



CITY OF PHOENIX

WATER SERVICES DEPARTMENT

Large Diameter Sanitary Sewer Rehabilitation – Grade 5 & 4 Manholes – North – Zone 3

PROJECT NUMBER WS90500273

TECHNICAL SPECIFICATIONS

March 2022

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**CITY OF PHOENIX
WATER SERVICES DEPARTMENT
LARGE DIAMETER SANITARY SEWER REHABILITATION – GRADE 5 & 4
MANHOLES – NORTH – ZONE 3**

TECHNICAL SPECIFICATIONS

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SECTION 01010

SUMMARY OF WORK

PART 1 – GENERAL

1.1 SCOPE

- A. CONTRACTOR shall provide all materials, equipment, and labor necessary to perform the work including, but not limited to, lighting, odor control, personnel facilities, traffic control, pavement replacement, manhole rehabilitation, noise control, and safety and health equipment.
- B. Major work to be performed under this Contract includes the following:
 - 1. Rehabilitation of 49 active sanitary sewer manholes or structures, identified by the Large-Diameter Sanitary Sewer Condition Assessment Report dated February 2020 (Report), with a NASSCO Structural Condition Grade 4 or higher. This scope of work only includes a specific subset of manholes identified as a Grade 4 or higher recommended for rehabilitation. These are located within Zone 3 as designated by the project plans throughout City of Phoenix right-of-way or easements, Arizona Department of Transportation, and Maricopa County Department of Transportation properties. Rehabilitation may include installation of corrosion coating systems, structural inserts, new manhole, polyvinyl chloride (PVC) liner repairs in all parts of the existing manholes as indicated in the Contract Documents. There will be bypass pumping for select manholes identified on the Contract Drawings but use of small diameter flow through plugs may need to be utilized within the manhole to complete the work.
 - 2. Restore surface area of the construction sites to pre-existing conditions.
 - 3. Provide traffic control during construction.

1.2 EXISTING UTILITIES

- A. In general, the location of existing sewer pipelines and manholes whether aboveground or underground, is indicated on the Drawings. This information has been obtained from the City's Graphical Information System (GIS). The City of Phoenix does not guarantee the accuracy or completeness of this information, and other aboveground or underground utilities not shown on the Drawings may be encountered. The CONTRACTOR shall locate and verify the location of all pipelines, and utilities prior to conducting any excavation work.
- B. CONTRACTOR is required to contact Arizona 811 at 811 two (2) working days prior to start of excavation work at each site.

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1.3 PRESENT CONDITIONS

- A. The project manhole's Closed-Circuit Television (CCTV) data was obtained by the City provided 2020 Large-Diameter Sewer Conditions Assessment Report.

1.4 FLOW CHARACTERISTICS

- A. Flow data can be provided to the CONTRACTOR to evaluate low-flow time for each work area. Due to the length of the interceptor and branch flow, the low-flow duration could change from work location to location.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01014

WORK SEQUENCE

PART 1 – GENERAL

1.1 CONTINUITY OF WORK

Work under this Contract shall be scheduled and performed to minimize disruption to the operation of the existing facilities and traveling public. CONTRACTOR shall provide all equipment and labor necessary to maintain sewer flow through and/or around existing facilities while working to reduce the impact to the traveling public.

1.2 PUBLIC INFORMATION SERVICES

- A. The ENGINEER will be responsible for public information and public relations for the project.
- B. The CONTRACTOR and ENGINEER shall attend meetings with the public as needed throughout the Contract.

1.3 CONSTRUCTION COORDINATION

- A. At the Preconstruction Conference, the CONTRACTOR shall designate a Representative who will be on the job or available for communication at all times during construction. The CONTRACTOR's Representative shall be available for notification 24 hours a day by mobile telephone, home telephone, answering service, pager, or other means acceptable to the ENGINEER. The Representative shall be the contact person representing the CONTRACTOR and shall be capable of giving direct field orders as the need arises. Official job communication shall be conducted between the CONTRACTOR's Representative and the ENGINEER.
- B. CONTRACTOR shall obtain approval from the ENGINEER 72 hours in advance of any change in the CONTRACTOR's daily work schedule. Work performed at times other than per the approved schedule, must first be approved by the ENGINEER. The CONTRACTOR shall be responsible for the coordination of work by materials' manufacturers and their field representatives.
- C. If work activities impact vacant dirt lots; a certified burrowing owl surveyor will be required to conduct a site visit at that location approximately 2 weeks prior to the work being conducted. If work activities can be restricted to paved areas, no burrowing owl survey is needed. If burrowing owls or potentially active burrows (natural or manmade holes 3 inches in diameter or greater) are observed during

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construction, work shall cease within 100 feet and the Environmental Quality Specialist shall be contacted (Andrea Love, 602-495-6718) to make appropriate arrangements.

- D. The CONTRACTOR shall be aware of wildlife that potentially inhabit the work areas. Care shall be given to such wildlife protected under the Migratory Bird Treaty Act of 1918 and the Sonoran Desert Tortoise. Refer to attached information regarding the Sonoran Desert Tortoise, and information regarding the Western Burrowing Owl and Migratory Birds to reduce the risk of impacting species protected by the Migratory Bird Treaty Act.
- E. If any archaeological materials are encountered during construction, the CONTRACTOR shall cease all ground-disturbing activities within 10 meters of the discovery and the City of Phoenix Archaeology office, 602-534-1573 and City of Phoenix Environmental Quality Specialist (Andrea Love, 602-495-6718 or James Marshall, 602-534-3747) shall be notified immediately and allowed time to properly assess the materials.

1.4 SCHEDULING AND SEQUENCING

- A. No construction activities shall begin until all required submittals are approved and the Owner has given the CONTRACTOR written approval.
- B. Traffic-control plans and Temporary Restriction and Closure System (TRACS) Permit must be submitted to the ENGINEER for all work in the public right-of-way. The CONTRACTOR will submit TRACS permit 7 days prior to the ENGINEER for review, and the ENGINEER will submit to the Right-of-Way department. Traffic-control plans must meet requirements and be approved by the City of Phoenix. Additionally, some of the rights-of-way are within the Arizona Department of Transportation and additional approval will be required. The ENGINEER must give written approval of the plan before construction shall begin. Traffic control will remain in effect as dictated by the traffic-control plan until all work is completed and inspected. CONTRACTOR shall maintain vehicular access to all private properties along this project on a 24-hour basis unless written approval is otherwise obtained from property owner(s) for reduced access.
- C. A map showing locations of possible storage sites shall be submitted to the ENGINEER at the Preconstruction Meeting. The CONTRACTOR must receive approval from the ENGINEER of the sites prior to start of work. If the locations for storage sites are outside the City of Phoenix right-of-way, the CONTRACTOR shall receive written approval from the property owner prior to start of work. Residential private property shall not be used for storage.

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- D. Odor control shall be provided at all times during the rehabilitation of the sewer manholes. The odor control plan shall be submitted to the ENGINEER for review prior to construction.
- E. Work shall be completed within 278 calendar days from the time of the Notice to Proceed.
- F. After completion of work at each individual manhole, the CONTRACTOR shall perform a detailed inspection of the work to confirm completion of all items. When the work is complete, the CONTRACTOR shall notify the ENGINEER.
- G. After receipt of the CONTRACTOR's written notice of completion of the work, the ENGINEER will perform a detailed inspection and will create a punch list for any remaining omissions and defects. Punch-list items shall be promptly completed. The ENGINEER will schedule reinspection upon satisfactory completion of punch-list items.
- H. Final inspection of the work by the ENGINEER will be made after receipt of the CONTRACTOR's written request for final inspection. All work for each manhole or work area shall be completed prior to the CONTRACTOR demobilizing from an individual work area.

1.5 COORDINATION WITH PAVEMENT MAINTENANCE PROGRAM

- A. The CONTRACTOR shall coordinate with the City of Phoenix's Street Maintenance Division and ENGINEER for conflicts with scheduled surface repaving projects.
- B. For all Sanitary Sewer Manhole Rehabilitations that require a new frame and cover or structural insert, the CONTRACTOR shall coordinate with the City's Street Maintenance Division to rehabilitate and install the frame and cover PRIOR to the Pavement Maintenance Project.
- C. Prior to any pavement replacement, the CONTRACTOR shall coordinate with the City of Phoenix's Street Maintenance Division to verify if any pavement disturbed during construction is a part of the City's Cool Pavement program.

1.6 HOLIDAY SEASON CONSTRUCTION MORATORIUM

Construction activities are not permitted near shopping center areas per Phoenix Traffic Barricade Manual without prior approval in writing by the right-of-way management office (602-262-6235). Holiday season construction moratorium is between November 20 and January 1 of each year.

1.7 CITY OF PHOENIX DOWNTOWN CORE AREA EVENTS

For construction activities within downtown core area (downtown core area is defined as the area between 7th Street and 7th Avenue, from McDowell Road on the north to Buckeye Road on the south), prior coordination with nearby event stakeholders is required to verify no events are going on at the time of construction activities, and to fulfill any requirements legislated by such stakeholders.

1.8 CONTRACTOR WORK HOURS

CONTRACTOR may be required to work at night to minimize disruption to area residents or businesses or to complete work during low- flow conditions. The City of Phoenix Project Manager shall obtain Night Work Approval from Street Transportation Department prior to working at night. Night work is considered between the following times depending on the time of year:

- 7pm to 6am from May 1st to September 30th
- 7pm to 7am from October 1st to April 30th

The CONTRACTOR shall adjust the work schedule to accommodate residents or business operation. The CONTRACTOR shall provide the Owner 7 days' notice of anticipated work schedules. Work hours shall be presented at the regularly scheduled progress meetings for approval by the Owner.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

CONTRACTOR shall complete the work systematically to minimize impacts to the right-of-way, and property owners. Work in Downtown Core area shall be grouped and fully completed in an efficient manner.

++ END OF SECTION ++

SECTION 01015

CONTRACTOR'S USE OF PREMISES

PART 1 – GENERAL

1.1 OWNER'S RESPONSIBILITIES

- A. The City of Phoenix's operating personnel and Wastewater Collections Department staff will be responsible for operating the existing sewers and facilities throughout the execution of this Contract. All contact between the City of Phoenix's personnel and the CONTRACTOR shall be through the ENGINEER or the designated City Representative.

1.2 CONTRACTOR'S RESPONSIBILITIES

- A. Use and Operation of Existing Facilities:
 - 1. CONTRACTOR shall not interfere with the operation of existing sewers and pipelines, except as specified herein, and shall exercise caution to ensure that debris and material from its operation does not enter the sewer. Any debris or blockage entering the sewer as a result of the CONTRACTOR'S work shall be immediately removed at the CONTRACTOR's expense. Proposed methods for construction in and around the existing facilities shall be included as part of the construction progress schedule specified in Section 01310.
- B. The CONTRACTOR shall coordinate the material and equipment storage locations and staging area locations with the City of Phoenix, as stated in Section 01014.
- C. The CONTRACTOR shall submit traffic-control plans to the ENGINEER for review. The ENGINEER will then send the approved plans to the City of Phoenix and/or authority having jurisdiction for all proposed impacts to public rights-of-way and temporary roadway restrictions. Refer to Section 02100 for traffic control requirements.
- D. If work activities impact vacant lots, a certified burrowing owl surveyor will be required to conduct a site visit at that location approximately 2 weeks prior to the work being conducted.
 - 1. If work activities can be restricted to paved areas, no burrowing owl survey is needed. If burrowing owls or potentially active burrows (natural or manmade holes 3 inches in diameter or greater) are observed during construction, work shall cease within 100 feet and the Environmental Quality Specialist shall be contacted (Andrea Love, 602-495-6718) to make appropriate arrangements.

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1.3 DAMAGE TO EXISTING PROPERTY

- A. CONTRACTOR will be held responsible for any damage to existing structures, piping, work, materials, or equipment because of its operations, and shall repair or replace any damaged structures, piping, work, materials, or equipment to the satisfaction of, and at no additional cost to, the OWNER and the City of Phoenix.
- B. CONTRACTOR shall protect all existing structures and property from damage and shall provide bracing, shoring or other work necessary for such protection per Occupational Safety and Health Administration (OSHA) requirements.
- C. CONTRACTOR shall be responsible for repairing all damage to streets, roads, curbs, sidewalks, ditches, embankments, landscaping, or other public or private property which may be caused by transporting equipment, materials, or workers to or from the work or and other work activities. CONTRACTOR shall make satisfactory arrangements with the agency having jurisdiction over the damaged property concerning its repair or replacement and as specified in these Contract Documents.
- D. Beginning July 1, 2017, all street pavement cuts will require asphalt resurfacing treatments based on the age of the pavement. At minimum, any cuts into an existing pavement older than 24 months will require a slurry seal and/or microseal treatment. See the City of Phoenix Street Pavement Cut Policy for additional requirements.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. This Section defines the items to be included in the Contract. Payment will be based on the CONTRACTOR'S Bid for all work required by the Contract Documents.
- B. Payment for work performed shall be in accordance with the unit price bid unless work is defined as an allowance item.

1.2 AUTHORITY

- A. The OWNER or OWNER'S Representative will take measurements and compute quantities.

1.3 UNIT QUANTITIES SPECIFIED

- A. Quantities indicated are for bidding purposes. CONTRACTOR shall be paid for actual quantities supplied or placed in the work and verified by the OWNER.

1.4 MEASUREMENT OF QUANTITIES

- A. Measurement by Each: Measured by completion of an independent task and all related tasks to the general work description.
- B. Measurement by Area: Measured by square dimension using mean length and width of radius.
- C. Thickness Measurement: Measured perpendicular to surface of liner or coating.
- D. Linear Measurement: Measured by linear dimension at the item centerline or mean chord.
- E. Lump Sum: Measured on a percent-of complete basis.
- F. Allowance: OWNER has provided a general allowance for items of work as directed by the OWNER. All costs shall be approved prior to initiating the work. Any work performed without prior authorization shall be at no additional cost to OWNER. Detailed backup documentation of cost shall be provided with pay application.

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1.5 PAYMENT

- A. Payment Includes: Full compensation for all required labor, products, materials, tools, equipment, transportation, services and incidentals, erection, application or installation of an item of the work, overhead and profit, insurance, bonding, taxes, and all other incidentals necessary to complete the construction.
- B. Payment for work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the OWNER multiplied by the unit sum/price for work which is incorporated in or made necessary by the work.
- C. Payment for allowance items will be made on proposals approved by the OWNER prior to commencement of work.
- D. All Contract prices included in the Bid Schedule shall be considered full compensation for all labor, products, materials, tools, equipment, transportation, services and incidentals, erection, application or installation of an item of the work, overhead and profit, insurance, bonding, taxes, and all other necessary work to complete the construction as shown on the Design Drawings and/or as specified in Technical Specifications to be performed under this project. Actual quantities of each item bid on a unit price basis will be determined upon completion of the construction in the manner set up for each bid item in this section of the Specifications. Payment for all items listed in the Bid Schedule will constitute full compensation for all work shown and/or specified to be performed under this project.
- E. The CONTRACTOR shall provide the OWNER or its Representative with assistance by providing necessary equipment, workers, and survey so that the OWNER can accurately determine and compute quantities accordingly. Quantities and measurements indicated are for bidding and Contract purposes only. OWNER shall determine payment by verifying quantities and measurements supplied or placed in the work. If the actual work requires more or fewer quantities than those quantities indicated, the CONTRACTOR shall provide the required quantities at the unit sum/prices contracted.

1.6 SCHEDULE OF VALUES

- A. CONTRACTOR shall submit a balanced Schedule of Values at the Preconstruction Conference. The total value of the activities shall equal the Contract amount. Overhead and profit shall be prorated to the activities. Activity values shall be rounded to the nearest dollar.
- B. If, in the opinion of the OWNER, the Schedule of Values is unbalanced, the CONTRACTOR shall be required to present documentation substantiating the cost allocations of those activities believed to be unbalanced.

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PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 BID ITEM NO. 1: REMOVAL AND REPLACEMENT OF MANHOLE FRAME AND COVER WITH CAST IRON FRAME AND COVER

- A. This Bid Item is full compensation for all work associated with removal, replacement and adjustment of manhole frame, cover and concrete collar. Work includes removal and disposal of existing manhole frames and covers, including concrete collars and asphalt. This Item includes installation of a new cast-iron manhole frame and cover and grade adjustment ring, application of corrosion coating within the chimney, and concrete collar and asphalt repair. Measurement for payment shall be per EACH set of frame, cover and concrete collar removed and replaced.

3.2 BID ITEM NO. 2: EPOXY COATING REHABILITATION IN MANHOLE

- A. This Bid Item is full compensation for all work associated with epoxy coating rehabilitation in manhole. Work includes cleaning, assessment, removal of existing coatings and rehabilitation of manhole with epoxy coating. This Item also includes branch-flow diversion within the manhole to facilitate the rehabilitation of the manhole. Measurement for payment shall be per SQUARE FOOT of epoxy coating.

3.3 BID ITEM NO. 3: REPAIR AND EPOXY COATING OF 48-INCH DIAMETER MANHOLE BENCH

- A. This Bid Item is full compensation for all work associated with repair, epoxy coating rehabilitation of a 48-inch diameter manhole bench, and for specified manholes preparation of bench for a structural insert. Work includes cleaning and surface preparation existing liner; bench reconstruction; rechanneling bench; any required bench coating rehabilitation to transition the new components to existing; application of coating to all exposed concrete surfaces from manhole wall or structural insert to channel, including keyway terminations and removal of cured-in-place pipe (CIPP) top coating; and extending branch sewer main straight into the manhole. Measurement for payment shall be per EACH 48-inch manhole bench repaired and epoxy coated.

3.4 BID ITEM NO. 4: REPAIR AND EPOXY COATING OF 60-INCH DIAMETER MANHOLE BENCH

- A. This Bid Item is full compensation for all work associated with repair, epoxy coating rehabilitation of a 60-inch diameter manhole bench, and for specified manholes preparation of bench for a structural insert. Work includes cleaning and surface preparation existing liner; bench reconstruction; rechanneling bench; any required bench coating

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rehabilitation to transition the new components to existing; application of coating to all exposed concrete surfaces from manhole wall or structural insert to channel, including keyway terminations and removal of cured-in-place pipe (CIPP) top coating; and extending branch sewer main straight into the manhole. Measurement for payment shall be per EACH 60-inch manhole bench repaired and epoxy coated.

3.5 BID ITEM NO. 5: EPOXY COATING OF MANHOLE CHANNEL

- A. This Bid Item is full compensation for all work associated with epoxy coating rehabilitation of manhole channel. Work includes cleaning, assessment, removal of existing coatings and rehabilitation of channel with epoxy coating. This Item also includes branch-flow diversion within the manhole to facilitate the rehabilitation of the manhole channel. Measurement for payment shall be per EACH manhole bench coated.

3.6 BID ITEM NO. 6: (NOT USED)

3.7 BID ITEM NO. 7: (NOT USED)

3.8 BID ITEM NO. 8: MANHOLE REHABILITATION WITH 42-INCH DIAMETER STRUCTURAL INSERTS

- A. This Bid Item is full compensation for all work associated with the installation of a 42-inch diameter structural insert within an existing manhole. Work includes excavation and removal of existing manhole cone; disposal of existing manhole components; extension of branch connections through the insert; and all insert components, including wall sections and cone section. This Item also includes epoxy-coating of the bench/throat and exposed concrete. Measurement shall be made from bottom of structural insert to top of the cone. Payment shall be per VERTICAL FOOT of structural insert installed.

3.9 BID ITEM NO. 9: MANHOLE REHABILITATION WITH 54-INCH DIAMETER STRUCTURAL INSERTS

- A. This Bid Item is full compensation for all work associated with the installation of a 54-inch diameter structural insert within an existing manhole. Work includes excavation and removal of existing manhole cone; disposal of existing manhole components; extension of branch connections through the insert; and all insert components, including wall sections and cone section. This Item also includes epoxy-coating of the bench/throat and exposed concrete. Measurement shall be made from bottom of structural insert to top of the cone. Payment shall be per VERTICAL FOOT of structural insert installed.

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3.10 BID ITEM NO. 10: (NOT USED)

3.11 BID ITEM NO. 11: VIDEO QUALITY CONTROL OF MANHOLE
REHABILITATION

- A. This Bid Item is full compensation for all work associated with video scanning of rehabilitated manholes. Work includes video scanning of manhole; and review of scan to determine complete and correct manhole rehabilitation. Measurement for payment shall be per EACH manhole scanned and reviewed.

3.12 BID ITEM NO. 12: TRAFFIC CONTROL (ALLOWANCE)

- A. This Bid Item is full compensation for all work associated with providing traffic control at manholes being rehabilitated. Work includes providing traffic-control measures that meet applicable regulatory requirements, including supply, placement, maintenance, and removal of any temporary travel surfacing. Payment shall be per EACH manhole that traffic control is required.

3.13 BID ITEM NO. 13: UNIFORMED OFF-DUTY LAW ENFORCEMENT OFFICER
(ALLOWANCE)

- A. This Bid Item is full compensation for all costs associated with providing an off-duty law enforcement officer at signalized intersections. Payment shall be on an HOURLY basis on an approved hourly rate.

3.14 BID ITEM NO. 14: BYPASS PUMPING AND DIVERSION (ALLOWANCE)

- A. This Bid Item is intended to be full compensation for all costs associated with dewatering the sanitary sewer manholes scheduled for rehabilitation. Flows shall be diverted around the construction site and discharged downstream into the existing sanitary sewer system. This Bid Item shall be full compensation for all labor, materials and equipment required to bypass pump and/or divert flows in manholes as specified in Section 02145 and detailed on the Contract Drawings, including any standby pumps. Payment shall include traffic control; excavation, shoring; all permanent suction/discharge manholes; supply and installation of all pumps; spill containment; piping and appurtenances with assembly; all pressure testing for leaks of entire bypass system with potable water; monitoring; and maintenance of entire system during operation, demobilization of all equipment, all surface restoration, excavation/installation/maintenance/restoration for roadway crossings, associated cost of use or access of property. This item also includes any noise suppression, plugging of sewers, water-level monitoring, odor control and removal and replacement of manhole cones and concrete collar (if necessary), including backfill and surface repairs back to original condition throughout the entire bypass alignment.

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- B. Measurement for payment shall be made on a LUMP-SUM basis for all costs associated with the bypass pumping system or diversion of flow around the work area, including odor control measures, mobilization, setup, testing, operation, cleaning, and demobilization. Payment will be made as a percentage of total project complete and acceptance by the OWNER.

3.15 BID ITEM NO. 15: ODOR CONTROL (ALLOWANCE)

- A. This Bid Item is full compensation for odor control measures utilized during manhole rehabilitation. Measurement for payment shall be made on a LUMP-SUM basis for all cost associated with odor control measures. Payment will be made as a percentage of total project complete and acceptance by the OWNER.

3.16 BID ITEM NO. 16: MOBILIZATION AND DEMOBILIZATION

- A. This Bid Item is full compensation for mobilization and demobilization, insurance, and bonds complete in every detail and all inclusive, as specified in Bid Documents. Payment shall be per EACH manhole completed.

3.17 BID ITEM NO. 17: ALLOWANCE FOR EXTRA WORK

- A. This Bid Item covers additional work not covered by the Contract Documents required to rehabilitate the manhole structures. An itemized cost proposal shall be submitted to the OWNER for review and approval. Payment shall be made at the CONTRACTOR'S unit prices or OWNER-agreed pricing.

3.18 BID ITEM NO. 18: OWNER'S CONTINGENCY

- A. This Bid Item covers additional work stipulated by the OWNER not covered by the Contract Documents. An itemized cost proposal shall be submitted to the OWNER for review and approval. Payment shall be made at the CONTRACTOR'S unit prices or OWNER-agreed pricing.

++ END OF SECTION ++

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SECTION 01060

SAFETY AND HEALTH

PART 1 – GENERAL

1.1 SAFETY AND HEALTH REGULATIONS

- A. The CONTRACTOR shall exercise precaution at all times for the protection of persons (including employees) and property. The CONTRACTOR shall comply with the provisions of all applicable laws pertaining to such protection, including all Federal, State and local occupational safety and health acts, standards and regulations promulgated thereunder.
- B. CONTRACTOR shall comply with Section 107 of the Federal Contract Work Hours and Safety Standards Act, as set forth in Title 29 of the Code of Federal Regulations (CFR). Copies of these regulations may be obtained from Labor Building, 14th and Constitution Avenue NW, Washington, DC 20013.
- C. In performance of the work, CONTRACTOR shall (a) comply with all applicable Federal, State and local statutes, regulations and ordinances regarding health and safety including, but not limited to, applicable portions of Title 29 of CFR (29 CFR 1910 and 1926; Occupational Safety and Health Administration [OSHA]); (b) prepare and comply with its own Health and Safety Plan and written safety and health procedures; and (c) comply with any applicable safety requirements established by the City of Phoenix for the site.
 - 1. Special attention should be given to Section 29 CFR 1910.146 and 29 CFR 1926 for Confined Spaces. By definition, the interior of the sanitary sewer manhole structure shall be considered a permit-required confined space.
- D. The CONTRACTOR shall provide and maintain in a neat, sanitary condition such accommodations for the use of the employees as may be necessary to comply with the requirements and regulations of the Arizona State Department of Health or as specified by the Maricopa County Health Department Sanitary Code.
- E. The CONTRACTOR shall provide all safeguards, safety devices and protective equipment and take any other needed actions, on its own responsibility, reasonably necessary to protect the life and the health of employees on the job, the safety of the public, and to protect property in connection with the performance of the work covered by this Contract.

1.2 SPECIAL CONSIDERATIONS

- A. This Section describes certain minimum precautions the CONTRACTOR shall consider in developing its Safety and Health Program. It supplements the regulatory requirements of paragraph 1.1 above and the requirements of the General Conditions. Sewers and appurtenant structures are considered confined spaces and are subject to Federal, State and local regulations governing confined-space entry and safety procedures.
- B. Infectious Diseases: CONTRACTOR should anticipate that a wide spectrum of disease-producing organisms will be present in the sewer. In addition to the requirements set forth in the regulations described in paragraph 1.1 above, the CONTRACTOR shall provide the following:
1. Instruction in appropriate disease-prevention mechanisms and personal sanitation practices for all workers and supervisors.
 2. A preventative inoculation program (tetanus/diphtheria, hepatitis, etc.) available to all personnel.
 3. Clothing to protect against infection, including rubber boots with full sole and heel steel insert-liners, safety glasses or goggles, and gloves.
- C. Dangerous Gases and Oxygen Deficiency: The sewer, sewer manholes and junction structures are confined spaces, which means they have a limited means of egress and are subject to the accumulation of dangerous gases or oxygen deficiency. Volatile petroleum products and common household hazardous materials may be discharged into the sewer. Explosive gases, such as methane generated from decomposing organic material, may be accumulated. Toxic gases, such as hydrogen sulfide, may be present in life-threatening concentrations. Significant oxygen depletion may occur. In addition, construction procedures may require combustion-engine machinery to be located in or near the work site. Therefore, gaseous combustion byproducts, such as carbon monoxide, may be present.
- D. In addition to the requirements set forth in the regulations described in paragraph 1.1 above, the CONTRACTOR shall provide the following:
1. Portable atmospheric monitors that measure levels of oxygen, explosive gas (methane), carbon monoxide, and toxic gas (hydrogen sulfide). Monitors shall be properly calibrated and carefully maintained throughout the construction period. Monitors shall be used continuously while personnel are in the sewer or confined space.
- E. Toxic Chemicals:
1. Toxic chemicals may be part of the construction process. The CONTRACTOR shall abide by all handling procedures recommended by the manufacturer when dealing with toxic chemicals.

F. Asbestos-Cement Pipe:

1. The Contractor shall abide by all asbestos-cement handling procedures as required by all local, State and Federal regulatory agencies.

PART 2 – PRODUCTS

2.1 SAFETY AND HEALTH PLAN

A. General:

1. The CONTRACTOR shall develop and maintain for the duration of the Contract three (3) copies of a Health and Safety plan that will effectively incorporate and implement all required health and safety precautions. At least one (1) copy shall be located on the CONTRACTOR'S work site.

B. Compliance:

1. The CONTRACTOR shall appoint an employee who is qualified and authorized to supervise and enforce compliance with the Safety and Health Plan. The CONTRACTOR is responsible for ensuring that necessary gas monitoring, protective clothing, and other supplies and equipment as specified are available to implement this Plan.

C. Revisions:

1. In the event that regulatory agencies or jurisdictions determine the Safety and Health Plan to be inadequate to protect employees and the public:
 - a. The CONTRACTOR shall stop the work in progress immediately upon receiving notification from the Engineer or regulatory agency until adequate safety measures are implemented.
 - b. The CONTRACTOR shall modify the Plan to meet the requirements of said regulatory agencies, jurisdictions, and the OWNER.
 - c. The CONTRACTOR shall provide the ENGINEER with the revisions to the Plan within 2 days of the notice of deficiency.

D. Minimum Considerations:

1. The Safety and Health Plan shall, at a minimum, include the following considerations:
 - a. Objective.
 - b. Key personnel and responsibilities.
 - c. Hazard analysis of the work activities and environment.
 - d. Training requirements, including authorized personnel and qualifications for work in confined spaces.
 - e. Personal protective equipment.
 - f. Confined-space entry procedures, including an atmospheric gas monitoring program and ventilation of work area and confined space.

