in a separate splice valve box.
- F. High Voltage Wiring for Automatic Controller:
1. Provide a 120-volt power connection to the automatic controller.
 2. All-electric Work shall conform to local codes, ordinances, and authorities having jurisdiction. A licensed electrician shall perform all high-voltage electrical Work.
- G. Automatic Controller
1. Install controller per manufacturer's instruction as detailed and shown on Drawings.
 2. Connect remote control valves to the controller in numerical sequence, as shown on Drawings.

3. The City of Phoenix's Representative shall approve the final location of the controller.
 4. A separate ground wire shall be installed for each controller if multiple controllers are utilized.
 5. All above-ground conduits shall be rigid galvanized with appropriate fittings.
- H. Electric Control Valves - Install 3 inches below finished grade where shown on Drawings and as detailed. When grouped, allow at least 12 inches between valve boxes. Install each remote control valve in a separate valve box. Install individual valve box flush with the ground. Place gravel in the bottom of each box below the valve with a minimum of 2 cubic feet of 3/4 inch crushed gravel.
- I. Drip Valve Assemblies - Install drip valve assembly as detailed.
- J. Drip Emitters - Install all surface emitters as detailed and stake them with acceptable tubing stakes.
- K. Valve Boxes:
1. Install one valve box for each type of valve installed as detailed. Valve box extensions are not acceptable except for master valves. Install gravel sump after compaction of all trenches. Place the final gravel portion inside the valve box after the valve box is backfilled and compacted.
 2. Brand controller letter and station number of the lid on each valve box. Letter and number size shall be no smaller than 1 inch and no greater in size than 1-1/2 inches. The depth of branding shall be no more than 1/8 inch into the valve box lid.
- L. Gate Valves - Install where shown on Drawings as detailed.
- M. Backflow Preventer - Install as detailed at the location shown on the Drawings or adjusted by the City of Phoenix's Representative. The City of Phoenix's Representative will approve the backflow preventer's final location.
- N. Backfilling - Do not begin backfilling operations until the required system tests have been completed. Leave trenches slightly mounded to allow for settlement after backfilling is completed. Trenches shall be finished and graded before the walkthrough of the system by the City of Phoenix's Representative.
1. Materials - Excavated material is generally considered satisfactory for backfill purposes. Backfill material shall be free of rubbish, vegetable matter, and a stone larger than 1 inch in maximum dimension. Do not mix subsoil with topsoil. Material not suitable for backfill shall be hauled away. The Contractor shall be responsible for providing suitable backfill if excavated material is unacceptable or insufficient to meet backfill, compaction, and final grade requirements.
 2. Open excavations shall be protected per OSHA regulations.
 3. Compact backfill to 90% maximum density, determined per ASTM D155-7, utilizing the following methods:
 - a. Mechanical tamping.
 - b. Puddling or ponding. Puddling, ponding, and jetting are prohibited within 20'-0" of building or foundation walls.
- O. Piping Under Paving:
1. Provide a minimum cover of 18 inches between the top of the pipe and the bottom of the

aggregate base for all pressure and non-pressure piping installed under asphaltic concrete or concrete paving.

2. Piping located under areas where asphalt or concrete paving will be installed shall be bedded with sand (a layer 6 inches below the pipe and 3 inches above the pipe).
3. Compact backfill material in 6-inch lifts at 90% maximum density determined per ASTM D155-7 using manual or mechanical tamping devices.
4. Set in place, cap, and pressure test all piping under paving, in the presence of the City of Phoenix's Representative before backfilling and paving operations.

P. Water Supply and Point of Connection - Water supply shall be as shown on the drawings

3.03 FIELD QUALITY CONTROL

- A. Flushing - After piping, risers and valves are in place and connected. Before installing sprinkler heads, thoroughly flush the piping system under a full head of water pressure from dead-end fittings. Maintain flushing for 5 minutes through furthest valves—cap risers after flushing.
- B. Testing - Notify Construction Manager in advance of all testing. Conduct tests in the presence of the City of Phoenix's Representative for the Project Site. Arrange for the company of the City of Phoenix's Representative 48 hours in advance of testing. Supply force pump and all other test equipment.
 1. After backfilling and installing all control valves, fill the pressure supply line with water and pressurize to 40 P.S.I. over the designated static pressure or 120 PSI, whichever is greater, for two hours.
 2. Leakage, Pressure Loss - The test is acceptable if no leakage or loss of pressure is evident during the test period.
 3. Leaks - Detect and repair leaks.
 4. The retest system until test pressure can be maintained for the duration of tests.
 5. Before final acceptance, the pressure supply line shall remain under pressure for 48 hours.
- C. Pre-Maintenance Inspection
 1. Arrange for the City of Phoenix's Representative's presence 48 hours before the walkthrough.
 2. The entire system shall be completely installed and operational before the scheduling of the walkthrough.
 3. Operate each zone in its entirety for the City of Phoenix's Representative at the time of the walkthrough and open all valve boxes if directed.
 4. Generate a list of items to be corrected before Final Completion.
 5. Furnish all materials and perform all Work required to correct all inadequacies of coverage due to deviations from Contract Documents.
 6. During the walkthrough, expose all drip emitters under operations for observation by the City of Phoenix's Representative to demonstrate that they are performing and install as designed; before placing all mulch material. Schedule a separate walkthrough if necessary.

D. Final Maintenance Inspection:

1. Arrange for the City of Phoenix's Representative's presence 48 hours before the walkthrough.
2. Show evidence to the City of Phoenix's Representative that the City of Phoenix has received all accessories, charts, record drawings, and equipment as required before the Final Completion walkthrough is scheduled.
3. Operate each zone for the City of Phoenix's Representative at the walkthrough to ensure the correction of all incomplete items.
4. Items deemed not acceptable by the City of Phoenix's Representative shall be reworked to the complete satisfaction of the City of Phoenix's Representative.
5. If, after the request to the City of Phoenix's Representative for the walkthrough for the Final Completion of the irrigation system, the City of Phoenix's Representative finds items during the walkthrough that have not been properly adjusted, reworked, or replaced as indicated on the list of incomplete items from the previous walkthrough, Contractor shall be charged for all subsequent walk-throughs. Funds will be withheld from final payment and retainage to Contractor, in the amount equal to additional time and expenses required by the City of Phoenix's Representative to conduct and document further walk-throughs as deemed necessary to ensure compliance with Contract Documents.

3.04 ADJUSTING

- A. Upon completion of the installation, "fine-tune" the entire system by regulating valves, adjusting patterns and break-up arms, and setting pressure-reducing valves at a proper and similar pressure to provide optimum and efficient coverage.
- B. If irrigation adjustments are determined to provide proper and more adequate coverage, make such adjustments before Final Acceptance, as directed, at no additional cost to the City of Phoenix. Adjustments may also include changes in control valve throttling.
- C. Due to unauthorized changes or poor installation practices, areas that do not conform to designated operation requirements shall be immediately corrected at no additional cost to the City of Phoenix.

3.05 CLEANING

Maintain continuous cleaning operation throughout Work. Dispose of, off-site at no additional cost to the City of Phoenix, all trash or debris generated by the installation of the irrigation system.

END OF SECTION

32 80 00 IRRIGATION SYSTEM

SECTION 32 90 00

PLANTING



PART 1 GENERAL

The extent of landscape development work is shown on the drawings and schedules. This Section includes provisions for the following items.

- Supplying and installing trees, shrubs, accents
- Soil Amendments
- Inert Materials – decomposed granite, angular rock, and boulders
- Landscape Maintenance
- Warranty of Landscape

1.01 REFERENCES

- A. ANSI Z60.1 – American Standard for Nursery Stock; 1996
- B. ANSI A300 – American National Standard for Tree Care Operations – Tree, Shrub and Other Woody Plant Maintenance – Standard Practices; 2001
- C. AAN-ASNS: American Association of Nurserymen, Inc. "American Standard for Nursery Stock" - 1986 Edition.
- D. AJCHN-SPN: American Joint Committee on Horticultural Nomenclature "Standardized Plant Names," Second Edition, 1942.
- E. ANA: Arizona Nursery Association Growers Committee "Recommended Tree Specifications," latest edition.
- F. ASTM: American Society for Testing and Materials.
- G. MAG Specifications latest edition.

1.02 RELATED WORK

- A. SECTION 01 81 00 SUSTAINABLE DESIGN REQUIREMENTS contain requirements for work that may affect this work.
- B. SECTION 02 41 00 DEMOLITION contains requirements for work that may affect this work.
- C. SECTION 31 00 00 EARTHWORK contains requirements for work that may affect this work.
- D. SECTION 32 80 00 IRRIGATION contains requirements that may affect the work of this Section.

