



City of Phoenix
OFFICE OF THE CITY ENGINEER
DESIGN AND CONSTRUCTION PROCUREMENT
200 West Washington Street, 6th Floor
Phoenix, Arizona 85003-1611

**DEER VALLEY AIRPORT
TAXIWAY BRAVO (B)3 CONNECTOR RELOCATION
DESIGN BID BUILD
AV31000088 FAA / ADOT**

ADDENDUM NO. 1

ISSUE DATE: May 15, 2019

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on **May 21, 2019**, are amended as follows:

QUESTIONS AND ANSWERS:

- Q1. For SGN-10, I'm assuming the new panels required are to be bid under item 70. Can you confirm?**
- A1:** The Three new panels in this 3-Mod sign are bid under Item 72 of the revised and attached Addendum No. 1 Bid Proposal – New Size 1 Panels Installed in Existing Sign.
- Q2. Under what bid item should the new base for this sign be bid?**
- A2:** A new bid item has been added as stated in this addendum. See attached Addendum No. 1 Bid Proposal.
- Q3. The solicitation online states to submit an electronic version and hard copy of our bids, can you please confirm?**
- A3:** You are required to follow the instructions as stated in the Call for Bids (C.F.B. – 1 thru 2) and Information for Bidders (I.F.B. – 2 thru 17).

SPECIFICATIONS:

- 1. REPLACE: BID PROPOSAL Pages P. – 1 thru P. – 5:** Delete pages P. – 1 thru P. – 5 in their entirety and replace with the attached revised BID PROPOSAL pages P. – 1 thru P. – 5.
- 2. REPLACE: ELECTRICAL SPECIFICATION ITEM L-858(L):** Delete this specification in its entirety and replace with the attached revised Specification ITEM L-858(L) LED AIRPORT GUIDANCE LIGHTING SYSTEMS (SIGNAGE).

3. **REPLACE: SECTION III-C CIVIL TECHNICAL SPECIFICATIONS TABLE OF CONTENTS:** Delete page i in its entirety and replace with the attached revised TABLE OF CONTENTS page i.
4. **ADD: CIVIL TECHNICAL SPECIFICATION ITEM P-100:** Add attached P-100 Contractor Quality Control, pages P-100-1 to P-100-2 to Section III-C CIVIL TECHNICAL SPECIFICATIONS.

NOTE: Bidders must acknowledge receipt of this Addendum by listing the number and date, where provided, on the PROPOSAL P - 1

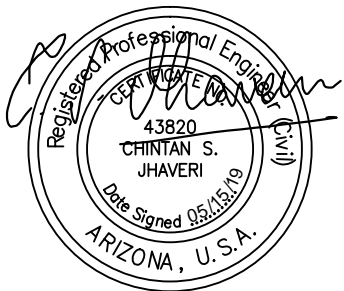
Attachments:

**Addendum No. 1 P.-1 – P.-5 Bid Proposal
Electrical Specification Item L-858(L)
Section III-C Civil Technical Specifications Table of Contents
Civil Technical Specification Item P-100**

*******END OF ADDENDUM NO. 1*******

Alfonso Sanchez
Project Manager
City of Phoenix Aviation Department

DESIGN ENGINEER'S SEAL:



EXPIRES 03-31-21

BID PROPOSAL
CITY OF PHOENIX, ARIZONA
OFFICE OF THE CITY ENGINEER
PROJECT TITLE: DVT BRAVO (B)3 CONNECTOR RELOCATION
PROJECT No.: AV31000088 FAA/ADOT
BOND ISSUE OR BUDGET PROJECT

PROPOSAL to the City Engineer of the City of Phoenix.

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

(Print or type contractor name)

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

Understands that construction of this project will be in accordance with all applicable Maricopa Association of Governments' (MAG) Uniform Standard Specifications and Uniform Standard Details, 2012 revision, and the City of Phoenix Supplements, 2012 revision to the MAG Uniform Standard Specifications and Details, except as otherwise required by the project plans and specifications.

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

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

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

Work will be completed within 90 calendar working days, beginning with the day following the starting date specified in the Notice to Proceed. The time allowed for completion of the work includes lead time for obtaining the necessary materials and/or equipment and approvals.

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

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

LINE NO.	ITEM NO.	DESCRIPTION	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT
1	M-003-8.1	Airport Safety and Security	LS	1		
2	U-200-6.1	Location of Underground Utilities	LS	1		
3	SP-11.1	Project Field Office	LS	1		
4	SP-30.1	Construction Survey Layout	LS	1		
5	SP-31.1	Miscellaneous Removals and Other Work (Allowance)	Allowance	1	\$125,000.00	\$ 125,000.00
6	SP-33.1	Adjust Existing Manhole to Finished Grade, MAG 422	EA	1		
7	SP-33.2	Sawcut and Remove Inlet, Construct Concrete Cap	EA	1		
8	SP-34.1	Unforeseen Utility Locating (Allowance)	HR	16		
9	SP-35.1	Existing Utility Relocations (Allowance)	Allowance	1	\$76,500.00	\$ 76,500.00
10	SP-37.1	Remove and Stockpile Crushed Aggregate Slope Protection	SY	15,252		
11	SP-38.1	Haul and Place Crushed Aggregate Slope Protection	SY	28,175		
12	SP-39.1	Install Rip Rap Apron Pad (D50 = 9", Depth = 2')	CY	7		
13	P-100-3.1	Contractor Quality Control	LS	1		
14	P-101-5.1	Remove Asphalt Concrete Pavement	SY	16,743		
15	P-101-5.2	Sawcut Asphalt Concrete Pavement Full Depth	LF	1,320		
16	P-102-4.1	Mobilization/Demobilization (Maximum 4%)	LS	1		
17	P-151-4.1	Clearing and Grubbing	LS	1		
18	P-152-7.1	Unclassified Excavation	CY	5,400		
19	P-152-7.2	Over Excavation of Unsuitable Materials and Backfill with Select Material (Allowance)	CY	550		
20	P-155-8.1	Lime Treated Subgrade (12", 5.5%)	SY	10,512		
21	P-156-6.1	Stormwater Pollution Prevention Plan	LS	1		
22	P-209-5.1	Crushed Aggregate Base Course (9")	SY	9,382		
23	P-401-8.1.1	Bituminous Surface Course	TON	4,255		
24	P-603-5.1	Bituminous Tack Coat	SY	14,204		

