



CITY OF HOUSTON

John Whitmire

Mayor



Jim Szczesniak
Director of Aviation

Houston Airports
Supply Chain Management
Post Office Box 60106
Houston, Texas 77205-0106
fly2houston.com

May 10, 2024

SUBJECT: Addendum No. 2

REFERENCE: Invitation To Bid (ITB) for Rehabilitation of Taxiways SA & SB at IAH; Solicitation No. HJA-TXSASB-2024-020; Project No. 0646A

To: All Prospective Bidders:

This Addendum is being issued for the following reasons:

- I. Replace Documents
 - a. **Document 00410 with Revised Document 00410 – Bid Form**
 - b. **Document 01110 with Revised Document 01110 – Summary of Work**
 - c. **Drawings General Section G01.02, G01.03, G01.04, G02.05 and Civil Section C05.05 with Revised Drawings General Section G01.02, G01.03, G01.04, G02.05 and Civil Section C05.05.**
 - d. **Specification Numbers SS-301 ‘Electrical Demolition and Relocation Work’, P-101 ‘Preparation and Removal of Existing Pavements,’ P-610 ‘Concrete for Miscellaneous Structures,’ D-701 ‘Pipe for Storm Drains and Culverts,’ and L-110 ‘Airport Underground Electrical Duct Banks and Conduits’ with Revised Specification Numbers SS-301 ‘Electrical Demolition and Relocation Work’, P-101 ‘Preparation and Removal of Existing Pavements,’ P-610 ‘Concrete for Miscellaneous Structures,’ D-701 ‘Pipe for Storm Drains and Culverts,’ and L-110 ‘Airport Underground Electrical Duct Banks and Conduits’**
- II. Add Drawings
 - a. **General Section G05.01 and G05.02, Civil Section C07.32A, and Electrical Section E05.01, E05.02, E05.10, E05.11.**


When issued, Addendum shall automatically become part of the solicitation documents and shall supersede any previous specification(s) and/or provision(s) in conflict with this Addendum. Addenda will be incorporated into the Contract as applicable. It is the responsibility of the bidder(s) to ensure that it has obtained all such Addenda. By submitting a bid on this project, bidder(s) shall be deemed to have received all Addenda.

Council Members: Amy Peck Tarsha Jackson Abbie Kamin Carolyn Evans-Shabazz Fred Flickinger Tiffany D. Thomas Mary Nan Huffman
Mario Castillo Joaquin Martinez Edward Pollard Martha Castex-Tatum Julian Ramirez Willie Davis Twila Carter
Letitia Plummer Sallie Alcorn

Controller: Chris Hollins

Addendum No. 2
Rehabilitation of Taxiways SA & SB at IAH;
Project No. 0646A
May 10, 2024

If further clarification is needed regarding this solicitation, please contact Jorge Ardines, Sr. Procurement Specialist, via email at jorge.ardines@houston.tx.gov.

DocuSigned by:

2B88A4B556CE4DC

Cathy Vander Plaats
Aviation Procurement Officer
Houston Airport System

cc: Al Oracion
Solicitation File

Attachments:

Revised Document 00410
Revised Document 01110
Revised Drawings General Section G01.02, G01.03, G01.04, G02.05 and Civil Section C05.05
Revised Specifications SS-301, P-101, P-610, D-701 and L-110
Additional Drawings General Section G05.01 and G05.02, Civil Section C07.32A, and Electrical Section E05.01, E05.02, E05.10, E05.11

CITY OF HOUSTON
INTEROFFICE CORRESPONDENCE

TO: Ms. Liliana Rambo, IAP, CM, CAPP
Chief Terminal Management Officer
Houston Airport System

FROM: Cathy Vander Plaats
Assistant Director
Houston Airport System

DATE: May 9, 2024

SUBJECT: Signature Authority

I will be out of the office Friday, May 10, 2024, returning Monday, May 13, 2024. During my absence Mr. Alfredo Oracion will be acting Aviation Procurement Officer with full signature authority. He can be reached at 281-230-8009 or Alfredo.Oracion@houstontx.gov.

DocuSigned by:

Cathy Vander Plaats

02232028DE99414...

Cathy Vander Plaats

cc: Catina Chapman
Dallas Evans
Alfredo Oracion
Melanie Brown
Andrew Czobor
Dawn Hoffman
Sam Rea
Kellie Irving
Robert Collins
Karen Newman

Document 00410A

BID FORM – PART A

To: **The Honorable Mayor and City Council of the City of Houston
City Hall Annex
900 Bagby Street
Houston, Texas 77002**

Project: Rehabilitation of Taxiways SA & SB

Project No.: PN 0646A

Bidder: _____

(Print or type full name of business entity, such as corporation, LLC, etc)

1.0 OFFER

- A. Total Bid Price:** Having examined the Project location and all matters referred to in Bid Documents for the Project, we, the undersigned, offer to enter into a Contract to perform the Work for the Total Bid Price shown on the signature page of this Document
- B. Security Deposit:** Included with the Bid is a Security Deposit in the amount of 10 percent of the Total Bid Price subject to terms described in Document 00200 – Instructions to Bidders.
- C. Period for Bid Acceptance:** This offer is open to acceptance and is irrevocable for 180 days from Bid Date. That period may be extended by mutual written agreement of the City and Bidder.
- D. Addenda:** All Addenda have been received. Modifications to Bid Documents have been considered and all related costs are included in the Total Bid Price.
- E. Bid Supplements:** The following documents are attached:
- Security Deposit (*as defined in Document 00200 – Instructions to Bidders*)
 - Document 00450 - Bidder's Statement of MWSBE Status
 - Document 00454 - Affidavit of Non-interest
 - Document 00455 - Ownership Information Form
 - Document 00456 - Bidder's Certificate of Compliance with Buy American Program (*required for AIP funded project*)
 - Document 00457 – Conflicts of Interest Questionnaire (CIQ)
 - Document 00458 - Bidder's Certificate Regarding Foreign Trade Restriction (*required for AIP funded project*)
 - Document 00459 - Contractor's Statement Regarding Previous Contracts Subject to EEO (*required for AIP funded project*)
 - Document 00460 – Pay or Play Acknowledgement Form (POP 1-A)
 - Document 00461 – Hire Houston First Affidavit
 - Document 00470 – Bidder's MWSBE Participation Plan (*required unless no MWSBE participation goal is provided in Document 00800 (the "Goal")*).
 - Document 00470D - Bidder's DBE Participation Plan (*required for AIP funded project*)

- Document 00471 – Bidder’s Record of Good Faith Efforts (*required if the goal in Bidder’s Participation Plan–Document 00470 is lower than the Goal*).
- Document 00472 – Bidder’s Goal Deviation Request (*required if the goal in Bidder’s Participation Plan–Document 00470 is lower than the Goal*).
- Document 00480 – Form SCM-1 Reference Verification
- Document 00481 – Non-Collusion Statement
- Document 00842 – Letter of Intent
- Others as listed: _____

2.0 CONTRACT TIME

- A.** If offer is accepted, Contractor shall achieve Date of Substantial Completion within 298 days after Date of Commencement of the Work, subject to adjustments of Contract Time as provided in the Contract.

15	SS-301-5.9	Existing Electrical Conduit, 1-Way 4"C, Cleared	LF	10,000		
16	SS-305-5.1	Directional Boring, 16-Way 2"C Polyethylene Conduits	LF	1,350		
17	SS-310-5.1	Temporary Airfield Lighting (Base Bid)	LS	1		
18	SS-310-5.2	Mobile Photometric Testing	LS	1		
19	SS-310-5.4	Spare L-861T(L) Taxiway Edge Light, Delivered to Airport	EA	54		
20	SS-310-5.5	Spare L-852C(L), Green/Green Lens, Taxiway Centerline Light, Delivered to Airport	EA	54		
21	SS-310-5.6	Spare L-852C(L), Yellow/Obscured Lens, Taxiway Centerline Light, Delivered to Airport	EA	12		
22	SS-310-5.7	Spare L-852D(L) Green/Green Lens Taxiway Centerline Light, Delivered to Airport	EA	65		
23	SS-310-5.8	Spare L-852D(L) Green/Yellow Lens Taxiway Centerline Light, Delivered to Airport	EA	1		
24	SS-310-5.9	Spare L-852D(L) Yellow/Yellow Lens Taxiway Centerline Light, Delivered to Airport	EA	10		
25	SS-310-5.10	Spare L-852G(L) Runway Guard Light, Delivered to Airport	EA	13		
26	SS-310-5.11	Spare L-858(L) Sign Components Package, Delivered to Airport	EA	3		
27	C-100-14.1	Contractor Quality Control Program (CQCP)	LS	1		
28	C-102-5.1a	Filter Dam Type II	LF	70		
29	C-102-5.1b	Reinforced Silt Fence	LF	25,320		
30	C-105-6.1	Mobilization	LS	1		
31	P-101-5.1	Asphalt Milling (1" and Variable Depth)	SY	63,730		
32	P-101-5.2	Asphalt Milling (2" and Variable Depth)	SY	204,600		
33	P-101-5.3	Asphalt Milling (5" and Variable Depth)	SY	45,370		
34	P-101-5.5	Concrete Pavement Removal (12"-15" Depth)	SY	550		
35	P-101-5.6	Remove and Dispose 24" CMP	LF	660		
36	P-101-5.7	Concrete Slope Paving Removal and Disposal	SY	9,680		

37	P-101-5.8	Concrete Headwall Removal	EA	10		
38	P-101-5.9	Asphalt Crack Repair	LF	140,000		
39	P-152-4.1	Unclassified Excavation	CY	72,240		
40	P-209-5.1	6" Crushed Aggregate Base Course	SY	2,880		
41	P-209-5.2	15" Crushed Aggregate Base Course	SY	76,570		
42	P-209-5.3	Aggregate Base Course (Slope Stabilization)	CY	1,410		
43	P-209-5.4	Separation Geotextile (Slope Stabilization)	SY	16,910		
44	P-209-5.5	Geogrid (Slope Stabilization)	SY	2,750		
45	P-307-7.1	6" Cement Treated Permeable Base	CY	320		
46	P-401-8.1	Bituminous Surface Course (PG 76-22)	TON	46,530		
47	P-403-8.1	Bituminous Base Course (PG 76-22)	TON	42,570		
48	P-501-8.1	10" Portland Cement Concrete Pavement	SY	390		
49	P-501-8.2	12"-15" Portland Cement Concrete Pavement	SY	530		
50	P-501-8.4	Concrete Pavement Partial Depth Repair	SF	2,000		
51	P-501-8.5	Concrete Pavement Crack Repair	LF	3,000		
52	P-610-6.1	Concrete Slope Paving	SY	15,650		
53	P-610-6.2	Modify Curb Opening	EA	65		
54	P-610-6.3	Concrete Pilot Channel	SY	12,070		
55	P-610-6.4	Interceptor Structure	SY	310		
56	P-620-5.1a	Taxiway Pavement Marking with Reflective Beads (Yellow)	SF	86,210		
57	P-620-5.1b	Taxiway Pavement Marking with Reflective Beads (Black)	SF	111,220		
58	P-620-5.1c	Thermoplastic Surface Painted Runway Direction Signs	EA	14		
59	P-620-5.1d	Thermoplastic Surface Painted Apron Control Marking Signs	EA	2		
60	P-620-5.1e	Surface Preparation	SF	197,430		
61	P-620-5.1f	Temporary Taxiway Pavement Markings (Yellow)	SF	14,200		

62	P-620-5.1g	Temporary Taxiway Pavement Markings (Black)	SF	24,400		
63	P-620-5.1h	Temporary Taxiway Pavement Markings Removal	SF	4,700		
64	P-620-5.1i	Removal of Existing Pavement Marking	SF	1,500		
65	D-701-5.1	Install 6'x5' RCB (Class V) Open Cut, Complete in Place	LF	70		
66	D-701-5.2	Install 7'x5' RCB (Class V) Open Cut, Complete in Place	LF	70		
67	D-701-5.3	Install 8'x4' RCB (Class V) Open Cut, Complete in Place	LF	160		
68	D-701-5.4	Install 10'x7' RCB (Class V) Open Cut, Complete in Place	LF	30		
69	D-701-5.5	Install 24" CMP Open Cut, Complete in Place	LF	2,280		
70	D-752-5.1	Install Wingwall, Complete in Place	CY	1,190		
71	T-901-5.1	Hydroseeding	AC	25.0		
72	T-904-5.1	Sodding	SY	46,570		
73	L-108-5.1	No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Trench, Duct Bank or Conduit	LF	177,400		
74	L-108-5.2	No. 6 AWG, Solid, Bare Copper Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit, Including Connections/Terminations	LF	3,000		
75	L-110-5.1	Flowable Fill Encased Electrical Conduit, 1W-2"C	LF	1,900		
76	L-110-5.2	Non-Encased Electrical Conduit, 1W-2"C	LF	150		
77	L-110-5.3	Concrete Encased Electrical Conduit, 1W-2"C	LF	1,150		
78	L-110-5.4	Concrete Encased Electrical Conduit, 1W-2"C with Saw Kerf Pavement Repair	LF	450		
79	L-110-5.5	Non-Encased Electrical Duct Bank, 16W-2"C	LF	225		
80	L-110-5.6	Non-Encased Electrical Duct Bank, 2W-2"C	LF	280		
81	L-110-5.7	Flowable Fill Encased Electrical Duct Bank, 2W-2"C	LF	650		
82	L-115-5.1	Existing Electrical Junction Structure/Manhole Adjusted to New Grade	EA	64		
83	L-115-5.2	4'x4'x4' Aircraft-Rated Handhole, Installed	EA	4		

84	L-115-5.3	L-868 Blank Cover with Spacers, Installed	EA	5		
85	L-125-5.1	L-852C/D(L) Taxiway Centerline Light, Installed on Adjusted Light Base	EA	754		
86	L-125-5.2	L-852C/D(L) Taxiway Centerline Light, Installed on Existing Light Base	EA	442		
87	L-125-5.3	L-861T(L) Base Mounted Taxiway Edge Light, Installed on Adjusted Light Base	EA	407		
88	L-125-5.4	L-861T(L) Base Mounted Taxiway Edge Light, Installed on Existing Light Base	EA	88		
89	L-125-5.5	L-858(L) Base Mounted Guidance Sign, Installed	EA	28		
90	L-125-5.6	L-852C/D(L) Taxiway Centerline Light, Installed on New Light Base	EA	38		
91	L-125-5.7	L-852G(L) In-Pavement Runway Guard Light, Installed	EA	62		
92	L-125-5.8	L-861T(L) Base Mounted Taxiway Edge Light, Installed on New Base in Existing Pavement	EA	18		
93	L-125-5.9	L-861T(L) Base Mounted Taxiway Edge Light, Installed on New Base in New Pavement	EA	23		
94	L-125-5.10	L-852C/D(L) Taxiway Centerline Light, Installed on New Base in Existing Pavement	EA	18		
95	L-125-5.11	Update Sign Legend	EA	1		
96	L-125-5.12	L-852C/D(L) Taxiway Centerline Light, Installed on New Base in Existing Pavement with Mill and Overlay	EA	18		
97	02378-4.1	Riprap Gradation No. 1, including Topsoil	TON	240		
TOTAL BASE UNIT PRICES						\$ _____

C. EXTRA UNIT PRICE TABLE: N/A

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D. CASH ALLOWANCE TABLE:

Item No.	Spec Ref.	Cash Allowance Short Title	Cash Allowance in figures (1)
	01210	Cash Allowance Item 1 – Building Permit, Additional Flaggers, Barricades, Site Conditions and specific safety conditions improvements	\$600,000
	01210	Cash Allowance Item 2 – Clean Air Incentive	\$200,000
	01210	Cash Allowance Item 3 – Duct Bank and Telecommunication Cable Relocation	\$200,000
<u>TOTAL CASH ALLOWANCES</u>			\$1,000,000

(1) Fixed Unit Price determined prior to Bid. Cannot be adjusted by the Bidder.

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E. ALTERNATES TABLE:

Additive Alternate 1 (High Speed Taxiway PCC Pavement Construction)

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
1	SS-305-5.1	Directional Boring, 16-Way 2"C Polyethylene Conduits	LF	1,300		
2	SS-310-5.3	Temporary Airfield Lighting (Additive Alternate 1)	LS	1		
3	P-152-4.1	Unclassified Excavation	CY	7,470		
4	P-101-5.1	Asphalt Milling (1" and Variable Depth)	SY	(3,410)		
5	P-101-5.4	Full-Depth Asphalt Shoulder Removal	SY	4,700		
6	P-209-5.1	6" Crushed Aggregate Base Course	SY	12,410		
7	P-209-5.2	15" Crushed Aggregate Base Course	SY	2,200		
8	P-304-8.1	6" Cement-Treated Base Course	SY	12,050		
9	P-403-8.1	Bituminous Base Course (PG 76-22)	TON	410		
10	P-501-8.3	18" Portland Cement Concrete Pavement	SY	10,560		
11	P-620-5.1a	Taxiway Pavement Marking with Reflective Beads (Yellow)	SF	1,690		
12	P-620-5.1b	Taxiway Pavement Marking with Reflective Beads (Black)	SF	2,180		
13	P-620-5.1c	Thermoplastic Surface Painted Runway Direction Signs	EA	4		
14	T-901-5.1	Hydroseeding	AC	(1.0)		
15	T-904-5.1	Sodding	SY	200		
16	L-108-5.1	No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Trench, Duct Bank or Conduit	LF	25,000		
17	L-108-5.2	No. 6 AWG, Solid, Bare Copper Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit, Including Connections/Terminations	LF	16,300		

18	L-110-5.1	Flowable Fill Encased Electrical Conduit, 1W-2"C	LF	1,700		
19	L-110-5.3	Concrete Encased Electrical Conduit, 1W-2"C	LF	1,100		
20	L-110-5.4	Concrete Encased Electrical Conduit, 1W-2"C with Saw Kerf Pavement Repair	LF	525		
21	L-110-5.5	Non-Encased Electrical Duct Bank, 16W-2"C	LF	320		
22	L-110-5.6	Non-Encased Electrical Duct Bank, 2W-2"C	LF	160		
23	L-110-5.7	Flowable Fill Encased Electrical Duct Bank, 2W-2"C	LF	700		
24	L-115-5.2	4'x4'x4' Aircraft-Rated Handhole, Installed	EA	3		
25	L-125-5.2	L-852C/D(L) Taxiway Centerline Light, Installed on Existing Light Base	EA	9		
26	L-125-5.3	L-861T(L) Base Mounted Taxiway Edge Light, Installed on Adjusted Light Base	EA	(23)		
27	L-125-5.4	L-861T(L) Base Mounted Taxiway Edge Light, Installed on Existing Light Base	EA	(8)		
28	L-125-5.5	L-858(L) Base Mounted Guidance Sign, Installed	EA	2		
29	L-125-5.6	L-852C/D(L) Taxiway Centerline Light, Installed on New Light Base	EA	14		
30	L-125-5.7	L-852G(L) In-Pavement Runway Guard Light, Installed	EA	31		
31	L-125-5.8	L-861T(L) Base Mounted Taxiway Edge Light, Installed on New Base in Existing Pavement	EA	15		
32	L-125-5.9	L-861T(L) Base Mounted Taxiway Edge Light, Installed on New Base in New Pavement	EA	22		
33	L-125-5.10	L-852C/D(L) Taxiway Centerline Light, Installed on New Base in Existing Pavement	EA	41		
TOTAL ADDITIVE ALTERNATE 1 UNIT PRICES						\$ _____

Additive Alternate 2 (Substituting PG 76-22 with 82-22 in high dynamic areas)

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
1	P-401-8.1	Bituminous Surface Course (PG 76-22)	TON	(9,727)		
2	P-401-8.2	Bituminous Surface Course (PG 82-22)	TON	9,727		
3	P-403-8.1	Bituminous Base Course (PG 76-22)	TON	(4,067)		
4	P-403-8.2	Bituminous Base Course (PG 82-22)	TON	4,067		
TOTAL ADDITIVE ALTERNATE 2 UNIT PRICES						\$ _____

Additive Alternate 3 (Miscellaneous Pavement Repair)

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
1	01555-1.04A	Traffic Control and Regulation, Excluding Flagmen	LS	1		
2	01555-1.04B	Flagmen	LS	1		
3	SS-300-5.1	Lockout/Tagout and Constant Current Regulator Calibration Procedures	LS	1		
4	C-100-14.1	Contractor Quality Control Program (CQCP)	LS	1		
5	C-105-6.1	Mobilization	LS	1		
6	P-101-5.2	Asphalt Milling (2" and Variable Depth)	SY	565		
7	P-101-5.10	Concrete Pavement Removal (14"-20" Depth)	SY	445		
8	P-401-8.1	Bituminous Surface Course (PG 76-22)	TON	145		
9	P-501-8.4	Concrete Pavement Partial Depth Repair	SF	500		
10	P-501-8.5	Concrete Pavement Crack Repair	LF	500		
11	P-501-8.6	Concrete Pavement Crack Repair (Epoxy Injection)	LF	400		
12	P-501-8.7	14"-20" Portland Cement Concrete Pavement	SY	445		
13	P-501-8.8	Concrete Joint Seal Repair	LF	5,000		

14	P-620-5.1a	Taxiway Pavement Marking with Reflective Beads (Yellow)	SF	2,000		
15	P-620-5.1b	Taxiway Pavement Marking with Reflective Beads (Black)	SF	2,000		
16	P-620-5.1f	Temporary Taxiway Pavement Markings (Yellow)	SF	2,115		
17	P-620-5.1g	Temporary Taxiway Pavement Markings (Black)	SF	2,115		
18	P-620-5.1h	Temporary Taxiway Pavement Markings Removal	SF	4,230		
19	SS-310-5.3	Temporary Airfield Lighting (Additive Alternate 3)	LS	1		
TOTAL ADDITIVE ALTERNATE 3 UNIT PRICES						\$ _____

Additive Alternate 4 (Ditch G FAA Duct Bank Relocation)

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
1	01555-1.04A	Traffic Control and Regulation, Excluding Flagmen	LS	1		
2	01555-1.04B	Flagmen	LS	1		
3	SS-301-5.10	Existing Concrete Encased Electrical Duct Bank, 4-Way 4"C, Cleared	LF	60		
4	SS-301-5.11	Existing Concrete Encased Duct Bank, 4-Way 4"C, Demolished	LF	60		
5	C-100-14.1	Contractor Quality Control Program (CQCP)	LS	1		
6	C-102-5.1a	Filter Dam Type II	LF	10		
7	P-101-5.11	Remove and Dispose 24" RCP	LF	20		
8	P-152-4.1	Unclassified Excavation	CY	66		
9	P-610-6.5	4" Seal Slab	CY	20		
10	P-610-6.6	Concrete Channel Lining	CY	48		
11	D-701-5.6	Install 24" RCP (Class V) Open Cut, Complete in Place	LF	20		

12	T-904-5.1	Sodding	SY	200		
13	L-110-5.8	FAA Style, Concrete Encased Electrical Duct Bank, 4Way-4"C	LF	370		
14	02378-4.1	Riprap Gradation No. 1 incl Topsoil	TON	15		
<u>TOTAL ADDITIVE ALTERNATE 4 UNIT PRICES</u>						\$ _____

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F1. TOTAL BASE BID PRICE: \$ _____
(Add Totals for Stipulated Price, Base Unit Price, Extra Unit Price, and Cash Allowance)

F2. TOTAL ADDITIVE ALTERNATE #1 BID PRICE: \$ _____

F3. TOTAL ADDITIVE ALTERNATE #2 BID PRICE: \$ _____

F4. TOTAL ADDITIVE ALTERNATE #3 BID PRICE: \$ _____

F5. TOTAL ADDITIVE ALTERNATE #4 BID PRICE: \$ _____

***** F6. GRAND BID TOTAL (F1+F2+F3+F4+F5):** \$ _____

2.0 SIGNATURES: By signing this Document, I agree that I have received and reviewed all Addenda and considered all costs associated with the Addenda in calculating the Total Bid Price.