1.03 SUBMITTALS

All items listed below shall be forwarded in a single package to the City of Phoenix's Representative within 45 days before planting work begins.

- A. Certification: Submit inspection certificates as required by governmental authorities or as requested herein. Submit the manufacturer's or vendors certified analysis for materials in Part 2. Submit data substantiating that materials comply with specified requirements—file copies of certificates with the City of Phoenix's Representative after acceptance of material.
- B. Schedule: Submit Landscape schedule; indicate the beginning and end dates for each work effort (examples, fine grade, planting, pre-emergent placement, placement of inert materials, etc.). If landscape construction is phased, include a phasing plan and schedule for each area.
- C. List of Nurseries: Submit a list of nurseries supplying plant material for the Project.
- D. Maintenance Instructions: Submit typewritten instructions recommending the City of Phoenix's maintenance efforts after Landscape Contractors' 90-DAY PLANT ESTABLISHMENT PERIOD and for the ONE-YEAR PLANT WARRANTY period and the year after that.
- E. Decomposed granite: The Contractor is to submit a five-pound sample of Decomposed granite showing each gradation and color. Verify to the City of Phoenix's Representative that there is sufficient supply from a single source to supply the Project. The Contractor is to submit a material certificate signed by the material producer and Contractor, certifying that Decomposed granite complies with or exceeds specified requirements.
- F. Angular Rock: Contractor to submit samples of 3" to 8" sized rock showing a color similar to the "Decomposed granite." Verify to the City of Phoenix's Representative that there is sufficient supply from a single source to supply the Project. The Contractor must submit a material certificate signed by the material producer and Contractor, certifying that Angular Rock complies with or exceeds specified requirements.

1.04 QUALITY ASSURANCE

- A. Nursery Qualifications: Company specializing in growing and cultivating plants with five (5) consecutive years of documented experience.
- B. Installer Qualifications: Company specializing in installing and planting plants with five (5) consecutive years of experience.
- C. The City of Phoenix's Representative reserves the right to take and analyze samples of materials for conformity to specifications at any time. The Contractor shall furnish samples upon request of the City of Phoenix's Representative. Rejected materials shall be immediately removed from the site at Contractor's expense. The Contractor shall pay the cost of testing materials not meeting specifications.
- D. Plant Material: Provide trees of quantity, size, genus, species, and variety shown and as scheduled for landscape work; and comply with recommendations and requirements of PART 1 "References." Provide healthy, vigorous stock grown at a recognized nursery following good horticultural practice and free of disease, insects, eggs, larvae, and defects such as knots, sunscald, injuries, abrasions, or disfigurement.

Measure plant materials with branches or trunks in their normal position and conformance with requirements with the above 1.01 REFERENCES. Do not prune to obtain the required sizes. Measure the main body of the tree for height and spread dimensions.

Plants shall be sound, healthy, well-branched, and densely foliated when in leaf. They shall have healthy, well-developed root systems and shall be free from evidence of physical damage or adverse conditions that would prevent thriving growth.

Plants shall not be pruned before delivery. Unless specified, trees that have damaged or crooked

leaders or multiple leaders will be rejected. Trees with abrasions of the bark, sunscald, disfiguring knots, or fresh cuts of limbs over 3/4" that have not been wholly callused will be rejected.

- E. Inspection: City of Phoenix's Representative may inspect plant material either at the place of growth or at the site before planting, for compliance with requirements for the genus, species, variety, size, and quality. The City of Phoenix's Representative retains the right to inspect further plant material for size and condition of the roots and rootball, insects, injuries and latent defects and may reject unsatisfactory or defective material at any time during work progress. Remove rejected plant material immediately from the project site.

1.05 REGULATORY REQUIREMENTS

- A. Perform work in accordance with all applicable laws, codes, and regulations required by authorities having jurisdiction over such work. Provide for all inspections and permits required by Federal, State, and local authorities in furnishing, transporting, and installing materials as shown or for completing the work identified herein.
- B. All plant materials shall be certified free of disease and hazardous insects.
- C. An individual licensed to perform this work shall apply all pesticides and herbicides.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. As approved by the General Contractor, a temporary storage yard for plants or equipment used on the Project may be placed at an on-site storage location. Should the Landscape Subcontractor elect to store plants and equipment on the site, they shall be responsible for enclosing the yard with a 6-foot chain link fence and meet all requirements for the protection of occupational and public health and safety by agencies having jurisdiction over such matters.

The storage area shall have a lockable gate for which the General Contractor will be provided a workable key for the duration of the storage yard's existence. No flammable fuels or explosives are permitted in the yard.

The Landscape Subcontractor shall deliver water to the plants stored in the yard. The General Contractor shall approve the watering methods used for the storage area.

The Contractor shall hold the City of Phoenix's Representative harmless from potential claims arising from the use of the land, acts of vandalism, or delays resulting from theft or unauthorized removal of materials and equipment from the storage yard.

- B. Packaged Materials: Deliver packaged materials in containers shall show the weight, analysis, and manufacturer name. Protect materials from deterioration during delivery and while stored at the site. Protect products/materials from weather or other conditions that would damage or impair the effectiveness of the product material.
- C. Trees and Shrubs: Do not prune before delivery unless approved by the City of Phoenix's Representative. Do not bend or bind-tie plant material in such a manner as to damage bark, break branches or destroy natural shape. Provide protective covering during delivery. Provide adequate protection for root systems and balls from drying winds and sun.

Deliver plant material after preparations for planting have been completed and plant immediately. If planting is delayed more than six hours after delivery, set trees in the shade, protect them from weather and mechanical damage, and keep roots moist by an acceptable means of retaining moisture. Water as often as necessary to maintain the root system in a wet condition

- D. Do not remove container-grown stock from the container until planting time.

1.07 SOURCE QUALITY CONTROL

- A. Ship materials with certificates of inspection required by governmental authorities. Comply with regulations applicable to materials herein.
- B. Do not make substitutions. If specified landscape material is not obtainable, submit proof of non-availability from five sources to the City of Phoenix's Representative, together with the proposal for the use of equivalent material with a corresponding adjustment of the contract price.

1.08 SITE CONDITIONS

- A. Water: Water will be provided by the Contractor through an accepted backflow preventer for the irrigation system (constructed as part of this Project) for use in the landscape installation at no charge to the Landscape Subcontractor. Water will not be available on-site until the tap is made for the irrigation system and the backflow preventer is installed, inspected, and approved.
- B. Site Examination: The prospective Contractors are encouraged to examine the plans and visit the job site before bidding on this Project and to satisfy their concerns as to the magnitude of the work involved, to become aware of the existing conditions, and to understand any restrictions to the completion of the proposed work. Failure to visit the site and acquaint himself with the existing conditions shall in no way relieve the Contractor from any obligation concerning his proposal.
- C. Final Grade: The Contractor shall be responsible for the finished grades on the plans.
- D. Utilities: Determine the location of underground utilities through Blue Stake and perform work to avoid possible damage. Hand excavate, as required. Repair or replace damaged utilities shall be made as directed by the City of Phoenix's Representative. The costs of repairs or replacement of utilities damaged by the actions of the Contractor shall be borne by the Contractor.
- E. Obstruction: If rock, underground construction, or other obstructions are encountered in the preparation of landscape areas or during plant pit excavation, the Contractor is to notify the City of Phoenix's Representative. Instructions may be issued to direct removal of obstruction to a depth less than 6" below the required planting depth. Proceed with work only after approval of the City of Phoenix's Representative.

1.09 SAMPLES AND TEST

- A. The City of Phoenix's Representative reserves the right to take and analyze samples of materials for conformity to specifications at any time. The Contractor shall furnish samples as identified in this Section and upon request by the City of Phoenix's Representative. Rejected materials shall be immediately removed from the site at Contractor's expense. The Contractor shall pay the cost of testing materials not meeting specifications.
- B. Label each type of plant with a securely attached waterproof tag bearing a legible designation of a botanical and common name.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Planting Seasons and Conditions: Planting shall not be done when the soil is muddy, or conditions are otherwise unsuitable for planting. The City of Phoenix's Representative will be the sole judge of the site soil's acceptability and planting conditions.

1.11 WARRANTY

- A. Warranty all plant materials against defects due to any cause for one (1) year from the Date of Landscape Substantial Completion and commencement of the formal Landscape Establishment Period.

- B. This warranty will not be enforced should plant material die due to vandalism, improper maintenance procedures (including over- or under-watering), over-fertilization, non-removal of braces/guy wires causing girdling trunks, fire, flood or hail, or other similar circumstances beyond the control of the Contractor.
- C. Replacements: Replace plant materials when they are no longer in satisfactory condition as determined by the City of Phoenix's Representative during the warranty period. Make replacements within fourteen (14) days of notification by the City of Phoenix's Representative. Plant replacement materials of the same size and species as originally specified, with a new warranty commencing on the replacement date. Remove dead plants within seven (7) days of notification. Replacements shall be made at no expense to the City of Phoenix.