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- g. Site control measures.
- h. Work practices, decontamination procedures, and work limitations.
- i. Emergency procedures, including sewer evacuation plan, location of first aid, fire extinguishers, eyewash, drinking water, map showing route to nearest medical facility, and a list of key personnel who are currently certified in first aid/CPR.
- j. Jobsite cleanup, and spill containment and cleanup procedures.
- k. Telephone numbers:
 - 1) 24-hour number to contact CONTRACTOR'S Representative.
 - 2) Emergency services.
 - 3) ENGINEER's Representative.
- l. Documentation (training, injury or illness, respirator-fit test, hazards notification log, etc.).

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

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SECTION 01062

PERMITS

PART 1 – GENERAL

The majority of the sanitary sewer rehabilitation for the Scope of Work is located in the City of Phoenix right-of-way. A few sanitary sewer manholes are in the Maricopa County Department of Transportation, Arizona Department of Transportation, Salt River Project right-of way or easements.

1.1 PERMITS

- A. CONTRACTOR shall obtain and pay for all permits required, including agency inspections. The CONTRACTOR shall provide copies to the ENGINEER before working in areas covered by those permits.
- B. The following permits may be required:
 - 1. Salt River Project (Grand Canal or Arizona Canal) – Utility Permit.
 - 2. 404 Permit.
 - 3. INCRA Permits.
 - 4. Traffic Barricade Manual, Chapter III – Street Closure Permit.
 - 5. Maricopa County Air Quality Permit.
 - 6. Hauling Permit.
 - 7. Maricopa County Earthmoving/Dust Control Permit.
 - 8. NPDES General Permit for Storm Water Runoff.
 - 9. Arizona Department of Transportation Encroachment Permit.
 - 10. Maricopa County Department of Transportation Construction in County Right-of-Way Permit.
 - 11. City of Phoenix TRACS Permit.
 - 12. Flood Control District of Maricopa County Right-of-Way Permit.
 - 13. Other as applicable.

1.2 POSTING

- A. Permits shall be posted at the site of the work.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

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SECTION 01064

INSPECTION AND TESTING

PART 1 – GENERAL

1.1 PERMITS

- A. All workmanship and materials shall be subject to inspection by the ENGINEER, OWNER or the ENGINEER'S or OWNER's inspector, who will determine compliance with the Contract Documents. All rejected materials shall be promptly replaced to the satisfaction of the ENGINEER or OWNER. The CONTRACTOR shall provide safe access to the work for inspection. The CONTRACTOR shall replace rejected work and materials at no additional cost to the OWNER.
- B. Inspection will be provided on a 10-hour per day, 5-day per week basis, excluding weekends and holidays for all work. The CONTRACTOR shall coordinate inspections and material testing 48 hours in advance.
- C. The CONTRACTOR shall provide testing as approved by the OWNER. Cost of inspection and testing shall be the responsibility of the CONTRACTOR.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

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SECTION 01071

STANDARD REFERENCES

PART 1 – GENERAL

1.1 ABBREVIATIONS

- A. Whenever used in the Contract Documents, the following abbreviations will have the meanings listed:

AAC	Arizona Administrative Code 1700 West Washington, 7 th Floor Phoenix, AZ 85007-2808
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, N.W., Suite 225 Washington, D.C. 20001
ACI	American Concrete Institute Post Office Box 9094 Farmington, MI 8333-9094
ADEQ	Arizona Department of Environmental Quality 3033 North Central Avenue Phoenix, AZ 85012
ADOT	Arizona Department of Transportation 206 South 17 th Avenue Phoenix, AZ 85004
ADWR	Arizona Department of Water Resources 1110 West Washington Street Phoenix, AZ 85007
AEIC	Association of Edison Illuminating Companies 51 East 42 nd Street New York, NY 10017
AISC	American Institute of Steel Construction, Inc. One East Wacker Drive, Suite 3100 Chicago, IL 60601-2001

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AISI	American Iron and Steel Institute 1101 17 th Street, N.W., Suite 1300 Washington, D.C. 20036-4700
ANSI	American National Standards Institute, Inc. 1430 Broadway New York, NY 10018
API	American Petroleum Institute 1001 K Street, N.W. Washington, D.C. 20006
ASCE	American Society of Civil Engineers 345 East 47 th Street New York, NY 10017
ASCI	American Standard Code for Information Interchange United States of America Standards Institute 10 East 40 th Street New York, NY 10016
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWS	American Welding Society 550 N.W. LeJeune Road Miami, FL 33135
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235
BOCA	Building Officials and Code Administrators 7926 Halstead Homewood, IL 60430
CFR	Code of Federal Regulations Superintendent of Documents Government Printing Office Washington, D.C. 20402

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CMAA Crane Manufacturers Association of America, Inc.
(Formerly called Overhead Electrical Crane Institute) (OECI)
326 Freeport Road
Pittsburgh, PA 15238

CPS City Phoenix Supplement to Maricopa Association of Government
Standards
(see MAG)

CRSI Concrete Reinforcing Steel Institute
180 North La Salle Street
Chicago, IL 60601

EI Edison Electric Institute
90 Park Avenue
New York, NY 10016

FEDSPEC Federal Specifications
General Services Administration
Specification and Consumer Information
Distribution Branch
Washington Navy Yard, Building 197
Washington, DC 20407

FEDSTDS Federal Standards
(see FEDSPEC)

IES Illuminating Engineering Society
c/o United Engineering Center
345 East 47th Street
New York, NY 10017

MAG Maricopa Association of Governments
1820 West Washington Avenue
Phoenix, AZ 85007

MCDOT Maricopa Department of Transportation
301 West Jefferson Street
Phoenix, AZ 85003

NACE National Association of Corrosion Engineers
P.O. Box 986
Katy, TX 77450

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NASSCO	National Association of Sewer Service Companies 2470 Longstone Lane, Suite M Marriottsville, MD 21104
NFPA	National Fire Protection Association Batterymarch Park Quincy, ME 02269
NPDES	National Pollution Discharge Elimination System U.S. Environmental Protection Agency, Region 9 75 Hawthorne Street, San Francisco, CA
OSHA	Occupational Safety and Health Act U.S. Department of Labor Occupational and Health Administration San Francisco Regional Office 450 Golden Gate Avenue, Box 36017 San Francisco, CA 94102
PSHIA	Phoenix Sky Harbor International Airport Aviation Department 2485 East Buckeye Road Phoenix, AZ 85034
SWPPP	Stormwater Construction Pollution Prevention Plan Environmental Protection Agency, Region 9 75 Hawthorne Street, San Francisco, CA
UBC	Uniform Building Code Published By ICBO
UL	Underwriters Laboratories Inc. 207 East Ohio Street Chicago, IL 60611
WABO	Welding Association of Building Officers Post Office Box 7310 Olympia, WA 98507

PART 2 – PRODUCTS (NOT USED)

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PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01102

CONTRACTOR'S HAZARDOUS MATERIALS MANAGEMENT PROGRAM

PART 1 – GENERAL

1.1 DESCRIPTION

- A. The CONTRACTOR shall comply with all local, State, and Federal rules and regulations related to environmental protection and environmental safety regulations and requirements including, but not limited to, the following:
1. Title 29 Code of Federal Regulations (CFR) Parts 1910, Occupational Safety and Health;
 2. Title 40 CFR, Environmental Protections;
 3. Title 49 CFR, Transportation;
 4. State – Occupational and Safety Health Administration (OSHA);
 5. State – Arizona Department of Environmental Quality (ADEQ);
 6. State – Arizona Department of Water Resources (ADWR); and
 7. Maricopa County Air Quality Rules and Regulations.
- B. In order to insure OWNER that the CONTRACTOR is complying with the intent of the regulations stated in paragraph A above, as they relate to the use of hazardous materials, hazardous wastes and other similarly defined (in those regulations) substances used on the site, the CONTRACTOR shall develop and maintain a Hazardous Materials Management Program that includes as a minimum, but is not limited to, the requirements specified herein. The interests of the OWNER are that accidental spills, site contamination, and injury of personnel on the Site are avoided. The OWNER will not enforce suspected violations of the rules and regulations referenced in Paragraph A above; however, OWNER will notify CONTRACTOR of suspected violations. If in the opinion of OWNER, CONTRACTOR fails to address the suspected violations in a timely and appropriate manner, OWNER will notify Federal, State, and/or local regulatory agencies, report the suspected violations to them, and request that they inspect the CONTRACTOR'S operations. Any fines that may be levied against OWNER for violations committed on the site by CONTRACTOR, as well as any costs to the OWNER associated with cleanup of materials, shall be reimbursed immediately by the CONTRACTOR. All documents required by the program shall be made available to the OWNER'S Environmental Representative immediately upon request.
1. Any hazardous waste, as defined in any of the above-listed regulations, generated by the CONTRACTOR shall be the responsibility of CONTRACTOR. If the CONTRACTOR is utilizing a substance that qualifies as a hazardous waste, CONTRACTOR shall obtain a provisional U.S. Environmental Protection Agency identification number listing the CONTRACTOR'S name and construction site

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addressing as the generator of the hazardous waste. The CONTRACTOR shall be responsible for the identification, analysis, profiling, transport and disposal of hazardous wastes generated. The identification number can be obtained from the ADEQ.

1.2 HAZARDOUS MATERIALS' PROGRAM REQUIREMENTS

- A. Within the regulations listed in paragraph 1.1.A. above, terms such as hazardous material, hazardous wastes, and similar terms have varying definitions. To dispel confusion regarding what materials fall under the Program Requirements and for the purposes of this paragraph 1.2, hazardous material is defined as "any material, whether solid, semi-solid, liquid, or gas, which, if not stored and/or used properly, may cause harm or injury to persons through inhalation, ingestion, absorption or injection, or which may negatively impact the environment through the use or discharge of the material on the ground, in the water (including groundwater), or to the air."
- B. CONTRACTOR shall develop and provide to the OWNER'S Environmental Representative a complete inventory of products containing hazardous materials in concentrations greater than 0.1% for carcinogens (as defined in Code of Federal Regulations (CFR) 29 Part 1910.1200D4) and 1% for all others that are being stored and/or used on the site. The inventory will be updated immediately when new materials are delivered to or taken from the site. The inventory shall include the name of the product, manufacturer, vendor, container size(s), number of containers, and the minimum and maximum volume of material intended to be stored on the site.
- C. CONTRACTOR shall develop and keep updated a list of hazardous materials that meet any of the following criteria:
1. Has a flash point of less than 140 degrees F.
 2. Has a pH of less than 2 or greater than 12.5.
 3. Contains any chemical listed in Title 40 CFR Part 260-269, regardless of quantity.
 4. Contains any chemical listed in the Comprehensive Environmental Response, Compensation and Liability Act lists regardless of quantity.
- D. CONTRACTOR shall maintain on the site two (2) notebooks containing current (dated within the past 2 years) Safety Data Sheets for all materials being used on the site, whether or not they are defined as a hazardous material in paragraph A herein. One notebook shall be kept in the CONTRACTOR's on-site office. These notebooks must be kept up to date as materials are brought onto and removed from the site.
- E. CONTRACTOR shall develop an Emergency/Spill Response Plan for each hazardous material or class/group of materials. As a minimum, the response Plan must address the following:

1. Provide a description of equipment on site available to contain and/or respond to an emergency/spill of the material.
 2. Notification procedures.
 3. Response coordination procedures between CONTRACTOR, OWNER, and ENGINEER.
 4. Provide a Site Plan showing the location of stored hazardous materials and location of spill containment/response equipment.
 5. Provide a description of the hazardous material handling and spill response training provided to CONTRACTOR's employees.
- F. CONTRACTOR shall, to the satisfaction of the OWNER'S Environmental Representative, properly and safely store all hazardous materials, which shall include as a minimum, the following:
1. Have a designated storage site for hazardous material, which includes secondary containment. The site must include barriers to prevent vehicles from colliding with the storage containers.
 2. Provide signage approved by the OWNER'S Environmental Representative clearly identifying the hazardous materials' storage site.
 3. All hazardous materials' containers must bear the applicable Hazard Diamonds.
- G. The CONTRACTOR shall properly label all containers of consumable materials, whether or not they are classified as hazardous materials under this section. The name of the CONTRACTOR or Subcontractor shall be stenciled on any container containing a hazardous material and on any container over 5-gallon capacity containing a nonhazardous material. All containers must have a label clearly identifying the contents. If any such unlabeled containers are discovered on the site, the OWNER'S Environmental Representative will notify the CONTRACTOR, and CONTRACTOR will within 1 hour properly label the container or remove it from the site. Any containers that are filled from larger containers must also be properly labeled.
- H. The OWNER encourages storage of hazardous materials off site until the materials are needed on the site.
- I. The CONTRACTOR shall make all documentation required herein available immediately upon request of the OWNER'S Environmental Representative. The CONTRACTOR'S Safety Representative will meet at least monthly with the OWNER'S Environmental Representative to review the CONTRACTOR'S Hazardous Materials Program documents, procedures, and inspect the storage site and job site to ensure the requirements specified herein are being complied with. The CONTRACTOR shall also provide the OWNER'S Environmental Representative with copies of all permits obtained from environmental regulatory agencies.

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PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01104

STORMWATER POLLUTION PREVENTION PLAN AND PERMIT

PART 1 – GENERAL

1.1 SCOPE

- A. CONTRACTOR shall comply with the terms and conditions of the National Pollutant Discharge Elimination System (NPDES) requirements under the U.S. Environmental Protection Agency (EPA) General Permit for Arizona. Under Provisions of that permit, CONTRACTOR shall be designated as permittee and shall be responsible for providing necessary material and for taking appropriate measures to minimize pollutants in stormwater runoff from the project.

- B. For land disturbances greater than 1 acre: The CONTRACTOR shall provide all material, labor and other permits and incidental cost related to:
 - 1. Preparing, updating and revising the Stormwater Pollution Prevention Plan (SWPPP).
 - 2. Installing and maintaining all structural and non-structural items chosen by CONTRACTOR to comply with the construction SWPPP.
 - 3. Clean-up and disposal costs associated with clean up and repair following storm events or CONTRACTOR-caused spills on the site.
 - 4. Implementing and maintaining Best Management Practices to comply with the AZPDES Construction General Permit requirements.
 - 5. Preparing the Notice of Intent (NOI) and Notice of Termination (NOT) shall be covered by the NPDES General Permit for Arizona.

- C. For land disturbances less than 1 acre: CONTRACTOR shall comply with requirements in the City of Phoenix Municipal Code Section 32C for Stormwater Quality Protection. The CONTRACTOR shall provide all material, labor and other incidental costs related to:
 - 1. Preparing a Construction Stormwater Management Plan (SWMP) and revising, as needed.
 - 2. Installing and maintaining all structural and non-structural items chosen by CONTRACTOR to comply with the construction SWMP.
 - 3. Clean-up and disposal costs associated with clean up and repair following storm events or CONTRACTOR-caused spills on the site.
 - 4. Implementing and maintaining Best Management Practices to comply with the OWNER'S stormwater code.

- D. CONTRACTOR shall coordinate the requirements under this section with the permit requirements. All necessary SWPPP/SWMP controls and practices must be implemented prior to commencement of any construction activity.

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1.2 SUBMITTAL

- A. The CONTRACTOR shall be aware that in accordance with the Arizona Department of Environmental Quality regulations, if less than 1 acre of land will be disturbed as a result of construction activity throughout the entire project area, then the CONTRACTOR is not required to submit NOI and NOT forms. However, if greater than 1 acre of land is disturbed as a result of construction activity throughout the entire project area, NOI and NOT forms will be required. Note that the staging area shall be included in the disturbed area.
1. Note that under Phoenix Municipal Code Section 32C-104, a SWMP will be required for this Scope of Work. The CONTRACTOR shall submit the Construction SWMP at the preconstruction kick off meeting.
- B. If it is determined that the project shall comply with NPDES General Permit for Arizona, then the CONTRACTOR shall submit, at least 2 days prior to the initial start of construction of the project, completed and signed NOI forms to the State of Arizona at the following address:
1. Arizona Department of Environmental Quality
Water Permits Section/Stormwater NOI (5415B-3)
1110 West Washington Street
Phoenix, AZ 85007
or
Fax to 602-771-4674
 2. CONTRACTOR shall submit to the OWNER, no later than 10 days before submitting to State and Federal agencies, the following:
 - a. NOI to be covered by the NPDES General Permit for Arizona, including certification of signature.
 - b. SWPPP for the project, including certification of signature. SWPPP shall include CONTRACTOR'S proposed temporary means for stormwater control during all phases of construction and include stormwater pumping/retention plans. This submittal shall be coordinated with CONTRACTOR'S Excavation Plan Submittal.
 - 1) A manual has been prepared by the Maricopa County Flood Control District to aid in CONTRACTOR'S preparation of the SWPPP. This manual, "Drainage Design Manual for Maricopa County Arizona, Volume III, Erosion Control," is available at the Flood Control District Office, 2801 West Durango Street, Phoenix, Arizona. The complete General Permit for Construction is in the September 9, 1992 Federal Register and is available at local libraries.
 3. CONTRACTOR shall submit to the OWNER, as part of the Construction SWPPP, a construction site inspection report that includes the following:
 - a. Inspection scope.
 - b. Inspector qualifications.
 - c. Observations of SWPPP non-compliance and corrective steps taken.

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- d. Certificate of Compliance with SWPPP and the NPDES General Permit for Stormwater Discharge in the event of no incidents.
- e. Reports shall be submitted each quarter, at a minimum, throughout the Contract duration.
4. CONTRACTOR shall submit to the OWNER, upon project completion, the NOT of coverage under the NPDES General Permit.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

A copy of the SWPPP/SWMP, approved by the regulatory agencies, shall be kept on the jobsite at all construction sites.

++ END OF SECTION ++

SECTION 01300

SUBMITTALS

PART 1 – GENERAL

1.1 SCOPE

- A. Submittals covered by these requirements include manufacturers' information, shop drawings, test procedures, test results, samples, requests for substitutions, and miscellaneous work-related submittals. Submittals shall also include, but not be limited to, all mechanical, electrical and electronic equipment and systems, materials, reinforcing steel, fabricated items, and piping and conduit details. The CONTRACTOR shall furnish all drawings, specifications, descriptive data, certificates, samples, test, methods, schedules, and manufacturer's installation and other instructions as specifically required in the Contract Documents to demonstrate fully that the materials and equipment to be furnished and the methods of work comply with the provisions and intent of the Contract Documents.

PART 2 – CONTRACTOR'S RESPONSIBILITIES

2.1 GENERAL

- A. The CONTRACTOR shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the material, equipment or method of work shall be as described in the submittal. The CONTRACTOR shall verify that all features of all products conform to the specified requirements. Submittal documents shall be clearly edited to indicate only those items, models, or series of equipment which are being submitted for review. All extraneous materials shall be crossed out or otherwise obliterated. The CONTRACTOR shall ensure that there is no conflict with other submittals and notify the ENGINEER in each case where its submittal may affect the work of another contractor or the OWNER.
- B. The CONTRACTOR shall coordinate submittals with the work so that work will not be delayed. The CONTRACTOR shall coordinate and schedule different categories of submittals so that one will not be delayed for lack of coordination with another. Extension of time will be allowed because of failure to properly schedule submittals. The CONTRACTOR shall not proceed with work related to a submittal until the submit process is complete. This requires that submittals for review and comment shall be returned to the CONTRACTOR stamped "No Exceptions Taken" or "Make Corrections Noted."

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- C. The CONTRACTOR shall certify on each submittal document that it has reviewed the submittal, verified field conditions, and complied with the Contract Documents
- D. The CONTRACTOR may authorize, in writing, a material or equipment supplier to deal directly with the ENGINEER or with the OWNER with regard to a submittal. These dealings shall be limited to contract interpretations to clarify and expedite the work.

PART 3 – CATEGORIES OF SUBMITTALS

3.1 GENERAL

- A. Submittals fall into two general categories: submittals for review and comment and submittals which are primarily for information only. Submittals which are for information only are, generally, specified as Product Data in Part 2 of applicable Specification sections.
- B. At the beginning of work, the ENGINEER will furnish the CONTRACTOR lists of those submittals specified in the project manual. Two separate lists will be provided: submittals for review and comment and Product Data (submittals) for information only.

3.2 SUBMITTALS FOR REVIEW AND COMMENT

- A. All submittals, except where specified to be submitted as Product Data for information only, shall be submitted by the CONTRACTOR to the ENGINEER for review and comment.

3.3 SUBMITTALS (PRODUCT DATA) FOR INFORMATION ONLY

- A. Where specified, the CONTRACTOR shall furnish submittals (Product Data) to the ENGINEER for information only.

PART 4 – TRANSMITTAL PROCEDURE

4.1 GENERAL

- A. Unless otherwise specified, submittals regarding material and equipment shall be accompanied by Transmittal Form 01300-A as specified in Section 01999. A separate form shall be used for each specific item, class of material, equipment, and items specified in separate, discrete sections, for which the submittal is required. Submittal documents common to more than one (1) piece of equipment shall be identified with all the appropriate equipment numbers. Submittals for various items shall be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole.

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- B. A unique number, sequentially assigned, shall be noted on the transmittal form accompanying each item submitted. Original submittal numbers shall have the following format: “XXX,” where “XXX” is the sequential number assigned by the CONTRACTOR. Resubmittals shall have the following format: “XXX-Y,” where “XXX” is the originally assigned submittal number and “Y” is a sequential letter assigned for resubmittals, i.e., A, B, or C being the 1st, 2nd, and 3rd resubmittals, respectively. Submittal 25B, for example, is the second resubmittal of Submittal 25.

4.2 DEVIATION FROM CONTRACT

- A. If the CONTRACTOR proposes to provide material, equipment, or method of work which deviates from the project manual, it shall indicate so under “Deviations” on the transmittal form accompanying the submittal copies.

4.3 SUBMITTAL COMPLETENESS

- A. Submittals which do not have all the information required to be submitted, including deviations, are not acceptable and will be returned without review.

PART 5 – REVIEW PROCEDURE

5.1 GENERAL

- A. Submittals are specified for those features and characteristics of materials, equipment, and methods of operation which can be selected based on the Contractor’s judgment of its conformance to the specified requirements. Other features and characteristics are specified in a manner which enables the CONTRACTOR to determine acceptable options without submittals. The review procedure is based on the CONTRACTOR’S guarantee that all features and characteristics not requiring submittals conform as specified. Review shall not extend to means, methods, techniques, sequences or procedures of construction, or to verifying quantities, dimensions, weights or gages, or fabrication processes (except where specifically indicated or required by the project manual) or to safety precautions or programs incident thereto. Review of a separate item, as such, will not indicate approval of the assembly in which the item functions.
- B. When the Contract Documents require a submittal, the CONTRACTOR shall submit the specified information as follows:
 - 1. One electronic copy in PDF format of all submitted information shall be transmitted for review and comment.
 - 2. Unless otherwise specified, one electronic copy in PDF format of all submittal information shall be submitted (Product Data) for information only.

5.2 SUBMITTALS FOR REVIEW AND COMMENT

- A. Unless otherwise specified, within 14 calendar days after receipt of a submittal for review and comment, the ENGINEER shall review the submittal and return one (1) electronic copy of the marked-up submittal noted in Part 1 above. The returned submittal shall indicate one of the following actions:
1. If the review indicates that the material, equipment or work method complies with the project manual, submittal copies will be marked “No Exceptions Taken.” In this event, the CONTRACTOR may begin to implement the work method or incorporate the material or equipment covered by the submittal.
 2. If the review indicates limited corrections are required, copies will be marked “Make Corrections Noted.” The CONTRACTOR may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated in operation and maintenance data, a corrected copy shall be provided.
 3. If the review reveals that the submittal is insufficient or contains incorrect data, copies will be marked “Revise and Resubmit.” Except at its own risk, the CONTRACTOR shall not undertake work covered by this submittal until it has been revised, resubmitted and returned marked either “No Exceptions Taken” or “Make Corrections Noted.”
 4. If the review indicates that the material, equipment, or work method does not comply with the project manual, copies of the submittal will be marked “Rejected – See Remarks.” Submittals with deviations which have not been identified clearly may be rejected. Except at its own risk, the CONTRACTOR shall not undertake the work covered by such submittals until a new submittal is made and returned marked either “No Exceptions Taken” or “Make Corrections Noted.”

5.3 SUBMITTALS FOR REVIEW AND COMMENT

- A. Such information is not subject to submittal review procedures and shall be provided as part of the work under this Contract and its acceptability determined under normal inspection procedures.

PART 6 – EFFECT OF REVIEW OF CONTRACTOR’S SUBMITTALS

6.1 GENERAL

- A. Review of Contract Drawings, methods of work, or information regarding materials or equipment the CONTRACTOR proposes to provide shall not relieve the CONTRACTOR of its responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the ENGINEER or the OWNER, or by any officer or employee thereof, and the CONTRACTOR shall have no claim under the Contract on account of the failure, or partial failure, of the method of work, material, or equipment so reviewed. A mark of “No

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Exceptions Taken” or “Make Corrections Noted” shall mean that the OWNER has no objection to the CONTRACTOR, upon its own responsibility, using the plan or method of work proposed, or providing the materials or equipment proposed.

+ + END OF SECTION + +

SECTION 01310

CONSTRUCTION SCHEDULE

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section specifies reports and schedules for planning and monitoring the progress of the work.
- B. The CONTRACTOR shall provide a graphic construction schedule indicating the various subdivisions of the work and the dates of commencing and finishing each. The schedule shall show the time allowed for testing and for other procedures which must be completed prior to the work being put into operation. The schedule will take into account the time of completion and the work sequence described in Section 01014.

PART 2 – PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. Within 10 days after the date of the Notice to Proceed, the CONTRACTOR shall submit in accordance with Section 01300, a construction schedule that conforms to this section. The submittal shall consist of a reproducible original and two (2) copies.
- B. Within 14 calendar days after receipt of the submittal, the ENGINEER shall review the submitted schedule and return one (1) copy of the marked-up original to the CONTRACTOR. If the ENGINEER finds that the submitted schedule does not comply with specified requirements, the corrective revisions will be noted on the submittal copy and returned to the CONTRACTOR.

PART 3 – EXECUTION

3.1 SCHEDULE REVISIONS

- A. Revisions to the accepted construction schedule may be made only with the written approval of the CONTRACTOR and OWNER.

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3.2 SCHEDULE REVISIONS

- A. Project status review and update shall be provided each month.

++ END OF SECTION ++

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SECTION 01311

PROJECT COORDINATION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. As more fully set forth in of the General Conditions, sole responsibility for coordination of all of the Work, belongs to CONTRACTOR. Supervise, direct and cooperate fully with all subcontractors, manufacturers, fabricators, suppliers, distributors, installers, testing agencies and all others whose services, materials or equipment are required to ensure completion of the Work within the Contract Time.
- B. As more fully set forth in of the General Conditions, cooperate with and coordinate the Work with the work of any other contractor, including utility service companies or OWNER'S employees performing work at the site.
- C. Not be responsible for damage done by contractors not under CONTRACTOR'S jurisdiction. Will not be liable for any such loss or damage, unless it is through the negligence of CONTRACTOR.
- D. Coordinate the Work with the work of others to assure compliance with schedules.
- E. Attend and participate in all project coordination or progress meetings and report on the progress of all Work and compliance with schedules.
- F. It is the duty of the CONTRACTOR to determine that all necessary permits have been obtained. The CONTRACTOR, at his own expense, obtain, maintain and close all the required permits which have not been furnished.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01312

PROGRESS MEETINGS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Date and Time:
 - 1. Regular Meetings: Every week on a day and time agreeable to OWNER, ENGINEER and CONTRACTOR.
 - 2. Other Meetings: As needed and/or required in other specific specification sections.
- B. Place: CONTRACTOR'S field office at Project site, or other mutually agreed upon location.
- C. The ENGINEER shall conduct weekly progress meetings, record and distribute minutes of the meeting to all attendees and others as requested. At a minimum, the agenda will include: Requests for Information (RFI) and submittal status, past week's progress and a 3-week look-ahead schedule to include upcoming inspections, current issues, long lead items, critical issues and the next scheduled meeting date.
- D. Provide data required and be prepared to discuss all items on agenda.

1.2 MINIMUM ATTENDANCE

- A. CONTRACTOR:
 - 1. When needed for the discussion of a particular agenda item, require representatives of subcontractors or suppliers to attend a meeting.
- B. ENGINEER.
- C. OWNER'S representative, if required.
- D. Others, as appropriate.
- E. Representatives present for each party shall be authorized to act on their behalf.

1.3 AGENDA

- A. Agenda will include, but will not necessarily be limited to, the following:
 - 1. Transcript of previous meeting.
 - 2. Progress since last meeting.
 - a. CONTRACTOR'S.