Bidder: _____
(Print or type full name of your proprietorship, partnership, corporation, or joint venture.*)

**** By:** _____
Signature Date

Name: _____
(Print or type name) Title

Address: _____
(Mailing)

(Street, if different)

Telephone and Fax Number: _____
(Print or type numbers)

* If Bid is a joint venture, add additional Bid Form signature sheets for each member of the joint venture.

** Bidder certifies that the only person or parties interested in this offer as principals are those named above. Bidder has not directly or indirectly entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding.

*** City reserves the right to choose not to add any alternates to the Base Bid Price or add any one or multiple alternates to the Base Bid Price. Evaluation shall be based on 'Grand Bid Total' amount.

Note: This document constitutes a government record, as defined by § 37.01 of the Texas Penal Code. Submission of a false government record is punishable as provided in § 37.10 of the Texas Penal Code.

**SECTION 01110
SUMMARY OF WORK**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project description.
- B. Work description.
- C. City occupancy.
- D. Contractor-salvaged products. *(Not Used)*
- E. Separate contracts and work by City. *(Not Used)*
- F. Extra copies of Contract Documents.
- G. Permits, fees and notices.
- H. Contractor Qualifications.

1.02 THE PROJECT

The Project is at the George Bush Intercontinental Airport in Houston, Texas.

1.03 GENERAL DESCRIPTION OF THE WORK

- A. Construct the Work under a single general construction, including additive Alternates if awarded, contract as follows:

Rehabilitation of Taxiways SA & SB

- Asphalt pavement rehabilitation of Taxiways SA, SB, SC, SF, SG, SH, SJ, and SK.
 - Asphalt shoulder widening and reconstruction along above-mentioned taxiways.
 - Partial depth repairs, and full depth replacement of damaged concrete pavement.
 - Concrete pavement widening at the high-speed Taxiways SH and SJ (Add Alt #1).
 - FAA Duct Bank relocation and Ditch G improvements (Add Alt #4).
 - Associated grading, drainage, pavement markings and electrical infrastructure.
 - Other work identified in the Plans, Specifications, and Contract Documents.
- B. Construct the Work in multiple construction phases following Section 01326 - Construction Sequencing.

C. Notice to Proceed

Following Contract Execution, the Contractor will be given an Administrative Notice to Proceed, which will include Mobilization, Operations Coordination, Approved Submittals, Request for Information (if any), Badging, Safety Training, and other requirements as needed to prepare for the Construction Work. Administrative NTP timeframe is estimated for an amount time of 90 days. Upon completion of pre-construction preparedness, HAS will issue a Construction Notice to Proceed.

D. The Work is summarized as rehabilitation of Taxiway SA & SB.

1. Rehabilitation existing PCC and Asphalt pavement construction designated or required to remain and to receive new construction, following *the construction plans*.

E. Construction limit lines are shown diagrammatically on Drawings.

1.04 CITY OCCUPANCY

The City will occupy the site and remain in operation, except those phase areas indicated as closed for construction, during the entire period of construction for the conduct of normal operations.

A. Cooperate with the City to reduce conflict, and to facilitate the City's operations. Coordinate Contractor's activities with City Operations or Maintenance personnel through City Engineer.

B. Schedule Work to fit these requirements.

1.05 CONTRACTOR-SALVAGED PRODUCTS (CSP) (*Not Used*)

1.06 SEPARATE CONTRACTS AND WORK BY CITY (*Not Used*)

1.07 EXTRA COPIES OF CONTRACT DOCUMENTS

Use reproducible documents, furnished by City following Document 00700 Paragraph 2.2.2, to make extra copies of Contract Documents (dialzo prints of Drawings and electrostatic copies of Project Manual) as required by Contractor for construction operations, and for Contractor's records following Sections 01726 - Base Facility Survey and 01770 - Contract Closeout. Follow Document 00700 Paragraph 1.3.

1.08 PERMITS, FEES AND NOTICES

Refer to Document 00700 Paragraph 3.14. Reimburse City for City's payment of fines levied against City or its employees because of Contractor's failure to obtain proper permits, pay proper fees, and make proper notifications. Reimbursement

will be by Change Order, reducing the Contract Price as based upon the dollar amount of fines imposed.

1.09 CONTRACTOR QUALIFICATIONS

The General Contractor (GC) and their first-tier subcontractors shall have commercial service airfield construction experience, including nighttime construction, of \$25,000,000 or more within the last 5 years. The GC and their first-tier subcontractors shall have FAA P-501 and P-401 pavement construction experience of runway and taxiway pavements, exclusive of bituminous shoulder pavements, including experience with paving P-401 with PG 76-22 and PG 82-22 bituminous pavement mix design.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADD. 2	05/03/2024 JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT
REHABILITATION OF TAXIWAYS SA & SB

INDEX OF SHEETS I

PROJECT MGR:	JEF
DESIGNER:	KKR
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	1" = 1"
DATE:	05/03/2024



Digitally Signed 05/03/2024
APPROVED BY: JEF

DIRECTOR
HOUSTON AIRPORT SYSTEM

PROJECT NO.	0646A
A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	

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X08.01-X08.04	SK CROSS SECTIONS
X09.01-X09.03	SH HIGH-SPEED CROSS SECTIONS (ADDITIVE ALTERNATE 1)
X10.01-X10.03	SJ HIGH-SPEED CROSS SECTIONS (ADDITIVE ALTERNATE 1)



REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADD. 2	05/03/2024 JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT
 REHABILITATION OF TAXIWAYS SA & SB
INDEX OF SHEETS II

PROJECT MGR:	JEF
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APPROVED BY: JEF

DIRECTOR
HOUSTON AIRPORT SYSTEM

PROJECT NO.	0646A
A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	

G01.03

BASE BID

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
	01210	Cash Allowances	LS	1
1	01555-1.04A	Traffic Control and Regulation, Excluding Flagmen	LS	1
2	01555-1.04B	Flagmen	LS	1
3	SS-130-4.1	Trench and Excavation Safety Systems	LF	85
4	SS-300-5.1	Lockout/Tagout and Constant Current Regulator Calibration Procedures	LS	1
5	SS-300-5.2	Removal/Repair of Broken Bolt, in Place	EA	235
6	SS-300-5.3	Retrofit Ground Lug to Existing Can, Installed	EA	235
7	SS-301-5.1	Existing Base Mounted Edge Light, Removed	EA	495
8	SS-301-5.2	Existing In-Pavement Centerline Light, Removed	EA	456
9	SS-301-5.3	Existing Base Mounted Guidance Sign, Removed	EA	28
10	SS-301-5.4	Existing Base Mounted Edge Light, Removed, Base Top Section, Removed	EA	50
11	SS-301-5.5	Existing In-Pavement Centerline Light, Removed, Base Top Section, Removed	EA	754
12	SS-301-5.6	Existing L-852G Runway Guard Light, Relocated on New Base	EA	5
13	SS-301-5.7	Abandoned Sign Foundation, Demolished	EA	2
14	SS-301-5.8	Existing Electrical Conduit, 1-Way 2"C, Cleared	LF	10,000
15	SS-301-5.9	Existing Electrical Conduit, 1-Way 4"C, Cleared	LF	10,000
16	SS-305-5.1	Directional Boring, 16-Way 2"C Polyethylene Conduits	LF	1,350
17	SS-310-5.1	Temporary Airfield Lighting (Base Bid)	LS	1
18	SS-310-5.2	Mobile Photometric Testing	LS	1
19	SS-310-5.4	Spare L-861T(L) Taxiway Edge Light, Delivered to Airport	EA	54
20	SS-310-5.5	Spare L-852C(L), Green/Green Lens, Taxiway Centerline Light, Delivered to Airport	EA	54
21	SS-310-5.6	Spare L-852C(L), Yellow/Obscured Lens, Taxiway Centerline Light, Delivered to Airport	EA	12
22	SS-310-5.7	Spare L-852D(L) Green/Green Lens Taxiway Centerline Light, Delivered to Airport	EA	65
23	SS-310-5.8	Spare L-852D(L) Green/Yellow Lens Taxiway Centerline Light, Delivered to Airport	EA	1
24	SS-310-5.9	Spare L-852D(L) Yellow/Yellow Lens Taxiway Centerline Light, Delivered to Airport	EA	10
25	SS-310-5.10	Spare L-852G(L) Runway Guard Light, Delivered to Airport	EA	13
26	SS-310-5.11	Spare L-858(L) Sign Components Package, Delivered to Airport	EA	3
27	C-100-14.1	Contractor Quality Control Program (CQCP)	LS	1
28	C-102-5.1a	Filter Dam Type II	LF	70
29	C-102-5.1b	Reinforced Silt Fence	LF	25,320
30	C-105-6.1	Mobilization	LS	1
31	P-101-5.1	Asphalt Milling (1" and Variable Depth)	SY	63,730
32	P-101-5.2	Asphalt Milling (2" and Variable Depth)	SY	204,600
33	P-101-5.3	Asphalt Milling (5" and Variable Depth)	SY	45,370
34	P-101-5.5	Concrete Pavement Removal (12"-15" Depth)	SY	550
35	P-101-5.6	Remove and Dispose 24" CMP	LF	660
36	P-101-5.7	Concrete Slope Paving Removal and Disposal	SY	9,680
37	P-101-5.8	Concrete Headwall Removal	EA	10
38	P-101-5.9	Asphalt Crack Repair	LF	140,000
39	P-152-4.1	Unclassified Excavation	CY	72,240
40	P-209-5.1	6" Crushed Aggregate Base Course	SY	2,880
41	P-209-5.2	15" Crushed Aggregate Base Course	SY	76,570
42	P-209-5.3	Aggregate Base Course (Slope Stabilization)	CY	1,410
43	P-209-5.4	Separation Geotextile (Slope Stabilization)	SY	16,910
44	P-209-5.5	Geogrid (Slope Stabilization)	SY	2,750
45	P-307-7.1	6" Cement Treated Permeable Base	CY	320
46	P-401-8.1	Bituminous Surface Course (PG 76-22)	TON	46,530
47	P-403-8.1	Bituminous Base Course (PG 76-22)	TON	42,570

BASE BID (CONT'D)

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
48	P-501-8.1	10" Portland Cement Concrete Pavement	SY	390
49	P-501-8.2	12"-15" Portland Cement Concrete Pavement	SY	530
50	P-501-8.4	Concrete Pavement Partial Depth Repair	SF	2,000
51	P-501-8.5	Concrete Pavement Crack Repair	LF	3,000
52	P-610-6.1	Concrete Slope Paving	SY	15,650
53	P-610-6.2	Modify Curb Opening	EA	65
54	P-610-6.3	Concrete Pilot Channel	SY	12,070
55	P-610-6.4	Interceptor Structure	SY	310
56	P-620-5.1a	Taxiway Pavement Marking with Reflective Beads (Yellow)	SF	86,210
57	P-620-5.1b	Taxiway Pavement Marking with Reflective Beads (Black)	SF	111,220
58	P-620-5.1c	Thermoplastic Surface Painted Runway Direction Signs	EA	14
59	P-620-5.1d	Thermoplastic Surface Painted Apron Control Marking Signs	EA	2
60	P-620-5.1e	Surface Preparation	SF	197,430
61	P-620-5.1f	Temporary Taxiway Pavement Markings (Yellow)	SF	14,200
62	P-620-5.1g	Temporary Taxiway Pavement Markings (Black)	SF	24,400
63	P-620-5.1h	Temporary Taxiway Pavement Markings Removal	SF	4,700
64	P-620-5.1i	Removal of Existing Pavement Marking	SF	1,500
65	D-701-5.1	Install 6"x5" RCB (Class V) Open Cut, Complete in Place	LF	70
66	D-701-5.2	Install 7"x5" RCB (Class V) Open Cut, Complete in Place	LF	70
67	D-701-5.3	Install 8"x4" RCB (Class V) Open Cut, Complete in Place	LF	160
68	D-701-5.4	Install 10"x7" RCB (Class V) Open Cut, Complete in Place	LF	30
69	D-701-5.5	Install 24" CMP Open Cut, Complete in Place	LF	2,280
70	D-752-5.1	Install Wingwall, Complete in Place	CY	1,190
71	T-901-5.1	Hydroseeding	AC	25.0
72	T-904-5.1	Sodding	SY	46,570
73	L-108-5.1	No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Trench, Duct Bank or Conduit	LF	177,400
74	L-108-5.2	No. 6 AWG, Solid, Bare Copper Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit, Including Connections/Terminations	LF	3,000
75	L-110-5.1	Flowable Fill Encased Electrical Conduit, 1W-2"C	LF	1,900
76	L-110-5.2	Non-Encased Electrical Conduit, 1W-2"C	LF	150
77	L-110-5.3	Concrete Encased Electrical Conduit, 1W-2"C	LF	1,150
78	L-110-5.4	Concrete Encased Electrical Conduit, 1W-2"C with Saw Kerf Pavement Repair	LF	450
79	L-110-5.5	Non-Encased Electrical Duct Bank, 16W-2"C	LF	225
80	L-110-5.6	Non-Encased Electrical Duct Bank, 2W-2"C	LF	280
81	L-110-5.7	Flowable Fill Encased Electrical Duct Bank, 2W-2"C	LF	650
82	L-115-5.1	Existing Electrical Junction Structure/Manhole Adjusted to New Grade	EA	64
83	L-115-5.2	4x4x4' Aircraft-Rated Handhole, Installed	EA	4
84	L-115-5.3	L-868 Blank Cover with Spacers, Installed	EA	5
85	L-125-5.1	L-852C/D(L) Taxiway Centerline Light, Installed on Adjusted Light Base	EA	754
86	L-125-5.2	L-852C/D(L) Taxiway Centerline Light, Installed on Existing Light Base	EA	442
87	L-125-5.3	L-861T(L) Base Mounted Taxiway Edge Light, Installed on Adjusted Light Base	EA	407
88	L-125-5.4	L-861T(L) Base Mounted Taxiway Edge Light, Installed on Existing Light Base	EA	88
89	L-125-5.5	L-858(L) Base Mounted Guidance Sign, Installed	EA	28
90	L-125-5.6	L-852C/D(L) Taxiway Centerline Light, Installed on New Light Base	EA	38
91	L-125-5.7	L-852G(L) In-Pavement Runway Guard Light, Installed	EA	62
92	L-125-5.8	L-861T(L) Base Mounted Taxiway Edge Light, Installed on New Base in Existing Pavement	EA	18
93	L-125-5.9	L-861T(L) Base Mounted Taxiway Edge Light, Installed on New Base in New Pavement	EA	23
94	L-125-5.10	L-852C/D(L) Taxiway Centerline Light, Installed on New Base in Existing Pavement	EA	18
95	L-125-5.11	Update Sign Legend	EA	1
96	L-125-5.12	L-852C/D(L) Taxiway Centerline Light, Installed on New Base in Existing Pavement with Mill and Overlay	EA	18
97	02378-4.1	Riprap Gradation No. 1, including Topsoil	TON	240

ADDITIVE ALTERNATE #1

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
1	SS-305-5.1	Directional Boring, 16-Way 2"C Polyethylene Conduits	LF	1,300
2	SS-310-5.3	Temporary Airfield Lighting (Additive Alternate 1)	LS	1
3	P-152-4.1	Unclassified Excavation	CY	7,470
4	P-101-5.1	Asphalt Milling (1" and Variable Depth)	SY	(3,410)
5	P-101-5.4	Full-Depth Asphalt Shoulder Removal	SY	4,700
6	P-209-5.1	6" Crushed Aggregate Base Course	SY	12,410
7	P-209-5.2	15" Crushed Aggregate Base Course	SY	2,200
8	P-304-8.1	6" Cement-Treated Base Course	SY	12,050
9	P-403-8.1	Bituminous Base Course (PG 76-22)	TON	410
10	P-501-8.3	18" Portland Cement Concrete Pavement	SY	10,560
11	P-620-5.1a	Taxiway Pavement Marking with Reflective Beads (Yellow)	SF	1,690
12	P-620-5.1b	Taxiway Pavement Marking with Reflective Beads (Black)	SF	2,180
13	P-620-5.1c	Thermoplastic Surface Painted Runway Direction Signs	EA	4
14	T-901-5.1	Hydroseeding	AC	(1.0)
15	T-904-5.1	Sodding	SY	200
16	L-108-5.1	No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Trench, Duct Bank or Conduit	LF	25,000
17	L-108-5.2	No. 6 AWG, Solid, Bare Copper Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit, Including Connections/Terminations	LF	16,300
18	L-110-5.1	Flowable Fill Encased Electrical Conduit, 1W-2"C	LF	1,700
19	L-110-5.3	Concrete Encased Electrical Conduit, 1W-2"C	LF	1,100
20	L-110-5.4	Concrete Encased Electrical Conduit, 1W-2"C with Saw Kerf Pavement Repair	LF	525
21	L-110-5.5	Non-Encased Electrical Duct Bank, 16W-2"C	LF	320
22	L-110-5.6	Non-Encased Electrical Duct Bank, 2W-2"C	LF	160
23	L-110-5.7	Flowable Fill Encased Electrical Duct Bank, 2W-2"C	LF	700
24	L-115-5.2	4x4x4' Aircraft-Rated Handhole, Installed	EA	3
25	L-125-5.2	L-852C/D(L) Taxiway Centerline Light, Installed on Existing Light Base	EA	9
26	L-125-5.3	L-861T(L) Base Mounted Taxiway Edge Light, Installed on Adjusted Light Base	EA	(23)
27	L-125-5.4	L-861T(L) Base Mounted Taxiway Edge Light, Installed on Existing Light Base	EA	(8)
28	L-125-5.5	L-858(L) Base Mounted Guidance Sign, Installed	EA	2
29	L-125-5.6	L-852C/D(L) Taxiway Centerline Light, Installed on New Light Base	EA	14
30	L-125-5.7	L-852G(L) In-Pavement Runway Guard Light, Installed	EA	31
31	L-125-5.8	L-861T(L) Base Mounted Taxiway Edge Light, Installed on New Base in Existing Pavement	EA	15
32	L-125-5.9	L-861T(L) Base Mounted Taxiway Edge Light, Installed on New Base in New Pavement	EA	22
33	L-125-5.10	L-852C/D(L) Taxiway Centerline Light, Installed on New Base in Existing Pavement	EA	41

ADDITIVE ALTERNATE #2

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
1	P-401-8.1	Bituminous Surface Course (PG 76-22)	TON	(9,727)
2	P-401-8.2	Bituminous Surface Course (PG 82-22)	TON	9,727
3	P-403-8.1	Bituminous Base Course (PG 76-22)	TON	(4,067)
4	P-403-8.2	Bituminous Base Course (PG 82-22)	TON	4,067