1.12 PLANT ESTABLISHMENT PERIOD

- A. From the time any plants and turf are planted until completion of the Ninety (90) Day Plant Establishment Period, the Contractor shall ensure that all plants are watered, trash and debris are removed weekly, weeds are controlled, plant replacements are made, plants pruned, and spraying for insects or disease completed. Traffic control, if required during the maintenance period, shall be included in the cost of contract items.
- B. Spray or dust appropriate insecticides, miticides, and fungicides as necessary to maintain plants in healthy and vigorous growing conditions until accepted by the City of Phoenix's Representative. Apply pest and disease control chemicals in accordance with the manufacturer's instructions. The Contractor will remove weeds and grasses, such as Dallas, Bermuda, Johnson, and Nut, from the project site.
- C. Make replacements of dead or unhealthy plants during the Ninety (90) Day Plant Establishment Period except for reserves resulting from the exclusions identified in PROJECT WARRANTY above. Plants damaged by frost shall be replaced during the maintenance period as directed by the City of Phoenix's Representative; there shall be no limit to the replacements due to frost. The City of Phoenix's Representative shall approve replacement plants before planting.
- D. Provide a schedule of maintenance activities to the City of Phoenix's Representative before starting the 90-day establishment period. Provide the City of Phoenix's Representative with weekly reports summarizing maintenance activities completed by the Contractor, including person-hours expended to complete the tasks.
- E. Lack of care or plant neglect during the 90-day establishment period: Each day during which the City of Phoenix's Representative determines that work under the Plant Establishment Period is required, and the Contractor is so advised. If the Contractor fails to accomplish the required work, the subject days will extend the 90-day maintenance and the warranty period.
- F. Final Maintenance Inspection: At the end of the Ninety (90) Day Plant Establishment, a final maintenance inspection will be performed to accept the landscape installation for the remaining warranty period. At the time, the Contractor shall have all planting areas under this Contract free of weeds and neatly cultivated. All plants shall be alive and healthy, without signs of stress.

If, after the inspection, the City of Phoenix's Representative believes that all work has been performed as per the drawings and specifications and that all plant materials are in satisfactory growing condition, he will give the Contractor written notice of final acceptance of the landscape installation and commencement of the one (1) year warranty period.

Work requiring corrective action or replacement in the judgment of the City of Phoenix's Representative shall be performed within ten (10) days after inspection. Corrective work and materials replacement shall be in accordance with the drawings and specifications and shall be made by the Contractor at no cost to the Project. Maintain corrected work until re-inspected by

the City of Phoenix's Representative. The Contractor shall be responsible for replanting, weeding, and maintaining the landscaping until the (90) Day Plant Establishment period is accepted. The City of Phoenix's Representative shall be the sole judge of acceptance of the 90-Day Plant Establishment Period.

- G. The remainder of the 1-Year Plant Warranty will extend 275 days beyond acceptance of the 90-Day Plant Establishment period, during which time the City of Phoenix is responsible for landscape maintenance. However, plant replacement may still be enforced, pending circumstances beyond City of Phoenix maintenance.

PART 2 PRODUCTS

2.01 TREES, SHRUBS, GROUNDCOVERS, CACTI, AND SUCCULENTS

- A. Trees, shrubs, groundcovers, and cacti and succulents: Shall be nursery-grown, plantation-grown, or collected stock from on/off-site, as noted on the plans, conforming to ANSI Z60-1 and shall be of the varieties specified in the plant list bearing botanical names listed in the AJCHN-SPN publication. Planting stock shall be well-branched and well-formed, sound, vigorous, healthy, and free from disease, sunscald, windburn, abrasion, and harmful insects or insect eggs and shall have healthy, regular, and unbroken root systems and shall bear evidence of conformance with the Arizona Native Plant Law. Trees shall be symmetrically developed, of the uniform habit of growth, with straight poles or stems, and free from objectionable disfigurements. Trees shall have been grown under climatic conditions similar to those in the locality of the Project.
- B. The minimum acceptable sizes of all plants, measured before pruning and with branches in normal position, shall conform to the measurements indicated in the plans or noted references. Plants larger in size than specified may be used as approved. If larger plants are used, the spread of roots shall be increased in accordance with ANSI Z60.1.
- C. Plants shall be dug and prepared for shipment in a manner that will not cause damage to branches, shape, and future growth after planting.
- D. Container-grown plants shall have sufficient root growth to hold the earth intact when removed from the containers but shall not be root bound.

2.02 SOIL AMENDMENT MATERIALS

- A. Forest Mulch: Shall be well-composted, nitrogen-stabilized wood fiber mulch with a carbon-to-nitrogen ratio of 30:1 available from Western Agricultural Products, Phoenix, Arizona, or approved equivalent.
- B. Plant Tablets: Shall be Agriform 21 grams, 20-10-5 fertilizer tablets, or approved equivalent.
- C. Soil Sulfur: This shall be a commercial-grade product produced for the intended use. Sulfur shall be approved before use on the Project.
- D. Bactericide: Shall be applied per manufacturer's recommendations.
- E. Herbicides and Pesticides: Contact herbicides and pesticides must comply with all applicable state and federal laws and be registered with the U.S. Environmental Protection Agency. Contact herbicides shall be quick-acting and permit planting within 7-10 days of their use.
- F. Sand: Shall be commercial grade mortar sand.

2.03 INERT MATERIALS

- A. The Inert material(s) placement, i.e., decomposed granite, angular rock, and boulders, shall be the type and size specified on landscape plans.
- B. The decomposed granite shall meet MAG Section 795 and shall not contain lumps or balls of clay, caliche, organic matter, or calcareous coating. Decomposed granite shall be placed in all planting areas shown on the plans. Provide documentation that a sufficient quantity (for each type of decomposed granite shown on the plans) is available to complete the Project from a single source.

2.06 ACCESSORIES

- A. Stakes and rubber hose Strap Tie: Provide stakes of sound new 2" diameter by 8' or 10' (see plant details) Cedar, Redwood, or Lodge Pole Pine, free of knotholes and other defects. Provide ½" reinforced garden hose with 12 AWG double stranded wire, manufactured to tie a tree to stakes.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Site Inspection and Review: The Contractor is to verify site conditions and note any irregularities affecting their work in this Section. Before beginning work, the Contractor must report any irregularities to the City of Phoenix's Representative. The Contractor shall verify that grading or other site work is complete before execution of work under this Section. Beginning work of this Section implies acceptance of current existing conditions.
- B. The Contractor is to verify the locations of all underground utilities. Coordinate with the City of Phoenix's Representative, and contact Blue Stake as needed. The placement of electrical, irrigation, and other underground utilities will be reviewed with the General Contractor and Landscape Contractor before the commencement of work. Conflicts will be brought to the City of Phoenix's representative's attention for resolution.

3.02 TREE, SHRUB, AND GROUNDCOVER PLANTING

- A. Clearing and grading: All planting areas shall be free of construction material and subgrade elevations established to permit landscape construction. No planting shall be done when the soil is excessively wet, in the opinion of the City of Phoenix's Representative.
- B. Layout: Layout individual tree locations and secure the City of Phoenix's Representative's acceptance before the start of planting work. Make minor adjustments as may be requested.
- C. Excavation: Plant pits shall be dug to produce vertical sides with a flat bottom; sides and bottom shall be scarified, as shown in the drawings. If pits are dug with an auger, and the sides of the pits become glazed, in the opinion of the City of Phoenix's Representative, the glazed surface shall be scarified. Loosen hard subsoil at the bottom of the excavation.
- D. Test drainage of the planting pit by filling it with water twice in succession. Plant pits retaining water for more than 24 hours shall be brought to the attention of the City of Phoenix's representative. Submit a proposal for correction in writing before proceeding with any planting operations.
- E. If a caliche is encountered, the Contractor is to break through it to provide drainage or bring it to the City of Phoenix's representative's attention for resolution.
- F. Plant tablet schedules for trees shall be per the manufacturer's recommendation.