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- b. Subcontractors’.
3. Completion status.
4. Planned progress for next period including a 3-week look-ahead schedule to include upcoming inspections.
5. Document and track to correction and closure any problems, conflicts, issues, and observations that are voiced by anyone of the project team.
6. Status of Shop Drawings, submittals, long lead items, RFI and RFAs.
7. Change Orders.
8. Pay Requests.
9. Quality Standards and Control.
10. Schedules, updated Project Schedules, including off-site fabrication and delivery schedules; corrective measures, if required.
11. Coordination between parties.
12. Permits.
13. Safety concerns.
14. Construction Photographs.
15. Record Drawings.
16. Warranty Requests.
17. Punch List Status.
18. Other business.
19. Next meeting date.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01380

PHOTOGRAPHS

PART 1 – GENERAL

1.1 PRECONSTRUCTION PHOTOGRAPHS

- A. The CONTRACTOR shall provide preconstruction photographs prior to commencement of work on the site. The photographs shall be electronic jpeg files with a minimum resolution of 5 megapixels with index file or folder structure to categorize and group photos and shall indicate on the front of each photo the date, project name, and the location where the photograph was taken. Before construction may start, electronic jpeg files shall be saved on an external storage drive with an index print clearly depicting preconstruction conditions and must be delivered to the ENGINEER. Preconstruction photographs shall be taken at locations to be designated by the ENGINEER.

1.2 CONSTRUCTION PHOTOGRAPHS

- A. The CONTRACTOR shall provide construction photographs showing the progress of the work. The CONTRACTOR shall provide a minimum of three (3) photographs (taken from grade) of the interior of each manhole structure prior to commencement of rehabilitation work. A minimum of four (4) additional photographs per manhole shall be taken of all the repair locations from within the manhole. Additional lighting or flash will be required to provide quality photographs from within the manhole. The photographs shall be electronic jpeg files with a minimum resolution of 5 megapixels saved on an external storage drive with an index file or folder structure to categorize and group photos and shall indicate on the front of each print the date, project name, and manhole number.
- B. A minimum of four (4) additional photographs per location shall be taken of general site conditions to represent the current construction activities or special areas of interest, shall be electronic jpeg files with a minimum resolution of 5 megapixels saved on an external storage drive with an index file or folder structure to categorize and group photos, and shall indicate on the front of each photo the date, project name and brief description of the photograph, including the location where the photograph was taken. Starting 1 week after the date of the preconstruction photographs and continuing as long as the work is in progress, a minimum of ten (10) weekly photographs shall be taken.
- C. Upon acceptance of the work, a minimum of 24 color exposure photographs shall be taken of the work area where directed by the ENGINEER. Electronic jpeg files on an external storage drive with an index file or folder structure to categorize and group photos shall be delivered to the ENGINEER within 10 days following each set of exposures.

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1.3 SUBMITTALS

- A. The CONTRACTOR shall submit the following information for Product Data per Section 01300:
1. Sample Photographs to represent photo quality, labeling, and file indexing.
 2. Pre-construction photographs take prior to construction.
 3. Construction photographs taken prior to each manhole rehabilitation, work completed within each manhole, and general site conditions.
 4. Post-construction site photographs.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01400

PUBLIC AWARENESS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. The CONTRACTOR is responsible for coordination and communication of the work with a public information (PI) firm hired by the ENGINEER.
- B. The PI firm will be responsible for informing adjacent property owners regarding the impact and schedule of the work. The CONTRACTOR shall attend PI meetings as requested by the OWNER to answer questions from the public regarding construction activities. CONTRACTOR shall respond to on-site public inquiries. In addition, the CONTRACTOR shall review and assist with the distribution of public information materials.

1.2 CONSTRUCTION NOTICES AND DOOR HANGERS

- A. The CONTRACTOR shall retain copies of the following materials at each site:
 - 1. Copies of the approved Written Project Notifications distributed by PI a minimum of 14 days prior to service interruption or potentially impacted by construction activities. (Format: English and Spanish)

1.3 WORK PROGRESS INTERRUPTION

- A. The CONTRACTOR shall notify the PI firm in work is delayed after a 24-hour notice has been distributed.

1.4 NOTICE OF DISRUPTION

- A. The CONTRACTOR shall notify the PI firm if construction activities will disrupt sewer service.

1.5 24-HOUR TELEPHONE HOTLINE

- A. The CONTRACTOR shall advise all project personnel that a project hotline telephone service is available to reply to resident's questions or concerns. The project hotline will be established and monitored by the ENGINEER'S PI firm for activity. The CONTRACTOR shall coordinate with the PI firm and assist in addressing hotline complaints or concerns.

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- B. A log of telephone or on-site contacts for complaints shall be maintained by the PI firm. Complaints shall be forwarded to the CONTRACTOR for resolution. The CONTRACTOR shall maintain a log of complaints received from the PI firm and the procedures undertaken for resolution. The CONTRACTOR shall immediately communicate to the OWNER any public issues concerning damage to private property, health concerns, nuisances and general complaints. The CONTRACTOR shall immediately address the issues. A log shall contain the following:
1. Date of Communication.
 2. Time of Communication.
 3. Name of Person Receiving the Complaint.
 4. Contact Name.
 5. Contact Address.
 6. Contact Return Telephone Number.
 7. Description of Complaint or Concern.
 8. Description of Discussions.
 9. Description of Proposed Resolution.
- C. A summary of all public contact log entries shall be submitted to the OWNER bi-weekly, or at scheduled progress meetings.

1.6 ATTENDANCE AT PUBLIC INFORMATION MEETING

- A. The CONTRACTOR shall attend public meetings as requested by the OWNER.

1.7 WORK IN EASEMENTS

- A. Work may take place in streets, alleys, or easements. Access and working space may be limited when working in easements. Attention to access and private-property protection is required when working in easements.
- B. The CONTRACTOR shall take preconstruction photographs of areas potentially impacted by construction activities according to Section 01380.

1.8 ON-SITE SUPERINTENDENT

- A. The CONTRACTOR shall have a Field Superintendent familiar with work on site during project work hours and shall be available to answer questions from or assist the public. The CONTRACTOR shall provide a letter to the OWNER authorizing the Field Superintendent to act on behalf of the CONTRACTOR regarding public relations or construction-related issues.

PART 2 – PRODUCTS (NOT USED)

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PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01550

CONTRACTOR'S UTILITIES

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section specifies the facilities, utilities, and security requirements.

PART 2 – PRODUCTS

2.1 POWER

- A. CONTRACTOR shall provide power at all work sites, as necessary. If needed, the CONTRACTOR shall coordinate with the electrical utility for power takeoff points, voltage and phasing requirements, transformers and metering and shall pay all costs arising therefrom. The CONTRACTOR shall comply with all applicable construction and safety regulations required by the City of Phoenix.
- B. CONTRACTOR shall use battery, pneumatic, or hydraulic power for all in-sewer work. This limitation is not necessary for work on the surface or in-sewer lighting.

2.2 LIGHTING AND ILLUMINATION

- A. The CONTRACTOR shall provide low-voltage lighting and illumination required in the sewer, in accordance with the guidelines published in Practice for Industrial Lighting, American National Standards Institute/Illuminating Engineering Society (ANSI/IES) RP7-1983. Surface lighting shall be placed to avoid nuisance to traffic or local residences.

2.3 TELEPHONE

- A. CONTRACTOR shall provide telephone service for its own use. Cellular telephone service is acceptable as a substitute for telephone service. These telephone costs shall be paid by the CONTRACTOR.

2.4 WATER

- A. All water for testing, flushing, cleaning and construction shall be furnished by the CONTRACTOR. Water may be available by connecting to the City of Phoenix's water system at a point approved by the City with approved connection accessories. The City shall charge the CONTRACTOR for water used in performing the above functions in

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accordance with the respective established rate schedule. A backflow preventer, meeting the requirements of ANSI A40.6, latest revision, shall be installed in each connection to the owner's water supply. The contractor shall be required to meter all water used.

2.5 SANITARY FACILITIES

- A. The CONTRACTOR shall provide toilet and decontamination facilities at the work site. CONTRACTOR shall comply with applicable laws, ordinances, and regulations pertaining to public health and sanitation of dwellings and camps.

2.6 CONTRACTOR'S SECURITY

- A. CONTRACTOR shall be responsible for the security of its material on site and in the CONTRACTOR's storage and parking areas. The CONTRACTOR shall provide a security fence around its storage area.

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01560

ENVIRONMENTAL CONTROLS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Provide and maintain methods, equipment, and temporary construction, as necessary, to provide controls over environmental conditions at the construction site and adjacent areas. Remove physical evidence of temporary facilities at completion of work.

1.2 TRANSPORTATION ROUTES

- A. The CONTRACTOR shall select its transportation routes for hauling materials, equipment, or imported products based on the existing condition of the manholes and impacts on local traffic. The transportation routes shall be documented in a traffic-control plan. All traffic-control haul plans shall be submitted for review per Section 01300.

Traffic-control haul plans shall include the following information:

1. Objective.
2. Transport equipment size, including load, (length, height, width).
3. Schedule, (date, time, frequency).
4. Impact to existing facilities and detailed map of route and any restrictions through the entire haul route within the general project area.

1.3 TRAFFIC CONTROL

- A. Refer to Section 2100 for traffic-control requirements.

1.4 SEWAGE SPILL CONTROL

- A. A sewage spill is defined as any release, planned or unplanned. Sewage spills are not permitted. The following are examples of a sewage spill: flow of sewage out of the sewer pipe; sewage leaks from fittings, pipes and pumps that are not captured; and sewage in contact with the soil, either on the ground or within pits or excavations. The CONTRACTOR shall be responsible for all consequences and damages caused by a sewage spill due to the CONTRACTOR'S work activities.
- B. CONTRACTOR shall give both verbal notification to the City within 4 hours of a spill and written notification to the City within 24 hours of a sewage spill.

- C. Prepare an Emergency Response Plan (ERP) which is consistent with City of Phoenix requirements for construction stormwater Best Management Practices and the Stormwater Pollution Prevention Plan (SWPPP) or Stormwater Management Plan (SWMP).
1. The ERP shall include the following information and steps for preparedness, prevention and reporting of spills/releases of raw sewage, potable water, and hazardous materials:
 - a. A description of operational practices to prevent spills/releases of raw sewage, potable water, fuel, and hazardous materials during construction.
 - b. A description of operational practices to contain spills/releases of raw sewage, potable water, fuel, and hazardous materials during construction.
 - c. A list of on-site equipment that is available to contain and/or respond to a spill/release.
 - 1) The list must include the name of the equipment, a description of the equipment, capabilities and limitations of the equipment, and the quantity and location of the equipment.
 - d. Procedures for required notifications regarding spills/releases.
 - 1) Include actions to be taken and by whom.
 - 2) Provide notification lists that include the names, titles, phone numbers (or other methods of notifications), and the required order of notification.
 - e. Spill Reporting Form.
 - 1) In the event of a spill, the CONTRACTOR shall submit a Spill Reporting Form (Form 1560 found in Section 01999). The ERP must include a copy of the Spill Reporting Form with directions for its completion and by whom, and with directions for its submittal to the designated representative of the City of Phoenix.
 - f. Procedures to coordinate the responsibilities imposed by the ERP between the CONTRACTOR and the City of Phoenix.
 - g. A description of emergency response training provided to the CONTRACTOR'S employees.
 2. Submit a draft copy of the ERP to the City for approval prior to beginning construction.

1.5 WILDLIFE AWARENESS

- A. The CONTRACTOR shall be aware of wildlife that potentially inhabit the work areas. Care shall be given to such wildlife protected under the Migratory Bird Treaty Act of 1918 and the Sonoran Desert Tortoise. Refer to attached information regarding the Sonoran Desert Tortoise, and information regarding the Western Burrowing Owl and Migratory Birds to reduce the risk of impacting species protected by the Migratory Bird Treaty Act.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SITE MAINTENANCE

- A. CONTRACTOR shall keep the work site, staging areas, storage and parking area, and CONTRACTOR'S facilities clean and free from rubbish and debris. Materials and equipment shall be promptly removed from the site when they are no longer necessary. Upon completion of the work and before final acceptance, the work site shall be cleared of equipment, unused materials, and rubbish to present a clean and neat appearance in conformance with the preconstruction condition of the site. Refer to each section for further requirements.
- B. CONTRACTOR shall not store equipment or materials other than at locations indicated by the OWNER. Property surrounding the work site shall be completely free of all debris and rubbish at all times.

3.2 CLEAN UP

- A. Waste material of any kind will not be permitted to remain on the site of the work or on adjacent streets. Immediately upon such materials becoming unfit for use in the work, they shall be collected, carried off the site, and disposed of by the CONTRACTOR, with the exception of aviation property in which a stockpile location shall be coordinated and spoils tested prior to removal from site. The CONTRACTOR shall be responsible for obtaining necessary permits or approval for the CONTRACTOR'S disposal site.
- B. The CONTRACTOR shall keep all buildings and areas occupied by the CONTRACTOR clear of all refuse, rubbish and debris that may accumulate from any source and shall keep them in a neat condition to the satisfaction of the ENGINEER.
- C. In the event that waste material, refuse, debris and/or rubbish are not removed from the work area by the CONTRACTOR, the OWNER reserves the right to have the waste, material, refuse, debris and/or rubbish removed at the CONTRACTOR'S expense.
- D. Paints, solvents, and other construction materials shall be handled with care to prevent entry of contaminants into storm drains, surface waters, or soils.

3.3 CONSTRUCTION FENCE AND BARRIERS

- A. A barrier shall be provided around all excavations and open structures. The barrier shall enclose the area and prevent unauthorized access.

3.4 STREET CLEANING

- A. CONTRACTOR shall be responsible for preventing dirt, dust, and sediments from escaping from trucks departing the project site by covering dusty loads, washing truck tires before leaving the site, or other reasonable methods.
- B. When working trucks, drilling rigs, and/or other equipment are on paved streets and roadways, the CONTRACTOR will be required to clean said streets as soon as possible, but no later than at the conclusion of each day's operations or 24-hour period at such interim periods as required by the ENGINEER.
- C. All street in the construction area used by CONTRACTOR'S trucks or any other equipment-hauling material to and from the area, whether within the Contract limits or adjacent thereto, shall be kept clean by the CONTRACTOR and shall be continuously serviced by the CONTRACTOR'S use of water trucks to control dust.
- D. Cleaning and dust control shall be as specified in Maricopa Association of Governments (MAG) Section 104.1.4 and shall be at the CONTRACTOR'S expense.
- E. Any violation of the requirements shall be sufficient grounds for the ENGINEER to order the streets in question cleaned by others and the cost to be paid by the CONTRACTOR.
- F. No solid materials or soils may be flushed into storm or in the sewer or wastewater facilities.
- G. CONTRACTOR shall use a power pick-up broom as part of the dust-control effort.

3.5 AIR-POLLUTION CONTROL

- A. CONTRACTOR shall not discharge smoke, dust, and other contaminants into the atmosphere that violate the regulations of any legally constituted authority. The CONTRACTOR shall maintain construction vehicles and equipment in good repair. Equipment exhaust emissions that are determined to be excessive by the ENGINEER shall cause the equipment to be repaired or replaced.
- B. CONTRACTOR shall also minimize dust nuisance by cleaning, sweeping, and sprinkling with water, or other means. The use of water, in amounts which results in mud on public streets, is not acceptable as a substitute for sweeping or other methods. Equipment for this operation shall be on the jobsite or available at all times.
- C. CONTRACTOR shall employ methods and procedures that mitigate the generation and discharge of objectionable odors to the surface environment at all times.

- D. Foul-Air Treatment: Units shall be installed per manufacturer instructions and at areas where odor complaints have arisen or as directed by the ENGINEER. The units shall be modular, prefabricated, air-extraction and activated-carbon systems. Approved products include the Calgon High Flow Ventsorb (1,000-cfm) or equal. The CONTRACTOR shall install a tarp over the source odor location to maximize the effectiveness of the ventilation and foul-air treatment.
- E. Alternatively, foul air may be treated with an approved liquid chemical system.

3.6 NOISE CONTROL

- A. CONTRACTOR shall perform all work in compliance with Occupational Safety and Health Administration (OSHA) standards and in no case will noise levels be permitted which would interfere with the work of the OWNER or others. The following Noise Design Criteria shall apply at the sensitive noise receptors:
 - 1. Commercial Areas 70-dBA
 - 2. Residential Areas 50-dBA
 - 3. Sensitive noise receptors are defined as occupied buildings with windows or doors facing the site.
- B. Each internal-combustion engine used for any purpose on the job or related to the job shall be equipped with a muffler and/or plywood/Styrofoam noise panel enclosing the engines of a type recommended by the manufacturer to keep the noise level within limits specified above. No internal-combustion engine shall be operated on the project without said muffler.
- C. Noisy portable equipment such as generators or compressors shall be located as far away from sensitive noise receptor areas as practicable. Noise barriers shall be constructed around noisy stationary construction equipment such as compressors or generators that have to be utilized at locations near (within 100 feet of) sensitive noise receptors as defined above.
- D. Idling equipment not actively utilized for extended periods of time shall be shut off.

3.7 TREE AND PLANT PROTECTION

- A. If a tree or any landscaped vegetation is damaged or destroyed by construction, or any action of the CONTRACTOR, the CONTRACTOR shall replace the damaged tree or plant with a healthy one of the same species. The replacement tree or plant shall be of the same size as the damaged tree or plant and will be placed at the existing grade. The CONTRACTOR shall bear all expenses required to establish the replacement tree or plant. The replacement tree or plant shall be guaranteed healthy for 1 year after the end of

construction date. The CONTRACTOR shall be responsible for any tree or plant that the CONTRACTOR replaced that is deemed unhealthy during that year.

- B. Cultivated Areas And Other Surface Improvements: All landscaped areas and other surface improvements which are damaged by actions of the CONTRACTOR shall be restored to their original condition at the CONTRACTOR'S expense.

3.8 SURFACE WATER CONTROL

- A. Temporary Pumping and Drainage: CONTRACTOR shall conform to the regulations and requirements of legally authorized surface water management agencies.
- B. CONTRACTOR shall be responsible for keeping any open excavations and other areas free from water as required to permit continuous progress of, or to prevent damage to its own work or work of others. The CONTRACTOR shall cover exposed excavated areas and spoil piles when runoff from rain is or would be likely to cause turbid waters to enter local waterways. The CONTRACTOR shall suspend work in the rain if such work cannot be performed without causing turbid runoff.

3.9 POLLUTION CONTROL

- A. Provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations.
- B. Take special measures to prevent harmful substances from entering public waters.
 - 1. Prevent disposal of wastes, effluents, chemicals, or other such substances in the sanitary sewer or adjacent properties.
- C. Provide systems for control of atmospheric pollutants.
 - 1. Prevent toxic concentrations of chemicals.
 - 2. Prevent harmful dispersal of pollutants into the atmosphere.
 - 3. Prevent the generation and discharge of objectionable odors to the atmosphere.
- D. All CONTRACTOR equipment used during construction shall conform to all current Federal, State and local laws and regulations.

3.10 ARCHAEOLOGICAL MONITORING

- A. The CONTRACTOR shall coordinate his work with the City of Phoenix archaeological monitoring representative. The Archaeological Representative shall be provided a construction schedule identifying the archaeological sensitive work areas and dates of work activities at the Preconstruction Meeting. The City will have an Archaeological Representative onsite during construction excavation to monitor for the presence of artifact(s). If artifacts are observed or unearthed, the CONTRACTOR shall cease work in

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that area and notify the City's Project Manager or its on-site representative (if present).
Work can proceed in that area once an evaluation of the artifact(s) is complete.
Archaeological sensitive locations are represented on the Drawings with key notes.

+ + END OF SECTION + +



Credit: AGFD



City of Phoenix
OFFICE OF ENVIRONMENTAL PROGRAMS

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, deserts 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/Portallimages/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 Office of Environmental Programs, Environmental Programs Coordinator, Tricia Balluff at (602) 534-1775 or tricia.balluff@phoenix.gov.



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



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

SECTION 01700

RESTORATION OF IMPROVEMENTS

PART 1 – GENERAL

1.1 STRUCTURES

- A. The CONTRACTOR shall take all precautions necessary to protect the integrity of all existing collection system and surrounding features. CONTRACTOR shall repair existing structures which may be damaged as a result of the work under this Contract.

1.2 ROADS AND STREETS

- A. Roads and streets where the surface is removed, broken, or damaged, or in which the ground has caved or settled during the work under this Contract, shall be resurfaced and brought to the original grade and section. Roadway used by the CONTRACTOR shall be cleaned and repaired. Before resurfacing material is placed, edges of pavements shall be trimmed back far enough to provide clean, solid, vertical faces, and shall be free of loose material. All paved surfaces shall be cut with a pavement saw. Rough cuts are not allowed. Repair work shall conform to Maricopa Association of Governments and/or Phoenix Supplemental Standards' paving details and requirements, including City of Phoenix Street Pavement Cut Policy effective July 1, 2017, per City Code, Chapter 31, Article III, Section 31-49.1.

1.3 CULTIVATED AREAS AND OTHER SURFACE IMPROVEMENTS

- A. Cultivated or planted areas and other surface improvements which are damaged by actions of the CONTRACTOR shall be restored to their original condition. Restoration shall take place within 1 week as directed by the ENGINEER.
- B. Existing guard post, barricades, and fences shall be protected and replaced if damaged.

1.4 PROTECTION OF EXISTING INSTALLATIONS

- A. The CONTRACTOR shall protect all existing operating facilities and structures from damages. However, if damage occurs, the CONTRACTOR shall immediately correct or replace existing equipment, controls, systems, structures, or facilities which are damaged in any way as a result of its operations.

PART 2 – PRODUCTS (NOT USED)

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North – Zone 3
PROJECT NUMBER: WS90500273

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

SECTION 01720

RECORD DRAWINGS

PART 1 – GENERAL

1.1 GENERAL

- A. Record Drawings refer to those documents maintained and annotated by the CONTRACTOR during construction and are defined as (1) a neatly and legibly marked set of Contract Drawings with an updated rehabilitation matrix on each sheet detailing the work completed in each manhole rehabilitated, and (2) additional documents such as Schedules and Contract submittals.
 - B. Unless otherwise specified, Record Drawings shall be full-size and maintained in a clean, dry, and legible condition. Record Drawings shall not be used for construction purposes and shall be available for review by the ENGINEER during normal working hours. At the completion of the work, prior to final payment, all Record Drawings shall be submitted to the ENGINEER.
 - C. Marking of the Drawings shall be kept current and shall be done at the time the material and equipment are installed. Annotations to the Record Drawings shall be made with an erasable colored pencil conforming to the following color code:
 - 1. Additions – Red
 - 2. Deletions – Green
 - 3. Comments – Blue
 - 4. Dimensions – Graphite*
- *Legibly mark to record actual depths, horizontal and vertical location of underground raceways, cables, and appurtenances referenced to permanent surface improvements.
- D. If the CONTRACTOR opts to use electronic Record Drawing files, the above requirements shall be met within the electronic documentation. This includes, but is not limited to, the requirement that the annotation color code be maintained in the electronic files such that when printed in color, the annotation colors are legible and distinguishable.
 - E. The CONTRACTOR shall provide information on the Record Drawing, as detailed in the City of Phoenix Engineering Policy P-85 Rev. Date 2004, for all new assets.

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PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

++ END OF SECTION ++

CITY OF PHOENIX: Water Services Department
PROJECT NAME: Large Diameter Sanitary Sewer Rehabilitation - Grade 5 & 4 Manholes
North - Zone 3
PROJECT NUMBER: WS90500273

SECTION 01999

REFERENCE FORMS

PART 1 - GENERAL

1.1 REQUIRED FORMS

- A. The forms listed below and included in this section are referenced from other sections of the Contract Documents:

<u>Form No.</u>	<u>Title</u>
00710-B	Request for Information Form
01300-A	Submittal Transmittal Form
1560	Spill Reporting Form

1.2 SCOPE

- A. The CONTRACTOR shall be responsible for the documentation forms for tests and evaluations required of the Contract that do not have specific forms identified. CONTRACTOR-generated forms shall follow the format established on Form 01300-A contained herein.

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00710-B. REQUEST FOR INFORMATION FORM

REQUEST FOR INFORMATION

RFI NO. _____

OWNER:	CITY OF PHOENIX	ROUTING	SENT	RECEIVED
PROJECT:	_____	Contractor	_____	_____
	_____	Engineer	_____	_____
CONTRACTOR:	_____	RPR/Contractor	_____	_____
RFI TITLE:	_____			
REFERENCES:	DRAWING NO: _____	LOCATION: _____		
	SPEC. SECTION: _____	PAGE: _____		
	OTHERS: _____			

The following information is requested as described below or in the attachments:

By: _____ Date: _____

The following information is provided as described below or in the attachments:

By: _____ Date: _____

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01300-A. SUBMITTAL TRANSMITTAL FORM

SUBMITTAL TRANSMITTAL

Submittal Description: _____ Submittal No: _____

Spec Section: _____

	Routing	Sent	Received
OWNER: CITY OF PHOENIX	Contractor		
PROJECT:	Engineer		
	Contractor		
CONTRACTOR:			

We are sending you Attached Under separate cover via _____
 Submittals for review and comment
 Product data for information only

Remarks: _____

Item	Copies	Date	Section No.	Description	Review action ^a	Reviewer initials	Review comments attached

^aNote: NET = No exceptions taken; MCN = Make corrections noted; A&R = Amend and resubmit; R = Rejected
 Attach additional sheets if necessary.

Contractor: Certify either A or B:

- A. We have verified that the material or equipment contained in this submittal meets all the requirements, including coordination with all related work specified (no exceptions).
- B. We have verified that the material or equipment contained in this submittal meets all the requirements specified except for the attached deviations.

<u>No.</u>	<u>Deviation</u>
_____	_____
_____	_____
_____	_____
_____	_____

Certified by: _____

Contractor's Signature

**SPILL REPORTING FORM
FORM 01560**

INSTRUCTIONS: The supervisor shall ensure that appropriate on-site personnel complete Parts A and B of this form. Part A shall be completed immediately upon discovery of a spill or release by the individual who first made the discovery. Part B shall be completed by a supervisor and immediately faxed, e-mailed or hand-delivered to Owner's Field Representative. (NOTE: for sewage spills, a verbal notification must be made with 4 hours.) There may be additional reporting requirements imposed by permits or mandated emergency response plans.

PART A First at the Scene

1. Facility name and address/location/intersection (or major cross streets):

2. Is/was there a fire or explosion or other release (except for sewage release) outside the facility?
Yes No
If yes, immediately contact the Fire Department (911) for assistance, initiate appropriate facility response procedures, then continue with this form.

3. Personal injuries and extent, if any: _____

4. Date and time of initial call or complaint: _____

5. Date and time spill found or confirmed: _____

6. Date spill reporting form completed: _____

7. Date and time spill occurred or started, if known: _____

8. What was spilled? Describe completely. List chemical names/wastewater if known.

9. How much was spilled? Use units such as gallons or pounds, etc.

10. Where and how did the spill occur?
 - (a) Manhole No.: _____
 - (b) Quarter Section Map No.: _____
 - (c) Include a description of the container or vessel from which the spill occurred:

 - (d) Attach diagram or map, if available.

**SPILL REPORTING FORM
FORM 01560**

11. Where did the spilled material go? Check all that apply.

- Drywell Dry wash Canal River bed
 Private property Retention basin Sanitary sewer Secondary containment
 Storm drain City street Air (vapors-odors) Other (specify below)

Describe: _____

12. How far did the spill travel? Describe the path the spill took to its final destination.

13. Was the spill stopped or contained? Describe how and by whom.

14. How long did the spill last? _____

15. Who found the spill? Use the back of this form if necessary.

Name: _____ Title: _____ Phone: _____

(a) _____

(b) _____

16. Who was notified of the spill? List names and identify how notification was made (phone call, fax, etc. Use the back of this form, if necessary).

Name	Dept./Div./Agency	Date/Time Notified	Method of Notification
------	-------------------	--------------------	------------------------

(a) _____

(b) _____

Printed name and signature of person who completed PART A:

Printed Name: _____ Title: _____ Phone: _____

Signature: _____ Date: _____

**SPILL REPORTING FORM
FORM 01560**

PART B Supervisor, Emergency Coordinator or Incident Commander

INSTRUCTIONS: Obtain a copy of the material safety data sheet (MSDS) for the released chemical. Please review the information provided in Part A for completeness and accuracy as part of completing the information below.

17. Facility EPA ID No.: _____

18. What proper precautions should be taken as a result of the release, including evacuation and other proposed response actions, based upon information available on the MSDS or by generator knowledge?

19. List any known or anticipated acute or chronic health risks associated with the release or advice regarding medical attention for exposures, based upon information available on the MSDS or by generator knowledge?

20. If this incident occurred during transport, including loading and unloading, please provide:

Carrier's name: _____

DOT Hazard Class(es): _____

21. Do you believe there is reason to continue ongoing analysis for possible human health or environmental impacts inside or outside the facility?

Yes No Don't know

If answer is "Yes" or "Don't know," contact the DCR.

CLEANUP

22. Is there continuing residue at the scene? Yes No

23. Name of organization or crew responsible for cleanup: _____

24. Summarize cleanup method and containment procedures:

25. Name of contractor and contact involved in cleanup:

**SPILL REPORTING FORM
FORM 01560**

26. Estimated quantity and manner of disposition of recovered material resulting from incident:

(a) Name and address of facility material taken to:

(b) Attach manifest or bill of lading.