25	P-620-5.1	Yellow Runway and Taxiway Paint	SF	3,801		
26	P-620-5.2	White Runway and Taxiway Paint	SF	578		
27	P-620-5.3	Red Runway and Taxiway Paint	SF	1,435		
28	D-701-6.1	18" RGRCP Class V Per D-701	LF	785		
29	D-701-6.2	24" RGRCP Class V Per D-701	LF	280		
30	D-751-6.1	Airfield Concrete Catch Basin (Single Grate) Per COP STD DTL P1570	EA	3		
31	D-751-6.2	Airfield Concrete Catch Basin (Double Grate) Per COP STD DTL P1570	EA	1		
32	D-751-6.3	Airfield Concrete Catch Basin (Triple Grate) Per COP STD DTL P1570	EA	1		
33	D-751-6.4	Storm Drain Manhole Base, MAG STD DTL 520	EA	1		
34	D-752-5.1	Reinforced Concrete Headwall, MAG Std. Dtl 501, Type 'U', with Trash Rack, MAG Std Dtl 502	EA	1		
35	L-100-5.1	Remove and Salvage TW Edge Light and Isolation Transformer, Demo Base Can	EA	74		
36	L-100-5.2	Remove and Salvage TW Edge Light and Isolation Transformer, Base Can to Remain	EA	4		
37	L-100-5.3	Remove and Salvage RW Threshold Light and Isolation Transformer, Demo Base Can	EA	8		
38	L-100-5.4	Remove and Salvage Elevated Runway Guard Light and Isolation Transformer, Demo Base Can	EA	2		
39	L-100-5.5	Remove and Salvage In-Pavement Runway Guard Light and Isolation Transformer, Demo Base Can	EA	10		
40	L-100-5.6	Remove and Salvage Taxiway Guidance Sign and Isolation Transformer, Demolish Sign Base	EA	13		
41	L-100-5.7	Remove and Salvage Taxiway Guidance Sign and Isolation Transformer, Sign Base to Remain	EA	1		
42	L-100-5.8	Remove and Salvage Existing LED REILs, Power Equipment and Wiring, Demo Concrete Foundations (Pair - Master and Slave Units)	EA	1		
43	L-100-5.9	Excavate and Remove Existing Conduit and Conductor	LF	6,930		
44	L-100-5.10	Remove Existing Conductor, Conduit to Remain (3615 LF)	LS	1		
45	L-100-5.11	Provide Temporary Airfield Power Cable Jumpers and Cover Signs as Required	LS	1		
46	L-100-5.12	Excavate and Remove Existing Junction Can	EA	3		
47	L-100-5.13	Excavate and Remove Existing Duct Marker for Re-Installation	EA	2		
48	L-100-5.14	Salvaged Elevated LED Runway Guard Light and Isolation Transformer on New L-867 Base Can	EA	2		
49	L-100-5.15	Install Salvaged REIL (Master and Slave Pair) and Power Equipment, New Wiring on New Concrete Foundations Complete	EA	1		

50	L-108-5.1	L-824, Type C, 1/C #8 AWG, 5kV Cable w/ #6 Ground	LF	7,655		
51	L-108-5.2	L-824, Type C, 2/C #8 AWG, 5kV Cable w/ #6 Ground	LF	3,545		
52	L-110-5.1	Single-way (1) - 2" Conduit, Slurry Encased	LF	6,270		
53	L-110-5.2	Single-way (1) - 2" Conduit, Concrete Encased	LF	480		
54	L-110-5.3	Multiple-way (3) - 2" Ductbank, Slurry Encased	LF	75		
55	L-110-5.4	Multiple-way (4) - 2" Ductbank, Slurry Encased	LF	485		
56	L-110-5.5	Multiple-way (4) - 2" Ductbank, Concrete Encased	LF	225		
57	L-110-5.6	Re-Install Removed Duct Marker	EA	2		
58	L-115-5.1	New Handhole, Type I, Air Craft Rated (4'x4'x4') Furnished and Installed with Aircraft Rated Lid	EA	4		
59	L-115-5.2	Install RGL Circuit Isolation Boxes and Conduit in New Handhole	EA	2		
60	L-115-5.3	Install New Cable Racks and Remove Concrete from Sump Drain / Drill New In Existing Hand Hole	EA	6		
61	L-852D-4.1	Install New L-852D, Incandescent, Bi-Directional (G / Y), In-Pavement, Displaced Runway Threshold Light and Isolation Transformer on New L-868 Base with 1" Spacer, Flange with Dam Ring and Multi-Hole Adapter Ring	EA	2		
62	L-852D-4.2	Install New L-852D, Incandescent, Bi-Directional (G / Obscure), In-Pavement, Displaced Runway Threshold Light and Isolation Transformer on New L-868 Base with 1" Spacer, Flange with Dam Ring and Multi-Hole Adapter Ring	EA	6		
63	L-852D-4.3	New L-852D, Incandescent, Bi-Directional (G / Y), In-Pavement, Displaced Runway Threshold Light and Isolation Transformer - Spare	EA	1		
64	L-852D-4.4	New L-852D, Incandescent, Bi-Directional (G / Obscure), In-Pavement, Displaced Runway Threshold Light and Isolation Transformer - Spares	EA	2		
65	L-858(L)-5.1	New Size 1 L-858(L) LED 2-Module Guidance Sign and Isolation Transformer, on New Concrete Base w/ 3' Asphalt Maintenance Pad	EA	2		
66	L-858(L)-5.2	New Size 1 L-858(L) LED 2-Module Guidance Sign and Isolation Transformer, on Existing Concrete Base	EA	1		
67	L-858(L)-5.3	Salvaged Size 1 L-858(L) LED 2-Module Guidance Sign and Isolation Transformer, on New Concrete Base w/ 3' Asphalt Maintenance Pad	EA	1		
68	L-858(L)-5.4	Salvaged Size 1 L-858(L) LED 3-Module Guidance Sign and Isolation Transformer, on New Concrete Base w/ 3' Asphalt Maintenance Pad	EA	1		
69	L-858(L)-5.5	New Size 2 L-858(L) LED 2-Module Guidance Sign and Isolation Transformer, on New Concrete Base w/ 3' Asphalt Maintenance Pad	EA	1		
70	L-858(L)-5.6	New Size 1 L-858(L) LED 3-Module Guidance Sign and Isolation Transformer, on New Concrete Base w/ 3' Asphalt Maintenance Pad	EA	4		
71	L-858(L)-5.7	New Size 1 L-858(L) LED 4-Module Guidance Sign and Isolation Transformer, on New Concrete Base w/ 3' Asphalt Maintenance Pad	EA	2		
72	L-858(L)-5.8	New Size 1 Sign Panels Installed in Existing Sign	EA	11		
73	L-858(L)-5.9	New 24" Concrete Sign Base Extension Installed to Extend Existing Sign Base - If Required (Contingency Item)	EA	1		
74	L-858(L)-5.10	New 36" Concrete Sign Base Extension Installed to Extend Existing Sign Base - If Required (Contingency Item)	EA	1		