ADDITIVE ALTERNATE #3

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
1	01555-1.04A	Traffic Control and Regulation, Excluding Flagmen	LS	1
2	01555-1.04B	Flagmen	LS	1
3	SS-300-5.1	Lockout/Tagout and Constant Current Regulator Calibration Procedures	LS	1
4	C-100-14.1	Contractor Quality Control Program (CQCP)	LS	1
5	C-105-6.1	Mobilization	LS	1
6	P-101-5.2	Asphalt Milling (2" and Variable Depth)	SY	565
7	P-101-5.10	Concrete Pavement Removal (14"-20" Depth)	SY	445
8	P-401-8.1	Bituminous Surface Course (PG 76-22)	TON	145
9	P-501-8.4	Concrete Pavement Partial Depth Repair	SF	500
10	P-501-8.5	Concrete Pavement Crack Repair	LF	500
11	P-501-8.6	Concrete Pavement Crack Repair (Epoxy Injection)	LF	400
12	P-501-8.7	14"-20" Portland Cement Concrete Pavement	SY	445
13	P-501-8.8	Concrete Joint Seal Repair	LF	5,000
14	P-620-5.1a	Taxiway Pavement Marking with Reflective Beads (Yellow)	SF	2,000
15	P-620-5.1b	Taxiway Pavement Marking with Reflective Beads (Black)	SF	2,000
16	P-620-5.1f	Temporary Taxiway Pavement Markings (Yellow)	SF	2,115
17	P-620-5.1g	Temporary Taxiway Pavement Markings (Black)	SF	2,115
18	P-620-5.1h	Temporary Taxiway Pavement Markings Removal	SF	4,230
19	SS-310-5.3	Temporary Airfield Lighting (Additive Alternate 3)	LS	1

ADDITIVE ALTERNATE #4

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
1	01555-1.04A	Traffic Control and Regulation, Excluding Flagmen	LS	1
2	01555-1.04B	Flagmen	LS	1
3	SS-301-5.10	Existing Concrete Encased Electrical Duct Bank, 4-Way 4"C, Cleared	LF	60
4	SS-301-5.11	Existing Concrete Encased Duct Bank, 4-Way 4"C, Demolished	LF	60
5	C-100-14.1	Contractor Quality Control Program (CQCP)	LS	1
6	C-102-5.1a	Filter Dam Type II	LF	10
7	P-101-5.11	Remove and Dispose 24" RCP	LF	20
8	P-152-4.1	Unclassified Excavation	CY	66
9	P-610-6.5	4" Seal Slab	CY	20
10	P-610-6.6	Concrete Channel Lining	CY	48
11	D-701-5.6	Install 24" RCP (Class V) Open Cut, Complete in Place	LF	20
12	T-904-5.1	Sodding	SY	200
13	L-110-5.8	FAA Style, Concrete Encased Electrical Duct Bank, 4Way-4"C	LF	370
14	02378-4.1	Riprap Gradation No. 1 incl Topsoil	TON	15



NO.	DESCRIPTION	DATE BY
1	ADD. 2	04/19/24 JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT
 REHABILITATION OF TAXIWAYS SA & SB
SUMMARY OF QUANTITIES

PROJECT MGR:	JEF
DESIGNER:	KKR
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	1" = 1'
DATE:	05/03/2024



APPROVED BY: JEF

DIRECTOR
HOUSTON AIRPORT SYSTEM

PROJECT NO.	0646A
A.I.P. NO.	XXXX
C.I.P. NO.	A-051



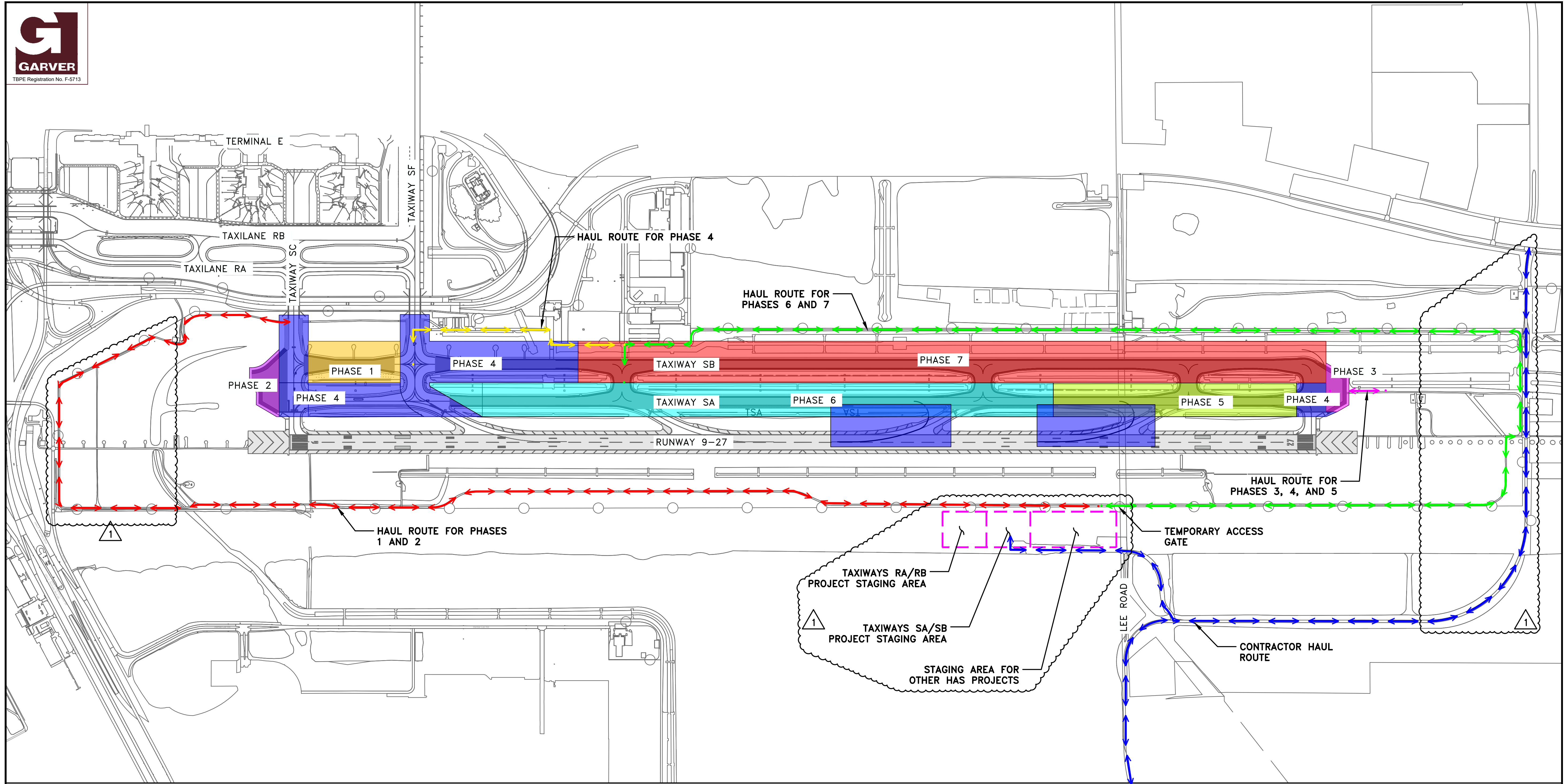
TBPE Registration No. F-5713



Jacobs

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TEXAS P.E. FIRM F-2966

NO.	DESCRIPTION	DATE BY
1	ADD.	04/19/24 JEF



GEORGE BUSH INTERCONTINENTAL AIRPORT
REHABILITATION OF TAXIWAYS SA & SB
OVERALL PHASING PLAN

PROJECT MGR:	DT
DESIGNER:	TM
DRAWN BY:	TM
CHECK BY:	DT
SCALE:	1"=500'
DATE:	05/03/2024



APPROVED BY: JEF

DIRECTOR
HOUSTON AIRPORT SYSTEM

PROJECT NO.	0646A
A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	

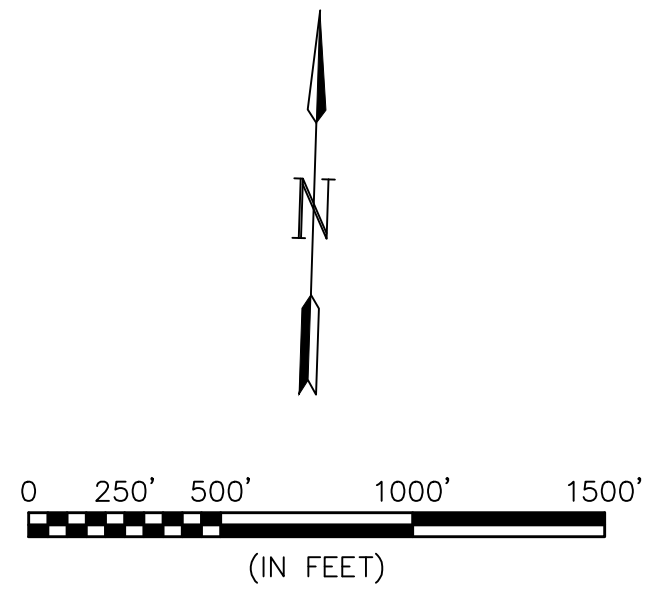
NOTES:

- CONTRACTOR SHALL USE EXTREME CAUTION WHILE MOVING ON ACTIVE TAXIWAYS AND SHALL ONLY USE APPROVED HAUL ROUTES FOR TRANSPORTATION PURPOSES.
- CONTRACTOR SHALL HAVE A SWEEPER TRUCK ON STANDBY AT ALL ACTIVE TAXIWAY CROSSINGS.
- WORK ON PHASES 2 AND 4 REQUIRES CLOSURE OF RUNWAY 9-27. WHEN THIS OCCURS, ALL PAVEMENT SOUTH OF TAXILANE RA SHALL BE CLOSED, AND BARRICADES SHALL BE PLACED OUTSIDE THE OBJECT FREE AREA OF TAXILANE RA INDICATING THE CLOSURE OF THE TAXIWAYS SC AND SF BRIDGES.
- THE PURPOSE OF THE PHASE ORDER NUMBERING IS TO PROVIDE THE CONTRACTOR A BASIC IDEA OF HOW THE PROJECT SHALL PROCEED. PHASING ORDER CAN BE CHANGED AT THE DIRECTION OF HAS OR AT THE REQUEST OF THE CONTRACTOR WITH THE APPROVAL OF HAS.
- CONTRACTOR SHALL INSTALL, MAINTAIN, AND AT THE CONCLUSION OF CONSTRUCTION OPERATIONS REMOVE THE TEMPORARY ACCESS GATE. COST FOR THE GATE IS INCLUDED IN MOBILIZATION.
- ANY CHANGES TO THE PHASING OR THE CSPP WILL REQUIRE FAA APPROVAL.

CONSTRUCTION PHASE DURATION		
PHASE	DURATION	WORK HOURS
1	30	24 / 7
2	14	10PM-6AM
3	14	10PM-6AM
4	60	24 / 7
5	30	24 / 7
6	60	24 / 7
7	60	24 / 7

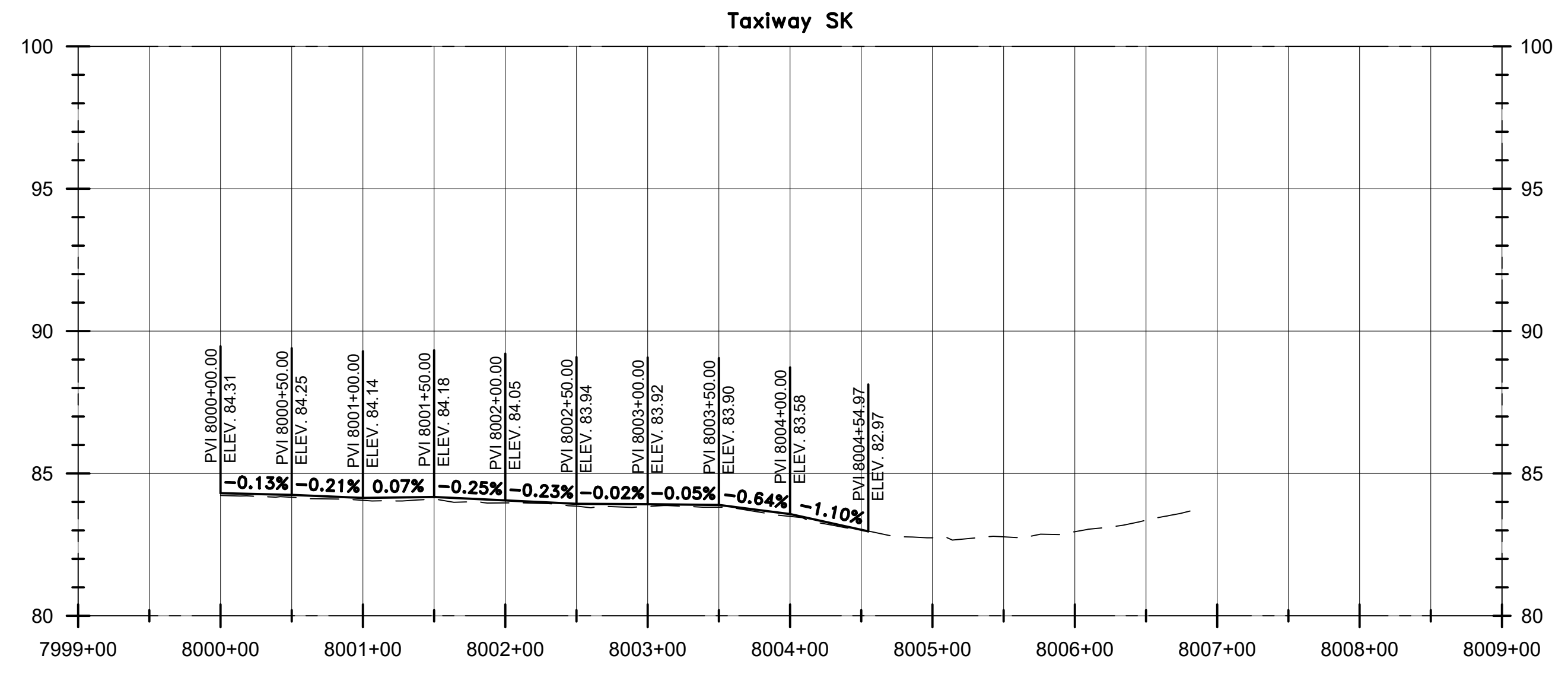
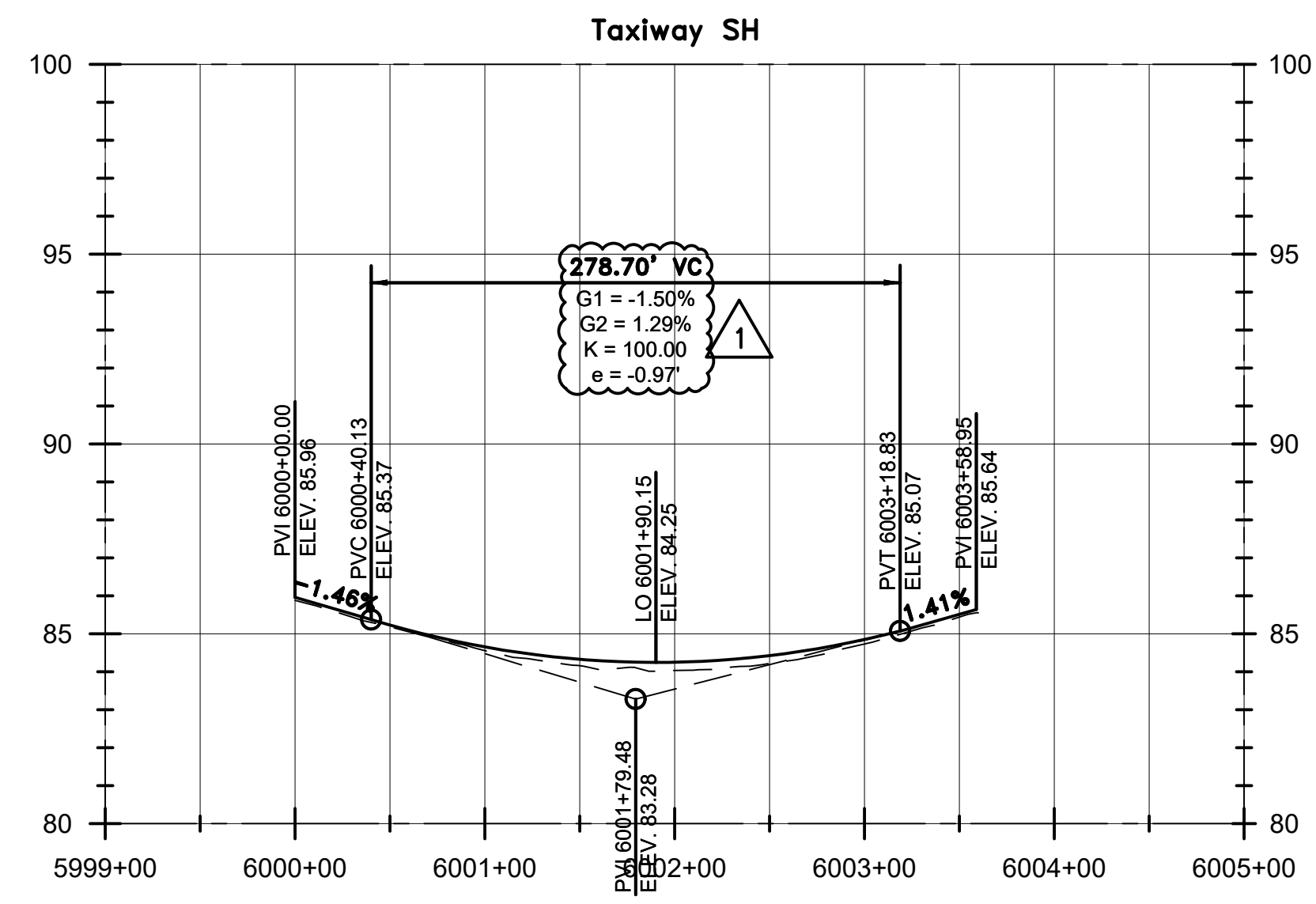
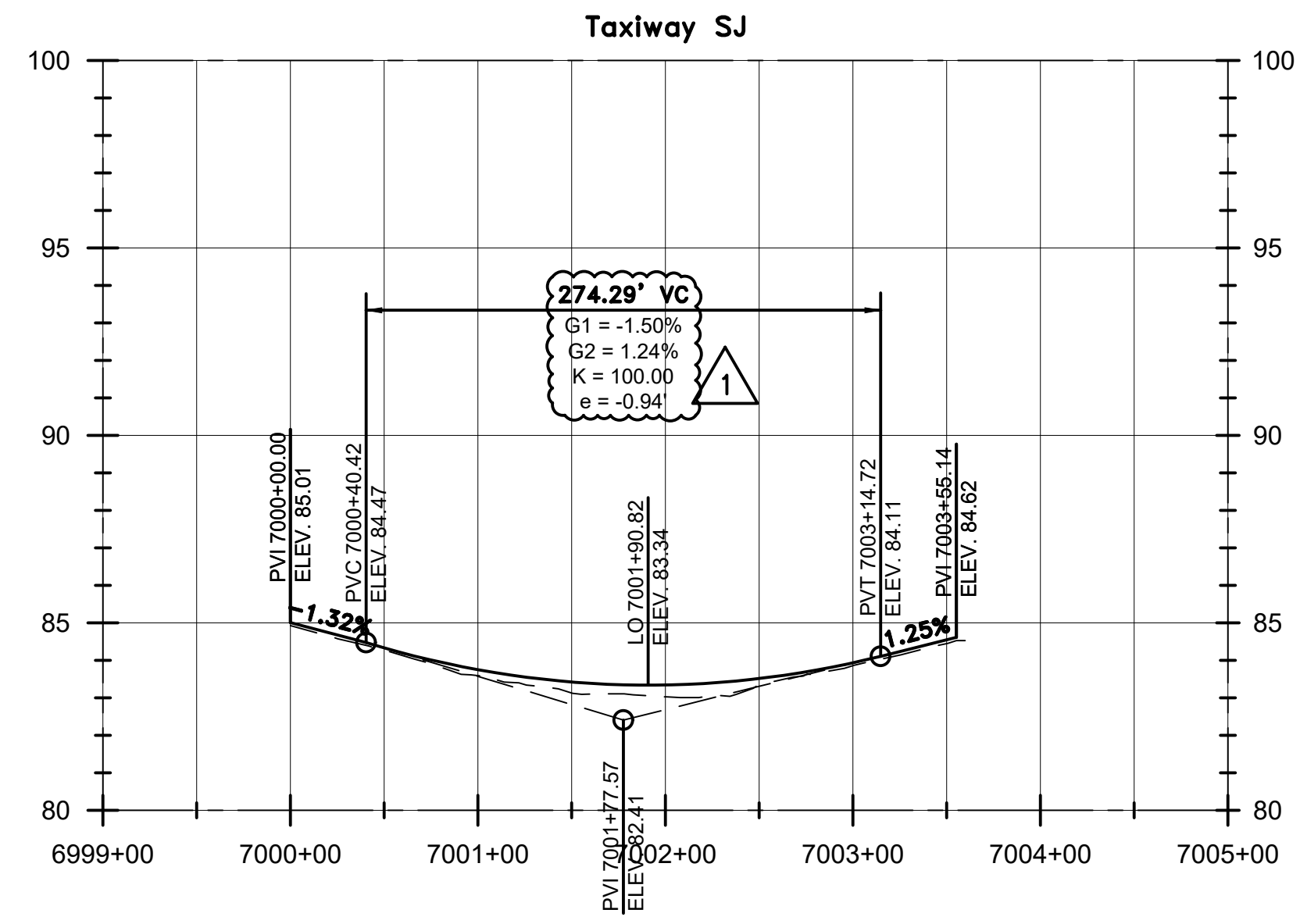
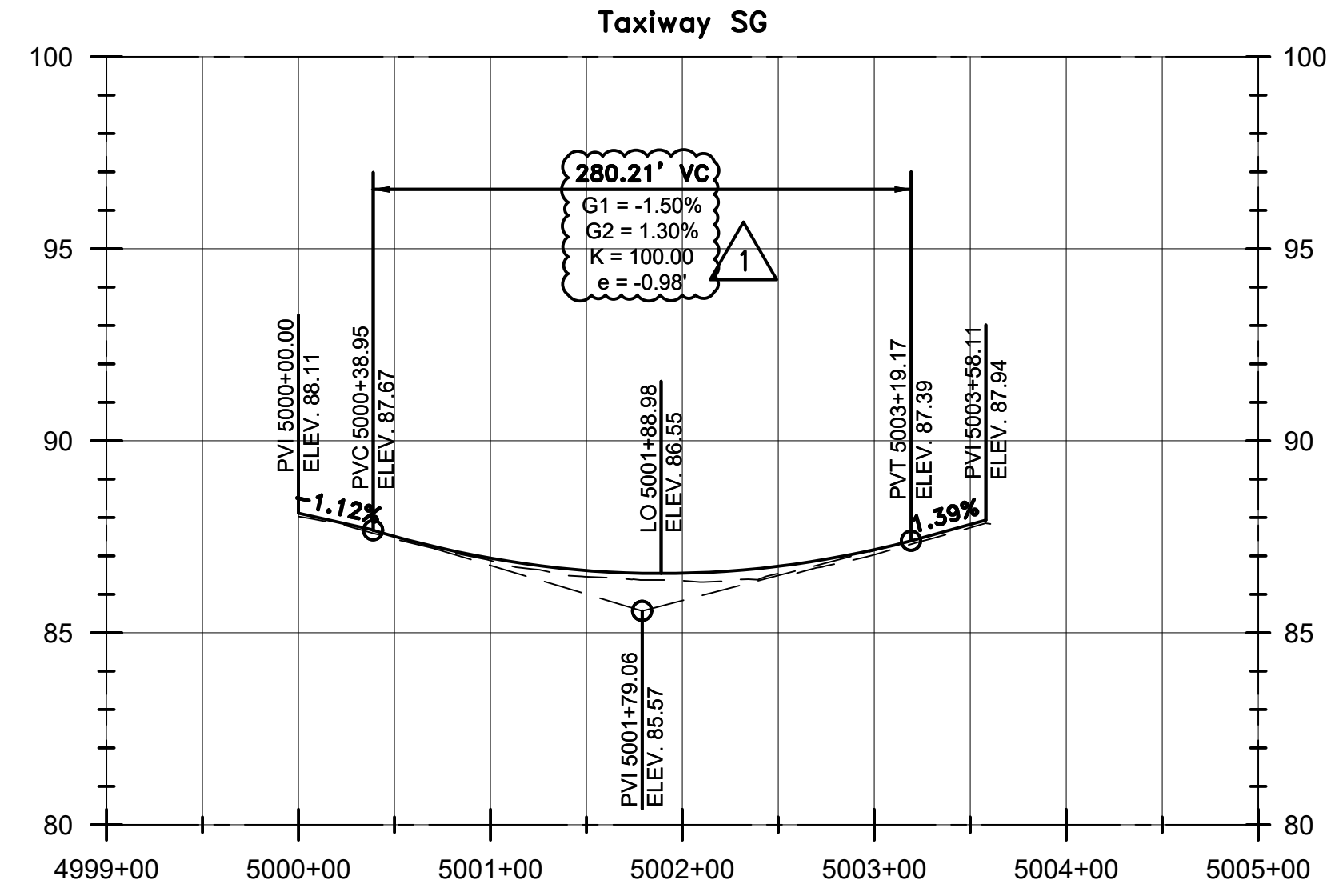
LEGEND