27. Schedule for additional sampling or cleanup, if any is required:

Printed name and signature of person who completed PART B:

Printed Name: _____ Title: _____ Phone: _____

Signature: _____ Date: _____

Attach MSDS, if available.

Page 4 of 4

END OF SECTION

SECTION 02100

TRAFFIC CONTROL

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Traffic control during construction shall be provided in accordance with the requirements of the City of Phoenix Supplements to the Maricopa Association of Governments (MAG) Uniform Standard Specification and Details Section 401, Traffic Control, City of Phoenix Traffic Barricade Manual (TBM) 9th Edition, and 2009 Manual of Uniform Traffic Control Devices (MUTCD).
- B. The CONTRACTOR shall be aware some work locations within the project limits may be under jurisdiction of Maricopa County Department of Transportation, Arizona Department of Transportation, or Salt River Project right-of-way and easements. Additional coordination may be required if traffic control measures encroach on Maricopa County Department of Transportation or Arizona Department of Transportation governed roadways.
- C. All streets, traffic ways, and sidewalks shall be kept open in a safe manner for the passage of traffic and pedestrians during the construction period unless otherwise approved by the City of Phoenix.
- D. When required to cross, obstruct or close a street, traffic way, or sidewalk for a short duration that is approved by the City of Phoenix, the CONTRACTOR shall provide and maintain suitable bridges, detours or other approved temporary means for the accommodation of vehicular and pedestrian traffic. Closings shall be for the shortest time practical, and passage shall be restored immediately after completion of construction.
- E. The CONTRACTOR shall give the OWNER 48 hours' advance notice of its proposed operations within any public rights-of-way and temporary roadway restrictions.
- F. All proposed roadway restrictions shall be submitted in a Traffic Control Plan and Temporary Restriction and Closure System (TRACS) Permit, per City of Phoenix TBM 9th Edition, for approval prior to commencement of operations. The CONTRACTOR will submit TRACS permit 7 days prior to the ENGINEER for review and submission to the Right-of-Way Department.
- G. The CONTRACTOR shall provide signs, signals, barricades, flares, lights and all other equipment, service and personnel required to regulate and protect all traffic and warn of

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hazards in accordance with MAG specifications. All such work shall conform to requirements of the City of Phoenix or authority having jurisdiction. Remove temporary equipment and facilities when no longer required and restore grounds to original condition.

- H. The CONTRACTOR shall provide a Traffic Control Plan and implement traffic control around all work as part of the Contract.
- I. Qualified and suitably equipped flaggers shall be used to assist all construction equipment and vehicles access to and from the construction site.

1.2 SEQUENCE OF CONSTRUCTION

- A. The sequence of construction shall conform to the requirements of the Special Traffic Regulations as stated in the City of Phoenix Supplement to MAG, Subsection 401.4 Traffic Control Measures.
- B. Night work will be allowed on this project upon written request to the OWNER for its approval prior to commencement of work.
- C. The right to direct the sequence of construction is a function vested solely with the OWNER. Prior to commencement of the work, the CONTRACTOR shall prepare and submit to the OWNER, a written phasing plan and work schedule for the project. This plan and work schedule shall be submitted to the OWNER at the Preconstruction Conference for review.
- D. When approved, the phasing plan and work schedule shall not be changed without the written consent of the OWNER. Orderly procedure of all work to be performed under this Contract shall be the full responsibility of the CONTRACTOR. The work schedule shall include the hours per day and the days per week that the CONTRACTOR plans to work on the project site.

1.3 HOLIDAY SEASON CONSTRUCTION MORATORIUM

- A. The Traffic Control Plan shall accommodate the holiday season construction moratorium in accordance with Section 01014-1.6.

1.4 TRAFFIC REGULATIONS

- A. The traffic regulations shall conform to City of Phoenix Supplement to MAG Subsection, General Traffic Regulations, City of Phoenix TBM 9th Edition, and 2009 MUTCD.
- B. The Downtown Corridor is bounded by: 23rd Avenue to the west, 20th Street to the east, McDowell Road to the north, and Buckeye Road to the south.

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- C. The Traffic Control Plan shall be submitted for review and approval by the City of Phoenix Street Transportation Department for all work or construction activities within City of Phoenix right-of-way impacted by construction operations.
- D. All traffic and/or traffic control devices on this project shall be provided, maintained and/or controlled as specified in the City of Phoenix TBM, 9th Edition and addendums thereof.
- E. Permission to restrict City of Phoenix streets, sidewalks and alleys (street closure permits) shall be requested as specified in Chapter 2 of the TBM, 9th Edition and addendums thereof.
- F. Unless otherwise provided for in the following "Special Traffic Regulations," all traffic on this project shall be regulated as specified in City of Phoenix TBM, 9th Edition and addendums thereof.
- G. No deviation to the "Special Traffic Regulations" will be allowed or implemented unless submitted to the ENGINEER for review and approval 2 weeks prior to proposed work.
- H. Only City of Phoenix certified contractors can set, move, or remove temporary traffic control devices (signs, barricades, etc.). This annual certification can be scheduled by calling 602-262-6235.
- I. Parking Meter Fees: To take a parking meter out of service requires a \$35 application fee and \$10 per meter per day.
- J. The City of Phoenix has the authority to remove and store temporary traffic control devices in emergency situations or, as a last resort, if the barricade owner will not pick them up. The City of Phoenix will assess removal and storage fees accordingly.
- K. The CONTRACTOR shall follow City of Phoenix Right-of-Way Management Program:
 - 1. City Code, Chapter 31, "Streets and Sidewalks" Article XII, Temporary Use of Sidewalks, to promote, preserve, and protect the health, safety, and welfare of the citizens of Phoenix in public right-of-way.

1.5 CIVIL SANCTIONS

- A. Civil sanctions for temporary traffic control violations apply as follows:

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Civil Sanction Per Day	Violation Description
\$1,500.00	Creating an imminent risk of death or injury to the public within the public right-of-way.
\$1,000.00	Restricting the right-of-way without proper certification or a Right-of-Way Temporary Use Permit.
\$1,000.00	Restricting traffic during peak traffic hours without authorization as described in the Traffic Barricade Manual.
\$1,000.00	Failing to correct or cure a violation, as listed in this schedule, within the time period stated on the warning notice.
\$1,000.00	Restricting traffic at signalized intersections without any work occurring.
\$500.00	Closing a sidewalk improperly or closing a sidewalk without proper certification or closing a sidewalk without a Right-of-Way Temporary Use Permit.
\$500.00	Violating the restrictions, limits, times and location of the Right-of-Way Temporary Use Permit.
\$500.00	Missing or improper use of advance warning signs.
\$500.00	Missing or improper use of barricades and channelizing devices.
\$250.00	Leaving advance-warning signs facing traffic after restriction has been removed - per one traffic direction.
\$250.00	Leaving traffic control devices in the right-of-way 24 hours after Right-of-Way Temporary Use Permit expires unless a request for a permit extension is received by the City of Phoenix prior to the expiration of such permit.
\$250.00	Use of an “Unacceptable” quality traffic control device as described in the Traffic Barricade Manual.
\$250.00	Rendering a bus stop inaccessible without relocating it or making other accommodations.

1.6 TRAFFIC CONTROL/ACCESS

- A. The CONTRACTOR shall be responsible to present Traffic Control Plans at the regularly scheduled project progress meeting for review. Uninterrupted access to commercial businesses and residences shall be maintained at all times. The CONTRACTOR shall be responsible to adjust work schedule to minimize disruption to normal operation of businesses.
- B. The CONTRACTOR shall be responsible to coordinate Traffic Control Plans and inform the project's public relations personnel of any potential impacts to commercial businesses or residents. The CONTRACTOR shall adjust work activities and schedules to minimize disruptions to the City of Phoenix, residents and traveling public. City of Phoenix reserves the right to request the CONTRACTOR move its operations or modify work plans and schedules to minimize disruptions to commercial business or residents at no cost to the OWNER.

1.7 TRAFFIC CONTROL PLAN DISTRIBUTION

- A. A copy of the approved Traffic Control Plan shall be submitted to the OWNER prior to start of work
- B. A copy of the approved Traffic Control Plan shall be on site and available for review while work activities are commencing. Failure to have an approved Traffic Control Plan on site while work is commencing will be grounds for rejection and non-payment of work being performed.

1.8 SPECIAL TRAFFIC REGULATIONS

- A. Streets identified in paragraph 1.4 can be reduced, when construction requires, during the times indicated below:
 - 1. Arterial Streets: May be restricted to a single thru lane for each direction of travel with left turns prohibited weekdays 8 p.m. to 6 a.m. Monday thru Friday and weekends 9 p.m. Friday to 6 a.m. Monday.
 - 2. For work within a reversible lane section, such as 7th Avenue: Between the hours of 6 a.m. to 9 a.m., maintain a minimum of two thru lanes southbound and a single thru lane northbound with left turns permitted Monday thru Friday. Between the hours of 3 p.m. to 7 p.m., maintain a minimum of two thru lanes northbound and a single thru lane southbound with left turns permitted Monday thru Friday.
 - 3. Collector Streets: May be restricted to a single thru lane for each direction of travel with left turns prohibited weekdays 8 p.m. to 6 a.m. Monday thru Friday and weekends 8 p.m. Friday to 6 a.m. Monday.
 - 4. Downtown Corridor: Restriction dates and times are subject to the downtown special event schedule as well as the following exceptions:

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5. Multiple lane one-way roads may be restricted to a single thru lane with turn lanes restricted at signalized intersections weekdays 8 p.m. to 6 a.m. Monday thru Friday and weekends 8 p.m. Friday to 6 a.m. Monday.
6. Planned Street Closure and Restrictions: Coordinate work sequence with other planned street closures and restrictions. Planned Street Closure and Restrictions can be found on the City of Phoenix Street Transportation:
 - a. <https://www.phoenix.gov/streetssite>
7. Reversible Lane: When construction requires restriction of the reversible lane along 7th Avenue weekdays 6 a.m. to 9 a.m. and/or 4 p.m. to 7 p.m., the CONTRACTOR shall ensure all reversible lane signage within the affected area is covered or removed, including the signage on the sides of the road. A Traffic Control Plan shall be submitted to the Traffic Department a minimum of 1 week in advance of the requested start date. The Traffic Control Plan shall include all conflicting reversible lane signage locations and manner of removal or coverage.

1.9 PORTABLE VARIABLE MESSAGE BOARDS

- A. Portable Variable Message Boards (VMB) and/or static project signs shall be provided on this project for all arterial and collector streets 24 hours per day from at least 14 days prior to any roadway restrictions until all roadway traffic restrictions are removed.

PART 2 – PRODUCTS

2.1 SUBMITTALS

- A. Phasing plan and work schedule
- B. A copy of each approved Traffic Control Plan for Product Data.

PART 3 – EXECUTION

3.1 POLICE OFFICER REQUIREMENTS

- A. The CONTRACTOR shall provide one off-duty police officer, as defined in the City of Phoenix TBM, 9th Edition, at signalized intersections affected from 6 a.m. to 7 p.m. weekdays, and during working hours at nights and weekends when traffic is restricted (as described in the City of Phoenix TBM, 9th Edition).
- B. Police officer hours may be reduced or suspended at the direction of the OWNER when construction activities do not restrict traffic through intersections.

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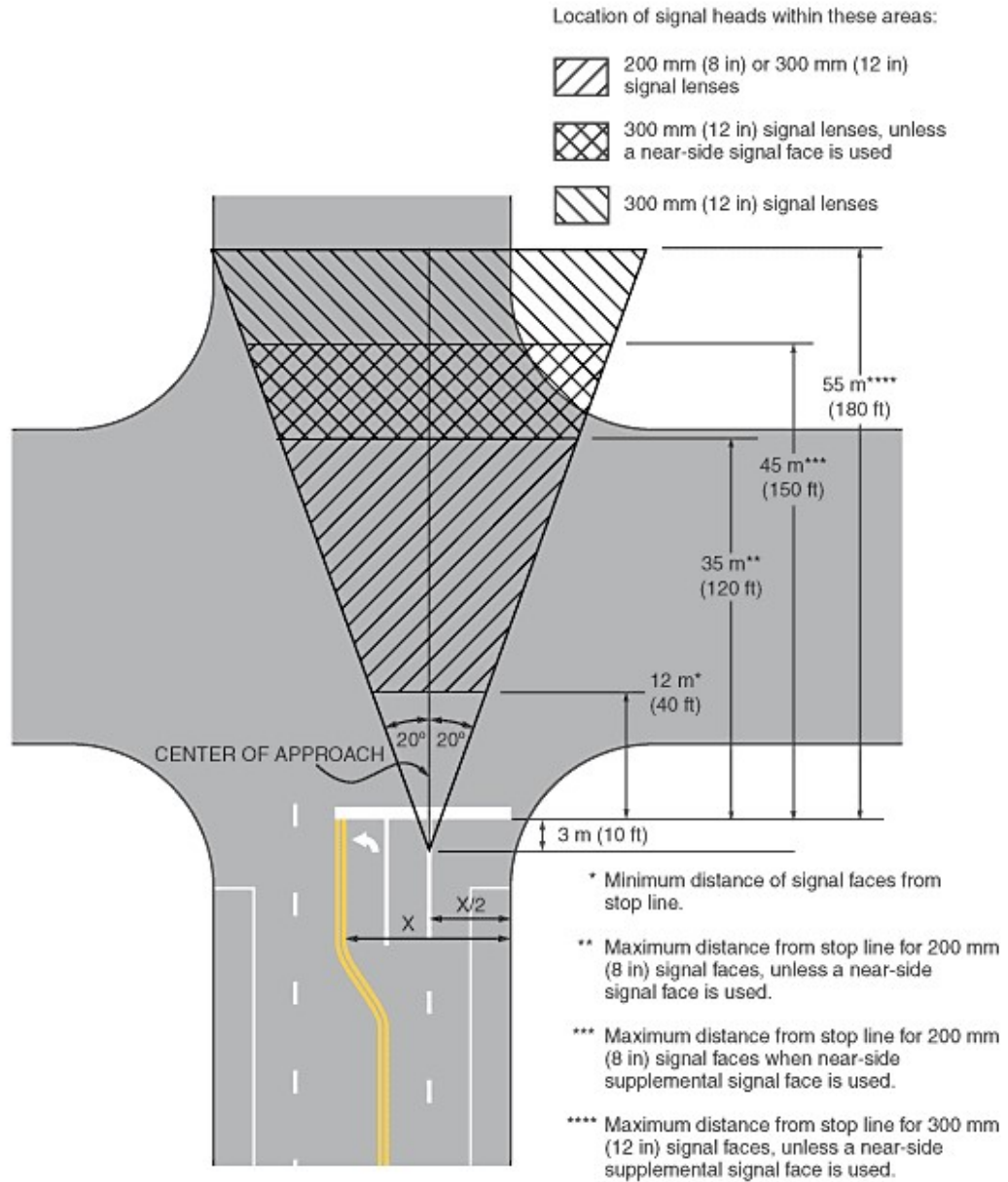
3.2 SIGNALIZED INTERSECTION REQUIREMENTS

- A. When left turns are prohibited at signalized intersections with left-turn arrow indications or when working near a signalized intersection, the Project Inspector shall notify the City of Phoenix Traffic Signal Shop by email at phxtmc@phoenix.gov at least 72 hours in advance to schedule for arrow indications to be turned off or to coordinate signals being affected by the construction.
- B. The Project Inspector shall provide the Traffic Signal Shop a written schedule indicating days, times and specific locations where left turns will be prohibited or where signals will be interrupted. When the work has been completed, the Inspector shall immediately notify the Traffic Signal Shop, so it can reactivate the left-turn arrow.

3.3 TRAFFIC SIGNAL HEAD VISIBILITY REQUIREMENTS

- A. The CONTRACTOR shall maintain a “40-degree Cone-of-Vision” at all intersections for full view of the intended traffic. If during construction, traffic will be positioned in such a manner that the driver cannot see a minimum of two (2) traffic signal head indications within 20-degrees on either side of straight ahead (40-degree Cone-of-Vision), immediately contact the Signal Engineer at 602-262-4693 prior to the start of any work.

Figure 4D-2. Horizontal Location of Signal Faces



Note: This figure illustrates the horizontal location of signal faces.

3.4 ACCESS REQUIREMENTS

- A. Local Access: The CONTRACTOR shall maintain local access to all side streets, access roads, driveways, alleys, and parking lots always and shall notify residents 72 hours in advance of any restrictions which will affect their access. The CONTRACTOR shall restore the access as soon as possible. If the primary access cannot be restored in a timely manner, the CONTRACTOR shall provide an alternative which shall be pre-determined with the residents prior to imposing any restrictions. Any local street restrictions imposed shall be such that local area traffic circulation is maintained.
- B. Business Access: Access shall be maintained to adjacent businesses always during their hours of operation. Access may be maintained by such measures as constructing driveways in half sections, or by providing bridging over new concrete. Properties having more than one point of access shall not have more than one access restricted for more than 14 consecutive calendar days at any given time. Access to adjacent driveways shall be provided during all non-working hours. Any business restrictions shall be coordinated with the affected business in writing at least 14 days prior to imposing restrictions.
- C. Pedestrian Access: The CONTRACTOR shall ensure that all sidewalks on this project remain in compliance with all the issues outlined by the American Disabilities Act (ADA) of 1990. All pedestrian walking areas, whether paved or unpaved, shall be maintained open and safe, or a suitable pedestrian detour route will be provided. Such measures as backfilling or ramping at a 12:1 slope to existing sidewalks or providing alternate sidewalk areas adjacent to existing sidewalks may be used. In high-pedestrian use areas, the ENGINEER may request temporary hard-surface walkways, and/or covered pedestrian walkways to be installed at no additional cost to the City of Phoenix. Right-of-Way Management representative(s) may also request an ADA/Pedestrian Plan for any proposed sidewalk restrictions or closures. All detours of pedestrians from the established path shall use handrail and cane-compliant equipment.
- D. Frontage Road Access: Local access shall be maintained always on frontage roads. Frontage roads shall not be used for through traffic, equipment parking, material storage, or spoil stockpile area. Frontage road closures shall follow the same special provisions as described in "Local Access Requirements."
- E. School Access: The CONTRACTOR shall provide clean and safe school zones, crosswalks, and walkways for students attending nearby schools during all hours of school use.
 - 1. This may require backfilling trenches, temporary pavement, shoring, plating, or pedestrian bridges with handrails across open trenches.

2. In addition to school zones and crosswalks, the CONTRACTOR shall maintain accessibility to all school bus routes during all hours of school use. The CONTRACTOR shall notify the school Principal and the School Safety Coordinator at least 14 days prior to any restrictions and shall restore access as soon as possible.
- F. Church Access: The CONTRACTOR shall maintain a high level of access to churches during all hours of church use. The CONTRACTOR shall coordinate any access restrictions with the clergy at least 14 days prior to any restrictions and shall restore access as soon as possible.
- G. Hospital Access: The CONTRACTOR shall maintain the emergency entrance to nearby hospitals by way of a paved lane for emergency vehicles always for the duration of the project. The CONTRACTOR shall coordinate any access restrictions with the Hospital Administrator at least 14 days prior to any restrictions and shall restore access as soon as possible.
- H. Fire Station Access: The CONTRACTOR shall maintain emergency vehicle access to and from the fire station at all times. The CONTRACTOR shall coordinate with the Fire Station Commander at least 7 days prior to any restrictions and shall restore access as soon as possible.
- I. Police Station Access: The CONTRACTOR shall maintain emergency vehicle access to and from nearby police stations at all times. The CONTRACTOR shall coordinate with the Police Station Commander at least 7 days prior to any restrictions and shall restore access as soon as possible.
- J. City Park Access: The CONTRACTOR shall maintain access to nearby parks during park hours. Any restrictions shall be coordinated with the appropriate Parks District Supervisor at least 7 days in advance, and full access shall be restored as soon as possible.
- K. Recreational Trail Crossing: The CONTRACTOR shall maintain the trail crossings safely open always and shall maintain all special trail signs required.
- L. Canal Access Road Requirements: Canal access and maintenance roads shall remain open always. Any work that may affect this project shall be coordinated with the appropriate agency contact at least 14 working days in advance.

3.5 SANITATION PICK-UP

- A. The CONTRACTOR shall provide sanitation pick-up for affected residents by relocating trash containers, or by providing alternative measures acceptable to the Sanitation Division of the City Public Works Department (602-256-3310).

3.6 SPECIAL SIGN REQUIREMENTS

- A. The CONTRACTOR shall provide, install and maintain advance notification, public informational and directional access signs (for businesses, churches, hospitals, schools, etc.) that may be required by the City of Phoenix. These signs may include, but are not limited to, portable changeable message signs, radar/speed sensing trailers, and other applicable Intelligent Transportation System type devices. The cost shall be included in the Bid Item for Traffic Control Devices.

3.7 BUS STOPS

- A. The CONTRACTOR shall maintain all existing bus stop locations on this project in a safe manner or provide alternate bus stop locations and related directional signage as required by the City of Phoenix. Relocation of bus stops shall be coordinated through the area Right-of-Way Management Agent and noted within Temporary Right-of-Way Use Permits issued through the Right-of-Way Management Office.

3.8 BICYCLE LANES

- A. Bicycle lanes present may be temporarily closed by the CONTRACTOR during construction. The CONTRACTOR shall provide, install and maintain appropriate on-site signage. The CONTRACTOR shall incorporate measures to shift bicycle traffic to a safe route through the construction area into the Traffic Control Plans.

3.9 FLAGGING OF TRAFFIC

- A. No flagging of traffic will be permitted during the peak traffic hours of 6:00 a.m. to 8:30 a.m. and 4:00 p.m. to 7:00 p.m. weekdays. If construction requires, intermittent flagging will be allowed from 8:30 a.m. to 4:00 p.m., if approved by City Project Inspector, to facilitate access for heavy construction equipment.

3.10 TRAFFIC CONTROL PLANS

- A. The CONTRACTOR shall submit to the Traffic Department a Traffic Control Plan for approval, showing placement of all traffic control devices, including all conflicting signs to be covered/removed or relocated, or other features that may conflict with the placement of temporary signage. This Plan shall be professionally drawn on a 24-inch x 36-inch reproducible medium and shall be submitted to the Traffic Department 2 weeks prior the Contract start time or at the Preconstruction Conference, whichever occurs first.

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3.11 TEMPORARY TRAFFIC CONTROL ZONE AND SAFETY

- A. At the time of the Preconstruction Conference, the CONTRACTOR shall designate an employee, other than the Project Superintendent, who is knowledgeable in the principles and methods of proper traffic control and safety. This employee is to be available on the project site during all periods/phases of construction to coordinate and maintain safe, acceptable, and effective temporary barricading whenever the construction affects traffic. This individual shall be authorized to receive and fulfill instructions from the City of Phoenix or its representative and shall supervise and direct traffic control. Instructions and information given by the City of Phoenix or its representative to this individual shall be considered as having been given to the CONTRACTOR.
- B. Failure to maintain temporary traffic control devices in accordance with the City of Phoenix Traffic Barricade Manual and the approved project Plans and Specifications shall result in suspension of the work and/or Civil Sanctions until deficiencies are corrected to the satisfaction of the OWNER.

3.12 SAFETY FENCING REQUIREMENT FOR TRENCHES AND EXCAVATIONS

- A. The CONTRACTOR shall provide safety construction fencing around all open trenches and excavations during all non-working hours.
- B. The CONTRACTOR shall provide for the safety and welfare of the public by adequately fencing all excavations and trenches that are permitted by the City of Phoenix to remain open when construction is not in progress.
- C. Fencing shall be securely anchored to approved steel posts located 6 feet on centers, having a minimum height of 6 feet, and shall consist of wire mesh fabric of sufficient weight and rigidity to adequately span a maximum supporting post separation of 6 feet.
- D. The fencing, when installed about the periphery of excavations and trenches, shall form an effective barrier against intrusion by the public into areas of construction. Fencing shall not create sight distance restrictions and/or visual obstructions for road users. The CONTRACTOR, always when construction is not in progress, shall be responsible for maintaining the fencing in good repair, and upon notification by the ENGINEER, shall take immediate action to rectify any deficiency. Prior to the start of any excavating or trenching required for the execution of the proposed work, the CONTRACTOR shall submit to the City for approval, detailed plans showing types of materials and methods of fabrication for the protective fencing.
- E. There will be no separate measurement or payment for furnishing, installing, or maintaining protective fencing. The cost shall be considered incidental to the cost of the pipe and/or structures.

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3.13 FINAL SIGNING AND STRIPING OF ROADWAY

- A. The CONTRACTOR, through the City Project Inspector, shall notify the Street Transportation Department, Traffic Services Division (602-262-6456), at least 30 days prior to desired completion of final roadway signing and lane-striping. This will allow adequate time for City of Phoenix crews to schedule and complete the task on time.

++ END OF SECTION ++

SECTION 02145

SEWER BYPASSING AND DIVERSION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Scope: This section describes the existing conditions for temporary bypassing of sewers that will be required to complete manhole channel rehabilitation and inspection for this project Scope of Work. This section covers requirements for bypass pumping and use of flow-diversion techniques, branch flow diversion, and use of flow-through plugs. Refer to the Contract Drawings for additional details and recommendations.
- B. Requirements:
1. CONTRACTOR shall provide labor, materials, and supervision to temporarily bypass flow around the CONTRACTOR'S work in accordance with the specific needs of the rehabilitation method being utilized and dewater the manhole structures in preparation for cleaning and rehabilitation of the channel. All references to the bypass pumping and/or bypass pumping system include, but are not limited to, all pumps, piping, valves and other equipment needed to move the intended flow from one location to another.
 2. The actual design of the bypass arrangement and alignment shall be prepared by the CONTRACTOR, and shall be submitted to the ENGINEER to determine conformance to project objectives. Means and methods of accomplishing the bypassing shall be the responsibility of the CONTRACTOR.
 3. Sanitary sewer mains shall remain in service at all times throughout the duration of the project. CONTRACTOR shall be responsible for diverting flow away from the limits of construction through the use of bypass pumping or flow diversions with prior written approval by the ENGINEER.
 4. Service to laterals shall be disrupted for a period of no more than 8 hours. Laterals within residential areas shall only be out of service between the hours of 8:00 am to 5:00 pm, Monday through Friday. Laterals within business areas shall be addressed on a case-by-case basis. If CONTRACTOR feels that it is necessary to disrupt lateral services for a period longer than 8 hours, CONTRACTOR shall provide alternate means of service without disrupting use of the service by the owner/resident.
 5. CONTRACTOR shall maintain pedestrian and vehicular traffic and comply with Americans with Disabilities Act regulations for access to all residential and commercial property unless written approval is otherwise obtained from the property owner allowing for reduced access. Where it is necessary for bypass piping to cross a road, CONTRACTOR shall provide pipe bridge or bury bypass piping to maintain traffic.

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6. It is the CONTRACTOR'S responsibility to arrange all necessary access and temporary construction agreements with all affected parties for the location of the bypass pumping system.
 7. The bypass pumping system shall be designed to normally maintain the wastewater flow below the top of the pipe, without surcharging.
 8. The CONTRACTOR shall have the complete bypassing system in place and successfully pressure tested at 1.5 times the maximum operating pressure of the system before bypassing any sewage.
 9. The CONTRACTOR shall notify the ENGINEER 48 hours prior to bypassing, plugging or shutting down bypassing of pipelines.
 10. The bypassed flow shall be continuously monitored by staff that are familiar with the equipment and have the ability to operate standby equipment as needed.
 11. CONTRACTOR is responsible for immediate and proper cleanup should any spill occur, regardless of amount. Additionally, regardless of the amount, the CONTRACTOR shall pay for all damages and fines incurred as a result of the spill.
 12. CONTRACTOR shall restore all field conditions disturbed during the bypass to their original state.
- C. Experience: CONTRACTOR shall utilize staff and/or a subcontractor that has been directly responsible for completion of other projects that required the bypass pumping of sewage flows in excess of 1 million gallons per day (mgd) and use of 8-inch to 18-inch flow-through plugs.

1.2 SUBMITTALS

- A. At the Preconstruction Conference, the CONTRACTOR shall submit, in accordance with the General Conditions, drawings and complete design data showing methods and equipment proposed to utilize in sewer bypassing for approval by the ENGINEER. The submittal shall include the following information:
1. Drawings indicating the scheme and location of temporary sewer plugs and bypass discharge lines. The drawings shall also show the method and location for discharging the bypass lines.
 2. Capacities of pumps, prime movers, flow-through plug configuration, and standby equipment.
 3. Design calculations proving adequacy of the system and selected equipment.
 4. Standby power source.
 5. Staffing plan.
 6. Show suction and discharge points with elevations and stationing on the design plans.
 7. Provide pump performance curves.
 8. Submit calculations to verify suction lift of pumps has not been exceeded.
 9. CONTRACTOR shall submit proposed noise control and exhaust control plans for pumping equipment.
 10. CONTRACTOR shall submit a proposed plan for disruption of sewer service laterals.