- G. **Backfill Mix:** Refer to the backfill mix requirements herein. To be acceptable, the backfill shall have removed stones greater than 1 inch in diameter without dirt balls, clumps, or layers of individual materials. Before the backfilling of holes, the Contractor shall provide a sample of the backfill for the City of Phoenix's Representative to review. As the project proceeds, this sample shall be used as reference material for the backfill.
- H. **Setting and Backfilling for Trees:** Set plant stock on undisturbed soil, plumb, and in the center of the pit with the top of the ball at elevation set to finished landscape grades. Remove boxes, including the bottom or containers, before setting. Do not use stock if the root ball is cracked or broken before or during planting operations. When set, place additional backfill around the base and sides of the ball and place plant tablets. Work each layer to settle backfill and eliminate voids and air pockets when the planting pit is approximately 2/3-full. Water thoroughly before placing the remainder of the backfill. Repeat watering until no more is absorbed. Water the soil again after placing the final layer of backfill.
- Cut plastic or metal containers on two sides with a metal cutter. Do not use the spade to cut cans. Do not handle container plants by foliage, branches, or trunks. After removing the plant from the container, scarify the side of the rootball to eliminate the root-bound condition.
- Remove all nursery-type plant stakes and labels from plants. Install tree staking per drawings.
- I. **Staking of Trees:** Stake and tie trees per project details
- J. **Watering:** All watering shall be done to provide uniform coverage and not cause erosion or damage to the finished surface.
- K. **Pruning:** Prune, thin out, and shape trees in accordance with ASNS. Prune trees to retain the required height and spread. Do not cut tree leaders; remove only injured or dead branches from flowering trees, if any. Prune trees to retain natural character. Plants should conform to the requirements of ANA after pruning.
- L. **Herbicide and Pesticide Application:** Herbicides, insecticides, and fungicides shall be applied as needed and following the manufacturer's recommendations and used by a licensed professional.

3.03 CACTI AND SUCCULENTS

- A. **Installation of Cacti and Succulents:** Lay out individual Cacti and Succulents locations. Stake locations, outline areas, and secure the City of Phoenix's Representative acceptance before the start of planting work. Make minor adjustments as requested by the City of Phoenix's Representative.
- B. **Excavation:** Excavate pits, as shown on drawings and schedules. Loosen hard subsoil at the bottom of the excavation.
- If a caliche is encountered, the Contractor is to break through it to provide drainage and bring it to the attention of the City of Phoenix for resolution.
- C. **Preparation of Cacti and Succulents Backfill Mix:** Soil removed from the plant pit shall be mixed with sand at 30% - 40% sand and 60% - 70% excavated on-site native soil.
- D. **Marking and Calibration for Cacti:** Before delivery to the site and planting, the Contractor shall mark the original north-appearing surface and establish calibration points. Record the distance between calibration marks of all cacti using a method acceptable to the City of Phoenix's Representative. The mark or its installation process shall not damage or deface the cacti. The mark must be capable of withstanding poor weather and expected working conditions without the possibility of erasure or detachment throughout the contract.

All wounds and cuts made to the Cacti and Succulents shall be treated with bactericide as approved on the same day the amount and wound were made.

All cut and damaged roots shall be treated with dusting sulfur as approved on the same day the cut and wound were made.

3.04 INERT MATERIALS INSTALLATION

- A. The areas on which Inert Materials are to be placed shall be graded according to the drawings before placement. The ground shall be reasonably smooth and firm, and all deleterious material and rocks larger than 1" in diameter shall be removed and disposed of off-site.
- B. The Contractor shall field identify the placement area by outlining the perimeter of each type of inert material placed on the plans by flagging, staking, or surface spray paint. In addition, landscape mass planting areas and groupings shall also have an identified perimeter.
- C. In areas to receive inert mulch apply **TWO** applications of pre-emergent weed control, such as Surflan or equal. The first application shall be before the placement of inert material. The 2nd application shall be applied to the finished surface of these areas as described below.
- D. Decomposed granite shall be wetted before placement over the accepted subgrade to eliminate powdering and dry placement. The decomposed granite shall not be mixed with and shall be protected from contamination with on-site soil materials or other undesirable materials before placement. Decomposed granite that, in the opinion of the City of Phoenix's Representative, has unwanted contaminants that shall be removed from the Project.
- E. Per the drawings, decomposed granite shall be placed where designated, including plant irrigation saucers.
- F. After placement and raking the decomposed granite, the Contractor shall lightly spray to remove fines from the surface, and water settles the material.
- G. A second pre-emergent herbicide application shall be applied to decomposed granite areas per the manufacturer's printed instructions. Following this application, the Contractor shall water in the pre-emergent herbicide per the manufacturer's recommendation so that it saturates into inert material and soil.

3.05 CLEAN-UP AND PROTECTION

Keep pavements and work areas clean, neat, and orderly during landscape work. Broom, scrub, or hose-affected areas as directed by the City of Phoenix's Representative. Soil deposits or compacted mud will not be allowed to remain on the roads, parking lots, or concrete surfaces. It shall be removed daily or more frequently as directed by the City of Phoenix's Representative.

Protect landscape work and existing improvements from damage due to landscape installation or the operations of other Contractors and trespassers. The Contractor assumes all responsibility for the portion or portions of the site under construction and shall provide and maintain safety devices and protective equipment as required by state and local laws, codes and ordinances. Maintain protection during installation and maintenance periods as needed. Treat, repair or replace Contractor damaged work as directed by the City of Phoenix's Representative at no cost to the City of Phoenix's Representative.

END OF SECTION

32 90 00 PLANTING



L O G A N S I M P S O N

December 4, 2023

Gerrald Adams, LEED AP
Director
Perlman Architects of Arizona, Inc.
2929 North Central Ave, Suite #1600
Phoenix, Arizona 85012

**Re: City of Phoenix – Fire Station No. 74
Green Infrastructure - Project Design Review**

Dear Gerrald,

As requested, Logan Simpson and Dibble Engineering have reviewed Fire Station No. 74's application for green infrastructure. Where feasible, the Project has complied with the "Greater Phoenix Metro Green Infrastructure Handbook" (Date 4/2019) with Low Impact Developments (LID) elements. Our construction documents will utilize the technical standard details and specifications (TSDS) within the Handbook's nine sections to support compliance elements.

For several LID elements, the Fire Station's landscape approach is integral to function and aesthetics, specifically in the context of the Project's site. Incorporating low water-use, low maintenance nursery stock plant material, and native seed slows the stormwater, which increases water infiltration and absorption. Over time, the landscape will decrease the reliance on potable water for drip irrigation of the plants, especially along the project site's exterior areas (outside the permitted wall) where native seed has been applied. The landscape approach also involves re-using the desert pavement in the native seeded exterior areas to support the bioretention soil media (BSM) and aid in holding moisture conveyed to the LID elements.

The civil engineering approach for LID is to provide a system combining bioretention swales and basins connected to curb openings, inlets, pipes and rock lined spillways. The south rock lined bioswale is designed to be over 500 feet long for only a 12 foot width. A hydrodynamic separator is designed for the stormwater outflow of the larger basin to the west, which will remove sediments from the stormwater prior to it discharging to the adjacent natural wash.

Enclosed is a spreadsheet outlining each section in the Handbook and our approach to providing areas of compliance.