	PHASING WORK AREA
	CONSTRUCTION STAGING AREA
	HAUL ROUTE



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REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADD.	2 05/03/2024 JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT
 REHABILITATION OF TAXIWAYS SA & SB

PROFILE

PROJECT MGR:	JEF
DESIGNER:	KKR
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	1" = 80'
DATE:	05/03/2024



APPROVED BY: JEF

PROJECT NO.	0646A
A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	

VERTICAL EXAGGERATION = 20

C05.05

ITEM SS-301 ELECTRICAL DEMOLITION WORK

DESCRIPTION

301-1.1 This item shall consist of the removal and satisfactory disposal of existing runway and taxiway edge lights, in-pavement lights, guidance signs, markers, manholes, handholes, junction structures, racks, pads, equipment, poles, towers, shelters, and other incidentals, all of which are not designated or permitted to remain, in accordance with this specification, the referenced specifications and drawings, and applicable advisory circulars. This work shall include the removal of indicated equipment, materials, and incidentals necessary for a complete item removal, including all restoration work, as a completed unit to the satisfaction of the Engineer.

301-1.2 The Contractor shall maintain current copies of all referenced and applicable standards on the job site. The Contractor is responsible to make known to the Engineer any conflict between plans and specifications that he observes or of which he is made aware.

MATERIALS

301-2.1 All backfill and repair materials used in electrical demolition, repair and restoration work shall comply with the referenced specifications and be approved by the Engineer.

Airport lighting equipment and materials shall meet the requirements outlined in Item SS-300 and Item L-125.

CONSTRUCTION METHODS

301-3.1 General. No demolition shall be started until the removal and/or relocation work has been laid out and approved by the Engineer. All material shall be disposed of off-site. All hauling and disposal will be considered a necessary and incidental part of the work. Hauling cost shall be considered by the Contractor and included in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

Equipment removal shall typically include removing the equipment and its accessories, removing foundations/pads, removing existing conduits, conductors and appurtenances, removal of conduit to below grade, and removal of existing circuits back to source. The work shall include restoring the area to match existing, including filling and tamping all holes with earth, and clearing and leveling the site.

The Contractor shall remove all existing underground cable, which is unused or rendered unusable by this project, when such is exposed or made accessible during this work. All such wiring removed shall become property of the Contractor and shall be immediately removed from the project. Wiring in conduit shall be removed as indicated or if new wiring is shown to be installed in its place. Existing wiring shall not be reused or reinstalled.

Wiring not exposed shall be abandoned in place, if a reasonable effort will not remove it. No measurement or payment will be made for this cable removal work. Damage to turf or other systems will not be permitted to salvage or retrieve existing cable.

Any damage to electrical equipment, systems, structures, conduits, cables, and accessories or other utilities, designated to remain in place, shall be repaired or replaced expeditiously at no additional cost to the Owner and to the satisfaction of the Owner and Engineer.

Holes, ditches, or other abrupt changes in elevation caused by the removal operations that could obstruct drainage or be considered hazardous or unsightly shall be backfilled, compacted, and left in a workmanlike condition.

Trenches or voids resulting from the removal or demolition of existing electrical equipment or other structures shall be filled with approved material placed in layers in accordance with Item P-152.

Concrete foundations and pads to be removed shall be obliterated full depth.

301-3.2 Removal and/or relocation of light fixtures and equipment. Light fixtures and other equipment which are to be removed shall be carefully excavated. All concrete bases and concrete anchors shall be removed by the Contractor. The removed lights, guidance signs, isolation transformers and wiring harnesses shall then be given to the Owner, or properly disposed of if so directed by the Owner. The ground around the removed lighting equipment shall be backfilled and properly compacted. Light fixtures and equipment which are to be relocated shall be stored on site and reinstalled with new lamps, new transformers, and all other new required accessories as indicated in the plans.

301-3.3 Removal of existing equipment. The Contractor shall carefully remove all salvageable equipment as indicated in the plans. Any equipment that is damaged during the removal and/or relocation operation shall be subject to a reduction in payment for removal and/or relocation of the equipment. All equipment that is removed during this project shall be transported to a site on the Airfield or removed from the Airfield and properly disposed of as directed by the Owner and the Engineer.

301-3.4 Relocation of existing equipment. Existing equipment that is to be relocated shall be carefully disconnected from the existing electrical system. The equipment shall be stored on site in an enclosed area protected from the weather as directed by the Owner and Engineer. The Contractor shall remove existing concrete bases and shall backfill and compact these areas to match existing. The electrical power circuit shall be field located and extended to the new installation location unless otherwise noted in the Plans. Coordinate the extension of the electrical service with the extension of the electrical duct serving the equipment and install duct, splice and cable markers to mark the new complete route.

Refer to the plans for additional installation requirements concerning the relocation of existing lights, signs, systems and incidentals.

Any equipment that is damaged during the relocation operation shall be subject to a reduction in payment for removal and/or relocation of the equipment.

Any equipment that is damaged during the relocation operation shall be repaired or replaced by the Contractor at his expense to the satisfaction of the Owner and Engineer.

301-3.5 Clearing of existing duct banks or conduits. Where new cable is to be installed in an existing duct bank or conduit, the full length of the duct bank or conduit shall be cleared of debris by mechanical means before installation of the new cable. Acceptable means of clearing existing duct banks or conduits may include using a mandrel, "hydro-jetting" method, or "roto-rooting" method as approved by the Engineer.

Where existing cables are being removed from an existing duct bank or conduit and replaced with new cables, the Contractor shall use the existing cable to clear the conduit and to pull in the new cable. No separate payment will be made for clearing these duct banks or conduits or for the existing cable removal. Clearing of these existing duct banks or conduits is incidental to the cable pay item unless otherwise noted.

METHOD OF MEASUREMENT

301-4.1 The quantity of existing lights or guidance signs, removed, to be measured under this item shall be the number of each complete unit removed, and accepted by the Engineer.

This item shall include removing and storing the existing equipment as directed by the Engineer.

Where the light base and concrete structure are indicated to be removed or demolished, the item shall include restoring the area to match existing, including removing the complete concrete item, filling and tamping all holes with earth, and clearing and leveling the site.

Where the light base and concrete structure are to remain, a new blank cover shall be installed for protecting the light base during the construction work. Blank covers shall be removed when the existing equipment is reinstalled and given to the Owner after completion of construction work in the respective area.

301-4.2 The quantity of existing duct bank or conduit, cleared, to be measured under this item, shall be the linear foot of duct bank or conduit cleared using a mandrel or other approved method to remove debris, including swabbing and clearing of each conduit in a duct bank, and installation of pull wires in spare conduits. Separate measurement shall be made for the various types and sizes of duct bank or conduit. Partial payment will not be made for duct bank or conduit that cannot be cleared using a method acceptable to the Engineer. Separate payment will not be made for existing cable removal.

301-4.3 The quantity of existing duct bank or conduit, demolished, to be measured under this item, shall be the linear foot of duct bank or conduit consisting of the complete demolition of the duct bank or conduit as detailed in the Plans and these Specifications, and accepted as completed electrical demolition work to the satisfaction of the Engineer.

BASIS OF PAYMENT

301-5.1 Payment will be made at the contract unit price for each complete item, measured as provided above, and accepted by the Engineer. 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 to the satisfaction of the Engineer.

Payment will be made under:

Item SS-301-5.1	Existing Base Mounted Edge Light, Removed -- per Each
Item SS-301-5.2	Existing In-Pavement Centerline Light, Removed – per Each
Item SS-301-5.3	Existing Base Mounted Guidance Sign, Removed -- per Each
Item SS-301-5.4	Existing Base Mounted Edge Light, Removed, Base Top Section, Removed -- per Each
Item SS-301-5.5	Existing In-Pavement Centerline Light, Removed, Base Top Section, Removed – per Each
Item SS-301-5.6	Existing L-852G Runway Guard Light, Relocated on New Base – per Each
Item SS-301-5.7	Abandoned Sign Foundation, Demolished – per Each
Item SS-301-5.8	Existing Electrical Conduit, 1-Way 2”C, Cleared – Linear Foot
Item SS-301-5.9	Existing Electrical Conduit, 1-Way 4”C, Cleared – Linear Foot
Item SS-301-5.10	Existing Electrical FAA Concrete Encased Duct Bank, 4-Way 4”C, Cleared –

per Linear Foot

Item SS-301-5.11 Existing Concrete Encased Duct Bank, 4-Way 4”C, Demolished – per Linear Foot

END OF ITEM SS-301

ITEM P-101 PREPARATION/REMOVAL OF EXISTING PAVEMENTS

DESCRIPTION

101-1.1 This item shall consist of preparation of existing pavement surfaces for overlay, surface treatments, removal of existing pavement, and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the applicable plans.

101-1.2 *Limits of pavement removal, pavement repair, joint and crack repair, paint and rubber removal, and cold milling are estimated in the plans. Actual limits of these items shall be coordinated with the Engineer prior to construction.*

EQUIPMENT AND MATERIALS

101-2 All equipment and materials shall be specified here and in the following paragraphs or approved by the Resident Project Representative (RPR). The equipment shall not cause damage to the pavement to remain in place.

CONSTRUCTION

101-3.1 Removal of existing pavement.

The Contractor's removal operation shall be controlled to not damage adjacent pavement structure, and base material, cables, utility ducts, pipelines, or drainage structures which are to remain under the pavement.

a. Concrete pavement removal. Full depth saw cuts shall be made perpendicular to the slab surface. The Contractor shall saw through the full depth of the slab including any dowels at the joint, removing the pavement and installing new dowels as shown on the plans and per the specifications. Where the perimeter of the removal limits is not located on the joint and there are no dowels present, the perimeter shall be saw cut the full depth of the pavement. The pavement inside the saw cut shall be removed by methods which will not cause distress in the pavement which is to remain in place. ~~If the material is to be wasted on the airport site, it shall be reduced to a maximum size of []~~. Concrete slabs that are damaged by under breaking shall be repaired or removed and replaced as directed by the RPR.

The edge of existing concrete pavement against which new pavement abuts shall be protected from damage at all times. Spall and underbreak repair shall be in accordance with the plans. Any underlying material that is to remain in place, shall be recompacted and/or replaced as shown on the plans. Adjacent areas damaged during repair shall be repaired or replaced at the Contractor's expense.

b. Asphalt pavement removal. Asphalt pavement to be removed shall be cut to the full depth of the asphalt pavement around the perimeter of the area to be removed. ~~If the material is to be [] wasted on the airport site [] [] incorporated into embankment [], it shall be [] broken to a maximum size of [] inches. [] [] meet the following gradation: []~~.

c. Repair or removal of Base, Subbase, and/or Subgrade. All failed material including surface, base course, subbase course, and subgrade shall be removed and repaired as shown on the plans or as directed by the RPR. Materials and methods of construction shall comply with the applicable sections of these specifications. Any damage caused by Contractor's removal process shall be repaired at the Contractor's expense.

d. Disposal. *All existing pavement removed shall be disposed of off-site. All hauling will be considered a necessary and incidental part of the work. Its costs shall be considered by the Contractor and included in the contract unit price for the pay items of work involved. No payment will be made separately or directly for hauling on any part of the work.*

101-3.2 Preparation of joints and cracks prior to overlay/surface treatment. Remove all vegetation and debris from cracks to a minimum depth of 1 inch. If extensive vegetation exists, treat the specific area with a concentrated solution of a water-based herbicide approved by the RPR. Fill all cracks greater than

1/4 inch wide with a crack sealant per ASTM D6690. The crack sealant, preparation, and application shall be compatible with the surface treatment/overlay to be used. To minimize contamination of the asphalt with the crack sealant, underfill the crack sealant a minimum of 1/8 inch, not to exceed 1/4 inch. Any excess joint or crack sealer shall be removed from the pavement surface.

Wider cracks (over 1-1/2 inch wide), along with soft or sunken spots, indicate that the pavement or the pavement base should be repaired or replaced as stated below.

Cracks and joints may be filled with a mixture of emulsified asphalt and aggregate. The aggregate shall consist of limestone, volcanic ash, sand, or other material that will cure to form a hard substance. The combined gradation shall be as shown in the following table.

Gradation

Sieve Size	Percent Passing
No. 4 (4.75 mm)	100
No. 8 (2.36 mm)	90-100
No. 16 (1.18 mm)	65-90
No. 30 (600 µm)	40-60
No. 50 (300 µm)	25-42
No. 100 (150 µm)	15-30
No. 200 (75 µm)	10-20

Up to 3% cement can be added to accelerate the set time. The mixture shall not contain more than 20% natural sand without approval in writing from the RPR.

The proportions of asphalt emulsion and aggregate shall be determined in the field and may be varied to facilitate construction requirements. Normally, these proportions will be approximately one part asphalt emulsion to five parts aggregate by volume. The material shall be poured or placed into the joints or cracks and compacted to form a voidless mass. The joint or crack shall be filled to within +0 to -1/8 inches of the surface. Any material spilled outside the width of the joint shall be removed from the pavement surface prior to constructing the overlay. Where concrete overlays are to be constructed, only the excess joint material on the pavement surface and vegetation in the joints need to be removed.

a. Soil Sterilants. Soil sterilants shall contain Bromacil or Prometone and shall be approved by the Engineer. Application rates shall be in accordance with the manufacturer's recommendations.

b. Crack Preparation. A high temperature compressed air lance shall be used at all times to blast out any vegetation, dirt, dampness and loose materials from the cracks. Existing crack sealant which is deteriorated shall be removed as directed by the Engineer. The high velocity hot air shall be not less than 2,000 °F in temperature. The air lance shall operate in a no flame impingement condition and shall have a directional controlled velocity of 330-fps minimum and a combustion temperature at ignition of no less than 2,000 °F. After cleaning of crack, tack coat shall be applied prior to the application of emulsified asphalt and aggregate. Tack coat shall conform to Item P-603 of these specifications.

c. Filler Application. After cracks have been cleaned, received soil sterilant and tack coat, and have been approved by the Engineer, the cracks shall be filled with the emulsified asphalt and aggregate described within this specification. The mix shall be raked in the crack by hand in order to completely fill the entire crack. Once the crack is filled, excess asphalt mix shall be rounded up along the length of the crack, and pinched into the crack using a small asphalt roller. The application and compaction method shall be approved by the Engineer prior to beginning crack cleaning operations.

101-3.3 Removal of Foreign Substances/contaminates prior to overlay. Removal of foreign substances/contaminates from existing pavement that will affect the bond of the new treatment shall consist of removal of rubber, fuel spills, oil, crack sealer, at least 90% of paint, and other foreign substances from the surface of the pavement. Areas that require removal are designated on the plans and as directed by the RPR in the field during construction.

Cold milling may be used. If chemicals are used, they shall comply with the state's environmental protection regulations. Removal methods used shall not cause major damage to the pavement, or to any structure or utility within or adjacent to the work area. Major damage is defined as changing the properties of the pavement, removal of asphalt causing the aggregate to ravel, or removing pavement over 1/8 inch deep. If it is deemed by the RPR that damage to the existing pavement is caused by operational error, such as permitting the application method to dwell in one location for too long, the Contractor shall repair the damaged area without compensation and as directed by the RPR.

Removal of foreign substances shall not proceed until approved by the RPR. Water used for high-pressure water equipment shall be provided by the Contractor at the Contractor's expense. No material shall be deposited on the pavement shoulders. All wastes shall be disposed of in areas indicated in this specification or shown on the plans.

101-3.4 Concrete spall or failed asphaltic concrete pavement repair.

a. Repair of concrete spalls in areas to be overlaid with asphalt. The Contractor shall repair all spalled concrete as shown on the plans or as directed by the RPR. The perimeter of the repair shall be saw cut a minimum of 2 inches outside the affected area and 2 inches deep. The deteriorated material shall be removed to a depth where the existing material is firm or cannot be easily removed with a geologist pick. The removed area shall be filled with asphalt mixture with aggregate sized appropriately for the depth of the patch. The material shall be compacted with equipment approved by the RPR until the material is dense and no movement or marks are visible. The material shall not be placed in lifts over 4 inches in depth. This method of repair applies only to pavement to be overlaid.

b. Asphalt pavement repair. The Contractor shall repair all spalled concrete as shown on the plans or as directed by the RPR. The failed areas shall be removed as specified in paragraph 101-3.1b. All failed material including surface, base course, subbase course, and subgrade shall be removed. Materials and methods of construction shall comply with the applicable sections of these specifications.

101-3.5 Cold milling. Milling shall be performed with a power-operated milling machine or grinder, capable of producing a uniform finished surface. The milling machine or grinder shall operate without tearing or gouging the underlying surface. The milling machine or grinder shall be equipped with grade and slope controls, and a positive means of dust control. All millings shall be removed and disposed off Airport property. If the Contractor mills or grinds deeper or wider than the plans specify, the Contractor shall replace the material removed with new material at the Contractor's Expense.

a. Patching. The milling machine shall be capable of cutting a vertical edge without chipping or spalling the edges of the remaining pavement and it shall have a positive method of controlling the depth of cut. The ~~RPR~~ Contractor shall layout the area to be milled with a straightedge in increments of 1-foot widths. *The Contractor's layout shall be approved by the RPR prior to beginning milling operations.* The area to be milled shall cover only the failed area. Any excessive area that is milled because the Contractor doesn't have the appropriate milling machine, or areas that are damaged because of his negligence, shall be repaired by the Contractor at the Contractor's Expense.

b. Profiling, grade correction, or surface correction. The milling machine shall have a minimum width of 7 feet and it shall be equipped with electronic grade control devices that will cut the surface to the grade specified. The tolerances shall be maintained within +0 inch and -1/4 inch of the specified grade. The machine must cut vertical edges and have a positive method of dust control. The machine must have the ability to remove the millings or cuttings from the pavement and load them into a truck. All millings shall be removed and disposed of off the airport.

c. Clean-up. The Contractor shall sweep the milled surface daily and immediately after the milling until all residual materials are removed from the pavement surface. Prior to paving, the Contractor shall wet down the milled pavement and thoroughly sweep and/or blow the surface to remove loose residual material. Waste materials shall be collected and removed from the pavement surface and adjacent areas by sweeping or vacuuming. Waste materials shall be removed and disposed off Airport property.