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11. CONTRACTOR shall submit bypass piping inspection, emergency flow reinstatement, and emergency response plans.
 12. CONTRACTOR shall submit qualifications as specified in Section 1.1 C. A minimum of three projects in the last 8 years shall be referenced.
- B. The actual design of the bypass arrangement shall be prepared by the CONTRACTOR or Subcontractor performing the work, and shall be submitted to the ENGINEER to determine conformance to project objectives. The CONTRACTOR shall be responsible for any subcontractor's design (if used) on this project. Means and methods of accomplishing the bypassing shall be the responsibility of the CONTRACTOR.
- C. Approval of submitted plans for sewer connection and temporary rerouting shall in no way relieve the CONTRACTOR of its responsibility for the protection of adjacent properties, downstream drainage systems and water tributaries against sewage spill. Any litigation, claims, fines, etc. associated with any sewage spill shall be the responsibility of the CONTRACTOR.

1.3 JOB CONDITIONS

- A. Available Flow Data: The CONTRACTOR is responsible for obtaining current flow condition information at the time of construction. The OWNER is not responsible for any deviations in quantity of sewage flow at any time during the construction period. Higher flows may be encountered depending on weather and other upstream conditions.
- B. Protection:
1. In areas where flows are bypassed, all bypass flows shall be discharged as approved by the ENGINEER. No bypassing to the ground surface, receiving waters, storm drains, or bypassing which results in soil or groundwater contamination or any potential health hazards shall be permitted.
 2. All sewer plugs 24 inches and larger shall have a minimum 3/8-inch, stainless steel, braided safety cable affixed to the plug. The safety cable should be anchored in such a way to restrain the plug from passing downstream, in the event the plug lost internal pressure.
- C. Scheduling: The bypassing system shall not be shut down between shifts, on holidays or weekends, or during work stoppages without written permission from the ENGINEER. The bypass system will have an attendant around the clock, 24 hours per day, 7 days per week, whose only duty is to maintain the bypass pumping system until the bypassing of that specific pipeline is no longer required.

PART 2 – PRODUCTS

2.1 PUMPING SYSTEMS

- A. CONTRACTOR shall maintain on site the following minimum requirements for all bypass pumping systems:
1. Sufficient equipment and materials to ensure continuous and successful operation of the bypass systems. The COMPLETE bypass system, including all piping, shall be continuously monitored by CONTRACTOR personnel.
 2. A system of pumps and piping operating on site to maintain a minimum 50% over capacity of the anticipated maximum flow (as determined by the CONTRACTOR).
 3. Sound-attenuated pumps and/or power generators shall be provided for bypass pumping system. The sound-attenuated pumps and/or power generators shall be capable of achieving an operating noise level of 70 decibels or less, measured at a distance of 50 feet. The CONTRACTOR shall be responsible to provide and install sound-attenuation devices, methods and/or system to maintain noise levels below stated decibels. Sound measurements shall be made and recorded by the CONTRACTOR in accordance with American National Standards S 13-1971.
 4. All liquid fuel powered pumps, generators, and other equipment shall be placed in a containment barrier to protect against gasoline, oil, and hydraulic fluid spills.
 5. All bypass piping shall be fused high-density polyethylene piping.

2.2 FLOW-THROUGH PLUG

- A. Flow-through plug technique of flow diversion through manhole structures can be utilized for this project to repair the manhole channel. This technique can be used to divert the entire flow through the manhole or may be used in conjunction with bypass/diversion to handle branch main flows. The use of this technique is at the CONTRACTOR'S own risk.
- B. There are various limitations to this technique, including flow rates, minimum reduced discharge size, manhole geometry, collection system elevations, and tributary connections within the manhole. The use of a flow-through plug is extremely site-specific. The CONTRACTOR shall evaluate each manhole and verify use of a flow-through plug application to complete required rehabilitation within the manhole structure.
- C. The CONTRACTOR shall continuously monitor the upstream system during use. Plugs shall be removed at the end of each work day.
- D. The selected rehabilitation CONTRACTOR shall have experience using larger diameter flow-through plugs in this application.
- E. Applicable information detailed in paragraph 1.2 shall be submitted for review.

PART 3 – EXECUTION

3.1 ESTIMATED FLOWS AND SEWER CAPACITY PROJECT PIPELINE

- A. Flow Conditions: The CONTRACTOR is responsible for obtaining current flow condition information at the time of construction. Any additional monitoring or gathering of flow data to properly size the bypass system is the responsibility of the CONTRACTOR. The CONTRACTOR shall include considerations for increased flows due to rainfall events, fluctuations of peak flows due to holidays, civic events, etc., equipment failure risks, etc., and provide adequate reserve capacity and redundancy to maintain sewer flows within the sewer pipe upstream and downstream of the bypass. The OWNER is not responsible for any deviations in quantity of sewage flow at any time during the construction period. If necessary, the CONTRACTOR shall provide additional means of flow diversion at no additional cost to the OWNER to handle deviations in quantity of sewage flow at any time during the construction period.

3.2 INSPECTION

- A. Prior to starting work within in the manhole structure, the CONTRACTOR shall complete a 24-hour performance test to demonstrate the ability to maintain the flow over the peak diurnal flow.
- B. The CONTRACTOR shall inspect the entire bypass pumping and piping system for leaks for spills on an hourly basis. The CONTRACTOR shall also create an inspection log and shall enter the time of the inspections and the condition of the piping and the name of the inspector into the log for review by the ENGINEER.

3.3 DAMAGES

- A. The CONTRACTOR shall repair, without cost to the OWNER, any damage that may result from its negligence, inadequate or improper installation, and maintenance and operation of bypassing system, including mechanical or electrical failures.

++ END OF SECTION ++

SECTION 02601

STRUCTURAL FIBERGLASS REINFORCED POLYESTER MANHOLE INSERTS

PART 1 – GENERAL

1.1 REQUIREMENTS

- A. This Section includes fiberglass reinforced polyester (FRP) manhole inserts for rehabilitation of existing sanitary sewer manholes. Products specified in this Section shall provide a chemically inert product that will provide structural support to deteriorating sanitary sewer manholes with composite materials designed for this purpose.
- B. The CONTRACTOR shall provide all labor, equipment, materials, and services necessary to rehabilitate the manhole including, but not limited to, traffic control, excavation to removal of existing manhole collar, frame, and cone; legally dispose of off-site existing deteriorated manhole components, along with the concrete collar and asphalt; bench modifications to accept insert; any required bench and or channel coating rehabilitation to transition the new components to existing; all insert components, including wall sections, cone sections, adjustment rings, frame and cover; asphalt roadway repair; and concrete collar replacement.
- C. Substitution of epoxy-coating systems for structural inserts will not be allowed. Epoxy shall only be provided in locations specified.
- D. Exposed concrete surfaces including bench, channel, and invert shall be prepared and coated with an approved epoxy coating system, refer to Section 02605.
- E. Manhole insert components design and installation shall meet the requirements of the government agency (i.e., Arizona Department of Transportation, Maricopa County, City of Phoenix, etc.) with jurisdiction of the right-of-way in which the work is completed, and as specified herein. In the case of conflict between the listed agency's requirements and as required herein, the requirements affording the greatest protection to the CITY shall apply, as determined by the ENGINEER.
- F. CONTRACTOR shall control and maintain sanitary sewer flows within the sewer system during the work. Service shall be maintained at all times throughout the duration of the project in accordance with Section 02145.
- G. Structural FRP (Section 02601) or Structural Polymer Concrete (Section 02603) Manhole Inserts are both allowable products. CONTRACTOR shall only utilize one manufacturer's product for all installations on this project.

1.2 QUALITY ASSURANCE

- A. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued.
- B. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued or replaced.
- C. This Section includes references to the following standards. They are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements affording the greatest protection to the CITY shall apply, as determined by the ENGINEER.

Reference	Title
ASTM C581	Practice for Determining Chemical Resistance of Chemical Thermosetting Resins Used in Glass-Fiber Reinforced Structures Intended for Liquid Service
ASTM C857	Standard Practice for Minimum Structural Design Loading for Underground Utility Structures
ASTM C923	Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM D578	Standard Specification Glass Fiber Strands
ASTM D648	Test Method for Deflection Temperatures of Plastics Under Flexural Load in Edgewise Position
ASTM D695	Test Methods for Compressive Properties of Rigid Plastic.
ASTM D790	Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D2412	Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel Plate Loading
ASTM D2583	Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM D2584	Test Method for Ignition Loss of Cured Reinforced Resins
ASTM D3753	Standard Specification for Glass-Fiber Reinforced Polyester Manholes and Wetwells
Green Book	Standard Specifications for public Works Construction (most recent edition)

1.3 QUALITY CONTROL

- A. All work relative to preparation for and installation of structural inserts shall be conducted in the presence of the ENGINEER.
- B. Inspection by the ENGINEER, third-party inspection firm, or the waiver of inspection of any particular portion of the work, shall not relieve the CONTRACTOR of responsibility to perform the work in accordance with these Specifications.
- C. Prior to the start of any work, the CONTRACTOR shall establish with the ENGINEER, schedules and procedures that will ensure that all preparation work has been inspected prior to the installation of the structural insert. These procedures shall remain in effect for the duration of the project. Under no circumstances shall any surfaces be coated or inserts be installed without prior approval of the ENGINEER. Inserts and coatings installed without the ENGINEER'S authorization shall be removed and reinstalled at the CONTRACTOR'S expense at the direction of the ENGINEER.
- D. The riser and cone sections shall be subject to inspection and approval by the ENGINEER. At the time of inspection, all material will be examined for compliance with the Specifications and approved Drawings. Any sections damaged after delivery and not deemed repairable by the manufacturer's representative and ENGINEER will be removed and replaced at the CONTRACTOR'S expense.
- E. At the completion of all insert installation and coating work, a final inspection shall be conducted. The CONTRACTOR, its Quality Assurance Manager, and the ENGINEER shall conduct a final inspection to establish that all work has been completed per the Contract Documents. Any deficiencies found shall be documented and corrected before final acceptance of the work will be granted. Manufacturer shall complete all required testing in accordance with American Society for Testing and Materials (ASTM) D3753, Section 8. Certified test results and a certification by the manufacturer stating the manholes meet the specified requirements and have been sampled, tested, and inspected in accordance with ASTM D3753 shall be submitted by the CONTRACTOR in accordance with paragraph 1.4.

1.4 SUBMITTALS

- A. Submittals in accordance with the General Conditions: Submit a copy of this Specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked (✓) to indicate Specification compliance or marked to indicate requested deviations from Specification requirements. Check-marks shall denote full compliance with a paragraph as a whole. If deviations from the Specifications are indicated, and therefore requested by the CONTRACTOR, each deviation shall be underlined and denoted by a number in the

margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The ENGINEER shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the CONTRACTOR with the Specifications. Failure to include a copy of the marked-up Specification sections, along with justification(s) for any requested deviations to the Specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

- B. Rehabilitation Schedule: The CONTRACTOR shall submit for review a complete detailed rehabilitation schedule. Schedules shall include the following minimum information: manhole identification, location, dimensions and depth as measured in the field, proposed manhole insert component dimensions and thickness, detailed base repair or modifications for each manhole, concrete collar and adjustment ring detail.
- C. Insert Installation Plan per paragraph 1.7.
- D. Manufacturer's certification that FRP manhole inserts meet or exceed the requirements of ASTM D3753 and certified test reports of sampling and testing as required by ASTM D3753.
- E. Manufacturer's product data and shop drawings, quality control plan and procedures, and recommendations for storage, handling, surface preparation and installation.
- F. Calculations demonstrating that the inserts are adequate to resist loadings as specified herein. Calculations shall be stamped and sealed by a Registered Professional Engineer of the State of Arizona.
- G. The CONTRACTOR shall submit the manufacturer warranties for all materials furnished under this section.
- H. Shop Drawings for Frame and Covers: Show dimensions and materials of construction by ASTM reference and grade and lettering to be provided on manhole covers.
- I. Manufacturer's certification attesting that the Installer is qualified and approved to install the insert system.

1.5 INSTALLER OF QUALIFICATIONS

- A. The Installer shall be fully certified by the manufacturer to install the manhole insert system. The CONTRACTOR shall provide evidence that the personnel performing installation have successfully completed the manufacturer's training.

- B. The Installer shall demonstrate experience by submitting references from a minimum of three (3) other manhole rehabilitation projects within the past 5 years, or the Installer shall have a minimum of 5 years of experience installing standard sanitary manholes.
- C. The Installer shall appoint a quality Assurance Manager to take full responsibility for the quality of the work. The Quality Assurance Manager shall be fully certified and have a minimum of 2 years of installation experience with installing standard sanitary manholes and installing coating systems.

1.6 MANUFACTURER'S REPRESENTATIVE

- A. The Manufacturer's Representative is a representative authorized to act on behalf of the manufacturer regarding technical and commercial issues. The Manufacturer's Representative shall spend at least 8 hours of on-site observation and field inspections of insert installations. The Manufacturer's Representative shall provide technical support to resolve field problems associated with the manufacturer's products furnished under this Contract or the application thereof throughout the duration of the work.

1.7 INSERT INSTALLATION PLAN

- A. An Insert Installation Plan shall be prepared that includes a description of the following:
 - 1. Quality Control Procedures:
 - a. Duties of the Installer's Quality Control Manager.
 - b. Duties of the Manufacturer's Representative
 - 2. Criteria for acceptance of the preparation of manhole surfaces.
 - 3. Plans for sewage diversion, if required.
 - 4. Method and material for sealing active leaks.
 - 5. Detailed plan of surface preparation, including details for repair and corrosion protection of existing bench, channel and invert, and preparation for installation of the insert base riser section.
 - 6. Details for installation of the riser sections, cone, grade rings, frame and cover.
 - 7. Details for connecting and sealing laterals and pipe connections both in the invert and through the riser where required.
 - 8. Details for site-specific issues that affect the installation.
 - 9. Detailed scheduling provisions for environment considerations such as work at night.
 - 10. Testing procedures.
 - 11. Rehabilitation schedule.
- B. Limitations, exceptions, precautions, and requirements that may adversely affect the performance of the insert shall be clearly and completely stated in the Installation Plan. If the manufacturer's installation requirements differ from these Specifications, the instructions shall clearly state where deviations are required.

1.8 WARRANTY

- A. The CONTRACTOR shall provide a written 25-year warranty for the structural insert as a manufactured product after final completion of the project. Warranty shall cover any structural, chemical and leakage failure. Structural failure is defined as the inability of the system to support itself, the existing manhole structure, traffic loads, earth loads, dead loads, live loads or other imposed loads. Chemical failure is defined as weight loss, spalling, cracking, buckling or blistering due to the chemical and biological constituents found in the manhole environment. Leakage failure is defined as infiltration into or exfiltration out of the manhole.
- B. The warranty shall cover removal and complete replacement of the entire insert. The warranty shall cover both the insert materials and the installation. The insert and the installation may both be covered by the manufacturer's warranty, or separate warranties may be issued by the manufacturer and the CONTRACTOR.

1.9 INSPECTION POINTS

- A. At certain stages in the structural insert installation process, the CONTRACTOR shall request approval from the ENGINEER to proceed with the next stage of the installation. The CONTRACTOR shall provide 24-hour notice that approval of an Inspection Hold Point is needed. The ENGINEER shall respond to the approval request within 24 hours. Failure to receive authorization from the ENGINEER at one of the designated Inspection Hold Points may prevent the acceptance of the work by the ENGINEER on behalf of the OWNER. The following are the designated Inspection Hold Points for each installation.
1. Structural insert delivery.
 2. Completion of manhole cleaning, removal of unsound material, stabilization of structure, installation of reinforcement for bench re-construction.
 3. Completion of bench and channel re-construction and manhole preparation.
 4. Structural insert installation and base grout.
 5. Final grade adjustment.
 6. Bench and chimney epoxy coating transition testing, refer to Section 02605.
 7. Final acceptance inspection.
- B. When requested, the CONTRACTOR shall provide the ENGINEER (Inspector) safe access to complete Hold Point inspections; the CONTRACTOR shall provide safe access to permit required confined space in accordance with all Federal, State and local confined space entry regulations. The Inspector will provide documentation of training in accordance with Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.146, 29 CFR 1910.21-32 and 29 CFR 1926.500-503. Additional site-specific training will be further defined at the Preconstruction Meeting between the CONTRACTOR and Inspector. Inspections will be coordinated with the CONTRACTOR'S work sequence or during final holiday testing.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. FRP manhole insert shall be manufactured to meet or exceed ASTM D3753 requirements. Construction shall consist of multiple layers of glass matting or woven matting and resin. The surface exposed to the sewer/chemical environment shall be resin-rich and shall have no exposed fibers.
- B. Resin shall be commercial grade unsaturated polyester resin or other suitable resin. Mixing lots of resin from different manufacturers or “odd-lotting” of resins shall not be permitted. Quality assurance records on the resin shall be maintained. Pigmented resin shall be allowed to provide a consistent, light-colored reflective surface to facilitate easy interior inspection from grade.
- C. Resin fillers and additives, when used, shall be inert to the environment and manhole construction. Additives, such as thixotropic agents, catalysts, promoters, etc., may be added as required by the specific manufacturing process. Calcium carbonate mixed by the fabricator shall not be permitted. The resulting reinforced material shall meet the minimum requirements as specified herein and in ASTM D3753.
- D. Reinforcing material shall be commercial grade “E” type glass in a form having a coupling agent that will provide a suitable bond between the glass reinforcement and the resin.
- E. Ultra violet (UV) inhibitors shall be added directly to resins to prevent photo degradation.
- F. Approved Manufacturers: LFM FRP Specialists, Inc., Sewer Shield Composites, or approved equal.

2.2 MANUFACTURE

- A. The insert shall contain sufficient structural strength to carry loading conditions including live, dead and hydrostatic loads. The insert shall provide structural support without reliance of structural support from the host manhole.
- B. The exterior surface shall be smooth with no sharp projections. Hand-work finish is acceptable if enough resin is present to eliminate fiber show. The exterior surface shall be free of blisters larger than 1/2-inch in diameter, delaminating, or fiber show.
- C. The interior surface shall be resin-rich with no exposed fibers. The surface shall be free of crazing, delaminating, blisters larger than 1/2-inch in diameter, and wrinkles of 1/8-inch or greater in depth. Surface pits shall be permitted if they are less than 3/4-inch in diameter and less than 1/16-inch deep. Voids that cannot be broken with finger pressure and that

are entirely below the resin surface shall be permitted if they are less than 1/2-inch in diameter and less than 1/16-inch thick. Any insert repair is subject to meet all requirements of this section.

- D. Manhole insert lengths shall be 6-inch increments ± 2 inches or as recommended by the manufacturer.
- E. Dimension tolerance of inside diameter shall be $\pm 1.0\%$ of required manhole insert diameter.
- F. The manhole insert cylinder shall have the minimum dynamic-load rating of 160,000 pounds when tested in accordance with ASTM D3753 Section 8.4. The insert shall not leak, crack, or suffer other damage when load-tested to 40,000 pounds and shall not deflect vertically downward more than 1/4-inch at the point of load application when loaded to 24,000 pounds.
- G. The manhole insert shall have the minimum pipe-stiffness values shown in the table below when tested in accordance with ASTM 3753, Section 8.5. The cylindrical portion of the manhole shall be tested in accordance with ASTM Method D2412.

Manhole Length (feet)	Minimum (pounds per square inch [psi])
3 – 6	0.72
7 – 12	1.26
13-20	2.01
21 – 25	3.02
26 – 35	5.24

- H. To determine soundness, apply an air- or water-pressure test to the manhole test sample. Test pressure shall not be less than 3 pounds per square inch gage (psig) or greater than 5-psig. While holding at the established pressure, inspect the entire manhole for leaks. Any leakage through the laminate or joints is cause for failure of the test. Refer to ASTM D 3753 8.6.

2.3 DESIGN

- A. All material properties used in design calculations shall be substantiated by certified test data in accordance with ASTM D3753.

- B. Provide wall section thickness for depth of manhole according to ASTM D3753, but not less than 0.5-inch in thickness. As a minimum, wall thickness shall be designed for:
 - 1. Full hydrostatic head pressure when manhole insert is completely empty and water elevation over the pipe equivalent to surface grade.
 - 2. Live loads (AASHTO LRFD HL-93 Traffic loads or Cooper E-80 loads) for each segment as applicable.
 - 3. Dead loads (i.e., soil depths) for each manhole as applicable.
- C. The manhole insert shall have the minimum structural properties (standard resin) given in the table below.

Test Property	Hoop Value (psi)	Axial Value (psi)
Flexural Strength (cone)	15,400	17,200
Flexural Strength (pipe)	22,500	14,300
Compressive Strength	8,900	NA

2.4 MARKING AND IDENTIFICATION

- A. Each manhole section shall have permanent markings on the interior surface as follows:
 - 1. Manufacturer name.
 - 2. Date of manufacturing.
 - 3. City of Phoenix project number.
- B. Lettering shall be a minimum of 2 inches in height.

2.5 JOINT SEALANT SYSTEMS

- A. If applicable manhole riser sections shall be joined using bell and spigot configuration. Joints shall be sealed with material consistent with the chemical resistance of the composite manhole sections and the system shall be approved by the insert manufacture.
- B. Joint sealants shall be designed for conditions of high groundwater to prevent leaks.

2.6 GRADE RINGS

- A. Grade rings shall be a chemically inert composite material, such as high-density polyethylene (HDPE) Adjusting Rings manufactured by Ladtech Inc. or Pro-Ring manufactured by Cretex or concrete reinforced adjusting rings coated with an approved epoxy coating system in accordance with Section 02605.

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- B. Grade rings shall meet American Association of State Highway and Transportation Officials (AASHTO) HS25 design live loadings.

2.7 MANHOLE FRAMES AND COVERS

- A. The manhole shall provide an area from which a grade ring can be installed to accept a typical metal frame and cover and have the strength to support a traffic load without damage to the manhole. The grade ring should be extended past the perimeter of the manhole at least 1 inch to transfer loads to the exterior wall of the manhole.
- B. The CONTRACTOR shall perform work in accordance with Maricopa Association of Governments (MAG) Standard Details 420, 422, and 423. The frames and covers shall be Product Numbers 2230Z (frame) and 2230A (cover), as manufactured by East Jordan Iron Works, or approved equal. The covers shall contain the CITY OF PHOENIX official logo and the words “CITY OF PHOENIX SANITARY SEWER.” The frames and covers shall have a nominal opening diameter of 30 inches.
- C. The cover shall seat firmly into the frame without rocking. If the cover does not firmly fit into the frame without rocking, it shall be returned to the manufacturer and replaced with one that will seat firmly into the frame without rocking.

2.8 CONCRETE COLLARS

- A. The Portland cement concrete collar around the frame or box shall be circular and shall be a minimum of 8 inches thick, placed flush with the adjacent new pavement surface per MAG Standard Detail 422. Concrete shall be a minimum of Class AA. All concrete shall be obtained from plants approved by the ENGINEER.
- B. A single No. 4 rebar hoop shall be placed in each concrete collar. The hoop diameter shall be such that its placement is centered between the edge of the manhole frame or valve box, and the outer edge of the concrete collar, the depth of the hoop shall be centered in the thickness of the collar. Each concrete ring shall be scored radially at quarter-circle points. Score lines shall be 0.25-inches wide by 0.5-inches deep. The concrete collar surface shall be medium broom-finished.
- C. Traffic shall not be allowed on the concrete collars until the concrete had reached a minimum compressive strength of 2500-psi on residential and 3000-psi on collector and major streets. On major streets the CONTRACTOR shall use “high-early” in the concrete mix, approved by the ENGINEER to minimize delay in reopening the street(s) to traffic.

2.9 CORROSION INHIBITOR FOR REINFORCING STEEL

- A. Reinforcing steel exposed by corrosion or during surface preparation shall be treated with a water-based epoxy resin, anti-corrosion coating and bonding agent such as Armatec 110 EpoCem, manufactured by the Sika Corporation, or approved equal.

2.10 CHEMICAL GROUT

- A. Chemical grout shall be used for infiltration elimination. Chemical grout shall be Sauereisen InstaPlug No. F-180, No. F-370 Chemical Grout, No. F-190 H2OPRUF manufactured by Sauereisen; or Environmental Coatings – Hydrophobic Grout Polyurethane System manufactured by Environmental Coatings; or approved equal and as recommended by the coating manufacturer. Surface preparation and application shall be as recommended by the manufacturer.

2.11 MORTAR

- A. Cementitious mortar for bench preparation shall be fast setting and consist of cement, fine aggregate, water, and admixtures for high early strength and bonding to existing concrete surface. Cementitious mortar shall be designed for application to vertical or overhead surfaces. The minimum compressive strength requirements are 2000-psi at 1 day and 4000-psi at 3 days when tested in accordance with ASTM C 109. Cementitious mortar shall be Structural Concrete V/O manufactured by Five Star; Rapid Set Mortar Mix manufactured by CTS Cement; C-120 Cement manufactured by Environmental Coatings, LLC; Sauereisen F-120/F-121 manufactured by Sauereisen, Inc.; or approved equal as recommended by the epoxy coating manufacturer. The cementitious mortar must be acceptable in writing by coating manufacturer.

2.12 EPOXY COATING SYSTEM

- A. The epoxy coating system shall be compatible with the insert material. Refer to Section 02605 for approved products.

PART 3 – EXECUTION

3.1 GENERAL

- A. CONTRACTOR shall follow all requirements for safety and ventilation in accordance with all applicable federal, state and local requirements.

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- B. CONTRACTOR shall provide means, labor and equipment to prevent solid waste contamination during construction activities. If necessary, install and operate sewage diversion pumping equipment to maintain sewage flows without backup, overflow or spill.

3.2 CLEANING AND PREPARATION

- A. CONTRACTOR shall clean manhole prior to preparation of interior surfaces as specified herein. Cleaning equipment including pumps, hoses, connectors, valves and nozzles shall produce a minimum blast pressure of 5,000 psi.
- B. CONTRACTOR shall also be responsible for any additional surface preparation beyond water-blasting as required by the grout, sealant, and coatings manufacturer. Where additional preparation is required, including sandblasting, the CONTRACTOR shall provide all labor, materials, and equipment as necessary, and at no additional cost to the OWNER. Solid blast materials shall be collected, removed and disposed of in the same manner as other cleaning debris.
- C. The CONTRACTOR shall give the ENGINEER a minimum of 7 days advanced notice prior to the start of any surface preparation work.
- D. CONTRACTOR shall remove all existing manhole steps or shall be cut-off flush with the interior surface of the manhole.
- E. Debris from cleaning operations shall be collected within the manhole and disposed of daily at an approved off-site location. Hauling containers shall be watertight.
- F. Repairs shall be made, as necessary, to existing manhole in order to receive inserts. The bench shall be re-constructed and leveled to prepare for insert and coating installation.

3.3 INFILTRATION ELIMINATION

- A. CONTRACTOR shall fill points of infiltration in manholes with chemical grout per manufacturer requirements. Chemical grout shall be injected into a predrilled injection hole through a static mixer until refusal or seal per manufacturer's recommendations.
- B. The injection process shall be repeated until infiltration is stopped completely, at no additional cost to the OWNER. It is the CONTRACTOR'S responsibility to ensure that all infiltration into the manholes has been eliminated, including infiltration caused by sealing points of infiltration lower in the manhole.
- C. Excess chemical grout shall be removed, and all manhole surfaces shall be cleaned until a smooth, uninterrupted surface is achieved. No voids, including injection hole, shall remain after chemical grout injection.

- D. Where large voids exist outside the manhole wall which would require excessive amounts of grout, the ENGINEER may direct the CONTRACTOR to first grout with cement prior to injection grouting. The ENGINEER shall determine the appropriate cement mix design in accordance with site conditions. The CONTRACTOR shall furnish all labor and materials necessary to pump cement. Care shall be taken during injection of grout or cement to ensure that excessive pressures do not develop and cause damage to the manhole structure. Upon completion, injection devices shall be removed, and the holes filled, and troweled flush with the wall surface using a fast setting, non-shrink grout mixture as recommended by the grout supplier.

3.4 EXCAVATION

- A. The asphalt or concrete around the top of the existing manhole shall be saw-cut as necessary to remove the cone section, chimney, frame and cover, to permit trench support if required and to leave room such that the insert may be properly assembled and installed. CONTRACTOR shall prevent soil and debris from falling into the manhole.
- B. During excavation shoring and sheeting deemed necessary to protect the excavation and to safeguard employees.
- C. Additional excavation maybe required in locations where the existing manhole is constructed with red brick. Brick manhole geometry are typically not true, and the cone section can be long tapers requiring more of the existing manhole structure to be removed to accept the structural insert.

3.5 INSTALLATION

- A. Installation shall be in strict accordance with the manufacturer's recommended procedures. Riser sections and components shall be handled with approved manufacturer's lifting devices. No other handling apparatus will be acceptable.
- B. Damaged insert riser section and components deemed repairable by the Manufacturer's Representative shall not be used without approval by the ENGINEER. CONTRACTOR shall submit a detailed repair plan, including the manhole location description of damage, and manufacturer's recommended repairs. Damaged items deemed unrepairable or rejected by the ENGINEER shall be removed from the site and replaced at the CONTRACTOR'S expense.
- C. CONTRACTOR shall saw-cut riser section as necessary to accommodate pipe entry and bench slopes. The bench area shall be built up with mortar or polymer concrete to provide a clean level surface to receive the riser. This build up should allow for a level surface above the existing top of the highest pipe. Refer to the Design Drawings for additional bench repair requirements. If pipe inverts are severely staggered, the initial polymer sleeve

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can be modified in the field to accommodate the difference in bench slopes. Make cuts or modifications in accordance with the manufacturer's recommendations.