Respectfully,

Jerry Moar, ASLA, LEED AP BD +C
Director of Landscape Architecture

C. Shannon Mauck PE
Vice President, Land Development

Summary of Comments Form

Submittal		Green Infrastructure Compliance	City of Phoenix Fire No. 74			
Date		12/4/2023	Logan Simpson/Dibble Engineering			
Section	Sub-Sections	Description	Not Complied	Partial Complied	Complied	Response / Comment
1		Permeable Pavements - Pervious Pavers are suitable for low-to-moderate-vehicular use areas, such as parking lots. Modular paving systems provide permeable paving surface and a reservoir material, such as base layer of crushed aggregate. Liners, geotextiles, and underdrains can also be used.			Yes	Within the site, there are (26) parking spaces for the employees and (2) additional parking spaces with (1) accessible parking space. All parking spaces will have concrete unit pavers installed in a basket weave pattern with soldier course edges. This will reduce surface run-off with infiltration capacity of underlying soil drainage at a controlled rate through under-drain outlets to downstream stormwater harvesting basin systems.
	1.1	Applicability and Advantages - Permeable pavements are suitable for low- to moderate-vehicular use areas, such as parking lots, overflow parking areas, sidewalks, and access roads.			Yes	Permeable pavers applied to (26) parking spaces for the employees and (2) additional parking spaces with (1) accessible parking space. All parking spaces will have concrete unit pavers installed in a basket weave pattern with soldier course edges.
	1.2	Design Considerations - Permeable pavements support traffic loads and manage surface water effectively (i.e. provide sufficient storage). As with any pavement, Americans with Disabilities Act (ADA) requirements must be followed.			Yes	The Belgard Holland concrete pavers support heavy loads by providing maximum interlock and pattern versatility, a practical choice for commercial installations. The concrete pavers can be utilized to construct an ADA-compliant pavement.
	1.3	Hydrologic Function - Permeable pavement systems are designed to reduce surface runoff by allowing stormwater to infiltrate the pavement surface.			Yes	The concrete pavements have a surface course layer and an underlying stone aggregate reservoir layer, allowing captured run-off to fully or partially infiltrate underlying soils.
	1.4	Structural Design Requirements - (1.4.1) Permeable pavers interlock in such a way that 5 to 15 percent of the surface remains open to allow water to pass. (1.4.2) Pervious Concrete is a rigid pavement system, which means that structural analysis should ensure that the thickness of the slab can support the anticipated surface loads.		Partial Complied		(1.4.2) The fine particles used in most concrete aggregate, pervious concrete, are surfaces that allow water to infiltrate, resulting in a gap-graded mixture with highly connected pore space.
	1.5	Underdrains - Permeable pavement systems without an underdrain are appropriate for soils with a minimum corrected in-situ infiltration rate of 0.3 inches/hour.		Partial Complied		The interlock concrete unit pavers allow water to infiltrate, resulting in a gap-graded mixture with highly connected pore space.
	1.6	Construction Considerations - The area that will be scarified should be roped off to avoid inadvertent traversing.		Partial Complied		The construction areas should be fenced off with a construction fence or silt fence to prevent soil compaction from equipment during construction of surrounding improvements.
	1.7	Maintenance - Adjacent areas that drain to the permeable pavement area should be permanently stabilized and maintained to limit the sediment load to the system.		Partial Complied		Vacuum sweeping will be typically performed a minimum of twice a year, while adjusting the frequency according to the intensity of use and deposition rate on the permeable pavement surface.
	1.8	Compatibility with Other LID Practices - Permeable pavements are typically the upstream LID facilities in a system, but they can be designed adjacent to curb openings.		Partial Complied		The concrete interlock pavers are near curb openings and other retention basins.
	1.9	Specifications - Section 344 - (344.1) (344.2) Placement of permeable interlocking concrete pavers will consist of constructing permeable unit pavers on a prepared subgrade by these specifications and in conformity with the lines, grades, thicknesses, and typical sections shown in the contract documents or as directed by the Engineer. (344.2.2) Base Course Materials. (344.3) The Contractor shall submit drawings and documentation as required in this specification and obtain written acceptance of submittals before using the materials or methods requiring approval. (344.4) - At least 15 days before construction of the permeable unit paver installation, and following the Engineer's acceptance of the qualifications described above, the contractor shall provide a minimum of 1 test panel for acceptance. (344.5) Permeable Interlocking Pavement Base Preparation (344.6) Quality Control Field Testing		Partial Complied		(344.1)(344.2.1) Permeable paver materials shall be approved following MAG Specification 106. (344.2.2) Soils will be analyzed by a qualified professional for infiltration rates and load bearing, given anticipated soil moisture conditions. (344.3) A qualified contractor will submit written evidence of who has the required certifications and who will be on-site at all times during the permeable unit paver installation, acting as the installer for the project. Within 7 days after notice to proceed, the contractor shall submit the name and location of a third-party quality assurance (QA) testing agency with experience in testing permeable unit pavements. (344.4) The Engineers will place, Place, joint, and cure the test panel to be a minimum of 275 square feet in size or as specified in the contract documents. (344.5) A mandatory pre-installation meeting will occur at least 1 week before the installation of the permeable unit pavers. It shall include, at a minimum, the Engineer, inspector, general contractor, permeable unit paver installer, and field testing agency. (344.6) The Engineer will perform materials approval testing. There will be a roughness test and an infiltration test.
2		Curb Openings - To convey runoff into and out of LID features, such as swales and or bioretention areas. Clear openings are typically at a minimum of 2 feet wide to convey flows from parking lots and stormwater capture areas with chamfered sides at 45 degrees. A minimum of 2-inch grade drop should be provided between the floor of the curb opening.			Yes	There are (2) curb openings that are 6 feet wide. The floor of the curb opening will slope toward the stormwater harvesting basin systems. A rip-rap spillway will be implemented with a 2-inch local gutter depression and installed with a 12-inch depressed flow line relative to the adjacent finish grade. A 12" minimum subgrade under the spillway and finish grade adjacent to the spillway shall be compacted to 95% with erosion-control geosynthetic fabric.
	2.1	Applicability and Advantages - The clear openings are typically 2 feet wide. Curb openings are regularly used to convey flows from parking lots and streets into stormwater capture areas and LID facilities.			Yes	There are (2) curb openings that are 6 feet wide. The curb openings are easy to maintain.

Summary of Comments Form

Section	Sub-Sections	Description	Not Complied	Partial Complied	Complied	Response / Comment
	2.2	Design Considerations - A minimum 2-inch grade drop should be provided between the floor of the curb opening and the finished grade of stormwater element to allow positive drainage.		Partial Complied		A rip-rap spillway will be implemented with a 2-inch local gutter depression and installed with a 12-inch depressed flow line relative to the adjacent finish grade.
	2.3	Compatibility with Other LID Practices - Curb openings can be implemented as an accessory to many LID and non-LID facilities.			Yes	The curb openings are used with vegetated/rock swales; stormwater harvesting systems, sediment traps, and bioretention systems to capture roadside stormwater.
	2.4	Maintenance - Curb openings should be inspected after storms of 0.5 inches or greater to make sure that they are not clogged with debris or sediments.		Partial Complied		The 6 feet wide curb openings are designed for low maintenance and to blend in with the natural landscape west of the site. Since the curb openings are located near the adjacent private driveway, it is easy to access for inspection.
	2.6	Specifications - 341- (341.1) (341.2) Curb openings can be retrofitted onto an existing roadway, or they can be constructed as part of the original construction. The construction materials for the curb opening will comply with MAG Specifications. (341.3) The contractor is responsible for the quality of the curb opening and any related work therein and shall guarantee this work against failure for 3 years. (341.4) Payment		Partial Complied		(341.1) (341.2) All aprons and curb openings shall be completed in concrete. Aprons will follow MAG Specification 505 and include a rock pad, riprap or protected inlet on the side slope, and a concrete sediment trap on the downstream. (341.3) All damages during construction shall be repaired by MAG Specifications 340 and 401. (341.4)
3		Sediment Traps - The sediment traps provide collection points for sediment and other debris before stormwater capture. A 3-inch concrete lip and flat surface pad should be constructed on three sides to reduce maintenance and encourage sediment deposition. The flow path length-to-width ratio should be 3 to 1 less because a higher flow path length to width ratio increases fine sediment removal. A rip-rap bottom is not recommended because they are difficult to clean, but with appropriate sized rock should be used to armor the sediment trap.		Partial Complied		The basin at the southeast corner of the site will trap sediment before the water can pond up and flow out. For the larger western basin a hydrodynamic separator will be installed to assist in sediment removal and water quality before the water can exit the basin. Sediment will drop out of the flows in the southern rock swale (12' wide and 550' long) as it flows to the wash. Installed at curb openings and inlets that receive concentrated stormwater flows, the rip-rap spillway will have a top of the slope that will transition to the toe of the slope at 4:1 max flow. The toe of the slope will have a 14-foot flat surface that will flow toward the 18-inch minimum turn down at the basin bottom. There are three 12-inch storm drainage pipe systems. One of the inlet storm drainages is located north of the building and southeast of the building. An additional storm inlet is located northwest of the retention basin.
	3.1	Applicability and Advantages - Sediment traps are applicable to areas with concentrated runoff flowing into a stormwater capture or LID facility and generally used as an accessory to another LID element or storage basin.			Yes	From the above parking lot west of the facility, the curb openings and gutter depressions reduce erosion and disperse energy away from the 4:1 sloped building and parking lot pad. An erosion control geosynthetic fabric non-woven Class A is incorporated under the Rip-Rap spillway per MAG SPEC SEC 796.2.3.
	3.2	Design Considerations - Riprap or appropriately sized rock should be used to armor the sediment trap side slopes.			Yes	Compacted side slopes to 95% with riprap
	3.3	Construction Considerations - Flows should be diverted around the sediment trap to protect it from inundation during construction.			Yes	The construction areas should be fenced off with a silt fence to prevent soil compaction from equipment during the construction of surrounding improvements.
	3.4	Maintenance - Sedimentation or debris should be removed at least every 6 months and after storms of 0.5 inches or greater.			Yes	The sediment traps are designed for low maintenance and to blend in with the natural landscape west of the site.
	3.5	Compatibility with other LID Practices - Sediment traps are utilized as an accessory with another LID facility or conveyance structure and are designed in conjunction with curb openings and vegetated/rock bioswales.			Yes	The sediment traps have been designed to mitigate surface runoff from the parking-lots through the curb openings. Trees and other hardscape materials accommodate the sediment trap by collecting or filtering other debris.
	3.6	Specifications - 643 - (643.1) (643.2) This work shall consist of supplying and constructing a sediment trap outlet in catch basins with additional sump depth as shown on the plans. (643.2) The materials for the storm harvesting basin will comply with MAG Specifications. (643.3) The sediment trap shall be constructed in accordance with the diameter and details shown on the project plan and details. (643.4) The unit of measure for the sediment trap will be per each and the payment will be made at the contract unit price per each specified, which will include excavation, shoring, backfill, compaction, rip-rap installation, and all labor, materials, tools, equipment and incidentals needed to complete work specified.		Partial Complied		(643.1) (643.2) The construction site will implement MAG Specifications 505, 703, 705, and 725. (643.3) The sediment trap outlet and all associated connection hardware necessary to complete the sediment trap outlet within the structure shall be completed as shown on the detail sheets of the plans and as directed by the Engineer. (643.4) The construction payment will follow MAG Specifications 206, 215, and 220.
4		Stormwater Harvesting Basin - Shallow vegetated earthen depressions that collect stormwater and cleanse it prior to the water percolating into the subsurface, an infiltration trench is designed in the center of the storage area so that surface water is infiltrated within 36 hours. Harvesting basins should be built adjacent to impervious areas like parking lots and recreational areas such as sport courts.			Yes	On the southeast corner of the building facility, stormwater harvesting basins will be constructed with vegetation at the basin's edge. The basin has a depth of 6 to 10 inches of natural contoured swale, containing angular rock for filtration. The larger retention basin to the west takes flows from the parking area and will hold water until it enters a hydrodynamic separator and ultimately outlets to a natural wash. Some of the sediment would drop to the bottom while the process is taking place.
	4.1	Applicability and Advantages - Harvesting basins should be built immediately adjacent to localized runoff sources/impervious areas (e.g. parking areas, driveways, and rooftops) in lieu of constructing a large, centralized on-site basin.			Yes	The basin is built adjacent to impervious parking-lots, driveway, and pathways. This enables the basin to collect storm runoff from the pervious pavers.
	4.2	Design Considerations - Stormwater harvesting basins may accept distributed flow along some or all perimeter sides from areas like parking lots or landscape areas. Slopes steeper than 3 to 1 should be rock-lined based on the engineering analysis.		Partial Complied		The basin is built adjacent to impervious parking-lots with pervious pavers. The stormwater harvesting basin may accept distributed flow along some or all perimeter sides from areas like parking lots or landscape areas.