75	L-861T-4.1	New Elevated L-861T Taxiway Edge Light (Incandescent Quartz) and Isolation Transformer on New L-867 Base Can	EA	9		
76	L-861T-4.2	New Elevated L-861T Taxiway Edge Light (Incandescent Quartz) and Isolation Transformer on New L-867 Base Can - Retrofit in Existing Asphalt Pavement	EA	2		
77	L-861T-4.3	New Elevated L-861T Taxiway Edge Light (Incandescent Quartz) and Isolation Transformer w/ L-867 Extension on Existing Shallow L-867 Base Can	EA	7		
78	L-861T-4.4	New Elevated L-861T(L) LED Taxiway Edge Light and Isolation Transformer on New L-867 Base Can	EA	26		
79	L-861T-4.5	Salvaged Elevated L-861T(L) LED Taxiway Edge Light and Isolation Transformer on New L-867 Base Can	EA	39		
80	L-861T-4.6	Elevated L-861T(L) LED Taxiway Edge Light (with Stem and Frangible Coupling) and Isolation Transformer - Spares	EA	3		
		TOTAL BASE BID (ITEMS 1 THRU 80 - INCLUSIVE)				Total \$
& _____/100 DOLLARS						
WRITTEN WORDS						

ITEM L-858(L) LED AIRPORT GUIDANCE LIGHTING SYSTEMS (SIGNAGE)

DESCRIPTION

858(L)-1.1 RELATED DOCUMENTS. The General Provisions of the Contract, including General and Special Conditions apply to work specified in this Item.

858(L)-1.2 GENERAL. This Item shall consist of internally lighted LED airport taxiway guidance signage furnished and installed in accordance with this specification, the referenced specifications, the manufacturer's recommendations, and the applicable codes, standards and Advisory Circulars. The signs shall be installed at the locations and in accordance with the dimensions, design, and details shown in the plans. This item shall include the furnishing of all equipment, materials, services, and incidentals necessary to place the systems in operation as completed units to the satisfaction of the RE, including concrete cast in place or precast sign bases with transformer enclosure, cover and gasket and an external sign grounding electrode system. Also included are temporarily mounted existing taxiway guidance signs, to be temporarily installed during construction phasing.

858(L)-1.3 FAA ADVISORY CIRCULARS AND STANDARDS.

a. Airfield signs and related materials covered by FAA specifications shall have the prior approval of the Federal Aviation Administration, Airports Service, Washington, DC 20591, and shall be certified by an approved laboratory such as ETL as conforming with applicable FAA standards and requirements, or shall be verified as exceeding FAA standards as required by these specifications.

b. All other equipment and material covered by other referenced specifications shall be subjected to acceptance through manufacturer's certification of compliance with the applicable specification. All electrical materials and equipment for which there is a nationally recognized standard shall bear the conformance labeling of the third party inspection authority, such as Underwriters Laboratories, Inc., Factory Mutual, ETL, or approved equal.

c. The following documents, of the issue in effect on date of application for qualification, are applicable to the extent specified:

Federal Aviation Administration (FAA) Advisory Circulars.

AC 150/5340-18F	Standards for Airport Sign Systems
AC 150/5340-30J	Design and Installation Details for Airport Visual Aids.
AC 150/5345-26D	Specification for L-823 Plug and Receptacle, Cable Connections (including Changes 1 & 2).



AC 150/5345-42H	Specification for Light Base and Transformer Housings, Junction Boxes and Accessories.
AC 150/5345-44K	Specification for Taxiway and Runway Signs.
AC 150/5345-47C	Isolation Transformers for Airport Lighting Systems.
AC 150/5345-53D	Airport Lighting Equipment Certification Program Federal Specification

L-S-300	Sheeting and Tape -- Reflective; Non-exposed Lens, Adhesive Backing
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Military Standard

MIL-STD-810	Environmental Test Methods
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American Society for Testing and Materials (ASTM)

ASTM D 4956	Specification for Retro reflective Sheeting for Traffic Control
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National Fire Protection Association (NFPA)

NFPA 70	National Electrical Code
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(Copies of FAA Advisory Circulars may be obtained from the Department of Transportation, Publications Section, M-494.3, Washington, DC 20590).

(Copies of Federal Specifications may be obtained from General Services Administration offices in Washington, DC, Atlanta, Boston, Denver, Chicago, Kansas City, New York, San Francisco, and Seattle).

(Copies of Military Standards may be obtained from the Commanding Officer, Naval Supply Depot, 5801 Tabor Avenue, Philadelphia, PA 19120, and Attention: Code CDS).

The signs shall meet or exceed FAA requirements when subjected to the qualification tests as described in the latest edition of AC 150/5345 – 44K.

The installation of Underground Cable for Airports, Airport Underground Electrical Duct, and Airport Lighting Systems that are not a part of this item are covered under the separate respective items of these specifications.

858(L)-1.4 SHOP DRAWINGS AND MATERIAL LISTS. Prior to the installation of any material and equipment and within 30 days of contract award, the Contractor shall submit to the Owner for approval six (6) copies of manufacturers' brochures or Electronic PDF containing complete dimensional and performance characteristics, installation and operation instructions, etc., for the following equipment: This list shall include the name of each item, the Federal



Aviation Administration specification number, the manufacturer's name, the manufacturer's catalog number, and the size, type and/or rating of each item.