- D. After mortar or polymer concrete has set, the riser base shall be installed. Riser sections and cone shall be installed using the appropriate wall alignment guides, gaskets and/or joint sealants. The risers shall be offloaded and lifted into place with approved manufacturer's lifting device. No other handling apparatus will be acceptable for handling material.
- E. All branch main and drop connections shall be re-established. CONTRACTOR shall field-cut openings in accordance with the manufacturer's recommendations. The existing main shall extend straight through the riser using CITY OF PHOENIX approved materials. All gaps and seal pipe ends shall be filled with approved epoxy materials.
 - 1. All non-booted or flexible coupler pipe entry areas shall be grouted by an epoxy patch kit provided by the manufacturer.
 - 2. All laterals and drop connections shall be re-established. The CONTRACTOR shall field-cut openings in accordance with the manufacturer's recommendations.
 - 3. Refer to Section 02145 for typical means to divert branch main sewers (15-inch diameter or less) from within the manhole to properly re-establish the branch connection within the manhole.
- F. The riser wall above the bench shall be cleaned and wiped down to allow for application of the epoxy coating system. All coating manufacturer's recommendations for preparing surfaces to receive epoxy shall be followed.
- G. The bench and insert transition shall be coated with approved epoxy. Epoxy coating shall continue a minimum of 6 inches up the insert face and be terminated by keying into the insert with a minimum 1/4-inch wide by 1/4-inch deep saw-cut. Refer to Section 02605 for epoxy coating products and application.
- H. Additional channel and bench repairs maybe required as indicated on the Design Drawings.
- I. The coating system shall extend to all exposed concrete surface, including the invert of the pipeline within the manhole; unless the channel is constructed of continuous vitrified clay pipe. Coating edges shall be terminated by keying into the substrate with a minimum 1/4-inch wide by 1/4-inch deep saw-cut. Prior to coating application, the saw-cut shall be dried and vacuumed to remove all dust and residue. During coating application, a liberal amount of material shall be applied to the saw-cut area and smoothed level.
- J. The annular space between the polymer riser and the existing manhole shall be filled with Class I (50- to 150-psi) Cementitious Low Strength Material (CLSM) or an approved material recommended by the insert manufacturer. Cement shall be Type V Portland Cement in accordance with ASTM C150.

- K. Refer to the Design Drawings for backfill and final grade adjustments.

3.7 SAFETY REQUIREMENTS

- A. All rehabilitation work, including surface preparation, shall be performed from within the manhole requiring work to be performed under a Confined-Space Entry Permit in accordance with all Federal, State and local confined-space entry regulations.
- B. Unless otherwise directed by the ENGINEER, the CONTRACTOR shall supply a continuous supply of fresh air to the manhole while conducting its work. CONTRACTOR shall not remove any manhole lid without first monitoring the extent of hazardous gas within the manhole or otherwise providing a safe atmosphere to the manhole interior

3.8 GRADE RINGS

- A. Grade rings shall be installed with a minimum of one 6-inch ring. The total distance from the top of the manhole cone to the top of the manhole frame after final paving shall not exceed 24 inches unless approved by the ENGINEER.
- B. Assemble units so that the top of the cover meets the following requirements, unless otherwise shown.
 - 1. In paved areas and travelled shoulder areas: Top of cover shall be flush with the paving surface or existing surface grade.
 - 2. In unimproved areas: Top of cover shall be 6 inches above grade.
- C. Grade Ring Joints: Prior to adjusting manholes to final grade, placing paving or landscaping, and installing concrete collars; grade rings may be joined by placing a single row of 100% butyl rubber rope sealant between the manhole cone or top of structure and the first grade ring, between grade rings, and between the top grade ring and the manhole frame. Sealant must have a minimum 1-inch by 1-inch cross section such as Kent Seal or approved equal.
- D. Final Manhole/Structure Adjustment: Set grade rings with grout or composite grade ring manufacture's approved recommended product. Grout shall cover the full width of the grade ring(s). The ring(s) shall be set fully concentric with the inside diameter of the manhole cone section or opening in the structure top. Grade rings not concentric shall be removed and replaced at no cost to the CITY. After grade ring is placed and prior to the grout taking a "set," any excess grout that extruded into the manhole or structure shall be removed flush with the interior of the grade ring and top of the cone section or structure opening.

3.9 MANHOLE FRAME AND COVERS

- A. The frame and cover shall lie flat in any position in the frame and have a uniform bearing through its entire circumference. Any frame and cover which creates noise when passed over by traffic shall be replaced.
- B. Secure the manhole frame to the grade ring with non-cementitious grout as recommended by the manufacturer. The grout shall extend across the full width of the base of the frame such that there are no voids under the frame. After the frame is placed and prior to the grout taking a “set,” any excess grout that extruded into the manhole or structure shall be removed flush with the interior of the frame and top of the cone section.
- C. Bolts shall be installed in the cover where specified or required by the agency with jurisdiction.

3.10 TESTING AND ACCEPTANCE

- A. The manufacturer shall submit the results of third-party testing to the OWNER and ENGINEER verifying resistance to sulfuric acid and other compounds as found in a sanitary sewer application. The chemical resistance test should be conducted in general accordance with The Green Book: Standard Plans for Public Works Construction, Section 211-2; (Pickle Jar Test).
- B. After installation, the OWNER or OWNER’S REPRESENTATIVE shall inspect manholes to verify riser sections have been properly installed, are level with tight joints, and are located at the correct elevations and orientations. All defects shall be corrected at no cost to the OWNER.
- C. Additional testing maybe required for other components that are installed to complete the structural insert installation, such as epoxy coatings per Specification Section 02605.
- D. A post construction panoramic scan of each manhole shall be performed and reviewed to determine complete and correct manhole rehabilitation. All defects shall corrected at no cost to the OWNER.

3.11 CLEANUP

- A. Any deleterious material and debris shall be removed from the manhole.
- B. The subgrade shall be restored according to Design Drawing and existing conditions.
- C. Upon completion of the installation, the CONTRACTOR shall remove surplus materials, protective coverings, and accumulated rubbish, and thoroughly clean all surfaces and

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repair any overspray, splashes, splatters or other lining-related damage. Surfaces damaged resulting from this cleanup shall also be cleaned, repaired, and refinished to the original or required condition.

- D. All debris shall be collected and hauled off to a proper disposal site as required by local, State and Federal regulations.

+ + END OF SECTION + +

SECTION 02603

STRUCTURAL POLYMER CONCRETE MANHOLE INSERTS

PART 1 – GENERAL

1.1 REQUIREMENTS

- A. This Section includes polymer concrete manhole inserts for rehabilitation of existing sanitary sewer manholes. Products specified in this Section shall provide a chemically inert product that will provide structural support to deteriorating sanitary sewer manholes with composite materials designed for this purpose.
- B. The CONTRACTOR shall provide all labor, equipment, materials, and services necessary to rehabilitate the manhole including, but not limited to: traffic control; excavation to remove existing manhole collar, frame, and cone; legal disposal of off-site, existing deteriorated manhole components, along with the concrete collar and asphalt; bench modifications to accept insert; any required bench and or channel coating rehabilitation to transition the new components to existing; all insert components, including wall sections, cone sections, adjustment rings, frame and cover; asphalt roadway repair; and concrete collar replacement.
- C. Substitution of epoxy-coating systems for structural inserts will not be allowed. Epoxy shall only be provided in locations specified.
- D. Exposed concrete surfaces including bench, channel, and invert shall be prepared and coated with an approved epoxy coating system, refer to Section 02605.
- E. Manhole insert components design and installation shall meet the requirements of the government agency (i.e., Arizona Department of Transportation, Maricopa County, City of Phoenix, etc.) with jurisdiction of the right-of-way in which the work is completed, and as specified herein. In the case of conflict between the listed agency's requirements and as required herein, the requirements affording the greatest protection to the CITY shall apply, as determined by the ENGINEER.
- F. CONTRACTOR shall control and maintain sanitary sewer flows within the sewer system during the work. Service shall be maintained at all times throughout the duration of the project in accordance with Section 02145.
- G. Structural Fiberglass Reinforced Polyester (FRP) (Section 02601) or Structural Polymer Concrete (Section 02603) Manhole Inserts are both allowable products. CONTRACTOR shall only utilize one manufacturer's product for all installations on this project.

1.2 QUALITY ASSURANCE

- A. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued.
- B. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued or replaced.
- C. This Section includes references to the following standards. They are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements affording the greatest protection to the CITY shall apply, as determined by the ENGINEER.

Reference	Title
ASTM C109	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
ASTM C443	Standard Specification for Joints for Concrete Pipes and Manholes, Using Rubber Gaskets
ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections (structural intent only)
ASTM C497	Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile
ASTM C857	Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
ASTM D 16	Standard Terminology for Paint, Related Coatings, Materials, and Applications
ASTM D1056	Standard Specification for Flexible Cellular Materials – Sponge or Expanded Rubber
ASTM D648	Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
ASTM D2584	Standard Test Method for Ignition Loss of Cured Reinforced Resins
ASTM D3960	Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
ASTM D4787	Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates.
ASTM D6783	Standard Specification for Polymer Concrete Pipe.
ASTM D7234	Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers
Green Book	Standard Specifications for public Works Construction (most recent edition)

1.3 QUALITY CONTROL

- A. All work relative to preparation for and installation of structural inserts shall be conducted in the presence of the ENGINEER.
- B. Inspection by the ENGINEER, third-party inspection firm, or the waiver of inspection of any particular portion of the work, shall not relieve the CONTRACTOR of responsibility to perform the work in accordance with these Specifications.
- C. Prior to the start of any work, the CONTRACTOR shall establish with the ENGINEER, schedules and procedures that will ensure that all preparation work has been inspected prior to the installation of the structural insert. These procedures shall remain in effect for the duration of the project. Under no circumstances shall any surfaces be coated or inserts be installed without prior approval of the ENGINEER. Inserts and coatings installed without the ENGINEER'S authorization shall be removed and reinstalled at the CONTRACTOR'S expense at the direction of the ENGINEER.
- D. The riser and cone sections shall be subject to inspection and approval by the ENGINEER. At the time of inspection, all material will be examined for compliance with the Specifications and approved Drawings. Any sections damaged after delivery and not deemed repairable by the manufacturer's representative and ENGINEER will be removed and replaced at the CONTRACTOR'S expense.
- E. At the completion of all insert installation and coating work, a final inspection shall be conducted. The CONTRACTOR, its Quality Assurance Manager, and the ENGINEER shall conduct a final inspection to establish that all work has been completed per the Contract Documents. Any deficiencies found shall be documented and corrected before final acceptance of the work will be granted. Manufacturer shall complete all required testing in accordance with American Society for Testing and Materials (ASTM) D3753, Section 8. Certified test results and a certification by the manufacturer stating the manholes meet the specified requirements and have been sampled, tested, and inspected in accordance with ASTM D3753 shall be submitted by the CONTRACTOR in accordance with paragraph 1.4.

1.4 SUBMITTALS

- A. Submittals in accordance with the General Conditions: Submit a copy of this Specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked (✓) to indicate Specification compliance or marked to indicate requested deviations from Specification requirements. Check-marks shall denote full compliance with a paragraph as a whole. If deviations from the Specifications are indicated, and therefore requested by the CONTRACTOR, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation

of the reasons for requesting the deviation. The ENGINEER shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the CONTRACTOR with the Specifications. Failure to include a copy of the marked-up Specification sections, along with justification(s) for any requested deviations to the Specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

- B. Rehabilitation Schedule: The CONTRACTOR shall submit for review a complete detailed rehabilitation schedule. Schedules shall include the following minimum information: manhole identification, location, dimensions and depth as measured in the field, proposed manhole insert component dimensions and thickness, detailed base repair or modifications for each manhole, concrete collar and adjustment ring detail.
- C. Insert Installation Plan per paragraph 1.7.
- D. Manufacturer's certification that FRP manhole inserts meet or exceed the requirements of ASTM D3753 and certified test reports of sampling and testing as required by ASTM D3753.
- E. Manufacturer's product data and shop drawings, quality control plan and procedures, and recommendations for storage, handling, surface preparation and installation.
- F. Calculations demonstrating that the inserts are adequate to resist loadings as specified herein. Calculations shall be stamped and sealed by a Registered Professional Engineer of the State of Arizona.
- G. The CONTRACTOR shall submit the manufacturer warranties for all materials furnished under this section.
- H. Shop Drawings for Frame and Covers: Show dimensions and materials of construction by ASTM reference and grade and lettering to be provided on manhole covers.
- I. Manufacturer's certification attesting that the Installer is qualified and approved to install the insert system.

1.5 INSTALLER OF QUALIFICATIONS

- A. The Installer shall be fully certified by the manufacturer to install the manhole insert system. The CONTRACTOR shall provide evidence that the personnel performing installation have successfully completed the manufacturer's training.

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- B. The Installer shall demonstrate experience by submitting references from a minimum of three (3) other manhole rehabilitation projects within the past 5 years, or the Installer shall have a minimum of 5 years of experience installing standard sanitary manholes.
- C. The Installer shall appoint a quality Assurance Manager to take full responsibility for the quality of the work. The Quality Assurance Manager shall be fully certified and have a minimum of 2 years of installation experience with installing standard sanitary manholes and installing coating systems.

1.6 MANUFACTURER'S REPRESENTATIVE

- A. The Manufacturer's Representative is a representative authorized to act on behalf of the manufacturer regarding technical and commercial issues. The Manufacturer's Representative shall spend at least 8 hours of on-site observation and field inspections of insert installations. The Manufacturer's Representative shall provide technical support to resolve field problems associated with the manufacturer's products furnished under this Contract or the application thereof throughout the duration of the work.

1.7 INSERT INSTALLATION PLAN

- A. An Insert Installation Plan shall be prepared that includes a description of the following:
 - 1. Quality Control Procedures:
 - a. Duties of the Installer's Quality Control Manager.
 - b. Duties of the Manufacturer's Representative
 - 2. Criteria for acceptance of the preparation of manhole surfaces.
 - 3. Plans for sewage diversion, if required.
 - 4. Method and material for sealing active leaks.
 - 5. Detailed plan of surface preparation, including details for repair and corrosion protection of existing bench, channel and invert, and preparation for installation of the insert base riser section.
 - 6. Details for installation of the riser sections, cone, grade rings, frame and cover.
 - 7. Details for connecting and sealing laterals and pipe connections both in the invert and through the riser where required.
 - 8. Details for site-specific issues that affect the installation.
 - 9. Detailed scheduling provisions for environment considerations such as work at night.
 - 10. Testing procedures.
 - 11. Rehabilitation schedule.
- B. Limitations, exceptions, precautions, and requirements that may adversely affect the performance of the insert shall be clearly and completely stated in the Installation Plan. If the manufacturer's installation requirements differ from these Specifications, the instructions shall clearly state where deviations are required.

1.8 WARRANTY

- A. The CONTRACTOR shall provide a written 25-year warranty for the structural insert as a manufactured product after final completion of the project. Warranty shall cover any structural, chemical and leakage failure. Structural failure is defined as the inability of the system to support itself, the existing manhole structure, traffic loads, earth loads, dead loads, live loads or other imposed loads. Chemical failure is defined as weight loss, spalling, cracking, buckling or blistering due to the chemical and biological constituents found in the manhole environment. Leakage failure is defined as infiltration into or exfiltration out of the manhole.
- B. The warranty shall cover removal and complete replacement of the entire insert. The warranty shall cover both the insert materials and the installation. The insert and the installation may both be covered by the manufacturer's warranty, or separate warranties may be issued by the manufacturer and the CONTRACTOR.

1.9 INSPECTION POINTS

- A. At certain stages in the structural insert installation process, the CONTRACTOR shall request approval from the ENGINEER to proceed with the next stage of the installation. The CONTRACTOR shall provide 24-hour notice that approval of an Inspection Hold Point is needed. The ENGINEER shall respond to the approval request within 24 hours. Failure to receive authorization from the ENGINEER at one of the designated Inspection Hold Points may prevent the acceptance of the work by the ENGINEER on behalf of the OWNER. The following are the designated Inspection Hold Points for each installation.
1. Structural insert delivery.
 2. Completion of manhole cleaning, removal of unsound material, stabilization of structure, installation of reinforcement for bench re-construction.
 3. Completion of bench and channel re-construction and manhole preparation.
 4. Structural insert installation and base grout.
 5. Final grade adjustment.
 6. Bench and chimney epoxy coating transition testing, refer to Section 02605.
 7. Final acceptance inspection.
- B. When requested, the CONTRACTOR shall provide the ENGINEER (Inspector) safe access to complete Hold Point inspections; the CONTRACTOR shall provide safe access to permit required confined space in accordance with all Federal, State and local confined space entry regulations. The Inspector will provide documentation of training in accordance with Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.146, 29 CFR 1910.21-32 and 29 CFR 1926.500-503. Additional site-specific training will be further defined at the Preconstruction Meeting between the CONTRACTOR and Inspector. Inspections will be coordinated with the CONTRACTOR'S work sequence or during final holiday testing.

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PART 2 – PRODUCTS

2.1 MATERIALS

- A. Polymer riser sections and components shall be a mixture of thermosetting resin, sand and aggregate. No cementitious or calcium carbonate materials shall be allowed. The polymer matrix shall conform to ASTM D6783 and have the following minimum requirements:
 - 1. Minimum Compressive Strength: 10,000 pounds per square inch (psi).
 - 2. Minimum Flexural Modulus: 2,000-psi.

- B. Thermosetting resin shall be unsaturated, certified, isophthalic polyester resins or vinyl ester resins. Mixing lots of resin from different manufacturers shall not be allowed. The resin shall meet the following minimum requirements:
 - 1. The resin shall have a minimum of deflection temperature of 158° F when tested at 264-psi (1.820 mPa) in accordance with ASTM D648.
 - 2. The resin content shall not be less than 7% of the weight of the sample as determined by test method D2584.
 - 3. Resin shall be suitable for applications in the corrosive conditions to which the structures will be exposed.

- C. Approved Manufacturers: Precast polymer components shall be Armorock; or approved equal.

2.2 MANUFACTURE

- A. Insert shall be comprised of acid-resistant polymer manhole risers, cone section and related components that conform to the structural intent of ASTM C478.

- B. Each manhole component shall be free of defects, including indentations, cracks, foreign inclusions and resin-starved areas that, due to their nature and degree or extent, detrimentally affect the strength and serviceability of the component part.

- C. Polymer manhole riser and cone sections are to be provided in various lengths in combination to provide correct height with the fewest joints. Variation in height of two opposite sides of the riser or conical tops shall not be more than 5/8-inch. The level tolerance in the joining surfaces of the riser or conical top shall not be more than 1/4-inch per foot, with a maximum of 1/2-inch in any one section.

2.3 DESIGN

- A. The insert shall contain sufficient structural strength to carry loading conditions including live, dead and hydrostatic loads. The insert shall be capable of providing all necessary structural support without reliance of structural support from the host manhole.

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- B. Manhole risers, conical tops, slab tops and grade rings shall be designed by manufacturer to meet the intent of ASTM C478 with allowable compositional and sizing differences required by a polymer product and modification to accept polymer construction in lieu of concrete as follows:
1. American Association of State Highway and Transportation Officials (AASHTO) LRFD HL-93 design live loading applied to manhole cover and riser sections.
 2. Polymer manholes shall be designed based upon live and dead load criteria in ASTM C857.10. The following exceptions to ASTM C478 shall be allowed.
 - a. Components shall be designed for the intended combinations of manufacturing materials. Component designs may be as non-reinforced members or reinforced members as recommended by the manufacturer.
 - b. Steel reinforcement is not required for circumferential reinforcement, joint reinforcement, or hoop reinforcement, but may be placed for the purpose of product handling. Manufacturer will determine the need for and type of reinforcement as it pertains to safety and lifting requirements.
- C. The polymer manhole sleeve shall have a minimum wall thickness of 2 inches and an outside clearance to the existing manhole interior surface of 3 inches on all sides. The wall thickness of risers and conical tops shall be not less than that prescribed by the manufacturer's design by more than 5%. Additional wall thickness shall not be cause for rejection.

2.4 MARKING AND IDENTIFICATION

- A. Each manhole section shall have permanent markings on the interior surface of each section as follows:
1. Manufacturer name.
 2. Date of manufacturing.
 3. City of Phoenix project number.
- B. Lettering shall be a minimum of 3 inches in height and the application shall be suitable for the sanitary sewer environment.

2.5 JOINT SEALANT SYSTEMS

- A. Manhole sections shall be joined using ethylene propylene diene methylene (EPDM) rubber seals complying with ASTM C443 and ASTM D1056. EPDM rubber seals shall be Trim-lok Rubber Seal manufactured by Trim-Lok, Inc., approved equal, or as recommended by the manufacturer.
- B. CONTRACTOR shall assume groundwater elevation is at the surface when groundwater is encountered. Gaskets shall be designed and provided for conditions of high groundwater to prevent flotation and leaks.

2.6 GRADE RINGS

- A. Grade rings shall be a chemically inert composite material, such as high-density polyethylene (HDPE) Adjusting Rings manufactured by Ladtech Inc. or Pro-Ring manufactured by Cretex or concrete reinforced adjusting rings coated with an approved epoxy coating system in accordance with Section 02605.
- B. Grade rings shall meet AASHTO HS25 design live loading applied to manhole cover and riser sections.

2.7 FRAME AND COVER

- A. The manhole shall provide an area from which a grade ring can be installed to accept a typical metal frame and cover and have the strength to support a traffic load without damage to the manhole. The grade ring should be extended past the perimeter of the manhole at least 1 inch in order to transfer as much of the load as practical to the exterior wall of the manhole.
- B. The CONTRACTOR shall perform work in accordance with Maricopa Association of Governments (MAG) Standard Details 420, 422, and 423. The frames and covers shall be Product Numbers 2230Z (frame) and 2230A (cover), as manufactured by East Jordan Iron Works, or approved equal. The covers shall contain the CITY OF PHOENIX official logo and the words “CITY OF PHOENIX SANITARY SEWER.” The frames and covers shall have a nominal opening diameter of 30 inches.
- C. The cover shall seat firmly into the frame without rocking. If the cover does not firmly fit into the frame without rocking, it shall be returned to the manufacturer and replaced with one that will seat firmly into the frame without rocking.

2.8 CONCRETE COLLARS

- A. The Portland cement concrete collar around the frame or box shall be circular and shall be a minimum of 8 inches thick, placed flush with the adjacent new pavement surface per MAG Standard Detail 422. Concrete shall be a minimum of Class AA. All concrete shall be obtained from plants approved by the ENGINEER.
- B. A single No. 4 rebar hoop shall be placed in each concrete collar. The hoop diameter shall be such that its placement is centered between the edge of the manhole frame or valve box, and the outer edge of the concrete collar, the depth of the hoop shall be centered in the thickness of the collar. Each concrete ring shall be scored radially at quarter-circle points. Score lines shall be 0.25-inches wide by 0.5-inches deep. The concrete collar surface shall be medium broom-finished.

- C. Traffic shall not be allowed on the concrete collars until the concrete had reached a minimum compressive strength of 2500-psi on residential and 3000-psi on collector and major streets. On major streets the CONTRACTOR shall use “high-early” in the concrete mix, approved by the ENGINEER to minimize delay in reopening the street(s) to traffic.

2.10 INFILTRATION CONTROL

- A. Chemical grout shall be used for infiltration elimination. Chemical grout shall be Sauereisen InstaPlug No. F-180, No. F-370 Chemical Grout, No. F-190 H2OPRUF manufactured by Sauereisen; or Environmental Coatings – Hydrophobic Grout Polyurethane System manufactured by Environmental Coatings; or approved equal, and as recommended by the coating manufacturer. Surface preparation and application shall be as recommended by the manufacturer.

2.11 MORTAR

- A. Cementitious mortar for bench preparation shall be fast setting and consist of cement, fine aggregate, water, and admixtures for high early strength and bonding to existing concrete surface. Cementitious mortar shall be designed for application to vertical or overhead surfaces. The minimum compressive strength requirements are 2000-psi at 1 day and 4000-psi at 3 days when tested in accordance with ASTM C 109. Cementitious mortar shall be Structural Concrete V/O manufactured by Five Star; Rapid Set Mortar Mix manufactured by CTS Cement; C-120 Cement manufactured by Environmental Coatings, LLC; Sauereisen F-120/F-121 manufactured by Sauereisen, Inc.; or approved equal as recommended by the epoxy coating manufacturer. The cementitious mortar must be acceptable in writing by coating manufacturer.

2.12 EPOXY COATING SYSTEM

- A. The epoxy coating system shall be compatible with the insert material. Refer to Section 02605 for approved products.

PART 3 - EXECUTION

3.1 GENERAL

- A. CONTRACTOR shall follow all requirements for safety and ventilation in accordance with all applicable federal, state and local requirements.
- B. CONTRACTOR shall provide means, labor and equipment to prevent solid waste contamination during construction activities. If necessary, install and operate sewage diversion pumping equipment to maintain sewage flows without backup, overflow or spill.

3.2 CLEANING AND PREPARATION

- A. CONTRACTOR shall clean manhole prior to preparation of interior surfaces as specified herein. Cleaning equipment including pumps, hoses, connectors, valves and nozzles shall produce a minimum blast pressure of 5,000 psi.
- B. CONTRACTOR shall also be responsible for any additional surface preparation beyond water-blasting as required by the grout, sealant, and coatings manufacturer. Where additional preparation is required, including sandblasting, the CONTRACTOR shall provide all labor, materials, and equipment as necessary, and at no additional cost to the OWNER. Solid blast materials shall be collected, removed and disposed of in the same manner as other cleaning debris.
- C. CONTRACTOR shall verify brick manholes condition and alignment as they are known to be irregular requiring additional excavation or chipping of the bricks.
- D. The CONTRACTOR shall give the ENGINEER a minimum of 7 days advanced notice prior to the start of any surface preparation work.
- E. CONTRACTOR shall remove all existing manhole steps or shall be cut-off flush with the interior surface of the manhole.
- F. Debris from cleaning operations shall be collected within the manhole and disposed of daily at an approved off-site location. Hauling containers shall be watertight.
- G. Repairs shall be made, as necessary, to existing manhole in order to receive inserts. The bench shall be re-constructed and leveled to prepare for insert and coating installation. Any grout repair to the base for support of the insert shall be constructed of 5000 PSI in 28 days grout and shall have a minimum reinforcement area of 0.5% with grade 60 reinforcing steel.

3.3 INFILTRATION ELIMINATION

- A. CONTRACTOR shall fill points of infiltration in manholes with chemical grout per manufacturer requirements. Chemical grout shall be injected into a predrilled injection hole through a static mixer until refusal or seal per manufacturer's recommendations.
- B. The injection process shall be repeated until infiltration is stopped completely, at no additional cost to the OWNER. It is the CONTRACTOR'S responsibility to ensure that all infiltration into the manholes has been eliminated, including infiltration caused by sealing points of infiltration lower in the manhole.

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- C. Excess chemical grout shall be removed, and all manhole surfaces shall be cleaned until a smooth, uninterrupted surface is achieved. No voids, including injection hole, shall remain after chemical grout injection.
- D. Where large voids exist outside the manhole wall which would require excessive amounts of grout, the ENGINEER may direct the CONTRACTOR to first grout with cement prior to injection grouting. The ENGINEER shall determine the appropriate cement mix design in accordance with site conditions. The CONTRACTOR shall furnish all labor and materials necessary to pump cement. Care shall be taken during injection of grout or cement to ensure that excessive pressures do not develop and cause damage to the manhole structure. Upon completion, injection devices shall be removed, and the holes filled, and troweled flush with the wall surface using a fast setting, non-shrink grout mixture as recommended by the grout supplier.

3.4 EXCAVATION

- A. The asphalt or concrete around the top of the existing manhole shall be saw-cut as necessary to remove the cone section, chimney, frame and cover, to permit trench support if required and to leave room such that the insert may be properly assembled and installed. CONTRACTOR shall prevent soil and debris from falling into the manhole.
- B. During excavation shoring and sheeting deemed necessary to protect the excavation and to safeguard employees. Refer to drawing C-006 for shoring requirements when excavating within 25 feet of railroad tracks.
- C. Additional excavation maybe required in locations were the existing manhole is constructed with red brick. Brick manhole geometry are typically not true, and the cone section can be long tapers requiring more of the existing manhole structure to be removed to accept the structural insert.

3.5 INSTALLATION

- A. Installation shall be in strict accordance with the manufacturer's recommended procedures. Riser sections and components shall be handled with approved manufacturer's lifting devices. No other handling apparatus will be acceptable.
- B. Damaged insert riser section and components deemed repairable by the Manufacturer's Representative shall not be used without approval by the ENGINEER. CONTRACTOR shall submit a detailed repair plan, including the manhole location description of damage, and manufacturer's recommended repairs. Damaged items deemed unrepairable or rejected by the ENGINEER shall be removed from the site and replaced at the CONTRACTOR'S expense.