Summary of Comments Form

Section	Sub-Sections	Description	Not Complied	Partial Complied	Complied	Response / Comment
	4.3	Construction Considerations - Filter fabric should not be used in stormwater harvesting basin. At a minimum, the bottom grade and side slopes should have the top 6 – 8 inches scarified. A percolation test should be completed before the construction of the underground storage area to determine if the site soils will perform as anticipated and/or if an underdrain is necessary.		Partial Complied		The construction areas will be fenced off with a silt fence to prevent soil compaction from equipment during the construction of surrounding improvements. The basin has a 6 to 10 inches depth of natural contoured swale, containing angular rock for filtration.
	4.4	Maintenance - After every storm greater than 0.5 inches, or semiannually at a minimum, the harvesting basins should be checked for erosion, sediment, debris, litter, and clogging.			Yes	Sedimentation or debris will be removed at least every 6 months after storms of 0.5 inches or greater.
	4.5	Compatibility with Other LID Practices - Stormwater harvesting basins are harmonious with and can seamlessly incorporate other LID techniques such as curb openings, bioretention systems, and sediment traps.			Yes	Potential curb openings adjacent to the driveway curb on the west side can aid in sufficing stormwater runoff from the impervious driveway to the large western basin. The proposed curb and wall openings allow stormwater to flow from the site to the basin.
	4.6	Specifications - Section 641 (641.1) (641.2) The storm harvesting basin will comply with MAG Specifications. (641.3.1) Install all temporary erosion control measures prior to site disturbance. (641.3.2) Excavation, Backfilling, and Grading (641.3.3) Construction Sequence Scheduling (641.4) Measurement and Payment.		Partial Complied		(641.1) (641.2) The construction site will implement the following MAG Sections: 201 Clearing and grubbing shall be performed in advance of grading operations; 215 Earthwork for Open Channels; 220 RipRap Construction; 430 Landscaping and Planting; 796 Geosynthetics. (641.3.1) The construction areas should be fenced off with a construction fence or silt fence to prevent soil compaction from equipment during the construction of surrounding improvements. (641.3.2) The basin will follow MAG Specification Section 215 – Earthwork for Open Channels. (641.3.3) The Construction of the road/site improvements in a manner that minimizes adverse impacts on the location and function of the stormwater BMPs. For example, ensure that construction access or equipment staging areas do not conflict with the final location of the basin. (641.4) The stormwater harvesting basin is 223 cubic feet.
5		Vegetated or Rock Bioswales - With vegetated/rock swales, an open shallow channel contain trees, grasses, and other low-lying vegetation covering the swale bottom and side slopes, with pervious pavers surface plating materials, such as decomposed granite, larger rock, and/or mulch. Vegetated or rock bioswales are designed to slow the flow of runoff to downstream discharge points through roughened surfaces, plants and check dams. Side slopes of bioswales should not be steeper than 3:1 for safety, erosion, and maintenance purposes. If located adjacent to sidewalks or parking lots, a 2-foot level shelf must be created along those elements as a recovery area. Swale bottom widths should be less than 8 feet if meandering is desired.		Partial Complied		Native seed mix coverage can accommodate the side slopes of the riprap spillway. With the low-lying vegetation covering the spillway, this can operate as a bioswale with a shallow channel. With the native seed mix and the riprap spillway, the toe of the slope can reduce the runoff flow to downstream discharge transition points. The side slopes are 3:1, with an 18-inch MIN turnaround on each side of the spillway. There is also a bioswale to the south.
	5.1	Applicability and Advantages - Rock bioswales are usually placed inline within a storm drain system and are intended to slow down and infiltrate runoff.			Yes	The riprap spillway slows the water, minimizing and decreasing runoff while reducing erosion and filtering stormwater pollutants. With the riprap in place, this stabilizes the slope and promote plant growth, reducing the reliance on potable water for landscape. The riprap spillway is relatively easy to construct and is cost-effective with low maintenance. The toe of the slope of the riprap spillway operates as a tiered/stepped mechanism for the steep longitudinal grade.
	5.2	Design Considerations - To prevent erosion of in-situ soils, the rock, vegetation, and/or organic mulches can stabilize the surface. The underdrain must connect to an appropriate downstream drainage facility, LID element, and/or underground stormwater collection system. The design objective is typically to improve the aesthetics of the swale and/or to match the existing landscape character of the surrounding lands.			Yes	While improving the landscape performance expectations, the site is relatively covered with drought-tolerant plants, enhancing the aesthetics of the swale and the facility. The drainage swale is South of the egress driveway, near the facility, consisting of shrubs, cacti accents, a tree, and a boulder to hold the soil in place while the water drains into an inlet. From the inlet, the water is drained into a 12-inch underdrain pipe. The water is then drained toward the bottom of the basin, where the riprap slows the velocity of the runoff into a natural setting retention basin.
	5.3	Construction Considerations - The areas upgradient of a bioswale must be stabilized prior to the construction of the bioswale. Subgraded soil is compacted and scarified to a depth of 6 to 8 inches with fine grading to avoid nonconformities. Angular rock can be placed following fine grading to provide a roughened surface to slow flow velocities and to protect the subgrade. Placing rock and seeding will improve overall aesthetics and support revegetation.		Partial Complied		Located south of the apparatus bay egress of the facility, the bioswale is near a retention basin with angular rock. The soil will be compacted and scarified to a depth of 6 to 8 inches. Much of the decomposed granite and vegetation will align the swale and blend into the landscape, providing drainage away from the building structure.
	5.4	Maintenance - After every storm greater than 0.5 inches or annually at a minimum, swales should be checked for erosion, sediment, debris, litter, and clogging.		Partial Complied		Since the swale is located near vegetation and the facility, It is easy to access for inspection. A boulder will be placed along the swale and near the inlet to prevent debris entering the inlet.
	5.5	Compatibility with other LID Practices - Vegetated/rock bioswales often are designed in conjunction with curb openings or permeable pavements. The bioswales should be connected to a proper discharge facility if designed for smaller storm events.		Partial Complied		The riprap spillway provides the curb openings and are distributing the runoff from the permeable pavers and parking lots. The runoff discharge is drained toward the bioretention basin which is west of the site.
	5.6	Specifications - Section 640, complies with MAG 201, 215, 220, 425, 430, and 796. For the construction methods, a temporary erosion control, swale excavation, backfilling, and grading, the MAG sections are implemented in the construction of the swale.			Yes	The construction site will implement the following MAG Sections: 201 Clearing and grubbing shall be performed in advance of grading operations; 215 Earthwork for Open Channels; 220 RipRap Construction; 430 Landscaping and Planting; 796 Geosynthetics (Rip Rap Spillway Erosion Control Geosynthetic Fabric Non-Woven, Class A per MAG SPEC Sec 796.2.3. Riprap construction shall consist of furnishing and placing stone, with or without grout, and underlain with filter material of granular filter blankets or erosion control geosynthetic fabric.
6		Bioretention Systems - To remove pollutants from stormwater through an engineered soil media, the bioretention system allows percolation into the subsoil or have an underdrain that directs infiltrated stormwater to a downstream drainage system. This system is generally deeper at 36-inch to 42-inches and their main purpose is to capture pollutants and to provide a medium to infiltrate stormwater. The underdrains are a minimum of 6-inches in diameter.			Yes	West of the site, a 3-foot-deep bioretention basin system will contain a ground coverage of native seed mix to mitigate erosion and blend into the South Mountain Preserve. On the southeast corner of the facility and the entrance north of the facility, two 6-inch storm under-drainages are located near the building, and one 12-inch storm drainage is located southwest of the basin. South of the site is a rock lined swale that serves the site and overflow from the existing retention basin at the northeast corner of Chandler and 19th Avenue, it ultimately outlets into the wash.