~~101-3.6. Preparation of asphalt pavement surfaces prior to surface treatment.~~ Existing asphalt pavements to be treated with a surface treatment shall be prepared as follows:

~~a. Patch asphalt pavement surfaces that have been softened by petroleum derivatives or have failed due to any other cause. Remove damaged pavement to the full depth of the damage and replace with new asphalt pavement similar to that of the existing pavement in accordance with paragraph 101-3.4b.~~

~~b. Repair joints and cracks in accordance with paragraph 101-3.2.~~

~~c. Remove oil or grease that has not penetrated the asphalt pavement by scrubbing with a detergent and washing thoroughly with clean water. After cleaning, treat these areas with an oil spot primer. []~~

~~d. Clean pavement surface immediately prior to placing the surface treatment so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film.~~

101-3.7 Maintenance. The Contractor shall perform all maintenance work necessary to keep the pavement in a satisfactory condition until the full section is complete and accepted by the RPR. The surface shall be kept clean and free from foreign material. The pavement shall be properly drained at all times. If cleaning is necessary or if the pavement becomes disturbed, any work repairs necessary shall be performed at the Contractor's expense.

101-3.8 Preparation of Joints in Rigid Pavement prior to resealing. Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound, moisture and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method used cleans the joint and does not damage the joint.

101-3.8.1 Removal of Existing Joint Sealant. All existing joint sealants will be removed by plowing or use of hand tools. Any remaining sealant and or debris will be removed by use of wire brushes or other tools as necessary. Resaw joints removing no more than 1/16 inch from each joint face. Immediately after sawing, flush out joint with water and other tools as necessary to completely remove the slurry.

101-3.8.2 Cleaning prior to sealing. Immediately before sealing, joints shall be cleaned by removing any remaining laitance and other foreign material. Allow sufficient time to dry out joints prior to sealing. Joint surfaces will be surface-dry prior to installation of sealant.

101-3.8.3 Joint sealant. Joint material and installation will be in accordance with Item P-605.

101-3.9 Preparation of Cracks in Flexible Pavement prior to sealing. Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound, moisture and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, the method used cleans the cracks and does not damage the pavement.

101-3.9.1 Preparation of Crack. Widen crack with router by removing a minimum of 1/16 inch from each side of crack. Immediately before sealing, cracks will be blown out with a hot air lance combined with oil and water-free compressed air.

101-3.9.2 Removal of Existing Crack Sealant. Existing sealants will be removed by routing. Following routing any remaining debris will be removed by use of a hot lance combined with oil and water-free compressed air.

101-3.9.3 Crack Sealant. Crack sealant material and installation will be in accordance with Item P-605.

101-3.10 Removal of Pipe and other Buried Structures.

a. Removal of Existing Pipe Material. Remove the types of pipe as indicated on the plans. The pipe material shall be legally disposed of off-site in a timely manner following removal. Trenches shall be backfilled with material equal to or better in quality than adjacent embankment. Trenches under paved areas must be compacted to 95% of ASTM D1557.

b. Removal of Inlets/Manholes. Not used.

METHOD OF MEASUREMENT

101-4.1 Pavement removal. The unit of measurement for pavement removal shall be the number of square yards removed by the Contractor. Any pavement removed outside the limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment. No direct measurement or payment shall be made for saw cutting. Saw cutting shall be incidental to pavement removal. Dowel bar installation shall be incidental to pavement removal.

101-4.2 Joint and crack repair. The unit of measurement for joint and crack repair shall be the linear foot of joint.

~~**101-4.3 Removal of Foreign Substances/contaminates.** The unit of measurement for foreign Substances/contaminates removal shall be the square foot.~~

~~**101-4.4 Spalled and failed asphalt pavement repair.** The unit of measure for failed asphalt pavement repair shall be square foot.~~

101-4.5 Concrete Spall Repair. The unit of measure for concrete spall repair shall be the number of square feet. The location and average depth of the patch shall be determined and agreed upon by the RPR and the Contractor.

101-4.6 Cold milling. The unit of measure for cold milling shall be inches of milling *depth* per square yard *as indicated in the plans*. The location and average depth of the cold milling shall be as shown on the plans. If the initial cut does not correct the condition, the Contractor shall re-mill the area and will be paid for the total depth of milling.

101-4.7 Removal of Pipe and other Buried Structures. The unit of measurement for removal of pipe and other buried structures will be made at the contract unit price for each completed and accepted item. This price shall be full compensation for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with paragraph 101-3.10.

101-4.8 Concrete Headwall Removal. The unit measurement for removal of concrete headwalls will be made at the contract unit price for each complete and accepted item. This shall be full compensation for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with paragraph 101-3.10.

BASIS OF PAYMENT

101-5.1 Payment. Payment shall be made at contract unit price for the unit of measurement as specified above. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of the material and for all labor, equipment, tools, and incidentals necessary to complete this item.

- P-101-5.1 Asphalt Milling (1" and Variable Depth) – per square yard
- P-101-5.2 Asphalt Milling (2" and Variable Depth) – per square yard
- P-101-5.3 Asphalt Milling (5" and Variable Depth) – per square yard
- P-101-5.4 Full-Depth Asphalt Shoulder Removal – per square yard
- P-101-5.5 Concrete Pavement Removal (12"-15" Depth) – per square yard
- P-101-5.6 Remove and Dispose 24" CMP – per linear foot
- P-101-5.7 Concrete Slope Paving Removal and Disposal – per square yard
- P-101-5.8 Concrete Headwall Removal – per each
- P-101-5.9 Asphalt Crack Repair – per linear foot
- P-101-5.10 Concrete Pavement Removal (14"-20" Depth) – per square yard

P-101-5.11 Remove and Dispose 24" RCP – per linear foot

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5380-6 Guidelines and Procedures for Maintenance of Airport Pavements.

ASTM International (ASTM)

ASTM D6690 Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

END OF ITEM P-101

ITEM P-610 CONCRETE FOR MISCELLANEOUS STRUCTURES

DESCRIPTION

610-1.1 This item shall consist of concrete and reinforcement, as shown on the plans, prepared and constructed in accordance with these specifications. This specification shall be used for all concrete other than airfield pavement which are cast-in-place.

MATERIALS

610-2.1 General. Only approved materials, conforming to the requirements of these specifications, shall be used in the work. Materials may be subject to inspection and tests at any time during their preparation or use. The source of all materials shall be approved by the Resident Project Representative (RPR) before delivery or use in the work. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be stored and handled to ensure preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed in them.

The use of pit-run aggregates shall not be permitted unless the pit-run aggregate has been screened and washed, and all fine and coarse aggregates stored separately and kept clean. The mixing of different aggregates from different sources in one storage stockpile or alternating batches of different aggregates shall not be permitted.

a. Reactivity. Fine aggregate and coarse aggregates to be used in all concrete shall have been tested separately within six months of the project in accordance with ASTM C1260. Test results shall be submitted to the RPR. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.08% at 14 days (16 days from casting). If the expansion either or both test specimen is greater than 0.08% at 14 days, but less than 0.20%, a minimum of 25% of Type F fly ash, or between 40% and 55% of slag cement shall be used in the concrete mix. If expansion of either the coarse or fine aggregate exceeds 0.08%, at 14 days limit the alkali loading contributed by the cement content of the cement to be less than or equal to 3.0 lb per cubic yard (1.8 kg per cubic meter), calculated in accordance with EB XXX.

If the expansion is greater than 0.20% the aggregates shall not be used, and test results for other aggregates must be submitted for evaluation; or aggregates that meet P-501 reactivity test requirements may be utilized.

610-2.2 Coarse aggregate. The coarse aggregate for concrete shall meet the requirements of ASTM C33 and the requirements of Table 4, Class Designation 5S; and the grading requirements shown below, as required for the project.

Coarse Aggregate Grading Requirements

Maximum Aggregate Size	ASTM C33, Table 3 Grading Requirements (Size No.)
1 1/2 inch (37.5 mm)	467 or 4 and 67
1 inch (25 mm)	57
3/4 inch (19 mm)	67
1/2 inch (12.5 mm)	7

610-2.2.1 Coarse Aggregate susceptibility to durability (D) cracking. Not used.

610-2.3 Fine aggregate. The fine aggregate for concrete shall meet all fine aggregate requirements of ASTM C33.

610-2.4 Cement. Cement shall conform to the requirements of ASMT C150 Types I, II, V or ASTM C595 Types IS, IP, IL, or IT.

610-2.5 Cementitious materials.

a. Fly ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash shall have a Calcium Oxide (CaO) content of less than 15% and a total available alkali content less than 3% per ASTM C311. Fly ash produced in furnace operations using liming materials or soda ash (sodium carbonate) as an additive shall not be acceptable. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the concrete mix, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the RPR.

b. Slag cement (ground granulated blast furnace (GGBF)). Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.

610-2.6 Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

610-2.7 Admixtures. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the RPR may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the RPR from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

c. Other chemical admixtures. The use of set retarding, and set-accelerating admixtures shall be approved by the RPR. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

610-2.8 Premolded joint material. Premolded joint material for expansion joints shall meet the requirements of ASTM D1751.

610-2.9 Joint filler. The filler for joints shall meet the requirements of Item P-605, unless otherwise specified.

610-2.10 Steel reinforcement. Reinforcing shall conform consist of [] conforming to the requirements of *the following table*.

Steel Reinforcement

Reinforcing Steel	ASTM A615, ASTM A706, ASTM A775, ASTM A934
Welded Steel Wire Fabric	ASTM A1064, ASTM A884
Welded Deformed Steel Fabric	ASTM A1064
Bar Mats	ASTM A184 or ASTM A704

610-2.11 Materials for curing concrete. Curing materials shall conform to ASTM C309 for **White-pigmented Liquid Membrane-Forming Compound, Type 2, Class B.**

CONSTRUCTION METHODS

610-3.1 General. The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified here. All machinery and equipment used by the Contractor on the work, shall be of sufficient size to meet the requirements of the work. All work shall be subject to the inspection and approval of the RPR.

610-3.2 Concrete Mixture. The concrete shall develop a compressive strength of 4,000 psi in 28 days as determined by test cylinders made in accordance with ASTM C31 and tested in accordance with ASTM C39. The concrete shall contain not less than 470 pounds of cementitious material per cubic yard. The water cementitious ratio shall not exceed 0.45 by weight. The air content of the concrete shall be 5% +/- 1.2% as determined by ASTM C231 and shall have a slump of not more than 4 inches as determined by ASTM C143.

610-3.3 Mixing. Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C94 or ASTM C685.

The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40°F without the RPRs approval. If approval is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50°F nor more than 100°F. The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his expense.

Retempering of concrete by adding water or any other material is not permitted.

The rate of delivery of concrete to the job shall be sufficient to allow uninterrupted placement of the concrete.

610-3.4 Forms. Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the RPR. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as shown on the plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes. The Contractor shall be responsible for their adequacy.

The internal form ties shall be arranged so no metal will show in the concrete surface or discolor the surface when exposed to weathering when the forms are removed. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied immediately before the concrete is placed. Forms shall be constructed so they can be removed without injuring the concrete or concrete surface.

610-3.5 Placing reinforcement. All reinforcement shall be accurately placed, as shown on the plans, and shall be firmly held in position during concrete placement. Bars shall be fastened together at intersections.

The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

610-3.6 Embedded items. Before placing concrete, all embedded items shall be firmly and securely fastened in place as indicated. All embedded items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The concrete shall be spaded and consolidated around and against embedded items. The embedding of wood shall not be allowed.

610-3.7 Concrete Consistency. The Contractor shall monitor the consistency of the concrete delivered to the project site; collect each batch ticket; check temperature; and perform slump tests on each truck at the project site in accordance with ASTM C143.

610-3.8 Placing concrete. All concrete shall be placed during daylight hours, unless otherwise approved. The concrete shall not be placed until the depth and condition of foundations, the adequacy of forms and falsework, and the placing of the steel reinforcing have been approved by the RPR. Concrete shall be placed as soon as practical after mixing, but in no case later than one (1) hour after water has been added to the mix. The method and manner of placing shall avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. The concrete shall not be dropped from a height of more than 5 feet. Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete shall be placed on clean, damp surfaces, free from running water, or on a properly consolidated soil foundation.

610-3.9 Vibration. Vibration shall follow the guidelines in American Concrete Institute (ACI) Committee 309R, Guide for Consolidation of Concrete.

610-3.10 Joints. Joints shall be constructed as indicated on the plans.

610-3.11 Finishing. All exposed concrete surfaces shall be true, smooth, and free from open or rough areas, depressions, or projections. All concrete horizontal plane surfaces shall be brought flush to the proper elevation with the finished top surface struck-off with a straightedge and floated.

610-3.12 Curing and protection. All concrete shall be properly cured in accordance with the recommendations in American Concrete Institute (ACI) 308R, Guide to External Curing of Concrete. The concrete shall be protected from damage until project acceptance.

610-3.13 Cold weather placing. When concrete is placed at temperatures below 40°F, follow the cold weather concreting recommendations found in ACI 306R, Cold Weather Concreting.

610-3.14 Hot weather placing. When concrete is placed in hot weather greater than 85°F, follow the hot weather concreting recommendations found in ACI 305R, Hot Weather Concreting.

QUALITY ASSURANCE (QA)

610-4.1 Quality Assurance sampling and testing. Concrete for each day's placement will be accepted on the basis of the compressive strength specified in paragraph 610-3.2. The RPR will sample the concrete in accordance with ASTM C172; test the slump in accordance with ASTM C143; test air content in accordance with ASTM C231; make and cure compressive strength specimens in accordance with ASTM C31; and test in accordance with ASTM C39. The QA testing agency will meet the requirements of ASTM C1077.

The Contractor shall provide adequate facilities for the initial curing of cylinders.

610-4.2 Defective work. Any defective work that cannot be satisfactorily repaired as determined by the RPR, shall be removed and replaced at the Contractor's expense. Defective work includes, but is not limited to, uneven dimensions, honeycombing and other voids on the surface or edges of the concrete.

METHOD OF MEASUREMENT

610-5.1 Portland cement concrete shall be measured by the number of square yards of concrete complete in place and accepted. In computing the yardage of concrete for payment, the dimensions used shall be those shown on the plans or ordered by the Engineer. No measurements or other allowances shall be made for forms, falsework, cofferdams, pumping, bracing, expansion joints, or finishing of the concrete. No deductions in yardage shall be made for the volumes of reinforcing steel or embedded items.

610-5.2 Portland cement concrete shall be measured by the number of curb openings modified as shown in the plans, complete in place and accepted. No measurements or other allowances shall be made for forms, falsework, cofferdams, pumping, bracing, expansion joints, or finishing of the concrete.

BASIS OF PAYMENT

610-6.1 Payment shall be made at the contract unit price for the unit of measurement as specified above. These prices shall be full compensation for furnishing all materials and for all preparation, delivery and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

P-610-6.1	Concrete Slope Paving – per square yard
P-610-6.2	Modify Curb Opening – per each
P-610-6.3	Concrete Pilot Channel – per square yard
P-610-6.4	Interceptor Structure – per square yard
P-610-6.5	4" Seal Slab – per cubic yard
P-610-6.6	Concrete Channel Lining – per cubic yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A884	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field

ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C685	Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1157	Standard Performance Specification for Hydraulic Cement
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1365	Standard Test Method for Determination of the Proportion of Phases in Portland Cement and Portland-Cement Clinker Using X-Ray Powder Diffraction Analysis

ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

American Concrete Institute (ACI)

ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 308R	Guide to External Curing of Concrete
ACI 309R	Guide for Consolidation of Concrete

END OF ITEM P-610

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ITEM D-701

PIPE FOR STORM DRAINS AND CULVERTS

DESCRIPTION

701-1.1 This item shall consist of the construction of pipe culverts and storm drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

701-2.1 Materials shall meet the requirements shown on the plans and specified below.

Reinforced Concrete pipe shall conform circular reinforced concrete pipe to requirements of ASTM C 76, for Class V wall thickness. Conform to rubber gasket joints for sanitary sewers and storm sewers and tongue and groove for roadside ditch culverts to ASTM C 443.

Reinforced Concrete Box boxes shall be machine-made or cast by process which will provide for uniform placement of concrete in forms and compaction by mechanical devices to produce dense, structurally sound concrete. RCBs in shall withstand FAA loading conditions.

701-2.2 Pipe. The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements:

AASHTO M167	American Association of State Highway and Transportation Officials Standard Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field Bolted Pipe, Pipe Arches, and Arches
AASHTO M190	Standard Specification for Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M196	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M219	Standard Specification for Corrugated Aluminum Alloy Structural Plate for Field Bolted Pipe, Pipe Arches, and Arches
AASHTO M243	Standard Specification for Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe Arches, and Arches
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300 to 1500-mm (12 to 60 in.) Diameter
AASHTO M304	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO MP20	Standard Specification for Steel Reinforced Polyethylene (PE) Ribbed Pipe, 300 to 900 mm (12 to 36 in.) Diameter
ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
ASTM A761	Standard Specification for Corrugated Structural Steel Plate, Zinc-Coated, for Field Bolted Pipe, Pipe Arches, and Arches

ASTM A762	Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM A849	Standard Specification for Post Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
ASTM B745	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
ASTM C14	Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe
ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C506	Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
ASTM D 558	Standard Test Method for Moisture-Density Relations of Soil Cement-Mixtures
ASTM F667	Standard Specification for 3 through 24 in Corrugated Polyethylene Pipe and Fittings
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
ASTM F794	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
ASTM F894	Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F949	Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
ASTM F2435	Standard Specification for Steel Reinforced Polyethylene (PE) Corrugated Pipe
ASTM F2562	Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage
ASTM F2736	Standard Specification for 6 to 30 in. (152 to 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe
ASTM F2764	Standard Specification for 30 to 60 in. (750 to 1500 mm) Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications

~~ASTM F2881 Standard Specification for 12 to 60 in. (300 to 1500 mm) Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications~~

~~ASTM D3034 Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings~~

701-2.3 Concrete. Concrete for pipe cradles shall have a minimum compressive strength of 3000 psi (20.7 MPa) at 28 days and conform to the requirements of ASTM C94.

701-2.4 Rubber gaskets. Rubber gaskets for rigid pipe shall conform to the requirements of ASTM C443. ~~Rubber gaskets for PVC pipe, polyethylene, and polypropylene pipe shall conform to the requirements of ASTM F477.~~ Rubber gaskets for zinc-coated steel pipe and pre-coated galvanized pipe shall conform to the requirements of ASTM D1056, for the "RE" closed cell grades. ~~Rubber gaskets for steel reinforced thermoplastic ribbed pipe shall conform to the requirements of ASTM F477.~~

701-2.5 Joint mortar. ~~Pipe joint mortar shall consist of one part Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.~~

701-2.6 Joint fillers. Poured filler for joints shall conform to the requirements of ASTM D6690.

701-2.7 Plastic gaskets. Plastic gaskets shall conform to the requirements of AASHTO M198 (Type B).

701-2.8. Controlled low-strength material (CLSM). CLSM is not allowed.

CONSTRUCTION METHODS

701-3.1 Excavation. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but it shall not be less than the external diameter of the pipe plus 12 inches on each side. The trench walls shall be approximately vertical.

The Contractor shall comply with all current Federal, state and local rules and regulations governing the safety of men and materials during the excavation, installation and backfilling operations. Specifically, the Contractor shall observe that all requirements of the Occupational Safety and Health Administration (OSHA) relating to excavations, trenching and shoring are strictly adhered to. The width of the trench shall be sufficient to permit satisfactory jointing of the pipe and thorough compaction of the bedding material under the pipe and backfill material around the pipe, but it shall not be greater than the widths shown on the plans trench detail. The trench bottom shall be shaped to fully and uniformly support the bottom quadrant of the pipe.

Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 8 inch or 1/2 inch for each foot of fill over the top of the pipe (whichever is greater) but for no more than three-quarters of the nominal diameter of the pipe. The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6 inches in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The Engineer shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

The excavation for pipes placed in embankment fill shall not be made until the embankment has been completed to a height above the top of the pipe as shown on the plans.

The contractor shall always maintain the positive drainage system and dewater the area in the event of rain fall and / or encountering the ground water. The contractor shall not place any storm sewer pipes, structures, subbase and any backfill material until the work area is properly drained and dewatered to achieve the optimum moisture content. Performance of the work described in this paragraph is not payable directly, but shall be considered as a subsidiary obligation of the Contractor and included in the contract price for the pay items of work involved.

701-3.2 Bedding. The pipe bedding shall be as specified herein conform to the class specified on the plans. The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. When no bedding class is specified or detailed on the plans, the requirements for Class C bedding shall apply.

a. **Rigid pipe.** Class A bedding shall consist of cement stabilized sand conforming to the plan details.

Cement stabilized sand should have a minimum compressive strength of 100 psi in 48 hours. The mix design should be submitted to the Engineer for review and approval. The minimum cement requirements should be determined based on compressive strength test within the optimum moisture content of +/- 3%.

Class B bedding shall consist of a bed of granular material having a thickness of at least 6 inches (150 mm) below the bottom of the pipe and extending up around the pipe for a depth of not less than 30% of the pipe's vertical outside diameter. The layer of bedding material shall be shaped to fit the pipe for at least 10% of the pipe's vertical diameter and shall have recesses shaped to receive the bell of bell and spigot pipe. The bedding material shall be sand or select sandy soil with 100% passing a 3/8 inch (9 mm) sieve and not more than 10% passing a No. 200 (0.075 mm) sieve.