- a) Shop drawings shall be submitted showing: installation requirements (i.e., foundation size, anchor bolt location, etc.); sign assembly, including all fabrication assembly and internal and external wiring diagrams; message layout for each sign; and tabulation of total volt-ampere (VA) for each sign at highest intensity step.
- b) Catalog cuts shall be submitted showing: sign and sign base (features and accessories, installation details); results of tests performed by an independent laboratory testing source in accordance with AC 150/5345-44K addressing visual examination, wind load and frangibility load tests, photometric test results with luminance maps, environmental tests, production tests; load data for all brightness steps, as measured from the primary side of the isolation transformer, and power factor; lamp life.
- c) Sign schedules including sign numbers and face panel descriptions.
- d) Steel L-867 base and steel cover (sign base and transformer enclosure.)
- e) Dimensioned and detailed pre-cast concrete bases.
- f) Manufacturer's statement of warrantee (see Paragraph 858-2.8)

In addition to the above specific items, a materials list shall be submitted listing each specification paragraph number and stating whether the materials proposed are as specified or are substitutions. If the item is a substitute item, a complete submittal as described in the above paragraph shall be provided for that item.

The submittal shall be complete and made in one submission in booklet form with hardbound cover. Partial submissions will not be reviewed or considered.

858(L)-1.5 MATERIAL DELIVERY SCHEDULE AND REQUIREMENTS. All signs and associated materials, (transformers and connecting cables, transformer housings, anchor bolts, floor flanges, breakable couplings, and incidental mounting hardware), for the project shall be procured under this contract in accordance with the material delivery directed by the RE. The following material distinction is made to define the material to be delivered:

- a. **Mounting Hardware.** Mounting hardware shall include detailed installation shop drawings as prepared by the sign supplier and approved by the RE, transformer housings, anchor bolts and floor flange templates, and sign markers (blank).
- b. **Sign.** Signs shall include the actual sign to be installed, transformer and connecting cables, floor flanges, breakable couplings, tethers, and all other incidentals necessary to provide a complete and operable sign.

EQUIPMENT AND MATERIALS



858(L)-2.1 GENERAL. Taxiway guidance signs, hereinafter referred to as "Signs," shall be retro-reflective and shall be the internally illuminated, use a LED (light emitting diode) technology and shall be ETL certified, conforming to AC 150/5345-44K, other referenced publications, and to the requirements of this Section. In the event of conflict, the more stringent of these shall apply. The signs shall have a record of having operated successfully for a minimum period of one year at an airport located in the continental United States. The sign manufacturer shall have minimum five years' experience in the manufacture of lighted airfield signs to FAA requirements.

Airport signage equipment and materials covered by FAA specifications shall have the prior approval of the Federal Aviation Administration, Airports Service, Washington, D.C. 20591, and shall be listed in Advisory Circular 150/5345-53D, Airport Lighting Equipment Certification Program.

All other equipment and materials covered by other referenced specifications shall be subject to acceptance through the manufacturer's certification of compliance with the applicable specifications and subject to Owner's approval.

Lists of the equipment and materials required for a particular system are contained in the applicable Advisory Circulars.

Match existing signs, new airport signs shall be curved face Lumacurve as manufactured by Standard Signs Inc., or approved equal, to match existing airfield signage. The Airport/Owner desires to achieve and maintain standardized airfield lighting equipment in order to reduce costs by minimizing replacement parts inventory and maintenance training.

858(L)-2.2 SIGN CLASSIFICATION. The classification of each sign shall be as shown on the Construction Drawings and as specified below:

a. Types. Signs of the following types are included:

(1) Type L-858R. Mandatory Instruction Sign. White Legend on a red background.

(2) Type L-858Y. Direction, Destination, and Boundary Sign. Black legend on a yellow background.

(3) Type L-858L. Taxiway Location Sign. Yellow legend and border on a black background.

b. Sizes. Signs of the following sizes are included:

(1) Size 1. 18-inch Sign Face with a 12-inch legend.

(2) Size 2. 24-inch Sign Face with a 15-inch legend.



c. Styles. Signs of the following styles are included:

- (1) **Style 2.** Powered from a 3-step series lighting circuit with a current range of 4.8 to 6.6 amperes (A).

d. Classes. Lighted signs of the following classes are included:

- (1) **Class 1.** Operation for -4° degrees Fahrenheit (F) (-20° degrees Celsius (C)) to 131° degrees F (55 degrees C) environment.

e. Modes of Signs. Signs of the following modes are part of this specification:

- (1) **Mode 2** – must withstand wind loads of 200 mph.

858(L)-2.3 EQUIPMENT TO BE SUPPLIED. The sign shall be complete in accordance with all specification requirements and shall include mounting legs and hardware, an electrical disconnect, any required series circuit adapter unit, and an instruction booklet.

858(L)-2.4 ENVIRONMENTAL REQUIREMENT. The signs, including all required components, shall be designed for continuous outdoor use under an ambient temperature range from -20 degrees C to +55 degrees C. The signs shall be capable of withstanding wind velocities up to 200 mph and exposure to driving rains.