- C. CONTRACTOR shall saw-cut riser section as necessary to accommodate pipe entry and bench slopes. The bench area shall be built up with mortar or polymer concrete to provide a clean level surface to receive the riser. This build up should allow for a level surface above the existing top of the highest pipe. Refer to the Design Drawings for additional bench repair requirements. If pipe inverts are severely staggered, the initial polymer sleeve can be modified in the field to accommodate the difference in bench slopes. Make cuts or modifications in accordance with the manufacturer's recommendations.
- D. After mortar or polymer concrete has set, the riser base shall be installed. Riser sections and cone shall be installed using the appropriate wall alignment guides, gaskets and/or joint sealants. The risers shall be offloaded and lifted into place with approved manufacturer's lifting device. No other handling apparatus will be acceptable for handling material.
1. All branch main and drop connections shall be re-established. CONTRACTOR shall field-cut openings in accordance with the manufacturer's recommendations. The existing main shall extend straight through the riser using CITY OF PHOENIX approved materials. All gaps and seal pipe ends shall be filled with approved epoxy materials.
 2. All non-booted or flexible coupler pipe entry areas shall be grouted by an epoxy patch kit provided by the manufacturer.
 3. All laterals and drop connections shall be re-established. The CONTRACTOR shall field-cut openings in accordance with the manufacturer's recommendations.
 4. Branch main shall be extended to within the manhole and coat around lateral to create a watertight seal. Pipe shall be extended straight and true to the existing main's alignment using City of Phoenix approved pipe material.
- E. Refer to Section 02145 for typical means to divert branch main sewers (15-inch diameter or less) from within the manhole to properly re-establish the branch connection within the manhole.
- F. The riser wall above the bench shall be cleaned and wiped down to allow for application of the epoxy coating system. All coating manufacturer's recommendations for preparing surfaces to receive epoxy shall be followed.
- G. The bench and insert transition shall be coated with approved epoxy. Epoxy coating shall continue a minimum of 6 inches up the insert face and be terminated by keying into the insert with a minimum 1/4-inch wide by 1/4-inch deep saw-cut. Refer to Section 02605 for epoxy coating products and application.
- H. Additional channel and bench repairs maybe required as indicated on the Design Drawings.
- I. The coating system shall extend to all exposed concrete surface, including the invert of the pipeline within the manhole; unless the channel is constructed of continuous vitrified clay pipe. Coating edges shall be terminated by keying into the substrate with a minimum 1/4-

inch wide by 1/4-inch deep saw-cut. Prior to coating application, the saw-cut shall be dried and vacuumed to remove all dust and residue. During coating application, a liberal amount of material shall be applied to the saw-cut area and smoothed level.

- J. The annular space between the polymer riser and the existing manhole shall be filled with Class I (50- to 150-psi) Cementitious Low Strength Material (CLSM) or an approved material recommended by the insert manufacturer. Cement shall be Type V Portland Cement in accordance with ASTM C150.
- K. Refer to the Design Drawings for backfill and final grade adjustments.

3.6 FIELD QUALITY CONTROL

- A. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the ENGINEER. At the time of the inspection, the material shall be examined for compliance with the requirements of this section. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the ENGINEER. At the time of inspection, the material will be examined for compliance with the requirements of this section.
- B. Coated surfaces shall be inspected and tested according to Section 02605.

3.7 SAFETY REQUIREMENTS

- A. All rehabilitation work, including surface preparation, shall be performed from within the manhole requiring work to be performed under a confined-space entry permit in accordance with all Federal, State and local confined-space entry regulations.
- B. Unless otherwise directed by the ENGINEER, the CONTRACTOR shall supply a continuous supply of fresh air to the manhole while conducting his work. CONTRACTOR shall not remove any manhole lid without first monitoring the extent of hazardous gas within the manhole or otherwise providing a safe atmosphere to the manhole interior.

3.8 GRADE RINGS

- A. Grade rings shall be installed with a minimum of one 6-inch ring. The total distance from the top of the manhole cone to the top of the manhole frame after final paving shall not exceed 24 inches unless approved by the ENGINEER.
- B. Assemble units so that the top of the cover meets the following requirements, unless otherwise shown.
 - 1. In paved areas and travelled shoulder areas: Top of cover shall be flush with the paving surface or existing surface grade.
 - 2. In unimproved areas: Top of cover shall be 6 inches above grade.

- C. Grade Ring Joints: Prior to adjusting manholes to final grade, placing paving or landscaping, and installing concrete collars; grade rings may be joined by placing a single row of 100% butyl rubber rope sealant between the manhole cone or top of structure and the first grade ring, between grade rings, and between the top grade ring and the manhole frame. Sealant must have a minimum 1-inch by 1-inch cross section such as Kent Seal or approved equal.
- D. Final Manhole/Structure Adjustment: Set grade rings with grout or composite grade ring manufacture's approved recommended product. Grout shall cover the full width of the grade ring(s). The ring(s) shall be set fully concentric with the inside diameter of the manhole cone section or opening in the structure top. Grade rings not concentric shall be removed and replaced at no cost to the CITY. After grade ring is placed and prior to the grout taking a "set," any excess grout that extruded into the manhole or structure shall be removed flush with the interior of the grade ring and top of the cone section or structure opening.

3.9 MANHOLE FRAME AND COVERS

- A. The frame and cover shall lie flat in any position in the frame and have a uniform bearing through its entire circumference. Any frame and cover which creates noise when passed over by traffic shall be replaced.
- B. Secure the manhole frame to the grade ring with non-cementitious grout as recommended by the manufacturer. The grout shall extend across the full width of the base of the frame such that there are no voids under the frame. After the frame is placed and prior to the grout taking a "set," any excess grout that extruded into the manhole or structure shall be removed flush with the interior of the frame and top of the cone section.
- C. Bolts shall be installed in the cover where specified or required by the agency with jurisdiction.

3.10 TESTING AND ACCEPTANCE

- A. The manufacturer shall submit the results of third-party testing to the OWNER and ENGINEER verifying resistance to sulfuric acid and other compounds as found in a sanitary sewer application. The chemical resistance test should be conducted in general accordance with The Green Book: Standard Plans for Public Works Construction, section 211-2; (Pickle Jar Test).
- B. After installation, the OWNER or OWNER'S REPRESENTATIVE shall inspect manholes to verify riser sections have been properly installed, are level with tight joints, and are located at the correct elevations and orientations. All defects shall be corrected at no cost to the OWNER.

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- C. Additional testing maybe required for other components that are installed to complete the structural insert installation, such as epoxy coatings per Specification Section 02605.
- D. A post construction panoramic scan of each manhole shall be performed and reviewed to determine complete and correct manhole rehabilitation. All defects shall be corrected at no cost to the OWNER.

3.11 CLEANUP

- A. Any deleterious material and debris shall be removed from the manhole.
- B. The subgrade shall be restored according to Design Drawing and existing conditions.
- C. Upon completion of the installation, the CONTRACTOR shall remove surplus materials, protective coverings, and accumulated rubbish, and thoroughly clean all surfaces and repair any overspray, splashes, splatters or other lining-related damage. Surfaces damaged resulting from this cleanup shall also be cleaned, repaired, and refinished to the original or required condition.
- D. All debris shall be collected and hauled off to a proper disposal site as required by local, State and Federal regulations.

++ END OF SECTION ++

SECTION 02605

SANITARY SEWER MANHOLE COATING SYSTEMS AND REHABILITATION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section specifies the coating system used for rehabilitation of brick or concrete sanitary sewer manholes to protect against corrosion. The work included under this section consists of furnishing all labor, equipment, materials and incidentals required to rehabilitate existing manholes. Rehabilitation shall consist of patching, restoration of manhole shelves and channels, and coating as shown on the Drawings. Coating shall consist of CITY OF PHOENIX approved coating system. Work shall include, but not be limited to, cleaning of concrete surfaces, reinforcing steel preparation and repair, application of coating, including surface preparation, coating of exposed metals and chimney, and testing.
- B. Definitions:
1. Specific coating terminology used in this section is in accordance with definitions contained in American Society for Testing and Materials (ASTM) D16, ASTM D3960, and the following definitions:
 - a. Coating Systems: All components together as a unit used to repair the manhole and protect against further corrosion. These components include, as applicable: defect filler and reprofiling materials; material used to repair channel and bench; infiltration control; primer; and finish coats.
 - b. Dry Film Thickness (DFT): The thickness of one fully cured, continuous application of coating.
 - c. Applicator: The person assigned by the CONTRACTOR to apply the specified coating system.
 - d. Termination Point: The vertical beginning and end of the coating system application.
 - e. Chimney Seal: The seal applied to the grade rings and manhole frame.

1.2 REFERENCES

- A. This Section contains references to the following documents. They are a part of this Section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this Section as if referenced directly. In the event of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

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B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of advertisement for bids or invitation to bid and any subsequent addenda, (or on the effective date of the agreement if there were no bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ASTM D16-93	Standard Terminology Relating to Paint, Varnish, Lacquer, and Related Products
ASTM D7234	Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers
ASTM D4258	Standard Practice for Surface Cleaning Concrete for Coating
ASTM D4262	Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces
ASTM D4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D543-95 (2001)	Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
OSHA 29 CFR 1926/1910	Occupational Safety and Health Administration (OSHA) Safety and Health Standards
SSPC	Steel Structures Painting Council Specifications, Vol. 2
ASTM D4414	Standard Practice for Measurement of Wet Film Thickness by Notch Gages
ASTM D4787-88	Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates
NACE	National Association of Corrosion Engineers

C. Additional References: Maricopa Association of Governments (MAG) and CITY OF PHOENIX Supplemental Standard Details and Specifications; Section 626 – Corrosion Coating of Sanitary Sewer Manholes.

1.3 CERTIFIED APPLICATOR

- A. The coating system shall be applied by an Applicator that has been certified by the coatings system manufacturer for over 5 years. The certification program shall include an annual renewal. The training outline for the certification program shall be submitted to the OWNER for review. The CONTRACTOR shall provide evidence that the personnel performing the product application for each project received the manufacturer's training for certification.
- B. The Applicator shall appoint a Quality Assurance Manager to take full responsibility for the quality of the work. The Quality Assurance Manager shall be fully certified and have a minimum of 2 years of application experience with the particular coating system within the geographical area located within the Southwestern United States.

1.4 MANUFACTURER'S REPRESENTATIVE

- A. The Manufacturer's representative is a representative authorized to act on behalf of the company regarding technical and commercial issues. The Manufacturer's representative shall furnish the following services:
 - 1. The Manufacturer's representative shall provide at least 8 hours of on-site observation and site-specific recommendations relative to surface preparation, mixing, application, and curing of his product.
 - 2. The Manufacturer's representative shall observe the start of surface preparation, mixing, and application of its concrete repair products.
 - 3. The Manufacturer's representative shall provide technical support to resolve field problems associated with the manufacturer's products furnished under this Contract or the application thereof throughout the duration of the work.
- B. The Manufacturer's representative shall be present and shall verify in writing that the proper procedures and equipment are used by the applicator and that the coating is being applied per the Coating System Application Plan.

1.5 COATING SYSTEM APPLICATION PLAN

- A. A Coating System Application Plan shall be prepared that includes a description of the following:
 - 1. Quality Assurance Procedures:
 - a. Detailed duties of the Applicator's Quality Assurance Manager.
 - b. Detailed duties of the Manufacturer's representative.
 - c. Training program to qualify personnel in the correct storage and handling of coating materials, and the necessary safety requirements.
 - d. List of application and testing equipment to be used, including inspections confirming satisfactory condition of equipment.

- e. Detailed procedures and methods for surface preparation, including repair and reprofiling if required, application of primer and final coating, and testing.
2. Criteria for acceptance of the preparation of concrete and manhole surfaces.
3. Plan for sewage diversion, if required.
4. Method and material for sealing active leaks.
5. Detailed plan of surface preparation, including repair and reprofiling.
6. Details of application of primer and finish coats, including required curing times.
7. Detailed environmental provisions such as shading from the sun.
8. Detailed scheduling provisions for environmental considerations such as working at night.
9. Testing procedures.
10. Adhesion testing.
11. DFT testing.
12. Holiday testing.
13. Surface pH testing.

1.6 MANUFACTURER’S WARRANTY

- A. A written warranty against coating failure shall be provided for the entire coating system, including all repair material, defect fillers, primers, intermediate, and finish coats. The minimum duration of the warranty shall be 5 years after Final Completion of the project. The product and the installation may both be covered by the manufacturer’s warranty, or separate warranties may be issued by the manufacturer and the installer.
- B. This warranty shall state that the coating will not fail for a minimum period of 5 years after Final Completion of the project. Coating failure is defined as blistering, cracking, embrittlement, or softening, or failure to adhere to the substrate. The warranty shall also apply to any repair materials, primers, or other products used in the application. If any repair or replacement is necessary within the warranty period, a new 5-year warranty period shall start at the date that the manhole is placed back into service.

1.7 PRODUCT TESTING

- A. The manufacturer shall submit the results of third-party testing to the OWNER and ENGINEER, if recommending alternative products from those specified. All alternative products shall be pre-approved by the OWNER and ENGINEER.
- B. Testing for Resistance to Sulfuric Acid and Other Compounds: Coatings, as applied to the manhole, must be chemically resistant when subjected to a 10% solution of sulfuric acid. Chemical resistance to be determined using ASTM G 20-88 (2002), modified as follows and with no further modifications:

1. Test specimens to be solid concrete cylinders having a maximum length of 6 inches and a maximum diameter of 2-1/2 inches. Coating to be applied to all surfaces of each test specimen, except the base.
 2. Separate test specimens to be subjected to each of six test reagents of varying pH, to include vapor and immersion phase deionized water (pH of 5 to 6); vapor and immersion phase 10% sulfuric acid (normal conditions); and vapor and immersion phase 30% sulfuric acid (accelerated test conditions to approximate longer term exposure to 10% sulfuric acid).
 3. Separate test specimens to be subjected to each of the following three reagents: 1) grease, 2) a 10% (by weight) detergent in water solution, and 3) 700 parts per million (ppm) biochemical oxygen demand (BOD).
 4. A separate test specimen to be subjected to gasoline for a period of 1 week; observations to be made and recorded on a daily basis.
 5. All testing to be done for a total of 6 months for each test specimen, unless specifically noted otherwise.
 6. A “control” test specimen to be maintained for comparison of immersed specimens throughout testing.
 7. For this Specification, acid concentration in terms of “percent” is defined as weight of solute per volume of solution. A sulfuric acid concentration of 10% contains 100 grams of sulfuric acid per liter of acid solution, which is the same as 1.02 moles of sulfuric acid per liter of acid solution. A sulfuric acid concentration of 30% contains 300 grams of sulfuric acid per liter of acid solution, which is the same as 3.1 moles of sulfuric acid per liter of acid solution. Estimated pH values for 10% and 30% sulfuric acid solutions are 0.01 and -0.49, respectively.
- C. After exposure to the solutions, specimens shall not exhibit any weight loss, spalling, cracking or blistering. Any changes to appearance such as color and texture shall be noted. Adhesion of the coating to the substrate shall be tested per ASTM D7234, and the mode of failure shall be such that the substrate fails before the coating separates from the substrate.
- D. Physical Testing: Results of the following tests, performed on cured and coated concrete specimens after being subjected to sulfuric acid resistance testing per Testing for Resistance to Sulfuric Acid and Other Compounds above, shall be provided.

Test	ASTM	Results
Compressive Strength	ASTM C579	> 4,000 pounds per square inch (psi)
Water Vapor Transmission	ASTM D1653, Method B	< 0.25 grams/100 square inch in 24 hours

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Test	ASTM	Results
Water Absorption	ASTM D543, Procedure A with distilled water	< 0.5% in 30 days following 14 days of cure
Abrasion Resistance	ASTM D4060	< 125 mg loss/1,000-gram load in 1,000 cycles in 14 days using a CS17 wheel
Flexural Strength and Modulus of Elasticity	ASTM D790	500,000-psi
Tensile Strength	ASTM D638	> 2,000-psi
Elongation	ASTM D638	> 1.0%
Adhesion	ASTM D7234	> 200-psi pull/substrate failure

1.8 INSPECTION HOLD POINTS

- A. At certain stages in the coating-application process, the CONTRACTOR shall request approval from the ENGINEER to proceed with the next stage of the installation. The CONTRACTOR shall provide 24-hour notice that approval of an Inspection Hold Point is needed. The ENGINEER shall respond to the approval request within 24 hours. Failure to receive authorization from the Engineer at one of the designated Inspection Hold Points may prevent the acceptance of the work by the ENGINEER on behalf of the OWNER. The following are the designated Inspection Hold Points for each installation.
1. Completion of surface repairs, reprofiling, and preparation.
 2. Completion of primer application.
 3. Completion of application of final coating.
 4. Completion of holiday testing and retesting.
- B. When requested the CONTRACTOR shall provide the ENGINEER (INSPECTOR) safe access to complete Hold Point inspections; the CONTRACTOR shall provide safe access to permit required confined space in accordance with all Federal, State and local confined space entry regulations. The INSPECTOR will provide documentation of training in accordance with Occupational and Safety Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.146, 29 CFR 1910.21-32 and 29 CFR 1926.500-503. Additional site-specific training will be further defined at the pre-construction meeting between the CONTRACTOR and INSPECTOR. Inspections will be coordinated with the CONTRACTOR'S work sequence or during final holiday testing.

1.9 DELIVERY AND STORAGE

- A. Materials shall be delivered to the job site in their original, unopened containers. Each container shall bear the manufacturer's name, coating type, batch number, and date of manufacture, storage life, and special handling directions.
- B. Materials shall be stored in enclosed structures and shall be protected from weather and excessive heat or cold. Flammable materials shall be stored in accordance with State and local codes. The authorized INSPECTOR shall reject materials exceeding the storage life recommended by the manufacturer and they shall be removed from the site and replaced at no additional cost to the OWNER.

1.10 ENVIRONMENTAL CONDITIONS

- A. The products furnished will be installed in sanitary sewer manholes. The products will be exposed to the extremes of temperatures and humidity. In addition, the products will be exposed to corrosive, abrasive and reactive liquids and gasses associated with wastewater conveyance. The products will be immersed or intermittently immersed in wastewater, and the product surfaces are subject to splashing of wastewater.

1.11 SUBMITTALS

- A. The following information shall be provided in accordance with General Conditions:
 - 1. A copy of this Specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked (✓) to indicate Specification compliance or marked to indicate requested deviations from Specification requirements. Check-marks shall denote full compliance with a paragraph as a whole. If deviations from the Specifications are indicated, and therefore requested by the CONTRACTOR, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The OWNER or his designated representative shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the CONTRACTOR with the Specifications. Failure to include a copy of the marked-up Specification sections, along with justification(s) for any requested deviations to the Specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.
 - 2. Certificate of Responsibility attesting that the CONTRACTOR has assigned, and that the Applicator accepts responsibility for installation of the products specified herein.
 - 3. Manufacturer's certification attesting that the Applicator is qualified and approved to install the products specified herein. In addition, the following Applicator qualifications shall be provided:

- a. Current Arizona Contractor's AE license or equivalent (specifically for the rehabilitation of concrete manholes). If the manhole(s) to be rehabilitated is (are) brick, then the AE license or equivalent shall state for the rehabilitation of concrete and brick manholes.
- b. The Applicator shall demonstrate applicable experience and performance history by submitting references from three other projects of 3 or more installations each, (within the past 5 years) using the same coating system within the geographical area located within the Southwestern United States. Include project name, client name, date of work, engineer, and name and phone number of a client or agency contact person familiar with the project.
- c. Certification and qualifications for testing for holidays and other discontinuities.
4. Manufacturer's certification in writing that the services have been provided and that application of concrete repair materials was performed and completed in accordance with the manufacturer's specifications. The CONTRACTOR shall submit all such certificates to the ENGINEER within 7 days of completion of each phase of concrete repair work.
5. Written warranty.
6. Coating System Application Plan.
7. Product test results.
8. Manufacturer's specification containing instructions and quality control procedures meeting the following requirements:
 - a. Instructions must be written and published by the manufacturer for the purpose of giving complete instruction for the use and application of the proposed coating for the conditions for which the coating is specified herein.
 - b. Instructions shall include at a minimum: surface preparation (including repairs and reprofiling), curing times, curing methods, special equipment and coating DFT.
 - c. Limitations, exceptions, precautions, and requirements that may adversely affect the performance of the coating shall be clearly and completely stated in the instructions. If the manufacturer's requirements differ from these Specifications, the instructions shall clearly state where deviations are required. Temperature and humidity limitations for minimum and maximum conditions are to be included.
9. Product data.

PART 2 – PRODUCTS

2.1 MANHOLE COATINGS

- A. Approved Products: The CITY OF PHOENIX maintains a list of approved products for manhole coatings. Only products on the CITY'S approved list may be used for this project. Refer to the CITY OF PHOENIX Supplemental Standard Details and Specifications to MAG, Section 626.

B. General:

1. Coating systems shall be compatible with the concrete or brick surface preparation methods as specified herein. Any limitations or deviations requested by the manufacturer shall be approved by the ENGINEER prior to surface preparation.
2. Epoxy-based coatings shall be applied within 2 months of their date of manufacture (unless the manufacturer's requirements are more stringent), or otherwise approved by the ENGINEER.
3. Primer shall be as recommended by the manufacturer.
4. Defect filler and repair materials shall be as recommended by the manufacturer.
5. Manhole infiltration control material shall be as recommended by the manufacturer and shall be covered under the same warranty as the coating system.

2.2 PRODUCT DATA

- A. CONTRACTOR shall provide the following information, before materials are delivered to the job site:
1. Material Safety Data Sheets (MSDS) for all products used in the coating system.
 2. Manufacturer's application instructions, including the following:
 - a. Surface preparation recommendations.
 - b. Primer type, where required.
 - c. Maximum dry and wet mil thickness.
 - d. Minimum and maximum curing time between coats, including atmospheric conditions.
 - e. Curing time before submergence in liquid.
 - f. Thinner to be used with coating material.
 - g. Ventilation requirements.
 - h. Minimum atmospheric conditions during which the coating is applied.
 - i. Application methods.
 - j. Maximum allowable moisture content.
 - k. Maximum storage life.
 3. List of materials proposed and manufacturer's data for each material.

2.3 CORROSION INHIBITOR FOR REINFORCING STEEL

- A. Reinforcing steel, exposed by corrosion or during surface preparation, shall be treated with a water-based epoxy resin, anti-corrosion coating and bonding agent, such as Armatec 110 EpoCem, manufactured by the Sika Corporation, or approved equal.

2.4 CHIMNEY SEAL

- A. Manhole chimney and manhole frame shall be sealed with the same corrosion-resistant material used throughout the manhole.

2.5 BONDING COMPOUND

- A. All surfaces where new concrete will be bonded with existing concrete shall be coated with a bonding compound as recommended by the manufacturer of the concrete repair material.

2.6 ACID RESISTANT MORTAR

- A. Acid-resistant mortar shall be used for bench restoration. The mortar shall be applied to a depth of at least 3- to 4-inch. The finish surface shall be hand-troweled to smooth and finish the bench and channel.

2.7 MANHOLE FRAME AND COVER REPLACEMENT OR ADJUSTMENT

- A. Manhole frames and covers shall be replaced if the cover is recessed 1/2-inch or lower than the frame or as indicated on the Drawings. The CONTRACTOR shall perform work in accordance with MAG Standard Details 420, 422, and 423. The frames and covers shall be Product Numbers 2230Z (frame) and 2230A (cover), as manufactured by East Jordan Iron Works, or approved equal. The covers shall contain the CITY OF PHOENIX official logo and the words “CITY OF PHOENIX SANITARY SEWER.” The frames and covers shall have a nominal opening diameter of 30 inches. Adjusting rings on these manholes shall be replaced as necessary to raise the lid to surface grade and slope. Concrete-adjusting rings shall receive corrosion-resistant coating.
- B. Frame and cover concrete collars shall be placed according to CITY FOR PHOENIX Supplement to MAG Section 345.5. A single No. 4 rebar hoop shall be placed in each concrete collar.

PART 3 - EXECUTION

3.1 COATINGS

- A. General:
 - 1. Coating products shall not be used until the OWNER has inspected the materials and equipment.
 - 2. Coatings shall only be applied by a manufacturer’s certified Applicator. The CONTRACTOR must provide evidence that personnel assigned to the project have successfully completed the manufacturer’s training.
 - 3. Manufacturer’s representative must be present during the first 25% of installations for the project or as deemed necessary by the ENGINEER and OWNER.
- B. Coating Systems: Coating system shall have a minimum thickness of 125 mils. Unless otherwise specified, the coating system shall not be applied until other work in the area is

complete and until the previous primer or underlayment coat has been inspected. The CONTRACTOR shall request approval authorization at all Inspection Hold Points.

C. Sequence of Work:

1. The CONTRACTOR shall perform the work in the following sequence:

a. Coating System

- 1) Replace frame and cover
- 2) Clean and assess manhole interior.
- 3) Remove all defective or failing materials throughout manhole.
- 4) Reinforcing steel treatment.
- 5) Structural repair (as directed by ENGINEER).
- 6) Repair of concrete defects.
- 7) Surface preparation.
- 8) Coating installation.
- 9) Testing.

b. Chimney Lining System:

- 1) Replace frame and cover
- 2) Clean manhole interior.
- 3) Reinforcing steel treatment.
- 4) Structural repair (as directed by ENGINEER).
- 5) Repair of concrete defects.
- 6) Lining installation.
- 7) Testing.

3.2 PREPARATION

A. General:

1. Before applying coating or surface treatments, the CONTRACTOR shall clean and prepare the manhole. The ENGINEER shall inspect and approve the cleaning and preparation prior to any subsequent work.
2. The CONTRACTOR shall examine all surfaces to be coated and shall correct all surface defects before application of any coating.
3. The CONTRACTOR shall perform an adhesion test after proper cure in accordance with ASTM D7234 to demonstrate that the specified field coatings adhere to the substrate. The adhesion test shall be witnessed by the OWNER'S REPRESENTATIVE. Test results showing an adhesion rating of 200 pounds per square inch (psi) or higher on all other surfaces shall be considered acceptable. Where unacceptable test results are obtained, the CONTRACTOR shall be responsible for removing and reapplying the specified coatings at no expense to the OWNER.
4. The general resurfacing limits of repair shall be defined by the Drawings, with minor adjustments as directed by the ENGINEER based upon conditions observed.

5. Existing odor control or odor sampling equipment may be present in manholes. The CONTRACTOR shall be responsible for the coordination and notification of the CITY Collections for removal and reinstallation of existing odor sampling equipment.
6. Existing flow meter equipment and apparatus may be present in manholes. The CONTRACTOR shall be responsible for the coordination and notification of the CITY Instrumentation and Controls for removal and reinstallation of existing flow meter equipment and apparatus.

B. Environmental Limits:

1. Lining and concrete repair shall not be performed if environmental conditions are not within the manufacturer's recommended limits. No lining work shall be performed under the following conditions:
 - a. Temperatures exceeding the manufacturer's recommended maximum and minimum allowable.
 - b. Dust- or smoke-laden atmosphere.
 - c. Damp or humid weather where relative humidity is above manufacturer's maximum allowable.
2. The project is located in a sanitary sewer environment where the work will be exposed to hydrogen sulfide-laden air and extended periods of high relative humidity. These atmospheric conditions may restrict the application and inhibit the cure of the specified lining systems. The CONTRACTOR shall provide facilities to maintain substrate and atmospheric conditions within the controlled environment, with respect to temperature and relative humidity, within the limits established by the manufacturer of the product(s) selected to ensure proper application and cure of the lining systems.

3.3 SEWAGE DIVERSION

- A. Provide means, labor, and equipment to divert flow from branch pipelines entering the manhole as necessary to prevent sewage flow from contacting surfaces to be coated. Refer to Section 02145 -Sewer Bypass and Diversion for additional requirements.
- B. In no case shall the CONTRACTOR allow any sewage to surcharge and backup into the main or lateral services , or in any way overflow into the environment.
- C. Provide means, labor, and equipment to prevent solid waste generated during rehabilitation activities from entering the sewage flow.

3.4 MANHOLE CLEANING AND PREPARATION

- A. Applicator shall inspect all surfaces within the manhole structure to receive a coating system prior to surface preparation. CONTRACTOR shall notify ENGINEER of disparity in the quantity of repair area and of surfaces which may interfere with the proper preparation, or application of the coating system.