Summary of Comments Form

Section	Sub-Sections	Description	Not Complied	Partial Complied	Complied	Response / Comment
	6.1	Applicability and Advantages - Bioretention systems are applicable to residential, commercial, and industrial sites and along roadways where stormwater volume reduction by infiltration or improved water quality is desired. Bioretention may be particularly well-suited to urban locations with highly impervious sites where space is limited, because they can provide higher infiltration rates.		Partial Complied		The increased open space of a bioretention area can be multifunctional, providing wildlife habitat and creating a "softer" aesthetic for streets and roads by incorporating additional landscaping and vegetation.
	6.2	Design Considerations - Bioretention areas should have a sediment trap at the inlet to collect the concentrated flow to prevent clogging, thereby prolonging the effective lifespan of the facility. If underdrains are used, they should be a minimum of 6 inches in diameter so that they can be cleaned without being damaged. A vertical clean-out pipe is an optional item. PVC and HDPE pipes used as underdrains should conform to ASTM D3034 and AASTHO 252M, respectively.		Partial Complied		There are three storm drainage grates within the property. Two of the 6" storm drainage pipe, which connects to the 12" storm drain outlet pipe, drains the storm runoff into a retention basin west of the property. Two other 4" storm drainage pipe connects to a 12" storm drain outlet pipe. These 12" storm drainage pipes also drain into the retention basin west of the property.
	6.3	Construction Considerations - At a minimum, the subgrade soils should have the top 6 – 8 inches scarified. Rock must be washed and free of fine particles before being placed in the bioretention system.			Yes	The soil will be compacted and scarified to a depth of 6 to 8 inches. The construction areas will be fenced off with a silt fence to prevent soil compaction from equipment during the construction of surrounding improvements. Rock will be wetted before placement to eliminate powdering.
	6.4	Maintenance - This LID element should be inspected quarterly and after storms of 0.5 inch or greater.		Partial Complied		Sedimentation or debris will be removed at least every six months after storms of 0.5 inches or greater. Any significant sediment accumulation or debris will be cleared.
	6.5	Compatibility with Other LID Practices - A sediment trap and curb opening are often designed in conjunction with this element. When an underdrain system is necessary, an appropriate outlet must be found.		Partial Complied		There are three storm drainage grates within the property. Two of the grate overflows are located north of the facility's private driveway and parking lot; both have the 6" storm drainage pipe, which connects to the 12" storm drain outlet pipe, draining storm runoff into a retention basin west of the property. Two other overflows are located south of the facility with a 4" storm drainage pipe connecting to a 12" storm drain outlet pipe. These 12" storm drainage pipes also drain into the retention basin west of the property.
	6.6	Specifications - 645 - (645.1) (645.2) complies with MAG 201, 215, 220, 425, 430, and 796. A bioretention system may include tree, shrub, and groundcover plantings. (645.3) Access is required to all bioretention areas for maintenance. For facilities off the road, an access road may be needed. For facilities on high-speed roads, ensure safe access via a shoulder or designated area. Within the bioretention area, the overflow structure must be accessible to maintenance crews. (645.3.1) Temporary Erosion Control. (645.3.2) Construction Sequence Scheduling (645.4) Measurement and Payment		Partial Complied		(645.1) (645.2) The bioretention basin system will contain a ground coverage of native seed mix to mitigate erosion and blend into the South Mountain Preserve. The bioretention basin complies with MAG 201, 215, 220, 425, 430, and 796. (645.3) There is access from Chandler Blvd. to accommodate maintenance crews. (645.3.1) There will be temporary erosion control measures before site disturbance and inspection of drainage pipes after each rainfall event. (645.3.2) An implementation schedule will be included as part of the erosion control plan to identify the order of operations for construction activities to avoid any stormwater Best Management Practices failures. (645.4) The basin is approximately 37,837 cubic feet. The construction site will implement the following MAG Sections: 201 Clearing and grubbing shall be performed in advance of grading operations; 215 Earthwork for Open Channels; 220 RipRap Construction; 430 Landscaping and Planting; 796 Geosynthetics Erosion Control Fabric Non-Woven, Class A per MAG SPEC Sec 796.2.3.
7		Curb Extensions - Placed in locations where a new curb is built out into a travel or parking lane to create an opportunity for the bioretention of street runoff and a space for trees, the curb extension may have sloped or vertical sides with on-line (flow-through) elements. The soil depth should be 12-18 inches to facilitate storage capacity and beneficial for vegetation. The opening collects roadway flow width for the first flush design storm (0.5 inch). Minimum planter width should be 30 inches, but any geometric shape can be built. The width of a small excavator or backhoe dictates the minimum width.		Partial Complied		On the northwest corner of 19th Ave. and Chandler Blvd. and southeast of facility, the stormwater harvesting basin will be constructed with vegetation. This creates an opportunity for the bioretention of street runoff and a space for trees.
	7.1	Applicability and Advantages - This LID element can be used along low-speed roadways, driveways, and parking lots.		Partial Complied		19th Ave and Chandler Blvd are low-speed zones with low traffic. This LID element can also function well in urban streetscapes as a traffic-calming measure, is easy to retrofit into an existing area, increases aesthetic open space for streets and roads by incorporating additional landscaping and vegetation, cools adjacent land areas, and reduces the Phoenix Metropolitan Area heat island effect, and provide additional stormwater storage capacity as compared to conventional landscape planters.
	7.2	Design Considerations - Minimum soil depth should be 12 – 18 inches to facilitate storage capacity and to be beneficial for vegetation. Minimum planter width should be 30 inches, but any geometric shape can be built. Curb extensions should be designed carefully not to be in conflict with dry utilities. The landscape will require some degree of supplemental watering to get the plants established and periodically during dry periods to maintain their viability.			Yes	The basin has a wider geometrical shape, offering more opportunities for storm runoff to filter into the basin. The basin is located away from any dry utility structures. The vegetation will be planted on the edge of the basin so the plants will not be waterlogged. Supplemental landscape irrigation will be provided.
	7.3	Construction Considerations - The asphalt, concrete curb, and subgrade removal are construction considerations and they should adhere to the MAG Specification. At a minimum, the bottom of the curb extension planter should have the top 6 – 8 inches scarified. Shoring may be required to reduce the potential of the adjacent soils from sloughing into the construction area.		Partial Complied		The curb and driveway next to the retention basin will comply with the City of Phoenix and MAG detail standards (COP STD DET P1255, MAG STD DET 222, TYPE A). The construction areas should be fenced off with a silt fence to prevent soil compaction from equipment during the construction of surrounding improvements.
	7.4	Maintenance - This LID element should be inspected quarterly and after storms of 0.5 inch or greater. These inspections are needed because damage is not apparent during dry weather. Any significant sediment accumulation or debris should be cleared.		Partial Complied		The sediment traps are designed for low maintenance and to blend in with the natural landscape west of the site. Inspections will be conducted annually to remove any debris and prevent clogging of the inlet structures. Encroaching vegetation will be maintained to avoid conflicts with the landscape buffer.
	7.5	Compatibility with Other LID Practices - Curb extensions are compatible with curb openings, sediment traps, permeable pavements, and overflow structures.		Partial Complied		The basin can have an under-drainage pipe that connects to the nearest storm grate located west of the basin. This is compatible with the overflow structure, improving storm runoff drainage from the streets and the facility. An inverted drainage pipe can also be placed south of the bottom basin, where a drainage swale is located.