858(L)-2.5 TAXIWAY GUIDANCE SIGN CONSTRUCTION FEATURES.

a. Sign Construction. Taxiway Guidance Signs shall be manufactured and furnished only by a supplier currently listed and approved under the FAA Airport Lighting Equipment Certification Program

- (1) Signs shall be constructed of lightweight, nonferrous materials, and shall be designed for installation on a concrete pad foundation. All required mounting hardware, except anchor bolts, shall be supplied with the sign. Loose parts shall be tethered to, or otherwise prevented from blowing away from, the installed sign enclosure. All screws or latches shall be the captive type, and shall be easy to open and close.
- (2) Mounting legs for each sign shall have frangible points located 2 inches or less above the concrete pad foundation. The frangible points shall withstand wind loads due to jet blast of 200 mph, as simulated by an applied static load of 0.9 psi, but shall break before reaching an applied static load over the legend panel of 1.3 psi. Legend panels and panel supports shall withstand, at a minimum, the pressure at which the frangible points break.
- (3) Taxiway guidance signs shall be of a modular design. Individual sign panel construction shall not exceed 42 inches in length. Sign panel shall be top load installed for maintenance efficiency.
- (4) To insure reduced energy and maintenance requirements, the L-858 sign light source shall utilize an energy efficient, long life LED type lamp or engineer



approved equal. Lamps shall be 4W with an estimated life of 25,000 hours. To facilitate quick lamp changes without the use of tools, lamps shall utilize a screw base socket. All sign configurations shall have a power factor of .92 or higher as measured on the primary of the L-830 isolation transformer. Sign systems must operate on both medium intensity (4.8A – 6.6A) and high intensity (2.8A – 6.6A) circuits without internal modification to give the airport maximum flexibility in sign usage and minimize parts to be stocked. To maximize maintenance personnel safety, there shall be no more than 170Vdc at any point inside the sign. In addition, the power supply circuit shall output a regulated DC current of 0.29 amps maximum.

- (5) Signs shall have legends on one or both sides, as required by the Drawings. The sign face shall comply with paragraph 858(L)-2.11. The sign face assembly shall have gasketing between the sign material and housing.
 - (6) The color of the sign enclosure shall be black.
 - (7) The sign shall be completely sealed against sand and dust so that all internal surfaces will remain bright and clean. The lamp(s) shall be easily changeable, and ballast and all electrical control equipment shall be easily accessible in enclosures mounted to the interior of the sign structure.
- b. Tether.** Each sign shall be supplied with a minimum of two tethers, with not less than two tethers per five sign legs, which can be secured to the sign enclosure. The tethers shall be installable such that each sign, when knocked down by a wind of greater than 200 mph, shall remain attached to the sign foundation. Tethers shall be 1/8" stainless steel aircraft cable and shall be secured to the sign enclosure and to a support leg base flange anchor bolt with lock nuts and large diameter washers.
- c. Electrical Features.**
- (1) The signs shall be relampable without the use of tools. Loose parts shall be tethered to, or otherwise prevented from blowing away from, the installed sign enclosure. All screws and latches shall be the captive type.
 - (2) Power input from the lighting circuit shall be made through an isolation transformer conforming to AC 150/5345-47C.
 - (3) Power input leads shall be at least two feet in length and shall allow for lead termination in a Type 1, Class A, Style 9 receptacle conforming to AC 150/5345-26D.
 - (4) The L-858 sign light source shall utilize individual Light Emitting Diode (LED) lamps or Engineer approved equal.
 - (5) All wiring shall conform to the requirements of NFPA 70. All wiring shall be color-coded and shall be clearly labeled. There shall be no exposed wiring.



- (6) All electrical materials and equipment for which there is a nationally recognized standard shall bear the conformance labeling of the third party inspection authority, such as Underwriters Laboratories, Inc., Factory Mutual, or ETL.

858(L)-2.6 REPLACEMENT PARTS POLICY. In order to maximize safe operations on the airfield, reduce risk of runway incursions and minimize inventory requirements, sign manufacturer shall provide the Owner an emergency replacement signs and parts service for the life of the signs. Orders for replacement parts and complete signs shall ship within 24 hours of order receipt. Manufacturer shall provide a history of providing such a service for a minimum of 5 years. The cost for this policy shall be considered incidental to each pay item for the signs.

858(L)-2.7 SPARES. In case of knock-downs or maintenance vehicle damage, new installations shall include 20-percent spare lamps/light sources for every sign supplied and 2 spare power supplies for every 10 signs supplied (minimum qty of 1). This will further protect the airport from premature component failure that occurs after the manufacturer's warranty expiration but prior to reaching the projected light sources full rated life.

858(L)-2.8 ELECTRICAL DISCONNECT.

- a) All lighted signs must be equipped with a power input disconnect cable terminated with a Type II plug under the requirements of AC 150/5345-26.
- b) The length of power disconnect cable must be at least 6 inches longer than required to permit the plug end to reach the top of the concrete pad on which the sign is mounted.
- c) A cable clamp or similar restraining device must be provided in the sign to prevent strain on the cable terminal connections when the cable plug is pulled apart.
- d) There must be no above ground power cable connections to signs. Power to a sign or sign array must be provided through breakaway cable connectors installed within the frangible point portion of the sign's mounting legs.
- e) There must be no external above ground electrical connection between signs in a sign array.
- f) The sign manufacturer must offer an optional ON/OFF power switch that is appropriate for the style of lighted signs. Signs for this project will be equipped with power switch and weatherproof cover.



858(L)-2.9 SIGN SIZES. The heights of the signs shall be in accordance with the dimensions as follows:

<u>Size</u>	<u>Legend Height</u> (Inches)	<u>Legend Panel Height</u> (Inches)	<u>Overall Mounting Height</u> (Inches)
1	12	18	24-30
2	15	24	30-36

The lengths of the signs shall be determined by the message to be conveyed, but shall not exceed the maximum length specified by Table 1 of AC 150/5345-44K.

858(L)-2.10 SIGN FACES

a. The signs shall be either single face (message only on one side) or double face (messages on two sides). The spacing, stroke, shape of legend characters, numerals, symbols, border for Type L-858L sign faces, and message dividers shall be in accordance with FAA AC 150/5345-44K.

b. The Contractor and Manufacturer shall provide a warranty for a minimum of three years against the delamination of the surface films from the face of the signs.

858(L)-2.11 PERFORMANCE REQUIREMENTS.

a. Sign Operation.

- (1) Signs shall be energized and operated at any incoming current value of the series lighting circuit without flickering.
- (2) The luminance level and uniformity of the sign shall be maintained across all series lighting circuit current values, as measured from the primary side of the isolation transformer.
- (3) Power input from the series lighting circuit shall be made through isolation transformers, properly rated, and conforming to AC 150/5345-47C.
- (4) Minimum rated operating lamp life, when sign is operated at the highest intensity step, shall not be less than 20,000 hours.
- (5) The connection of multiple signs on a taxiway lighting circuit shall not adversely impact other circuit components, such as constant current regulator or isolation transformer.

b. Sign Luminance and Color.