Class C bedding shall consist of bedding the pipe in its natural foundation material to a depth of not less than 10% of the pipe's vertical outside diameter. The bed shall be shaped to fit the pipe and shall have recesses shaped to receive the bell of bell and spigot pipe.

b. **Flexible pipe.** For flexible pipe, the bed shall be roughly shaped to fit the pipe, and a bedding blanket of sand or fine granular material shall be provided as follows:

Pipe Corrugation Depth		Minimum Bedding Depth	
inch	mm	inch	mm
1/2	12	1	25
1	25	2	50
2	50	3	75
2-1/2	60	3-1/2	90

c. **PVC, polyethylene, and polypropylene pipe.** For PVC, polyethylene, and polypropylene pipe, the bedding material shall consist of coarse sands and gravels with a maximum particle size of 3/4 inches (19 mm). For pipes installed under paved areas, no more than 12% of the material shall pass the No. 200 (0.075 mm) sieve. For all other areas, no more than 50% of the material shall pass the No. 200 (0.075 mm) sieve. The bedding shall have a thickness of at least 6 inches (150 mm) below the bottom of the pipe and extend up around the pipe for a depth of not less than 50% of the pipe's vertical outside diameter.

701-3.3 Laying pipe. The pipe laying shall begin at the lowest point of the trench and proceed upgrade. The lower segment of the pipe shall be in contact with the bedding throughout its full length. Bell or groove ends of rigid pipes and outside circumferential laps of flexible pipes shall be placed facing upgrade. Pipe shall be placed using a laser level or other means to ensure proper slope and alignment.

Paved or partially lined pipe shall be placed so that the longitudinal center line of the paved segment coincides with the flow line.

~~Elliptical and elliptically reinforced concrete pipes shall be placed with the manufacturer's reference lines designating the top of the pipe within five degrees of a vertical plane through the longitudinal axis of the pipe.~~

701-3.4 Joining pipe. Joints shall be made with (1) Portland cement mortar, (2) Portland cement grout, (3) rubber gaskets, (4) plastic gaskets, or (5) coupling bands.

~~Mortar joints shall be made with an excess of mortar to form a continuous bead around the outside of the pipe and shall be finished smooth on the inside. Molds or runners shall be used for grouted joints to retain the poured grout. Rubber ring gaskets shall be installed to form a flexible watertight seal.~~

- a. **Concrete pipe.** Concrete pipe may be either bell and spigot or tongue and groove. The method of joining pipe sections shall be so the ends are fully entered and the inner surfaces are reasonably flush and even. Joints shall be thoroughly wetted before applying mortar or grout.
- b. **Metal pipe.** Metal pipe shall be firmly joined by form-fitting bands conforming to the requirements of ASTM A760 for steel pipe and AASHTO M196 for aluminum pipe.
- ~~c. **PVC, polyethylene and polypropylene pipe.** Joints for PVC, Polyethylene, and Polypropylene pipe shall conform to the requirements of ASTM D3212 when water tight joints are required. Joints for PVC and Polyethylene pipe shall conform to the requirements of AASHTO M304 when soil tight joints are required. Fittings for polyethylene pipe shall conform to the requirements of AASHTO M252 or ASTM M294. Fittings for polypropylene pipe shall conform to ASTM F2881, ASTM F2736, or ASTM F2764.~~

701-3.5 Backfilling. Pipes shall be inspected before any backfill is placed; any pipes found to be out of alignment, unduly settled, or damaged shall be removed and relaid or replaced at the Contractor's expense.

Material for backfill shall be fine, readily compatible soil or granular material selected from the excavation or a source of the Contractor's choosing. It shall not contain frozen lumps, stones that would be retained on a 2-inch (50 mm) sieve, chunks of highly plastic clay, or other objectionable material. Granular backfill material shall have 95% or more passing the a 1/2 inch (12 mm) sieve, with 95% or more being retained on the No. 4 (4.75 mm) sieve.

When the top of the pipe is even with or below the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches on each side of the pipe and shall be brought up one foot above the top of the pipe or to natural ground level, whichever is greater. Thoroughly compact the backfill material under the haunches of the pipe without displacing the pipe. Material shall be brought up evenly on each side of the pipe for the full length of the pipe. Backfill shall conform with the details and cement stabilized sand shall be placed per details.

When the top of the pipe is above the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches and shall be brought up evenly on each side of the pipe to one foot above the top of the pipe. The width of backfill on each side of the pipe for the portion above the top of the trench shall be equal to twice the pipe's diameter or 12 feet (3.7 m), whichever is less. Backfill shall conform with the details and cement stabilized sand shall be placed per details.

~~For PVC, polyethylene, and polypropylene pipe, the backfill shall be placed in two stages; first to the top of the pipe and then at least 12 inches over the top of the pipe. The backfill material shall meet the requirements of paragraph 701-3.2c.~~

All backfill shall be compacted to the density required under Item P-152.

It shall be the Contractor's responsibility to protect installed pipes and culverts from damage due to construction equipment operations. The Contractor shall be responsible for installation of any extra strutting or backfill required to protect pipes from the construction equipment.

METHOD OF MEASUREMENT

701-4.1 The length of pipe shall be measured in linear feet of pipe in place, completed, and approved. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. The several classes, types and size shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipe being measured.

701-4.2 Concrete for pipe cradles shall not be measured separately for payment but shall be considered incidental to the installation of the pipe.

701-4.3 Excavation shall not be measured separately for payment but shall be considered incidental to the installation of the pipe.

BASIS OF PAYMENT

701-5.1 Payment will be made at the contract unit price per linear foot for each kind of pipe of the type and size designated.

These prices shall fully compensate the Contractor for furnishing all materials and for all preparation, excavation, and installation of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item D-701-5.1	Install 6'x5' RCB (Class V) Open Cut, Complete in Place - per linear foot
Item D-701-5.2	Install 7'x5' RCB (Class V) Open Cut, Complete in Place - per linear foot
Item D-701-5.3	Install 8'x4' RCB (Class V) Open Cut, Complete in Place - per linear foot
Item D-701-5.4	Install 10'x7' RCB (Class V) Open Cut, Complete in Place - per linear foot
Item D-701-5.5	Install 24" CMP Open Cut, Complete in Place – per linear foot
Item D-701-5.6	Install 24" RCP (Class V) Open Cut, Complete in Place – per linear foot

MATERIAL REQUIREMENTS

AASHTO M167	Standard Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field Bolted Pipe, Pipe Arches, and Arches
AASHTO M190	Standard Specification for Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M196	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M198	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
AASHTO M219	Standard Specification for Corrugated Aluminum Alloy Structural Plate for Field Bolted Pipe, Pipe Arches, and Arches
AASHTO M243	Standard Specification for Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe Arches, and Arches
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe

AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300 to 1500-mm (12- to 60-in.) Diameter
AASHTO M304	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO MP20	Standard Specification for Steel Reinforced Polyethylene (PE) Ribbed Pipe, 300 to 900 mm (12 to 36 in.) Diameter
ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains
ASTM A761	Standard Specification for Corrugated Steel Structural Plate, Zinc Coated, for Field Bolted Pipe, Pipe Arches, and Arches
ASTM A762	Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM A849	Standard Specification for Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
ASTM B745	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
ASTM C14	Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe
ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C94	Standard Specification for Ready Mixed Concrete
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C506	Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
ASTM D1056	Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber
ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

- ~~ASTM D6690 — Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements~~
- ~~ASTM F477 — Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe~~
- ~~ASTM F667 — Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings~~
- ~~ASTM F714 — Standard Specification for Polyethylene (PE) Plastic Pipe (DR PR) Based on Outside Diameter~~
- ~~ASTM F794 — Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe & Fittings Based on Controlled Inside Diameter~~
- ~~ASTM F894 — Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe~~
- ~~ASTM F949 — Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings~~
- ~~ASTM F2435 — Standard Specification for Steel Reinforced Polyethylene (PE) Corrugated Pipe~~
- ~~ASTM F2562 — Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage~~
- ~~ASTM F2736 — Standard Specification for 6 to 30 in. (152 to 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe~~
- ~~ASTM F2764 — Standard Specification for 30 to 60 in. (750 to 1500 mm) Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications~~
- ~~ASTM F2881 — Standard Specification for 12 to 60 in. (300 to 1500 mm) Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications~~

END OF ITEM D-701

ITEM L-110 AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS

DESCRIPTION

110-1.1 This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete or buried in sand) installed per this specification at the locations and per the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits. It shall also include all turfing trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandrelling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables per the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification. *Refer to Item SS-301 for additional electrical demolition work requirements.*

EQUIPMENT AND MATERIALS

110-2.1 General.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the RPR.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR and replaced with materials, that comply with these specifications, at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in project that accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specification section. The RPR reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

110-2.2 Steel conduit. Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other similar environments shall be painted with a 10-mil thick coat of asphaltum sealer or shall have a factory-bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10 mils of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions. In lieu

of PVC coated RGS, corrosion wrap tape shall be permitted to be used where RGS is in contact with direct earth.”

110-2.3 Plastic conduit. Plastic conduit and fittings shall conform to the following requirements:

- UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10.
- UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
- UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
- UL 651A covers W-C-1094-Rigid PVC Conduit and high-density polyethylene (HDPE) Conduit type III and Class 4.

Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

- a. Type I—Schedule 40 and Schedule 80 PVC suitable for underground use either direct-buried or encased in concrete.
- b. Type II—Schedule 40 PVC suitable for either above ground or underground use.
- c. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.
- d. Type III –HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

110-2.4 Split conduit. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

110-2.5 Conduit spacers. Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads. They shall be designed to accept No. 4 reinforcing bars installed vertically.

110-2.6 Concrete. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

110-2.7 Precast concrete structures. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another RPR approved third party certification program. Precast concrete structures shall conform to ASTM C478.

110-2.8 Flowable backfill. Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

110-2.9 Detectable warning tape. Plastic, detectable, American Public Works Association (APWA) red (electrical power lines, cables, conduit and lighting cable), orange (telephone/fiber optic cabling) with continuous legend magnetic tape shall be polyethylene film with a metallized foil core and shall be 3-6 inches wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

110-3.1 General. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The RPR shall indicate specific locations as the work progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches inside diameter or comply with the National Electrical Code based on cable

to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches per 100 feet. On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. Under pavement, the top of the duct bank shall not be less than 18 inches below the subgrade; in other locations, the top of the duct bank or underground conduit shall be not less than 18 inches below finished grade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 inch smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed the light bases, manholes, pull boxes, etc., and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the RPR of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200-pound test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet.

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways, taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

All conduits within concrete encasement of the duct banks shall terminate with female ends for ease in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch sieve. Flowable backfill may alternatively be used. *The Contractor shall ascertain the type of soil or rock to be excavated before bidding. All such rock removal shall be performed and paid for under subsidiary to the respective trenching or conduit or duct bank pay item.*

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for

approval by the RPR. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared per the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet.

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the RPR, the unsuitable material shall be removed per Item P-152 and replaced with suitable material. Additional duct bank supports shall be installed, as approved by the RPR.

All excavation shall be unclassified and shall be considered incidental to Item L-110. Dewatering necessary for duct installation, and erosion per federal, state, and local requirements is incidental to Item L-110.

Unless otherwise specified, excavated materials that are deemed by the RPR to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the RPR and compacted per Item P-152.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables) cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

a. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred

b. Trenching, etc., in cable areas shall then proceed with approval of the RPR, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

110-3.2 Duct banks. Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet beyond the edges of the pavement or 3 feet beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 inches thick prior to its initial set. The Contractor shall space the conduits not less than 3 inches apart measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 3 to 6 inches wide tape, 8 inches minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch wide tape only for single conduit runs. Utilize the 6-inch wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the RPR shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the RPR.

110-3.3 Conduits without concrete encasement. Trenches for single-conduit lines shall be not less than 6 inches nor more than 12 inches wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4-inch sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the Airport's secured area where trespassing is prohibited are at least 18 inches below the finished grade. Conduits outside the Airport's secured area shall be installed so that the tops of the conduits are at least 24 inches below the finished grade per National Electric Code (NEC), Table 300.5.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed

at 5-foot intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

110-3.4 Markers. The location of each end and of each change of direction of conduits and duct banks shall be marked by a concrete slab marker 2 feet square and 4 - 6 inches thick extending approximately one inch above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building. Each cable or duct run from a line of lights and signs to the equipment vault must be marked at approximately every 200 feet along the cable or duct run, with an additional marker at each change of direction of cable or duct run.

The Contractor shall impress the word "DUCT" or "CONDUIT" on each marker slab. Impression of letters shall be done in a manner, approved by the RPR, for a neat, professional appearance. All letters and words must be neatly stenciled. After placement, all markers shall be given one coat of high-visibility orange paint, as approved by the RPR. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the RPR. The letters shall be 4 inches high and 3 inches wide with width of stroke 1/2 inch and 1/4 inch deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

110-3.5 Backfilling for conduits. For conduits, 8 inches of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 except that material used for back fill shall be select material not larger than 4 inches in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

110-3.6 Backfilling for duct banks. After the concrete has cured, the remaining trench shall be backfilled and compacted per Item P-152 "Excavation, *Subgrade*, and Embankment" except that the material used for backfill shall be select material not larger than 4 inches in diameter. In addition to the requirements of Item P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet of duct bank or one work period's construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

110-3.7 Restoration. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include sodding, topsoiling, seeding, and mulching, shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

110-3.8 Ownership of removed cable. Where existing cabling marked on the plans for removal or demolition is removed, it is the responsibility of the contractor to dispose of offsite via recycling methods. The electrical contractor is the owner of the removed cabling unless otherwise noted.

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks shall be measured by the linear feet of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated material, and restoration, and for drain lines, the termination at the drainage structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

BASIS OF PAYMENT

110-5.1 Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for removal and disposal of existing duct banks and conduits as shown on the plans, 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 per the provisions and intent of the plans and specifications.

Payment will be made under:

Item L-110-5.1	Flowable Fill Encased Electrical Conduit, 1W-2”C - per Linear Foot
Item L-110-5.2	Non-Encased Electrical Conduit, 1W-2”C - per Linear Foot
Item L-110-5.3	Concrete Encased Electrical Conduit, 1W-2”C – per Linear Foot
Item L-110-5.4	Concrete Encased Electrical Conduit, 1W-2”C with Saw Kerf Pavement Repair – per Linear Foot
Item L-110-5.5	Non-Encased Electrical Duct Bank, 16W-2”C – per Linear Foot
Item L-110-5.6	Non-Encased Electrical Duct Bank, 2W-2”C – per Linear Foot
Item L-110-5.7	Flowable Fill Encased Electrical Duct Bank, 2W-2”C – per Linear Foot
Item L-110-5.8	<i>FAA Style, Concrete Encased Electrical Duct Bank, 4W-4”C – per Linear Foot</i>

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circular (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program

ASTM International (ASTM)

ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
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National Fire Protection Association (NFPA)

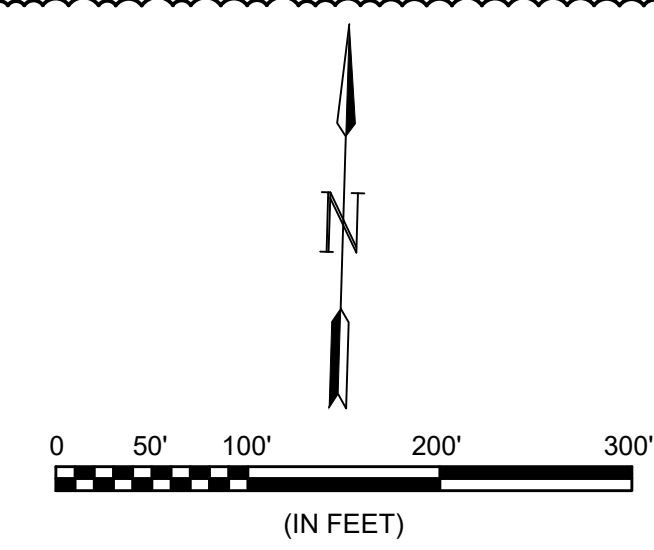
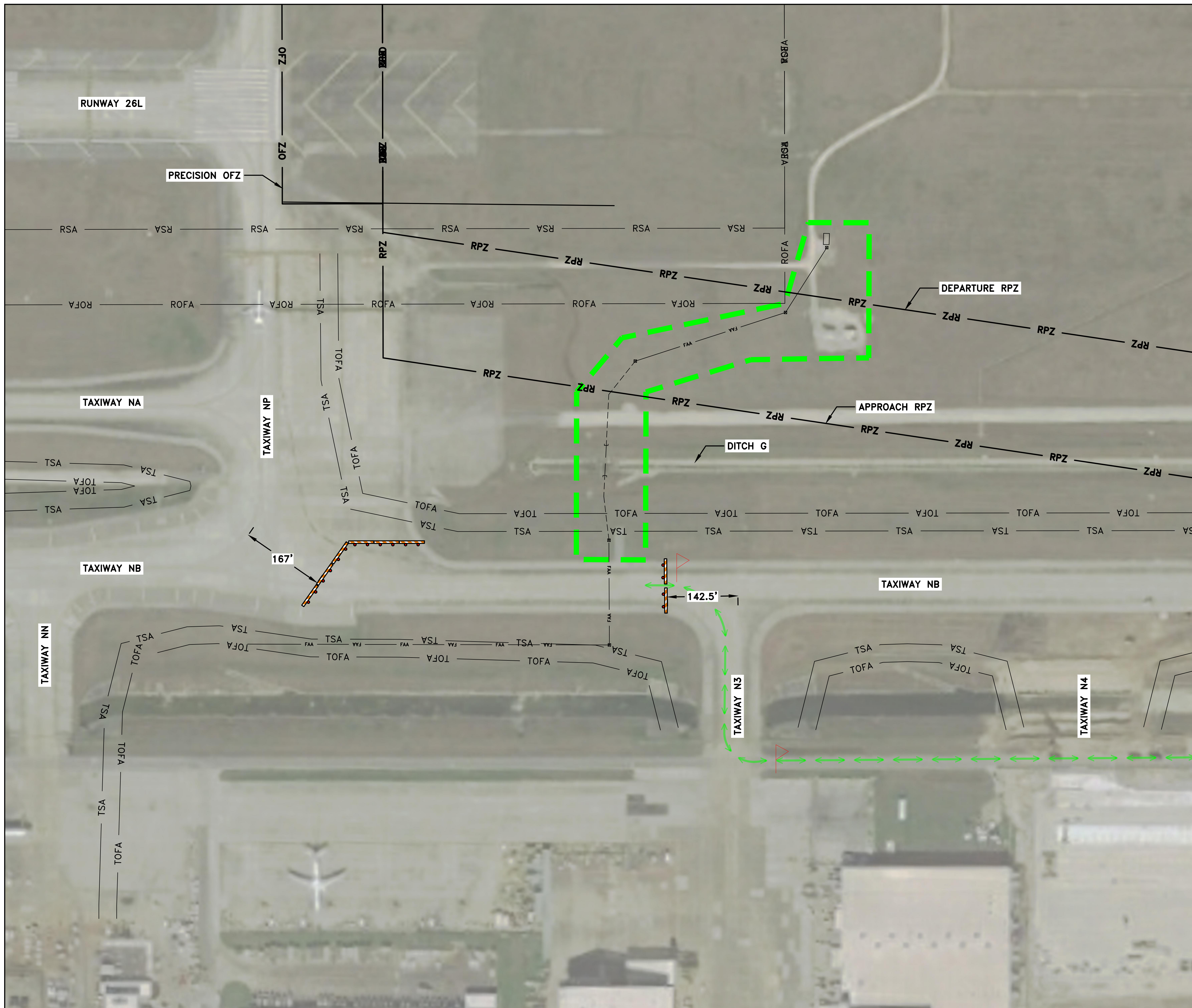
NFPA-70	National Electrical Code (NEC)
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Underwriters Laboratories (UL)

UL Standard 6	Electrical Rigid Metal Conduit - Steel
UL Standard 514B	Conduit, Tubing, and Cable Fittings
UL Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL Standard 1242	Electrical Intermediate Metal Conduit Steel
UL Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit

END OF ITEM L-110

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LEGEND	
— FAA —	EXISTING FAA DUCT BANK
— RSA —	RUNWAY SAFETY AREA
— ROFA —	RUNWAY OBJECT FREE AREA
— RPZ —	RUNWAY PROTECTION ZONE
— OFZ —	RUNWAY OBSTACLE FREE ZONE
— TSA —	TAXIWAY SAFETY AREA
— TOFA —	TAXIWAY OBJECT FREE AREA
	LOW-PROFILE BARRICADE
	PHASING WORK AREA
	HAUL ROUTE

NOTES:

1. WORK HOURS SHALL BE THE NIGHTTIME WORK HOURS OF 10:00PM TO 6:00AM OR AS DIRECTED BY THE AIRPORT. THIS WORK WILL BE PERFORMED CONCURRENTLY WITH PHASE 1. NO ADDITIONAL CONTRACT TIME SHALL BE AWARDED.
2. CONTRACTOR SHALL USE EXTREME CAUTION WHILE MOVING ON ACTIVE TAXIWAYS AND SHALL ONLY USE APPROVED HAUL ROUTES FOR TRANSPORTATION PURPOSES.
3. REQUIREMENTS TO REOPEN: THE PHASING AREA WILL REOPEN AFTER EACH WORK PERIOD IN ORDER TO SERVICE AIR TRAFFIC THROUGH THE DAY. ALL BARRICADES MUST BE REMOVED.
4. CONTRACTOR SHALL PLAN FOR A 2 HOUR CLEAN UP AFTER EACH WORK PERIOD IN ORDER TO ACCOMMODATE INSPECTION FOM IAH AIRPORT OPERATIONS AND ENSURE COMPLIANCE WITH FAA STANDARDS FOR THE REOPENING OF TAXIWAYS BY 6:00AM.
5. CONSTRUCTION LIMITS AREA APPROXIMATE AND WILL BE CONFIRMED WITH RPR AND/OR HAS PROJECT MANAGER PRIOR TO STARTING ANY WORK.
6. CONTRACTOR SHALL PROTECT ALL EXISTING UTILITIES, HAND HOLES, AIRFIELD EQUIPMENT, DRAINAGE STRUCTURES, AND BUILDINGS NOT SHOWN FOR DEMOLITION. ANY DAMAGE AS A RESULT OF CONSTRUCTION ACTIVITIES SHALL BE REPAIRED BY THE CONTRACTOR AT NO COST TO THE OWNER.
7. CONTRACTOR SHALL MAINTAIN A CLEAR ROUTE THROUGH WORK AREA FOR ARFF VEHICLE RESPONSE.