Summary of Comments Form

Section	Sub-Sections	Description	Not Complied	Partial Complied	Complied	Response / Comment
	7.6	Specifications - Section 647- (647.1)The curb scale extension is typically a small-scale bioretention cell located along rural streets between and replaces the roadway and roadway curb. These facilities may include tree, shrub, and groundcover plantings. (647.2) The materials shall follow MAG Specifications 201, 215, 220, 425, 430, and 796. (647.3) Access is required to all bioretention areas for maintenance. For facilities on high-speed roads, ensure a safe access route for maintenance personnel. (647.3.1) Temporary Erosion Control - Inspect erosion control measures once a week and after each rainfall event. Make any required repairs immediately. Erosion control devices shall be maintained until the site is stabilized, as the Engineer determines. (647.3.2) Construction Sequence Scheduling - An implementation schedule should be included in the erosion control plan to identify the order of operations for construction activities. At a minimum, the subgrade shall be scarified, ripped, or tilled to a depth of 6 – 8 inches, with equipment having tines spaced no greater than 8 – 12 inches apart. (647.4) The unit of measure for a curb extension will be cubic feet.		Partial Complied		(647.1) and (647.4) The basin is a small-scale bioretention cell, approximately 1,326 cubic feet, located on the corner of 19th Ave and Chandler Blvd., Shrubs and trees are planted on the edge of the basin.(647.2) The construction site will implement the following MAG Sections: 201 Clearing and grubbing shall be performed in advance of grading operations; 215 Earthwork for Open Channels; 220 RipRap Construction; 430 Landscaping and Planting; 796 Geosynthetics Erosion Control Fabric Non-Woven, Class A per MAG SPEC 796.2.3.The construction areas should be fenced off with a construction fence or silt fence to prevent soil compaction from equipment during construction of surrounding improvements. (647.3.2) The swale will have a depth of 6 to 10 inches of natural contours with angular rock.
8		Bioretention Planters - Located in hardscape areas between the curb and sidewalk, the planters are typically a small scale bioretention cell. The minimum soil depth should be 18-inches to facilitate storage capacity and to provide a benefit for vegetation. The minimum planter width should be 30 inches. The basin areas should be sized to capture and treat the first flush design storm (0.5 inch) and drain surface water in less than 36 hours.		Partial Complied		A small retention basin is located southeast of the facility. This bioretention planter serves as a small scale bioretention cell.
	8.1	Applicability and Advantages - This LID application can be used where there is available ROW and an offset from travel lanes		Partial Complied		The small retention basin, which also serve as a curb extension from the right-of-way of 19th Ave and Chandler Blvd., function well in urban streetscapes and preservation sites. It provides additional stormwater storage capacity. The bioretention basin mitigates the Phoenix Metropolitan Area heat island effect and cools adjacent land areas.
	8.2	Design Considerations - The minimum planter width should be 30 inches so they are easy to construct with a small excavator or backhoe, but any geometric shape can be built.		Partial Complied		The basin has a wider geometrical shape, offering more opportunities for storm runoff to filter into the basin. The basin is 55 feet by 33 feet wide, with angular rock and geotextile fabric used to separate the prepared soil and the gravel envelope. The design objective is typically to improve the planter's aesthetics, provide shade and landscaping for comfort, and/or install plant materials that will thrive in the prepared soil and within the inundation characteristics of the element. The vegetation will be planted on the basin's edge so the plants will not be waterlogged. Supplemental landscape irrigation will be provided.
	8.3	Construction Considerations - At a minimum, the bottom of the bioretention planter should have the top 6 - 8 inches scarified. Shoring may be required to reduce the potential of the adjacent soils from sloughing into the construction area.		Partial Complied		The bioretention basin cell's subgrade and native soil will be scarified at a minimum of 6 to 8 inches. Construction areas should be fenced off with a construction fence or silt fence to prevent soil compaction from equipment during construction of surrounding improvements.
	8.4	Maintenance - This LID element should be inspected quarterly and after storms of 0.5 inches or greater.			Yes	Sedimentation or debris will be removed at least every 6 months and after storms of 0.5 inches or greater.
	8.5	Compatibility with Other LID Practices - Bioretention planters can be integrated with curb openings.		Partial Complied		The bioretention basin cell can accommodate potential curb openings from 19th Ave.
	8.6	Specifications - Section 646 - (646.1) Streetscape bioretention planters will usually have vertical sides but may have sloped sides if sufficient space is available, which includes tree, shrub and groundcover plantings. (646.3) Access is required to access all bioretention areas for maintenance. Provide a safe, practical access route for maintenance crews.			Yes	(646.1)There is sufficient space for a slope grade that will have the top 6 to 8 inches scarified. The small scale bioretention basin will follow MAG Specification 430, 201, 215, 220, 425, 430, and 796. (646.3.1)The construction areas will be fenced off with a construction fence or silt fence to prevent soil compaction from equipment during the construction of surrounding improvements. (646.3.2) An implementation schedule will be included as part of the erosion control plan to identify the order of operations for construction activities. (646.4) The construction site will implement the following MAG Sections: 201 Clearing and grubbing shall be performed in advance of grading operations; 215 Earthwork for Open Channels; 220 RipRap Construction; 430 Landscaping and Planting; 796 Geosynthetics Erosion Control Fabric Non-Woven, Class A per MAG SPEC 796.2.3.
9		Domed Overflow Structures - This allows for ponding within multiple stormwater capture facilities and provides an outlet for larger storm events that exceed the capacity of each facility. Overflow structures drain into a downstream collection system, such as a storm drain, basin, channel, or natural wash. The grate overflow elevation should be at least 3 inches below the adjacent sidewalk or on top of the curb. There should be a 2-foot barrier from the debris pad to any vegetation. The opening area would need to be calculated accounting for the domed grate, the orifice equation.		Partial Complied		There are three storm drainages grate within the property. Two of the grate overflows are located north of the facility's private driveway and parking-lot, both have the 6" storm drainage pipe, which connects to the 12" storm drain outlet pipe, draining storm runoff into a retention basin west of the property. Two other grate overflows are located south of the facility with a 4" storm drainage pipe, connecting to a 12" storm drain outlet pipe. These 12" storm drainage pipes also drain into the retention basin west of the property.
	9.1	Applicability and Advantages - Overflow structures are applicable to most commercial, industrial, and high-density residential developments that have a drainage collection system downstream.			Yes	West of the property is a retention basin 3 feet in depth with a 12-inch invert storm drainage pipe southeast of the bottom basin. The retention basin serves as the downstream collection system from the overflow structural storm drainage pipes east of the basin, which applies to the facility within the property.
	9.2	Design Considerations - Overflow structures must connect to a downstream collection system, such as a storm drain, basin, channel, or natural wash.			Yes	There are five storm grate overflow structures located on the facility's private driveway and south of the property. A 6 inch storm drainage pipe drains the storm runoff from the building onto the storm grate overflow structures, which connects to a 12 inch storm drainage pipe and retention basin. From the building, three 4 inch storm drainage pipes connect to the storm grate overflow structures, dispensing the storm runoff into a retention basin, located west of the property.
	9.3	Construction Considerations - The overflow structure should be located at the downstream end of a drainage facility.			Yes	A 6 inch storm drainage pipe is connected from the building and drains the storm runoff from the building to the storm grate overflow structure, which connects to a 12 inch drainage pipe, draining the storm runoff onto the retention basin west of site. Three 4 inch storm drainage pipes are also connected from building to the storm grates, 12 inch drainage pipe and onto the retention basin.

Summary of Comments Form

Section	Sub-Sections	Description	Not Complied	Partial Complied	Complied	Response / Comment
	9.4	Maintenance - Overflow structures should be inspected after storms of 1.25 inches or greater to make sure that they are not clogged with debris or sediments.			Yes	Inspections will be conducted annually to remove any debris and prevent clogging of the inlet structures. Encroaching vegetation will be maintained to avoid conflicts with the landscape buffer.
	9.6	<p>Specifications - Section 642 -(642.1) This work shall consist of furnishing and placing domed overflow risers in LID facilities as shown in the contract documents, or as directed by the Engineer. (642.2) The materials consist of Concrete Pipe Riser per MAG 505 and Domed/Beehive Grate: 29-inch diameter domed grate using cast or ductile iron. Connect riser to underdrain piping using the appropriate glues, primers, fittings, tees, and/or elbows. (642.3.2) The measure and payment are for each domed overflow risers. Payment for domed overflow risers will be made at the contract unit price per each for the diameter specified, which will include excavation, shoring, backfill, compaction, installation of pipe riser and stone base including connections, gaskets, domed/bee hive grate, and all labor, materials, tools, equipment and incidentals needed to complete work specified.</p>		Partial Complied		The concrete base storm drain grate overflow structures are to be Class 'A' per MAG section 505