- (1) The internally illuminated background of the Type L-858Y sign and the legend of the Types L-858R and L858L signs shall have an average luminance from 10 to 30 foot-lamberts, with 16 to 30 foot-lamberts at the 2 highest intensity steps (white or yellow).
- (2) Signs must be viewed from 800' feet at night to determine if the luminance level is sufficient to make the Type L-858Y and L-858R background colors and Type L-858L legend and border colors readily discernible. Type L-858B, Runway Distance Remaining signs, must be viewed from 200' feet at full brightness. Panel joints must not interfere with the legibility of the sign or leak light to create a color discontinuity across the joint. Signs must be evenly illuminated with no dark areas or banding that interferes with legibility. Uniformity shall be kept as defined in FAA AC 150/5345-44K.
- (3) The sign shall have a uniformity ratio no greater than 5:1 for luminance measured at any 3-inch grid on the sign for a specific color, and no more than 1.5:1 for luminance measured at any adjacent 3-inch grids.
- (4) Manufacturer shall provide a three-year warranty on the retro reflective material lamination process.

858(L)-2.12 FINISH. External surfaces of the signs, excluding the mounting legs and face panel, shall be painted with a primer coat and a low luster, black finish coat. The surface color treatment of the nonmetallic surfaces shall be equal in quality to that obtained on metal surfaces.

858(L)-2.13 NAMEPLATE. Each sign shall have a nameplate giving the Sign Name as shown on the Construction Drawings, Type, Size, Style, Class, manufacturer's name, address, catalog number, and lamp data, including type and rating. The nameplate on Style 2, 3, and 5 signs shall give the total maximum volt-amp load and power factor as seen from the primary of the isolation transformer. The total maximum volt-amp load indicated shall reflect the highest possible volt-amp loading on the regulator and shall include loading due to a "worst case" isolation transformer, and any required ballast and/or adaptor units. The nameplate shall be mounted to the exterior of the sign enclosure at the top side of the sign.

858(L)-2.14 WORKMANSHIP. The equipment shall be fabricated in accordance with the highest quality workmanship. All wiring shall be neatly run and laced. All sharp edges and burrs shall be removed. Painted surfaces shall be free from runs, blotches, and scratches.

858(L)-2.15 INSTRUCTION BOOKLET. Two (2) copies of an instruction booklet shall be included with each order of signs, which shall include installation instructions, maintenance procedures (including operating voltage and point readings), and a complete parts list, including recommended spare parts list. It shall also describe the lamp wattage or current needed to maintain the luminance levels specified herein.



858(L)-2.16 SIGN COVER. Sign covers shall be capable of fully covering the sign and withstanding the weather conditions and jet blast to which it may be subjected during its installation. The material shall be sufficiently heavy (similar to canvas) to completely obscure the sign message so that it cannot be read.

858(L)-2.17 CONCRETE. Concrete for bases shall conform to the requirements of Item P-610 Structural Portland Cement Concrete. Precast concrete base shall be sized for four module signs.

858(L)-2.18 CONDUIT. Rigid steel and EMT conduit and fittings shall conform to the requirements of Fed. Spec. WW-C-581. PVC conduit and fittings shall conform to the requirements of Fed. Spec. W-C-1094.

858(L)-2.19 LIGHT BASE. Type L-867, galvanized steel, size B, one-piece, with steel cover plates meeting the requirements of FAA AC 150/5345-42H. Provide with grounding lug, grommets, conduit hubs and drainage holes as shown on the drawings.

858(L)-2.20 ISOLATING TRANSFORMER. An isolating transformer shall be provided with each sign and shall conform to the requirements of the applicable Advisory Circular. Provide with extended secondary connector cable kit. Transformers shall be minimum sized per manufacturer's requirements. Isolation transformer shall conform to the latest edition of FAA AC 150-5345-47C, Isolation Transformers for Airport Lighting Systems. The isolation transformer shall be an integrated unit, with power input leads at least 24 inches in length - one lead terminating in a Type I, Class A, Style 2 plug and the other lead in a Type I, Class A, Style 9 receptacle, conforming to the latest edition of FAA AC 150-5345-26D, Specification for L-823 Plug and Receptacle, Cable Connectors.

CONSTRUCTION METHODS

858(L)-3.1 GENERAL. The installation and testing details for the systems shall be as specified in the applicable Advisory Circulars.

858(L)-3.2 PHASING AND INTERRUPTIONS. The construction phasing and airfield operational requirements for this project may require that new signs are installed and covered until directed by the RE to activate the signs. Activating the signs will be done as directed by the RE or Operations.

858(L)-3.3 TEMPORARY UNLIGHTED SIGNS. If lighted signs are not available when required, temporary unlighted signs shall be provided and installed on the foundations for the associated permanent sign where required for aircraft operations. Sign legs with frangible points shall be fastened to the concrete foundation with drilled anchor bolts as required and as approved by the RE. When no longer required, signs shall be removed and any remaining



holes in the concrete foundation shall be filled with grout. Temporary unlighted signs shall be salvaged when no longer required unless otherwise directed by the RE.

858(L)-3.4 LOCATION/ELEVATION. The signs shall be installed at the locations indicated in the plans. Guidance signs shall be located where indicated, offset 10'-20' from edge of full-strength pavement for Size 1 and offset 20'-35' from edge of full-strength pavement for Size 2 unless otherwise noted. Longitudinal tolerance is 1'-0". Foundation elevation shall be no more than 1 inch above finish grade (pavement or millings) or flush with 3" minus rock infields as established on the civil grading and drainage drawings.

858(L)-3.5 ASPHALT HOUSEKEEPING / MAINTENANCE PADS. A 3 feet wide by 3 inch thick asphalt housekeeping pad shall be provided around each new sign base in unpaved areas or infields with 3" minus rock and contoured as required by civil grading and drainage plans. Asphalt shall conform to the requirements of MAG spec for mix design and be placed in a 3" minimum thickness on a compacted base around concrete sign foundation.

858(L)-3.6 TRANSFORMER. The transformer shall be installed in the L-867 base at location and position as indicated on the plans. The primary cable connections shall be made by use of the L-823 plug and receptacle cable connectors in accordance with plans and specifications.