KEYMAP



REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADD.	2 05/03/2024 JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT
 REHABILITATION OF TAXIWAYS SA & SB
**ADDITIVE ALTERNATE 4 PHASING PLAN -
 DITCH G DUCT BANK RELOCATION**

PROJECT MGR:	JEF
DESIGNER:	DAG
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	1" = 100'
DATE:	05/03/2024



APPROVED BY: JEF

DIRECTOR HOUSTON AIRPORT SYSTEM	
PROJECT NO.	0646A
A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	



TBPE Registration No. F-5713



10351 STELLA LINK RD
HOUSTON, TEXAS 77025
(832) 767-0090
TBPE FIRM No. F-14087

NO.	DESCRIPTION	DATE	BY
1	ADD.	4/19/24	JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT
REHABILITATION OF TAXIWAYS SA & SB
**DRAINAGE DETAILS VII (ADDITIVE
ALTERNATE 4)**

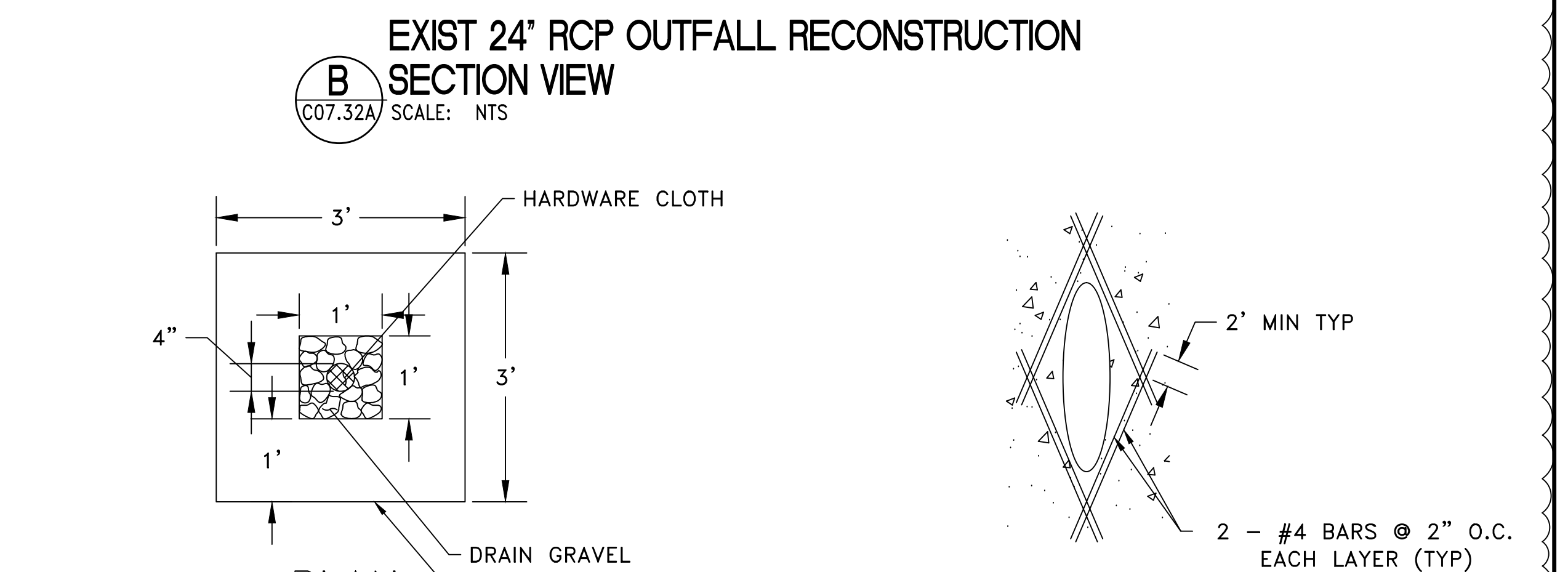
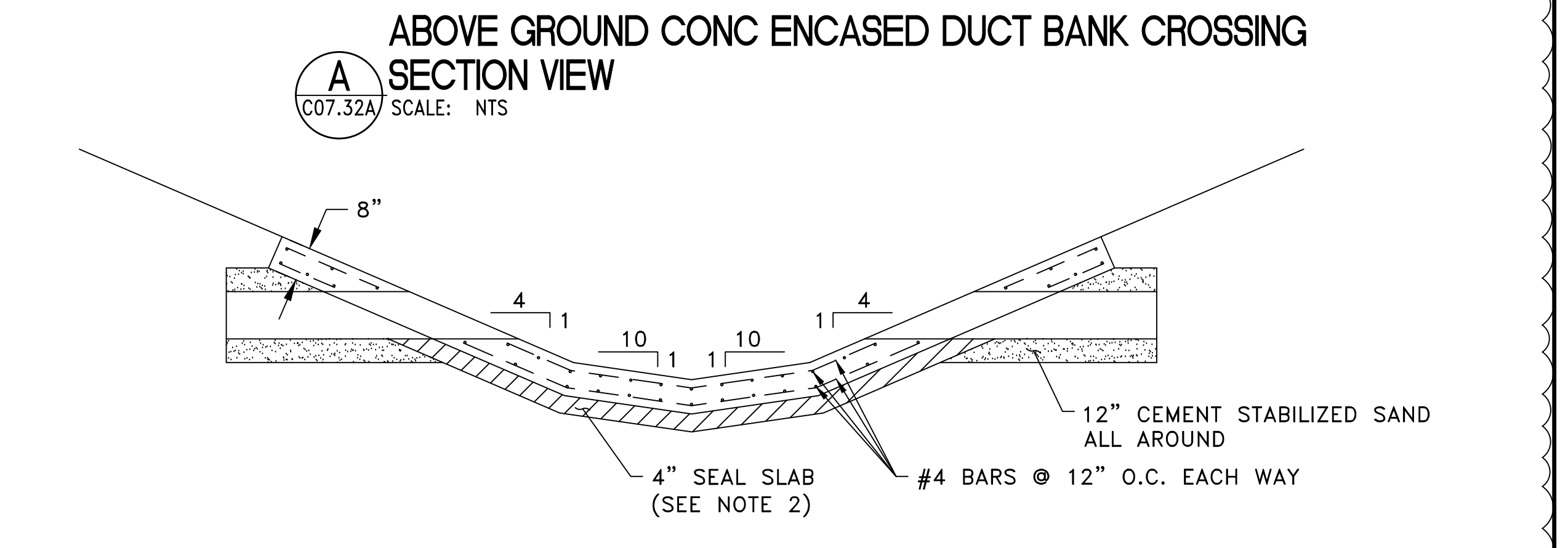
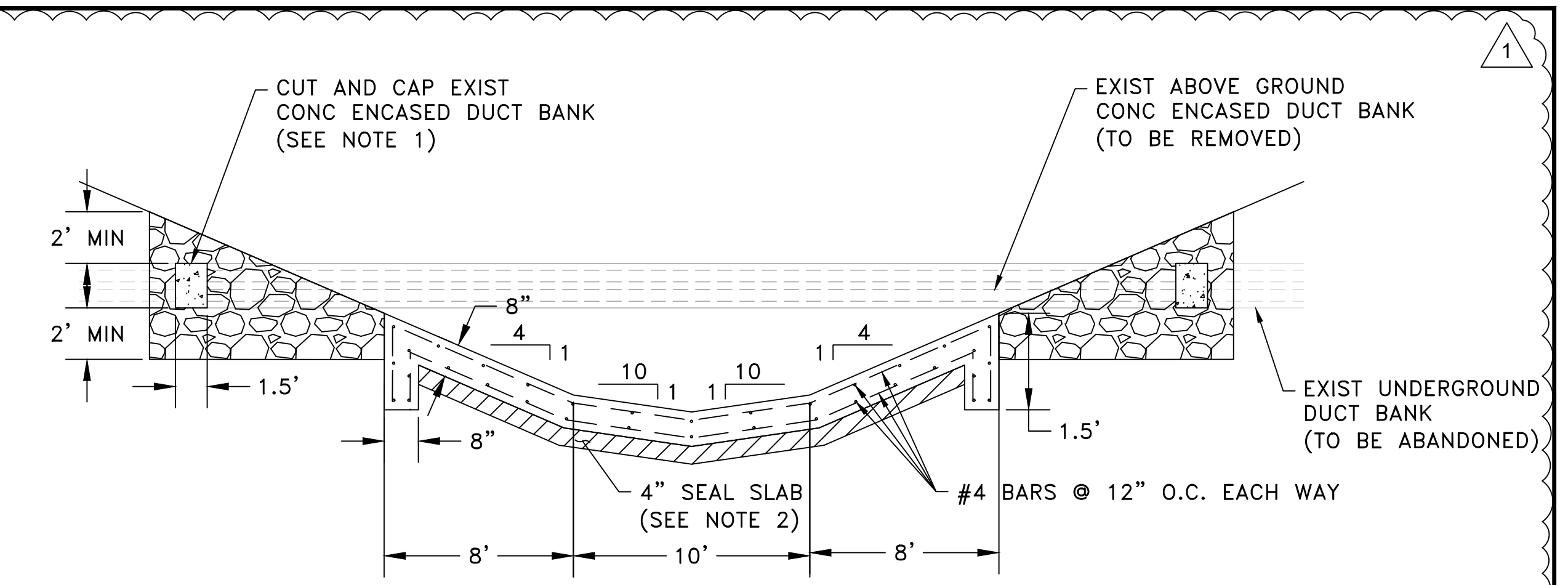
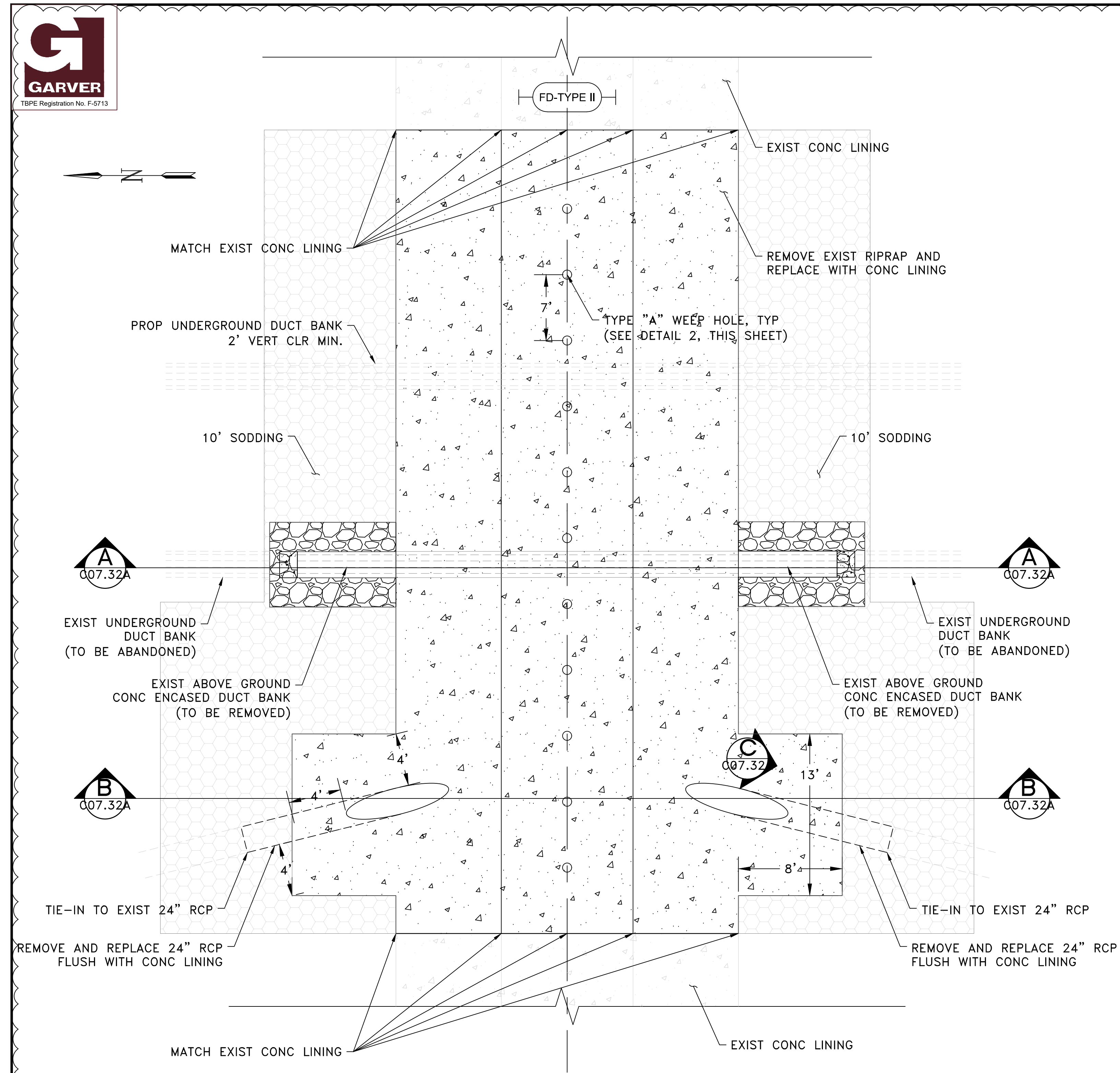
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DESIGNER:	KKR
DRAWN BY:	HSC
CHECK BY:	JEF
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APPROVED BY: JEF

PROJECT NO.	0646A
A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	

C07.32A



WEEP HOLE NOTES:

- MATERIALS**
 - PIPE: 4 INCH DIA SCH 40 PVC
 - DRAIN GRAVEL:

SIEVE SIZE	% FINER
1 IN	100
3/4 IN	70-100
3/8 IN	20-90
NO. 4	0-60
NO. 8	0
 - HARDWARE CLOTH:

MIN OPEN	MAX OPEN
1/8 IN	1/4 IN
 - FILTER FABRIC:

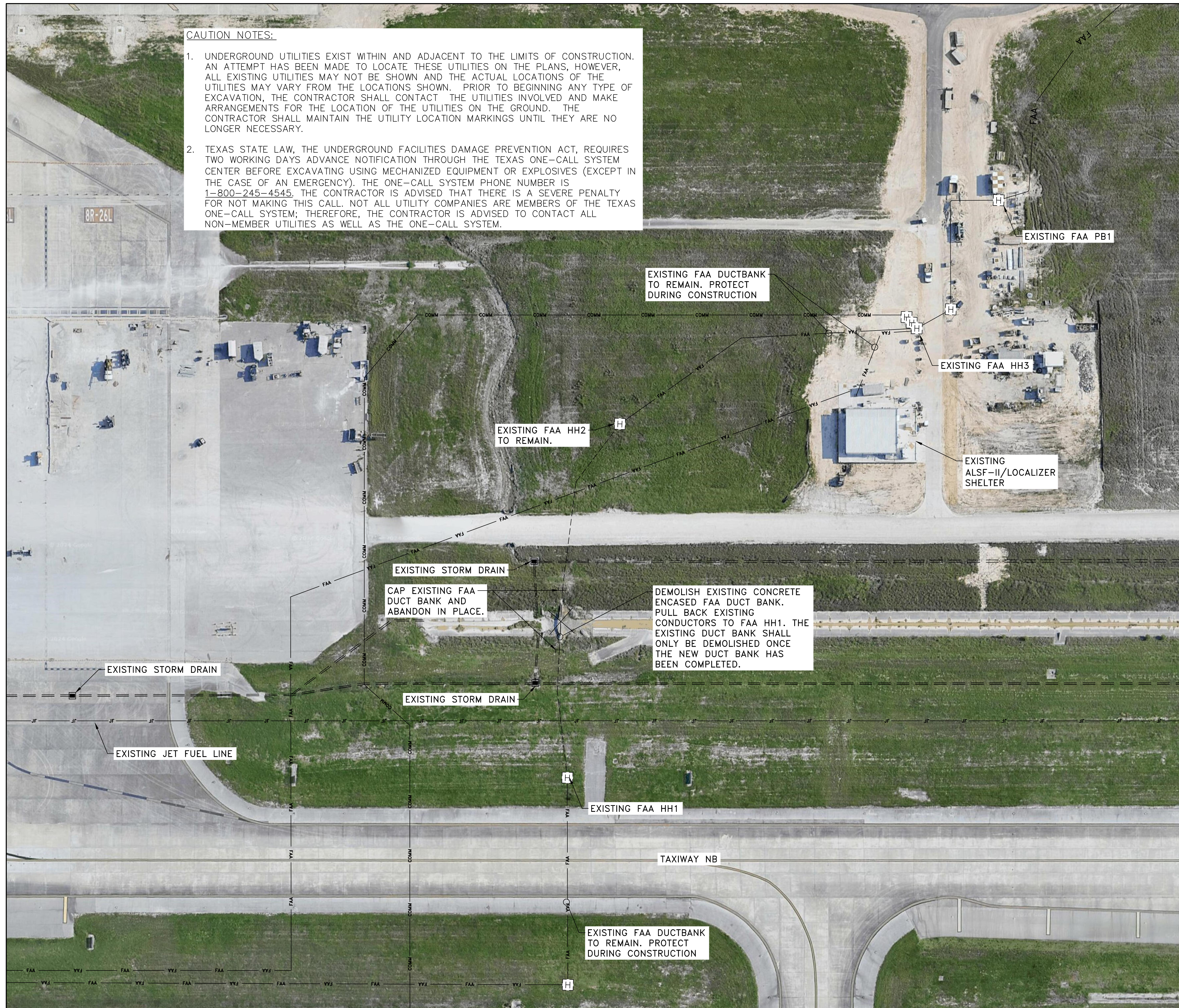
NON-WOVEN GEOTEXTILE	SIEVE NO.	100 MIN
MIN. AOS	70	MAX
MAX AOS	NO. 8	70 MAX
WEIGHT	70	6 OZ MIN
	OS/SY	
- CUT WEEP HOLE PIPE FLUSH WITH CONCRETE SURFACE

- NOTES**
- EXIST ABOVE GROUND CONC ENCASED DUCT BANK TO BE CUT AND CAPPED ACCORDING TO DETAIL 5, SHEET E05.11
 - NON-REINFORCED 4" MIN NON-STRUCTURAL CONCRETE SEAL SLAB IS REQUIRED BENEATH THE BOTTOM OF CONCRETE CHANNELS
 - CONCRETE SHALL BE STRUCTURAL CONCRETE IN ACCORDANCE WITH SPECIFICATION P-610
 - JOINTS**
 - PLACE CONSTRUCTION JOINT AT 20-FOOT MIN SPACING CONTINUOUSLY THROUGH CONC LINING.
 - PLACE EXPANSION JOINT AT 60-FOOT MAX SPACING CONTINUOUSLY THROUGH CONC LINING.
 - FAA APPROVAL (IN WRITING) SHALL BE REQUIRED PRIOR TO ANY UTILITY REMOVAL



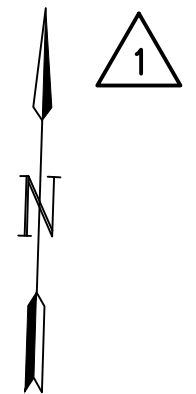
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CAUTION NOTES:

1. UNDERGROUND UTILITIES EXIST WITHIN AND ADJACENT TO THE LIMITS OF CONSTRUCTION. AN ATTEMPT HAS BEEN MADE TO LOCATE THESE UTILITIES ON THE PLANS, HOWEVER, ALL EXISTING UTILITIES MAY NOT BE SHOWN AND THE ACTUAL LOCATIONS OF THE UTILITIES MAY VARY FROM THE LOCATIONS SHOWN. PRIOR TO BEGINNING ANY TYPE OF EXCAVATION, THE CONTRACTOR SHALL CONTACT THE UTILITIES INVOLVED AND MAKE ARRANGEMENTS FOR THE LOCATION OF THE UTILITIES ON THE GROUND. THE CONTRACTOR SHALL MAINTAIN THE UTILITY LOCATION MARKINGS UNTIL THEY ARE NO LONGER NECESSARY.
2. TEXAS STATE LAW, THE UNDERGROUND FACILITIES DAMAGE PREVENTION ACT, REQUIRES TWO WORKING DAYS ADVANCE NOTIFICATION THROUGH THE TEXAS ONE-CALL SYSTEM CENTER BEFORE EXCAVATING USING MECHANIZED EQUIPMENT OR EXPLOSIVES (EXCEPT IN THE CASE OF AN EMERGENCY). THE ONE-CALL SYSTEM PHONE NUMBER IS 1-800-245-4545. THE CONTRACTOR IS ADVISED THAT THERE IS A SEVERE PENALTY FOR NOT MAKING THIS CALL. NOT ALL UTILITY COMPANIES ARE MEMBERS OF THE TEXAS ONE-CALL SYSTEM; THEREFORE, THE CONTRACTOR IS ADVISED TO CONTACT ALL NON-MEMBER UTILITIES AS WELL AS THE ONE-CALL SYSTEM.