1. The entire manhole interior including frame, walls, and bench shall be cleaned prior to rehabilitation using either abrasive blasting and/or high-pressure water blast as recommended by the coating and/or repair product manufacturer and approved by the ENGINEER. Where mechanical cleaning is accomplished by blast cleaning, the abrasive used shall be washed, graded and free of contaminants which might interfere with the adhesion of the coatings. The air used for blast-cleaning shall be sufficiently free of oil and moisture to not cause detrimental contamination of the surfaces to be coated. All concrete, brick, existing lining/coating or mortar that is not sound or has been damaged by chemical exposure shall be removed to a sound, neutralized surface.
 2. All contaminants, including oil, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed. Detergent-water cleaning and hot-water blasting may be necessary to remove oils, grease, or other hydrocarbon residues from the concrete. A mild chlorine solution may be used to neutralize the surface to diminish microbiological bacteria growth prior to final rinse and coating system.
 3. CONTRACTOR shall also remove all dirt, rocks, rust, spalled masonry (including existing lining/coating, mortar, concrete, and brick), roots, sludge, grit, and other deleterious materials and debris from the interior of the manhole. If required by the OWNER, the manhole shall be restored to the original surface profile. The finished interior surface shall consist of sound concrete or brick with adequate profile and porosity to provide a strong bond between the necessary repair materials and/or coating and the substrate.
 4. Surface preparation method(s) shall be based upon the conditions of the substrate, service environment and the requirements of the coating to be applied. Debris from cleaning operations shall be collected within the manhole and disposed of at an approved off-site location. Hauling containers shall be watertight.
- B. CONTRACTOR shall remove all manhole steps prior to cleaning. Unless otherwise directed by the ENGINEER, manhole steps shall be cut flush with the manhole wall. Voids or holes remaining from removal of the steps shall be filled and troweled flush with the wall using a manhole-patching material approved by the Manufacturer's representative.
- C. CONTRACTOR shall also be responsible for any additional surface preparation beyond water-blasting as required by the coating manufacturer. Where additional preparation is required, including abrasive-blasting, shot-blasting, grinding, scarifying or acid-etching, the CONTRACTOR shall provide all labor, materials, and equipment as necessary, and at no additional cost to the OWNER. Solid blast materials shall be collected, removed and disposed of in the same manner as other cleaning debris.
- D. The CONTRACTOR shall ensure that the surface meets the manufacturer's requirements for moisture level, pH, temperature and profile. Saw-cut the perimeter of each repair area to a depth of 1/2 inch, as detailed in the Drawings. Concrete surface pH shall be greater than 7. Do not cut reinforcing steel.

- E. All infiltration shall be stopped prior to coating application using materials compatible with the coating system and approved for use by the manufacturer's representative.
- F. Verify prepared surfaces after cleaning, but prior to application of the epoxy-coating system, to determine pH and moisture content of the concrete meets manufacturer's recommendations.
- G. The area between the manhole and the manhole ring and any other area that might exhibit movement or cracking due to expansion and contraction shall be grouted with a watertight, expansive grout, approved for use by the manufacturer's representative.
- H. The coating system shall extend to all exposed concrete surfaces or to existing competent coating; Coating edges shall be terminated by keying into the substrate with a minimum 1/4-inch wide by 1/4-inch deep saw-cut. Prior to coating application, the saw cut shall be dried and vacuumed to remove all dust and residue. During coating application, a liberal amount of material shall be applied to the saw-cut area and smoothed level.

3.5 REINFORCING STEEL TREATMENT

- A. Procedures: Where corrosion or surface preparation activities have exposed reinforcing steel, the following procedure shall be used:
 - 1. If half the diameter of the reinforcing steel, or more, is exposed, chip out behind the reinforcing steel a minimum of 1/2-inch for placement of grout or polymer concrete.
 - 2. Determine section area loss of reinforcing steel.
 - 3. Where reinforcing steel cross-section area loss exceeds 15% of the original reinforcing steel, perform structural repair as directed by the ENGINEER.
 - 4. Abrasive-blast all exposed reinforcing steel surfaces to remove all contaminants and corrosion products.
 - 5. Apply a 20-mil (wet) coat of corrosion inhibitor to all surfaces of the clean, exposed reinforcing steel with stiff brush or spray equipment. Cure to tack-free 2 to 3 hours.
 - 6. Apply a second 20-mil (wet) coat of corrosion inhibitor and allow for 2-hour to 3-hour cure prior to placement of polymer mortar or grout
- B. Abrasive Blasting:
 - 1. Prior to abrasive-blasting, all salts, oil, grease, scum, or other visible contaminants shall be removed by high-pressure water blasting,
 - 2. Blast-cleaning shall be performed using dry abrasive-blasting procedures in accordance with ASTM D4259. Abrasive particle size and type shall be sufficient to produce the specified surface profile. Abrasive material in the blast-cleaning operation shall be free of contaminants that would interfere with adhesion of the corrosion inhibitor and shall not be reused.
 - 3. The CONTRACTOR shall comply with the applicable Federal, State, and local air-pollution control regulations for blast cleaning.

4. Abrasive-blasting hoses shall be grounded to prevent accumulation of static electricity.
5. Compressed air for air-last cleaning shall be supplied at adequate pressure from well-maintained compressors equipped with oil/moisture separators which remove at least 95% of the contaminants.
6. The CONTRACTOR shall keep the area of his work in a clean condition and shall not permit materials to accumulate as to constitute a nuisance or hazard to the performance of the work or the operation of the existing facilities. After abrasive-blasting, thoroughly vacuum or wash with clean water, all surfaces as required to remove dust, salts and detergent residue.

3.6 STRUCTURAL REPAIR

A. General:

1. Perform structural repairs as directed by the ENGINEER. Structural repairs shall include splicing new reinforcing steel to existing reinforcing steel and providing additional reinforcing steel as directed. All reinforcing steel shall comply with the requirements of ASTM A615, shall be Grade 60, and shall match existing reinforcing steel. Provide 3/8-inch diameter anchor bolts as needed to support reinforcing steel.
2. Where reinforcing steel cross sectional area loss exceeds 15% of the original reinforcing steel and is not referenced on the Drawings for a structural repair; the OWNER'S REPRESENTATIVE shall be notified to quantify and evaluate the defect. The CONTRACTOR shall perform structural repair as directed by the ENGINEER. Payment for this work will be from the OWNER'S allowance and a case-by-case basis.

3.7 DEFECT REPAIR

- A. All surface defects, including tie holes, any honeycombing, or otherwise defective concrete or brick shall be repaired. All voids, holes, and rough or irregular surfaces shall be filled.
- B. The CONTRACTOR shall use the repair and fill material recommended by the coating manufacturer and approved by the ENGINEER to repair or fill all defects. Areas to be patched shall be cleaned. Minor honeycombed or otherwise defective areas shall be removed to solid concrete. The edges of the cut shall be perpendicular to the surface of the concrete. Patches on exposed surfaces shall be finished to match the adjoining surfaces after they have set. Finishes shall be equal in workmanship, texture and general appearance to that of the adjacent undamaged concrete or brick. Concrete with honeycombing which exposes the reinforcing steel or with defects that affect the structural strength shall be repaired. The exposed reinforcing steel shall be mechanically cleaned and coated in accordance with paragraph 3.5. The proposed repair method shall be approved by the ENGINEER.
- C. Extend all existing control and expansion joints through any patch or repair area.

3.8 APPLICATION

- A. All coatings shall be applied in strict accordance with the manufacturer's requirements and recommendations and any specific OWNER requirements.
- B. Confirm that the ambient temperature and humidity, the prepared surface temperature and moisture content, and the temperature of the coating material to be applied are within the manufacturer's recommended ranges. Coatings shall be applied when the ambient temperature and humidity is steady or falling.
- C. The prime and finish coat (as applicable) shall be a contrasting color. The color of the final coat shall be chosen by the OWNER.
- D. Ensure that pump, hoses, gun, tip, and pressure are properly matched for the coating to be applied. Ensure that the application equipment has been properly cleaned prior to application of coating. Test spray pattern for uniformity of distribution.
- E. Protect surfaces from rapid drying due to heavy wind or hot sun.
- F. Cure coatings in strict accordance with the manufacturer's recommendations.
- G. Drying time between coats shall be as recommended by coating manufacturer.
- H. The coating shall be applied to a minimum thickness of 125 mils. The CONTRACTOR shall verify and measure the wet film thickness during the application.
- I. The CONTRACTOR shall follow coating manufacturer's requirements for bonding the coating systems to the installed sewer liner, if applicable.

3.9 REPAIR MANHOLE BENCH AND CHANNEL

- A. The CONTRACTOR shall repair manhole bench and channel with acid-resistant mortar. As a minimum, CONTRACTOR shall raise manhole channel to the same elevation as high as the crown of the pipe. Manhole bench shall be sloped as shown. Minimum mortar thickness shall be 3/4-inch.
- B. After the bench and channel have been repaired, all surfaces shall receive a coating system.
- C. If there are branch main connections at the bench elevation; the bench shall be channeled to direct the lateral flow into the main channel of the manhole.

3.10 CLEANUP

- A. Upon completion of coating, the CONTRACTOR shall remove surplus materials, protective coverings, and accumulated rubbish, and thoroughly clean all surfaces and repair any overspray, splashes, splatters or other coating-related damage. Surfaces damaged resulting from this cleanup shall also be cleaned, repaired and refinished to the original or required condition.

3.11 HOLIDAY TEST

- A. All newly coated surfaces shall be Holiday/Spark tested for holes. The spark tester used shall provide 12,500 volts for 125-mil thickness coatings. If pinholes are found, the CONTRACTOR shall repair the coating as recommended by the manufacturer and retest. All testing and repair work shall be at the CONTRACTOR'S expense.
- B. The spark testing will be performed by the CONTRACTOR and witnessed by the OWNER or OWNER'S DESIGNATED REPRESENTATIVE and shall be completed (and any repairs made) prior to the final acceptance inspection. CONTRACTOR shall give the ENGINEER 48 hours advanced notice of all scheduled holiday testing.

3.12 ADHESION TESTING

- A. The CONTRACTOR shall perform an adhesion test after proper cure for 15% of manhole structures completed on this project with a minimum of three (3) dollies per structure tested. The OWNER or OWNER'S REPRESENTATIVE will determine the structures to be tested and the location of the tests within the structure. Testing will be in accordance with ASTM D7234 to demonstrate that the specified field coatings adhere to the substrate. The adhesion test shall be witnessed by the OWNER'S REPRESENTATIVE. Test results showing an adhesion rating a minimum of 200-psi on concrete and 100-psi on brick and some portion of substrate shall be adhered to coating and dolly shall be considered acceptable.
- B. Where unacceptable test results are obtained, the CONTRACTOR shall be responsible for removing and reapplying the specified coatings at no expense to the OWNER.

3.13 PH TESTING

- A. The CONTRACTOR shall perform pH testing to the substrate after the surface has been cleaned. The surface shall be dry and have a pH greater than 7.

3.14 DRY MIL THICKNESS TESTING

- A. The CONTRACTOR shall use the adhesion test dollies to verify the dry mil thickness of the epoxy coating. Epoxy-coating systems shall have a minimum thickness of 125 mils, not including any primer or surface preparation material thickness. Where unacceptable test results are obtained, the CONTRACTOR shall be responsible for reapplying the specified coatings, per the manufacturer’s recommendation, to the required thickness at no expense to the OWNER.

3.15 PANORAMIC SCAN INSPECTION

- A. A post construction panoramic scan of each manhole shall be performed and reviewed to determine complete and correct manhole rehabilitation. All defects shall be corrected at no cost to the OWNER.

3.16 SAFETY AND VENTILATION REQUIREMENTS

- B. The CONTRACTOR shall exercise precaution at all times for the protection of persons (including employees) and property. The CONTRACTOR shall comply with the provisions of all applicable laws pertaining to such protection, including all Federal, State and local occupational safety and health acts, standards and regulations promulgated thereunder.
- C. In performance of the work, CONTRACTOR shall (a) comply with all applicable Federal, State and local statutes, regulations and ordinances regarding health and safety including, but not limited to, applicable portions of Title 29 of CFR (29 CFR 1910 and 1926; Occupational Safety and Health Administration [OSHA]); (b) prepare and comply with its own Health and Safety Plan and written safety and health procedures; and (c) comply with any applicable safety requirements established by the City of Phoenix for the site.
- D. Special attention should be given to Section 29 CFR 1910.146 and 29 CFR 1926 for Confined Spaces. By definition, the interior of the sanitary sewer manhole structure shall be considered a permit-required confined space.

++ END OF SECTION ++

SECTION 09811

LINING FOR CONCRETE SEWER MANHOLES AND STRUCTURES

PART 1--GENERAL

1.1 REQUIREMENTS

- A. Work under this Specification includes the rehabilitation of existing polyvinyl chloride (PVC) lined manhole structures. The rehabilitation shall be performed by installing repair patches as detailed on the Drawings and as specified in this section.
- B. The CONTRACTOR shall provide all materials, labor, equipment, and services as specified herein, which are necessary for:
 - 1. Traffic control, if required.
 - 2. Safe access into manhole.
 - 3. Cleaning and removal of deteriorated or detached material.
 - 4. Liner repairs as detailed on the Contract Drawings.
 - 5. Quality program.
 - 6. Sample collection for performance of required material tests.
- C. The CONTRACTOR shall furnish all samples for product testing at the request of the OWNER and those identified in the Inspection and Testing Plan as part of the Construction Quality Plan.
- D. The CONTRACTOR shall cleanup, restore existing surface conditions and structures, and repair any PVC liner segments determined to be defective.
- E. The Bid Prices submitted by the CONTRACTOR shall include all costs of permits, labor, equipment and materials for the various Bid Items necessary for furnishing and installing, complete in place, PVC liner repairs in accordance with this section. All items of the work not specifically mentioned herein which are required to make the product perform as intended and deliver the final product as specified herein shall be included in the respective lump-sum and unit prices Bid.
- F. PVC Liner Assessment:
 - 1. During development of the Drawings repair location were assumed based on limited available data; due to this limited data the corrosion protection lining system shall be assessed for all manhole structures. Refer to the Drawings for defect locations and additional information. Assessment shall be a visual inspection completed by the rehabilitation contractor to identify defects and recommend repairs. Locations of liner defects shall be physically marked within the manhole structure with repair recommendation. The rehabilitation contractor shall work closely with the

CONTRACTOR and OWNER’S Representative during the assessment to understand the defects and repair recommendations.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these Specifications.
- B. Manufacturer’s specifications and recommendations.
- C. Comply with the applicable editions of the following codes, regulations and standards.
 - 1. 2015 CITY OF PHOENIX Supplement to 2015 MAG (Maricopa Association of Governments) Specifications.
 - 2. American Society for Testing and Materials (ASTM):
 - a. ASTM D 638, Standard Test Method for Tensile Properties of Plastics.
 - b. ASTM D 790, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - c. ASTM D 412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubber and Thermoplastic Elastomers-Tension.
- D. Comply with the applicable reference Specifications as specified elsewhere in the Contract Documents.
- E. The work and installation of all equipment and materials shall comply with all provisions of the codes, regulations and standards specified above, as applicable, and other applicable federal, state and local codes, laws and regulations.
 - 1. Local Authorities:
 - a. CITY OF PHOENIX, Arizona:
 - 1) Water Services Department (WSD)
 - 2) Street Transportation Department – Right-of-Way management

1.3 CONTRACTOR SUBMITTALS

- A. Submittals shall be made as specified elsewhere in the Contract Documents.
- B. The CONTRACTOR shall submit, to the ENGINEER, a Performance Work Statement (PWS). Unless otherwise directed by the CITY, the PWS shall, at a minimum, contain the following:
 - 1. Letter stating that the liner joint repair materials meet the requirements as defined in this section.
 - 2. Detailed Installation Plan describing all site preparation work; cleaning operations; pre-repair assessment inspection of all manhole structures; installation procedure; method of welding; quality control, testing to be performed; final inspection;

- warranties furnished; and all else necessary and appropriate for a complete liner rehabilitation.
3. Description of the liner materials to be furnished for the project. Materials shall be fully detailed in the submittals and conform to this section.
 4. Letter from the PVC liner manufacturer accepting the Installer of the PVC liner repairs and stating Installer's past experience in installation of manufacturer's material.
 5. Letter from the CONTRACTOR documenting a minimum of 3 years of continuous experience installing liner repairs in manhole, and similar configuration as included in this Contract. The lead personnel, including the superintendent, the foreman and the lead crew personnel for the PVC liner installation shall have a minimum of 3 years of total experience with the PVC liner repairs and shall have demonstrated competency and experience to perform the work. The name and experience of each lead individual performing work shall be submitted. In addition, all installers that will be performing welding shall be prequalified by the lining material manufacturer and possess current certification with photo identification to be kept on-site during welding work.
 6. Manufacturer's literature, illustrations, installation procedures, specifications and engineering data, including materials, dimensions, installation ambient temperature range, and weight of PVC liner material.
 7. Detailed procedures for welding of weld strips.
- C. Product Submittals: The following submittals shall be provided in accordance with the General Requirements.
1. Complete shop drawings, including description of installation.
 - a. PVC liner spot repair details.
 2. Complete materials list.
 3. PVC welder/installer certifications from lining material manufacturer.
 4. Quality-control test procedures with anticipated levels of passing test results.
 5. Manufacturer's shipping, storage and handling recommendations for all components of the PVC liner system.
 6. All Material Safety Data Sheets (MSDS) for all materials to be furnished for the project.

1.5 QUALITY ASSURANCE

- A. CONTRACTOR shall establish and maintain an effective Quality Control/Quality Assurance Program, as part of the submittal process.
- B. A detailed Quality Control Plan with Inspection and Testing Plan shall be submitted to the ENGINEER and OWNER, as part of the submittal process.
- C. CONTRACTOR Qualifications:
1. Applicators: The application of plastic liner to forms and other surfaces shall be considered as highly specialized work. Personnel performing this type of work shall be trained in methods of installation and shall demonstrate their ability to the ENGINEER.

2. Welders: Each welder shall prequalify by successfully passing a welding test before doing any welding. Requalification may be required at any time deemed necessary by the ENGINEER. All costs associated with qualification and requalification of welders shall be borne by the CONTRACTOR. All test welds shall be made in the presence of the CITY representative and shall consist of the following:
 - a. Two pieces of liner, at least 15 inches long and 9 inches wide, shall be lapped 1-1/2 inches and held in a vertical position.
 - b. A welding strip shall be positioned over the edge of the lap and welded to both pieces of liner. Each end of the welding strip shall extend at least 2 inches beyond the liner to provide tabs.
 - c. The weld specimen shall be submitted to the ENGINEER and shall be tested as follows:
 - 1) Each welding strip tab, tested separately, shall be subjected to a 10-pound pull, normally to the face of the liner with the liner being held firmly in place. There shall be no separation between the welding strip and liner when the welding tabs are submitted to the test pulls.
 - 2) Three test specimens shall be cut from the welded sample and tested in tension across the welds. Tensile strength measured across the welded joint shall be at least 2000 pounds per square inch (psi). If none of the specimens fail when tested as specified herein, the weld will be considered as satisfactory in tension.
 - 3) If one of the specimens fails to pass the tension test, a retest will be permitted. The retest shall consist of testing three additional specimens cut from the original welded sample. If all three of the retest specimens pass the test, the weld shall be considered satisfactory.
 - 4) A disqualified welder may submit a new welding sample when, in the opinion of the ENGINEER, there has been sufficient off-the-job training or experience to warrant reexamination.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery of tools, equipment and material shall be coordinated by the CONTRACTOR to minimize storage time and not delay the work.
- B. The CONTRACTOR shall be responsible for negotiating directly with the CITY to secure a staging area for the duration of the work, if required.
- C. All materials, shipped to the project site, shall be accompanied by test reports certifying that the material conforms to the ASTM standards listed herein. Materials shall be shipped, stored, and handled in a manner consistent with written recommendations of the PVC liner system manufacturer to avoid damage. Damage includes, but is not limited to, gouging, abrasion, flattening, cutting, puncturing, or ultra-violet degradation. All damaged materials shall be promptly removed from the project site at the CONTRACTOR's expense and disposed of in accordance with all current applicable agency regulations.

- D. The CONTRACTOR shall inspect the product prior to installation and any defects found shall be immediate cause for rejection and removal from the project site.

1.7 WARRANTY

- A. The materials used for the project shall be certified by the manufacturer for the specified purpose. The manufacturer shall warrant the PVC liner material to be free from defects in raw materials for 1 year after the date of Final Acceptance by the CITY. The CONTRACTOR shall guarantee and warrant the installation as described elsewhere in the Contract Documents
- B. During the CONTRACTOR warranty period, defects affecting the integrity, strength, function and/or operation of the manhole, shall be repaired at the CONTRACTOR’s expense.

PART 2 - PRODUCTS

2.1 PVC LINING REPAIR MATERIALS

- A. For “Large Patch” PVC repairs, mechanical anchors shall be 1/4-inch diameter Zamac nail with mushroom head or approved equal. Minimum anchor length shall be 1-1/4-inch
- B. The PVC liner material shall be tested in accordance with the chemical resistance and other requirements of Standard Specifications for Public Works Construction (SSPWC) Section 211-2 Chemical Resistance Test (Pickle Jar). Submit proof of meeting these requirements to ENGINEER.

2.2 PHYSICAL PROPERTIES

- A. Plastic liner plate sheets, welding strips and other accessories shall have the following physical properties when tested at 77°F ±5°.

Table 1. Minimum Physical Properties		
Property	Initial	(Par.2.4)
Tensile Strength	2,200-psi min. (15 MPa min.)	2,100-psi min. (14.5 MPa min.)
Elongation at Break	200% min.	200% min.
Shore Durometer, Type D (with respect to initial test results)	1-sec. 50-60 10-sec. 35-50	±5 ±5
Weight Change		±1.5%

2.3 CHEMICAL RESISTANCE

- A. After conditioning to constant weight at 110°F (43°C), tensile specimens and weight-change specimens shall be exposed to the following solutions for a period of 112 days at 77°F ±5° (25°C ±3°). At 28-day intervals, tensile specimens and weight-change specimens shall be removed from each of the chemical solutions and tested in accordance with paragraph 2.1B. If any specimen fails to meet the 112-day requirement before completion of the 112-day exposure, the material will be subject to rejection.

Chemical Solution	Concentration
Sulfuric Acid	20% **
Sodium Hydroxide	5%
Ammonium Hydroxide	5% **
Nitric Acid	1% **
Ferric Chloride	1%
Sodium Hypochlorite	1%
Soap	0.1%
Detergent (linear alkyl benzyl sulfonate or LAS)	0.1%
Bacteriological	BOD not less than 700 ppm

2.4 ADHESIVES AND CLEANERS

- A. Adhesives, solvents, and activators shall be submitted to the ENGINEER for acceptance. Adhesives shall be limited to those products accepted by the ENGINEER. No adhesive shall be applied to liner or liner strips which will deleteriously affect the liner or strip.
- B. Adhesive products and flammable solvents shall not be used in connection with plastic liner with locking extensions.
- C. Cleaning agents for use with plastic liner with locking extensions shall be water-soluble or dispersible, nonflammable, and not detrimental to the plastic liner.

PART 3 - EXECUTION

3.1 PREPARATION

- A. The CONTRACTOR shall procure encroachment permit(s) and implement traffic control, if required in the permit.

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- B. The CONTRACTOR shall be responsible for all required notifications prior to performing the work. Notifications shall include the ENGINEER, CITY, and any other agencies involved with the work.
- C. CONTRACTOR shall inspect all surfaces within the manhole structure to receive liner repairs prior to surface preparation. CONTRACTOR shall notify ENGINEER of any disparity in the quantity of repairs and of surfaces which may interfere with the proper preparation, or application of the lining system.
- D. Where reinforcing steel cross sectional area loss exceeds 15% of the original reinforcing steel, the OWNER'S Representative shall be notified to quantify and evaluate the defect. The CONTRACTOR shall perform structural repair as directed by the ENGINEER. Payment for this work will be from the OWNER'S Allowance and a case-by-case basis.
- E. PVC liner installation shall be in accordance with the manufacturer's specifications as described and submitted in the PWS.

3.2 INSTALLATION OF TYPE P-1 MODIFIED JOINT

- A. New PVC Joints Over Existing Field Joints:
 - 1. A Type P-1 Modified joint will be used with in the manhole barrel and chimney areas at weld strip failures.
 - 2. Field joints at the pipe joints shall be Type P-1 (modified) with 6-inch wide (or wider as needed to weld onto sound PVC liner material) joint strip and 1-inch wide weld strips as depicted on Design Drawing details. Type P-1 (modified) joint shall be centered over the existing pipe joint.
 - 3. Edge of new 6-inch wide (or wider as needed to weld onto sound PVC liner material) joint strip shall be heat-fuse welded to the existing PVC lining along the circumference of the pipe on both edges of the new joint, along with 1-inch weld strips at the edges per Design Drawings
 - 4. Surface preparation shall be per manufacturer's recommendations.
 - 5. In situations where concrete substrate loss is greater than or equal to 1/2-inch wall loss, install material per manufacturer's recommendations and per Drawing Details after removing detached PVC liner. In locations that have concrete substrate loss less than 1/2-inch wall loss, utilize plain-sheet PVC liner for the repair, per manufacturer's recommendations. Concrete substrate shall be clean, sound, dust-free, and dry.

3.3 APPLICATION OF PLASTIC LINER WITH ADHESIVE

- A. Concrete Surfaces:
 - 1. The concrete surface shall be etched by sandblasting to develop a slightly granular surface. Permits for the equipment and allowable methods from the Maricopa County Air Quality Division shall be posted on or near sandblasting equipment as required.

When permitted by the ENGINEER, the concrete surface may be acid-etched in lieu of being sandblasted.

2. After the sandblasting, the concrete surface shall be thoroughly cleaned of dust. Surfaces etched with acid shall be thoroughly dried before applying primer.
3. The concrete surface shall receive two brush coats of an approved primer. Coverage shall not exceed 250 square feet per gallon for each coat of primer. The first coat of primer shall be thinned with an equal amount of approved thinner. The first primer coat shall be permitted to dry for at least 2 hours before the application of the second primer coat. The second coat of primer shall be applied unthinned and permitted to dry for at least 4 hours.
4. The concrete surface and the back surface of the liner shall each be given two coats of an approved adhesive. Allow 2 hours drying time between applications. Coverage shall not exceed 250 square feet per gallon for each coat of adhesive.
5. One coat of an approved activator shall be applied to both the adhesive coat on the liner and the adhesive-coated concrete. Application of activator shall be limited to the extent that the application of coated liner can be completed within a 20-minute period. The activator shall be applied evenly by brushing. Coverage of the activator shall not exceed 500 square feet per gallon.
6. When the surface of the adhesive is tacky to the touch, the liner shall be positioned with one edge firmly pressed down. The liner shall then be rolled into place, care being taken to avoid the formation of air pockets. All joints shall be tight-fitting butt joints. The surface of the liner shall be rubbed vigorously to secure the liner.
7. Corner and welding strips shall be positioned over all joints and welded in place.

3.4 APPLICATION OF PLASTIC LINER TO STEEL SURFACES

- A. All steel surfaces to which plastic liner is to be applied shall be sandblasted, leaving surfaces free of all mill scale, rust, grease, moisture, and other deleterious substances. All interior welds shall be ground smooth and all weld spatters removed. After welds are ground, weld metal shall not project more than 1/16-inch above the structure surface. If field-welding is required, the plastic liner shall not be installed closer than 12 inches to the weld. Plastic liner shall be installed in the weld area after welding on the steel has been completed.
- B. The application of primer, adhesive, activator, and liner to steel surfaces shall conform to the requirements set forth herein for bonding of liner to concrete surfaces with adhesive. All field joints shall be tight-fitting butt joints. After the liner has been applied to steel surfaces, corner strips or welding strips shall be applied over all joints and welded in place.

3.5 TESTING

- A. Inspections:
 1. The CONTRACTOR shall notify ENGINEER of impending completion of surface cleaning, prior to PVC lining.

2. The notifications shall be given a minimum 24 hours in advance of PVC lining repairs and any testing, including adhesion testing and spark testing. Failure to provide notification at these designated times/work stages may prevent the acceptance of the work by the ENGINEER.
- B. Adhesion/Bond Testing:
1. The CONTRACTOR shall perform an adhesion test with a thin-bladed chisel after proper heat-fuse welding of the PVC material in accordance with manufacturer's recommended procedures. Costs associated with weld-testing are incidental to the unit price cost of lining.
 2. Where unacceptable test results are obtained, the CONTRACTOR shall be responsible for re-welding at no additional expense to the CITY.
- C. Holiday Testing: Testing shall be as specified in CITY OF PHOENIX Supplement to MAG Section 741.8
- D. Acceptance of the completed work is subject to inspection by the OWNER or OWNER'S Representative. If the overall quality of the materials and installations is found to be unacceptable in the opinion of the OWNER, repair and retesting will be required.

3.6 REPAIRS OF PVC LINING SYSTEM

- A. Visible pinhole defects shall be cleaned and sealed with a 1-inch wide heat-fused weld strip.
- B. All blisters, splits and damage to the existing PVC lining shall be prepared to a point 1-inch beyond the limits of the damaged lining area.
- C. Blisters splits and damage to the existing PVC lining shall be completely removed to a 1-inch minimum beyond the repair area.
- D. Repairs larger than 18 inches in any direction shall be brought to the attention to the ENGINEER for review and approval of proposed repair procedure.

3.7 CLEANUP

- A. Upon completion of PVC lining, the CONTRACTOR shall remove surplus materials, protective coverings, and accumulated rubbish, and thoroughly clean all surfaces.
- B. All discarded materials shall be disposed of properly. Cleanup and disposal of discarded material shall be at no additional cost to the CITY OF PHOENIX or representative.

++ END OF SECTION ++