858(L)-3.7 HARDWARE. All bolts, nuts, washers and lock washers shall be stainless steel. Install using high temperature anti-seize compound.

858(L)-3.8 CABLE, CONNECTOR, AND ISOLATION TRANSFORMERS. The primary and secondary cable leads of the transformers are supplied with factory-installed molded connectors. Visual inspection of these items during installation is very important. Minor cuts, bruises, or mishandling may result in progressive deterioration, which will eventually cause complete failure, but not until sometime after acceptance tests. During installation, these items shall be inspected for the following:

- a. The mating surfaces of molded connectors are clean and dry when plugged together. If clean and dry inside, these high voltage connectors, with taping, form a connection equal or superior to a conventional high voltage splice. Conversely, if they are wet or dirty no amount of taping can produce a satisfactory connection. Two or three turns of tape should be used to hold the connector together and keep the parting line clean. Keeping the factory-installed caps in place until the final connection is made can ensure cleanliness of mating surfaces. The mating surfaces of uncapped connectors should not be laid down, touched, or breathed upon. If a connection must be broken, the connectors should be immediately capped.
- b. The connectors are completely plugged together. After initial plugging, trapped air pressure may partially separate the plug and receptacle. If this happens, wait a few seconds and push them together again. Two or three turns of tape should be used to hold them in place.
- c. The cables are not cut by shovels, kinked, and crushed by vehicle wheels bruised by rocks, or damaged in any way during handling and installation.



d. The cables do not directly cross each other and are separated by the specified distance.

e. The cables are not bent sharply where they enter (or leave) a conduit, and are supported properly by tamped ground so future settling will not cause sharp bends.

858(L)-3.9 IDENTIFICATION NUMBERS. Circuit identification shall be assigned to each sign in accordance with the drawings. The placing of the Circuit ID shall be accomplished by use of 2-inch diameter brass or bronze marker, with the numerals approximately 1/4-inch in height, engraved or stamped in, embedded in concrete next to transformer housing as detailed on the drawings, so each faces the taxiway or runway. Sign identification numbers shown on plans shall be engraved by Manufacturer furnish.

858(L)-3.10 FIELD TESTS AND INSPECTIONS.

a. Contractor shall provide the RE 10 working days' notice prior to test(s). All deficiencies found shall be corrected and tests repeated.

b. Operation. Upon completion of all the tests required under other sections, the Contractor shall show by in-service demonstration that all circuits, control equipment, and all lights covered by the contract are in good operating condition. The testing of each circuit shall be made using local control switches on the regulators in each lighting vault. Each switch shall be operated so that each switch position is engaged at least five times. During this process, all lights and associate equipment shall be observed to determine that each circuit operates properly. Telephone or radio communication between the operator and the observers shall be provided. The above tests shall be repeated from the alternate control station, from the remote control points, and also again from the local control switches on the regulators. Each lighting circuit shall be tested by operating the lighting circuits at each brightness step. Visual examination shall be made at the beginning and at the end of this test to determine that the correct signs are energized.

858(L)-3.11 ELECTRICAL TESTS ON CABLES. In addition to the cable tests required under other sections, the test described below shall be performed on the segment of primary series circuit cable connecting each sign to a light base. The test shall be performed for each sign prior to connecting the sign to the runway or taxiway lighting circuit. The test results shall be recorded and shall be submitted to the RE. The purpose of the test is to verify the good condition of new cable installed in conduit, prior to connecting to the existing lighting circuit.

a. Connect together the segments of primary cable from the sign base to the connecting light base. Include the sign isolation transformer in the loop. Support both leads so that there are gaps of several inches between bare conductors and ground. Make sure that the cable sheath is clean and dry for a distance of at least one foot from the end of the cable. Also make sure that exposed insulation at the end of the cable is clean and dry.

b. Apply a 500-volt test voltage with suitable meg-ohmmeter, such as model 1250 made by AEMC (manually operated), or approved equal. 500 Volts must be applied to the circuit. The insulation resistance to ground shall not be less than 200 meg-ohms to be acceptable. The contractor shall repair/replace any cable segment reading less than 200 meg-ohms and



retest, at no additional cost to the airport. Only after acceptable readings are obtained shall the cable be connected to the series lighting circuit.

c. All the 500 and higher voltage tests on the airfield lighting circuits must be carefully monitored by the RE to ensure that excessive voltages are not applied to the circuits. The contractor shall coordinate all the tests with the RE prior to starting the tests.

d. The field test and the inspection of the system shall be incorporated into the signage pay items, with no separate payment made.

METHOD OF MEASUREMENT

858(L)-4.1 NEW L-858(L) LED SIZE 1 SIGNS ON NEW CONCRETE FOUNDATIONS. The quantity of each new sign shall include: Furnishing a new L-858(L) sign, LEDs, isolation transformers, L-867 transformer housing, hardware, conduits to sign with spare stubs and ground rod with ground conductor bonds to equipment installed and mounted to a new concrete foundation with new wiring and L-823 connectors installed as a complete unit, connected to circuit, operating for a minimum of one week burn-in period, ready for operation, tested and accepted. **New signs shall also include a 3' wide asphalt maintenance pad around each concrete base. No separate payment will be made.**

858(L)-4.2 NEW L-858(L) SIZE 1 SIGNS ON EXISTING EXTENDED FOUNDATIONS. The quantity of each new sign shall include: Furnishing a new L-858(L) sign, LEDs/Lamps, isolation transformers, hardware, reconnection of existing external grounding conductor (or new ground rod / conductor if not existing), installed and mounted to the existing concrete foundation with a cast in place concrete base extension of sufficient length required to install new sign including new wiring and L-823 connectors complete, connected to circuit, operating and ready for operation and accepted. No separate payment will be made.

858(L)-4.3 SALVAGED L-858(L) LED SIZE 1 SIGNS ON NEW CONCRETE FOUNDATIONS. The quantity of each salvaged existing sign on new concrete sign base shall include: Installing existing salvaged L-858(L) (LED) signs and isolation transformers complete with new L-867 transformer housing, hardware, conduits to sign with spare stubs and ground rod with ground conductor bonds to equipment installed and mounted to a new concrete foundation with new wiring and L-823 connectors installed as a complete unit, connected to circuit, operating for a minimum of one week burn-in period, ready for operation, tested and accepted. **New sign bases shall also include a 3' wide asphalt maintenance pad around each concrete base. No separate payment will be made.**

858(L)-4.4 NEW SIZE 1 SIGN PANELS INSTALLED IN EXISTING SIGN. The quantity of each new sign panel installed in existing sign shall include: Furnishing and installing new sign panels of original equipment manufacturer, installed in each existing sign in accordance with the Plans, ready for operation, tested and accepted.



BASIS OF PAYMENT

858(L)-5.1 SYSTEM COMPONENT. Payment will be made at the contract unit price for each complete system component listed below installed in place by the Contractor, tested and accepted. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this Item.

Payment will be made under:

- | | |
|--------------------|--|
| Item L-858(L)-5.1 | New Size 1 L-858(L) LED 2-Module Guidance Sign and Isolation Transformer, on New Concrete Base w/ 3' Asphalt Maintenance Pad – per each |
| Item L-858(L)-5.2 | New Size 1 L-858(L) LED 2-Module Guidance Sign and Isolation Transformer, on Existing Concrete Base – per each |
| Item L-858(L)-5.3 | Salvaged Size 1 L-858(L) LED 2-Module Guidance Sign and Isolation Transformer, on New Concrete Base w/ 3' Asphalt Maintenance Pad – per each |
| Item L-858(L)-5.4 | Salvaged Size 1 L-858(L) LED 3-Module Guidance Sign and Isolation Transformer, on New Concrete Base w/ 3' Asphalt Maintenance Pad – per each |
| Item L-858(L)-5.5 | New Size 2 L-858(L) LED 2-Module Guidance Sign and Isolation Transformer, on New Concrete Base w/ 3' Asphalt Maintenance Pad – per each |
| Item L-858(L)-5.6 | New Size 1 L-858(L) LED 3-Module Guidance Sign and Isolation Transformer, on New Concrete Base w/ 3' Asphalt Maintenance Pad – per each |
| Item L-858(L)-5.7 | New Size 1 L-858(L) LED 4-Module Guidance Sign and Isolation Transformer, on New Concrete Base w/ 3' Asphalt Maintenance Pad – per each |
| Item L-858(L)-5.8 | New Size 1 Sign Panels Installed in Existing Sign – per each |
| Item L-858(L)-5.9 | New 24" Concrete Sign Base Extension Installed to Extend Existing Sign Base - If Required (Contingency Item) – per each |
| Item L-858(L)-5.10 | New 36" Concrete Sign Base Extension Installed to Extend Existing Sign Base - If Required (Contingency Item) – per each |



REFERENCED PUBLICATIONS

858(L)-6.1 FEDERAL SPECIFICATIONS REFERENCED IN ITEM L-858(L).

<u>Number</u>	<u>Title</u>
WW-C-581	Conduit, Metal, Rigid; and Coupling, Elbow; and Nipple, Electrical Conduit: Zinc-Coated
W-C-1094	Conduit, Plastic-Type II Schedule 40

858(L)-6.2 FAA SPECIFICATION REFERENCED IN L-858.

AC 150/5340-18F	Standards for Airport Sign Systems.
AC 150/5345-26D	Specification for L-823 Plug and Receptacle, Cable Connections (including Changes 1 & 2).
AC 150/5345-42H	Specification for Light Base and Transformer Housings, Junction Boxes and Accessories (including Change 1).
AC 150/5345-44K	Specification for Taxiway and Runway Signs.
AC 150/5345-47C	Isolation Transformers for Airport Lighting Systems.

END OF ITEM L-858(L)



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SECTION III-C

CIVIL TECHNICAL SPECIFICATIONS

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ITEM P-100 CONTRACTOR QUALITY CONTROL

DESCRIPTION

100-1.1 GENERAL. This item shall consist of all work necessary to ensure quality control of the Contractor's work during construction in accordance with General Provision Specification Section 100 and all the Civil and Electrical Technical Specifications.

The Contractor shall be responsible to conduct all quality control testing and inspections as indicated in the these specifications, and for each pay item that is shown in the Bid schedule, as well as any other test or inspection not specifically listed, but necessary to adequately control the work to the satisfaction of the City of Phoenix Materials Laboratory. The Engineer's quality acceptance test results will be made available to the Contractor upon request. The Contractor shall not depend on the City of Phoenix quality acceptance for the Contractor's Quality Control Program.

The Contractor shall submit his plan for Quality Control Testing and Inspection as required in General Provisions, Section 100, for review and approval to the Engineer at least five (5) working days prior to the pre-construction conference.

METHOD OF MEASUREMENT

100-2.1 GENERAL. Measurement for Contractor Quality Control to be paid for will be determined by the actual cost of the work. Actual costs of the work will be calculated in accordance with the City of Phoenix Supplements to the MAG Uniform Specifications, Section 109, as modified by the Special Provision Specification Section 29. Travel time to and from Phoenix Deer Valley Airport will not be measured for payment. All costs associated with the Contractor quality control testing laboratory, field and laboratory equipment, supplies and tools will not be measured for payment directly under this provision, but are to be included in the items for which payment is made.

Contractor Quality Control is for the personnel, tests, facilities and documentation required to implement Contractor Quality Control and will be paid as a lump sum with the following schedule of partial payments:

- a. With first pay request, 25% with approval of CQCP and completion of the Quality Control (QC)/Quality Assurance (QA) workshop.
- b. When 25% or more of the original contract is earned, an additional 25%.
- c. When 50% or more of the original contract is earned, an additional 20%.
- d. When 75% or more of the original contract is earned, an additional 20%
- e. After final inspection and acceptance of project, the final 10%.



BASIS OF PAYMENT

100-3.1 Contractor Quality Control, measured as prescribed above, shall be paid as a lump sum. Such payment shall be full compensation for furnishing all technicians, inspectors, testing equipment and field vehicles. All other labor, equipment, materials, tools and incidentals necessary to accomplish this item is to be included under Item P-102 Mobilization/Demobilization.

Payment will be made under:

P-100-3.1 Contractor Quality Control – per Lump Sum

END OF ITEM P-100