HOUSTON AIRPORTS
GARVER
 12141 Wickchester Lane
 Suite 200
 Houston, TX 77079
 (713) 491-8333
 TBPE Registration No. F-5713

GENERAL NOTES:

1. REFER TO SHEET E0.01 FOR ELECTRICAL SYMBOL LEGEND.
2. COORDINATE WORK WITH LOCAL FAA FIELD REPRESENTATIVE, ELECTRIC SHOP, AND OPERATIONS.

REVISIONS

NO.	DESCRIPTION	DATE BY
1	ADD.	2 05/03/24 JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT
 REHABILITATION OF TAXIWAYS SA & SB
ADDITIVE ALTERNATE 4 TWY FAA DUCT BANK DEMOLITION PLAN

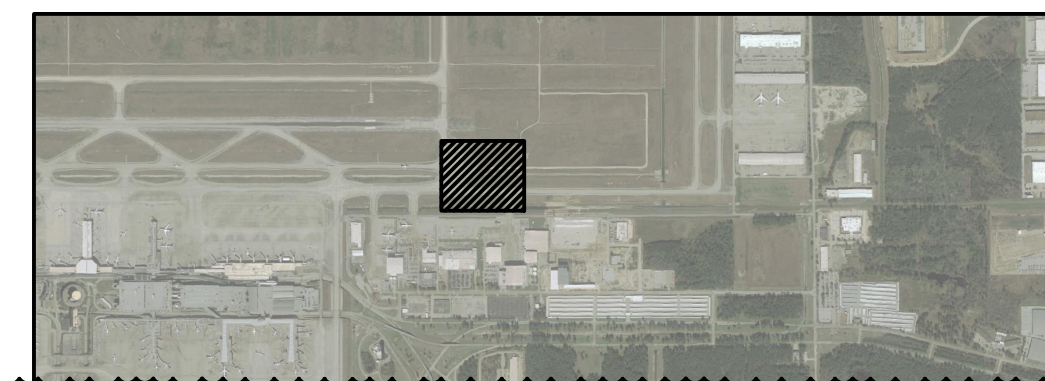
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DRAWN BY:	DAG
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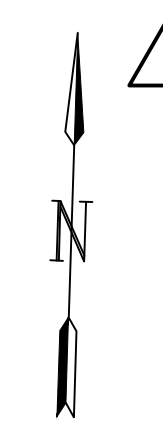
APPROVED BY: JEF
 DIRECTOR
 HOUSTON AIRPORT SYSTEM

PROJECT NO.	0646A
A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	

KEYMAP



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GENERAL NOTES:

1. REFER TO SHEET E0.01 FOR ELECTRICAL SYMBOL LEGEND.
2. COORDINATE WORK WITH LOCAL FAA FIELD REPRESENTATIVE, ELECTRIC SHOP, AND OPERATIONS.
3. REFER TO E05.10 FOR WIRING DIAGRAMS AND FIBER OPTIC CABLE SPLICE LOCATIONS.



REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADD.	2 04/19/24 JEF

**GEORGE BUSH INTERCONTINENTAL AIRPORT
 REHABILITATION OF TAXIWAYS SA & SB
 ADDITIVE ALTERNATE 4 TWY FAA DUCT
 BANK INSTALLATION PLAN**

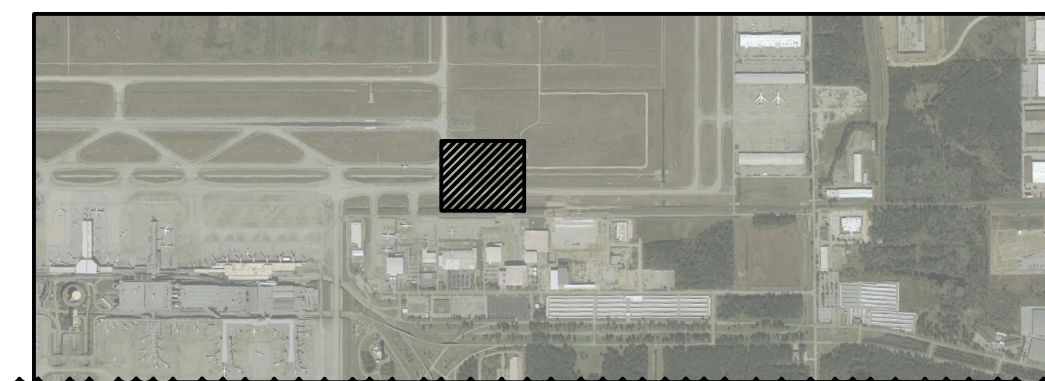
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CHECK BY:	JEF
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DATE:	05/03/2024



APPROVED BY: JEF
 DIRECTOR
 HOUSTON AIRPORT SYSTEM

PROJECT NO.	0646A
A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	

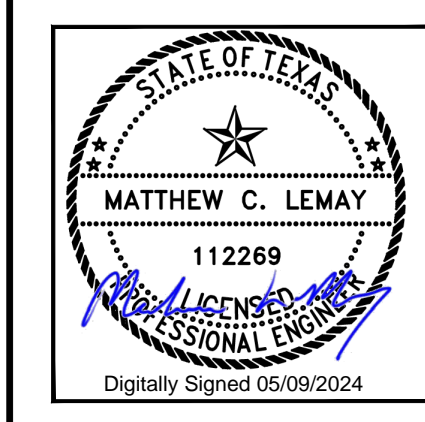
KEYMAP



NO.	DESCRIPTION	DATE BY
1	ADD. 2	05/03/24 JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT
 REHABILITATION OF TAXIWAYS SA & SB
ADDITIVE ALTERNATE 4 FAA DUCT BANK ELECTRICAL DETAILS I

PROJECT MGR:	JEF
DESIGNER:	KKR
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	NONE
DATE:	05/03/2024



APPROVED BY: JEF

PROJECT NO.	0646A
A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	

PHASING NOTES:

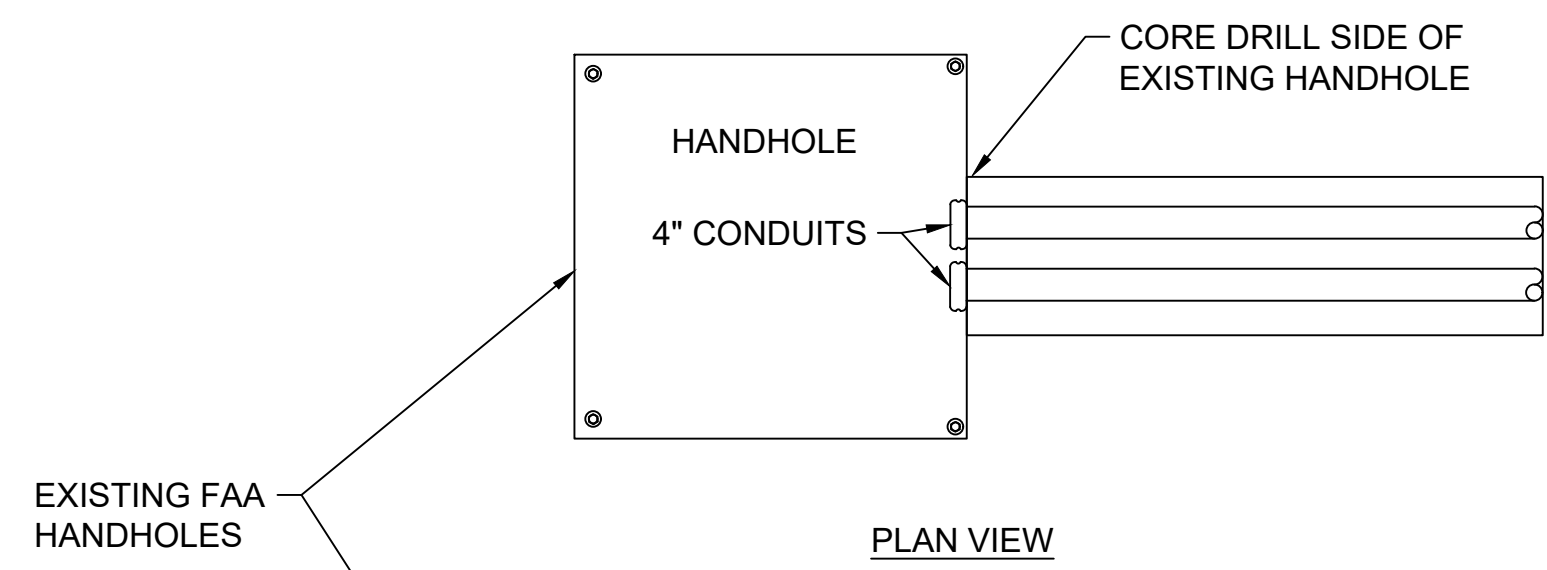
- ALL WORK MUST BE COMPLETED DURING A RUNWAY CLOSURE OF RUNWAY 8R-26L DUE TO NAVIGATIONAL AID IMPACTS.
- THERE ARE NO NEW CABLE SPLICES ALLOWED.
- THE CONTRACTOR MUST SUBMIT TEST RESULTS FOR ALL EXISTING FAA CABLES IMPACTED IN THIS PROJECT PRIOR TO CONSTRUCTION.
- THE CONTRACTOR WILL DISCONNECT EXISTING FIBER FROM THE PUNCH DOWN BOX INSIDE THE LOC ROOM INSIDE THE ALSF SHELTER. NO SPLICE IS ALLOWED.
- THE NEW CONCRETE ENCASED DUCT BANK SHALL BE CONSTRUCTED BETWEEN HH1 AND HH2. NEXT, A SHUTDOWN OF THE RUNWAY 8R ILS SHALL BE COORDINATED. DURING THE SHUTDOWN OF THE ILS, THE FAA CABLES SHALL BE DISCONNECTED FROM THE PUNCH DOWN BOX INSIDE THE LOC ROOM INSIDE THE ALSF SHELTER AND PULLED BACK TO HH1. NEXT THE CABLES SHALL BE PULLED BACK INTO THE NEW DUCT BANK AND RE-TERMINATED AT THE PUNCH DOWN BOX. THE CABLES SHALL BE TESTED TO ALLOW REACTIVATION OF THE 8R ILS. FINALLY, THE EXISTING FAA DUCT BANK CONNECTING HH1 AND HH2 WILL BE DEMOLISHED OVER DITCH G-1 AND ABANDONED IN PLACE ELSEWHERE.
- THE NEW DUCT BANK CAN BE CONSTRUCTED AND TIED INTO EXISTING FAA HH1 AND HH2.
- ONCE THE DUCTS HAVE BEEN APPROVED, THE CONTRACTOR CAN INSTALL THE INNERDUCTS AND CABLES FOR COMPLETION OF THE SCOPE. FOLLOWING THE CABLES INSTALLATION, TEST ALL CABLES AND SUBMIT THE TEST RESULTS.

GENERAL NOTES:

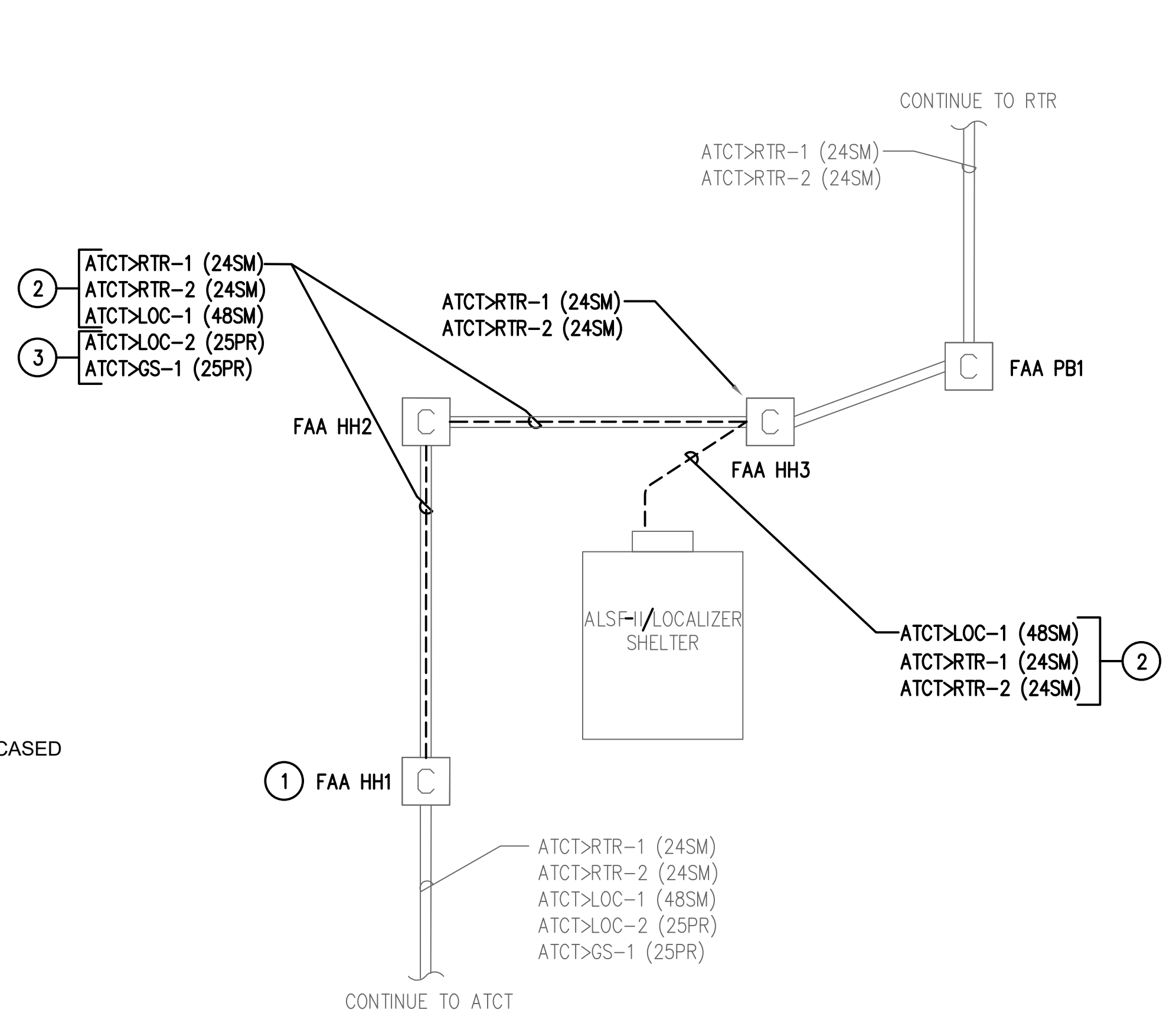
- COORDINATE WORK WIL LOCAL FAA FIELD REPRESENTATIVE, ELECTRIC SHOP AND OPERATIONS.
- ALL CABLES MUST BE TESTED WITH A POWER METER AND OTDR PRIOR TO CONSTRUCTION. SUBMIT TEST RESULTS TO ENGINEER FOR REVIEW. REVIEW OF OTDR RESULTS MAY ALTER SPLICE LOCATION.
- THE INTENT IS THAT THE CONTRACTOR WILL DISCONNECT THE FIBER OPTIC CABLE AT PUNCH DOWN BOX INSIDE THE LOC ROOM INSIDE THE ALSF SHELTER AND PULL THE EXISTING CABLES BACK TO FAA HANDHOLE 'HH1'. ONCE THE NEW DUCT BANK CONNECTION FROM FAA HANDHOLE 'HH1' TO 'HH2' HAS BEEN COMPLETED, THE EXISTING FIBER OPTIC CABLES WILL BE RE-TERMINATED AT THE PUNCH DOWN BOX.
- REFER TO SHEET E05.02 FOR THE FAA DUCT BANK PLAN ASSOCIATED WITH THE FIBER ONE LINE DIAGRAMS ON THIS SHEET.
- THE CONTRACTOR IS REQUIRED TO CLEAN ALL EXISTING DUCTS WITH MANDRELL BEFORE THE INSTALLATION OF NEW OR EXISTING CABLES OR INNERDUCT.

KEYED NOTES:

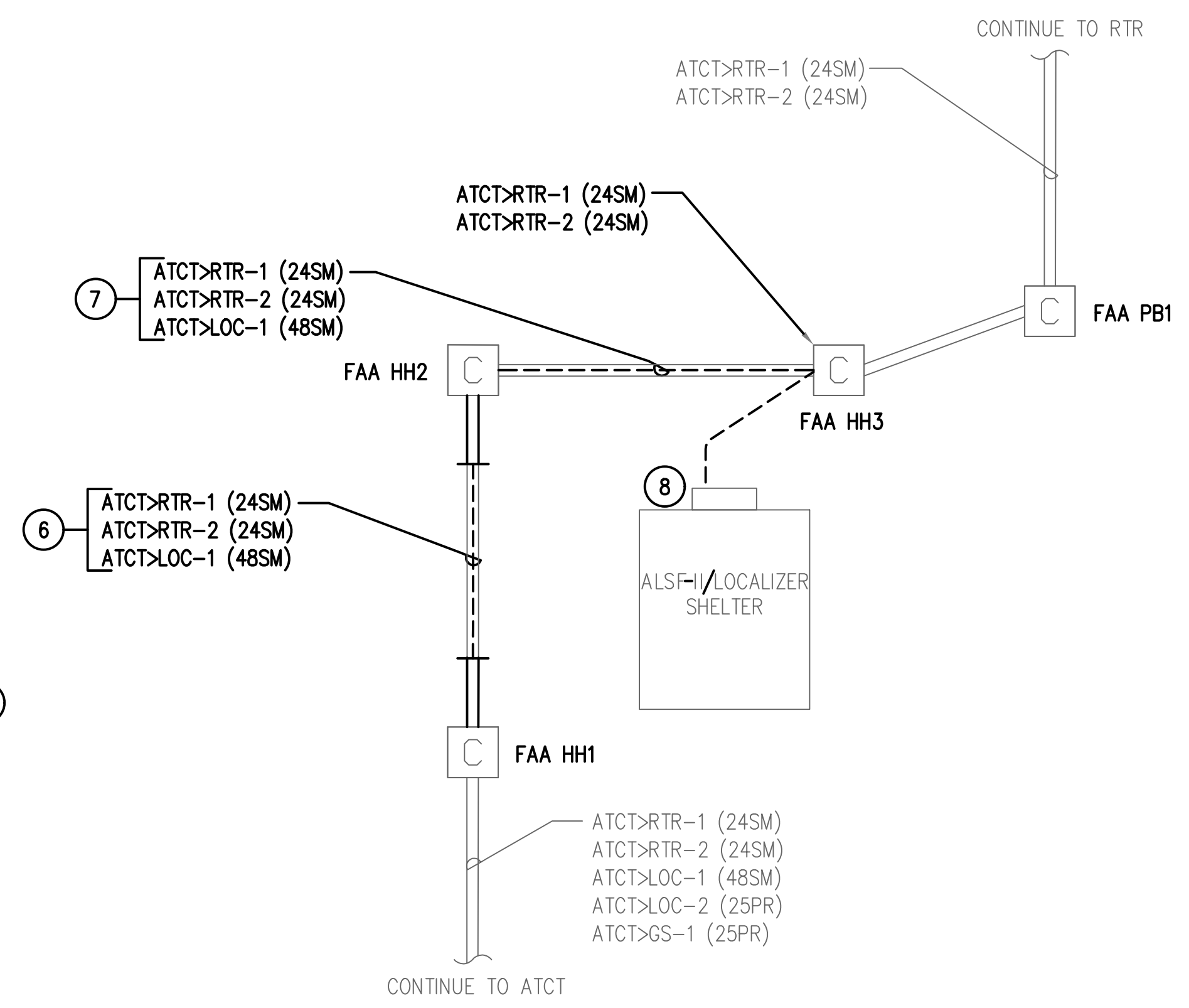
- EXISTING FIBER OPTIC CABLE TO BE COILED AND PROTECTED IN HANDHOLE DURING CONSTRUCTION.
- EXISTING FIBER TO BE DISCONNECTED AND PULLED BACK TO FAA HANDHOLE 'HH1'.
- EXISTING COPPER CABLING TO BE REMOVED. WHERE CABLES CANNOT BE REMOVED, TAG CABLE END NOTING IT AS "ABANDONED".
- NOT USED.
- NOT USED.
- INSTALL NEW 3 PACKS 3"-3 CELL MAXCELL INNERDUCT FROM 'HH1' TO 'HH2'. INSTALL EXISTING FIBER OPTIC CABLES NOTED IN INDIVIDUAL CELLS. INSTALL INFLATABLE BAG AT EACH HANDHOLE ENTRY TO SEAL DUCT.
- EXTEND FIBER OPTIC CABLE IN EXISTING INNERDUCT. UPDATE ALL LABELS.
- RECONNECT AND ENSURE ALL STRANDS ARE ALIGNED IN EXISTING SHELTER.



1 EXISTING HANDHOLE CONNECTION DETAILS
 E05.10 SCALE: NONE



2 FAA FIBER ONE-LINE DIAGRAM - DEMO
 E05.10 SCALE: NONE



3 FAA FIBER ONE-LINE DIAGRAM - PROPOSED
 E05.10 SCALE: NONE

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NO.	DESCRIPTION	DATE BY
1	ADD. 2	05/03/24 JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT
 REHABILITATION OF TAXIWAYS SA & SB
ADDITIVE ALTERNATE 4 FAA DUCT BANK ELECTRICAL DETAILS II

PROJECT MGR:	JEF
DESIGNER:	KKR
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	NONE
DATE:	05/03/2024

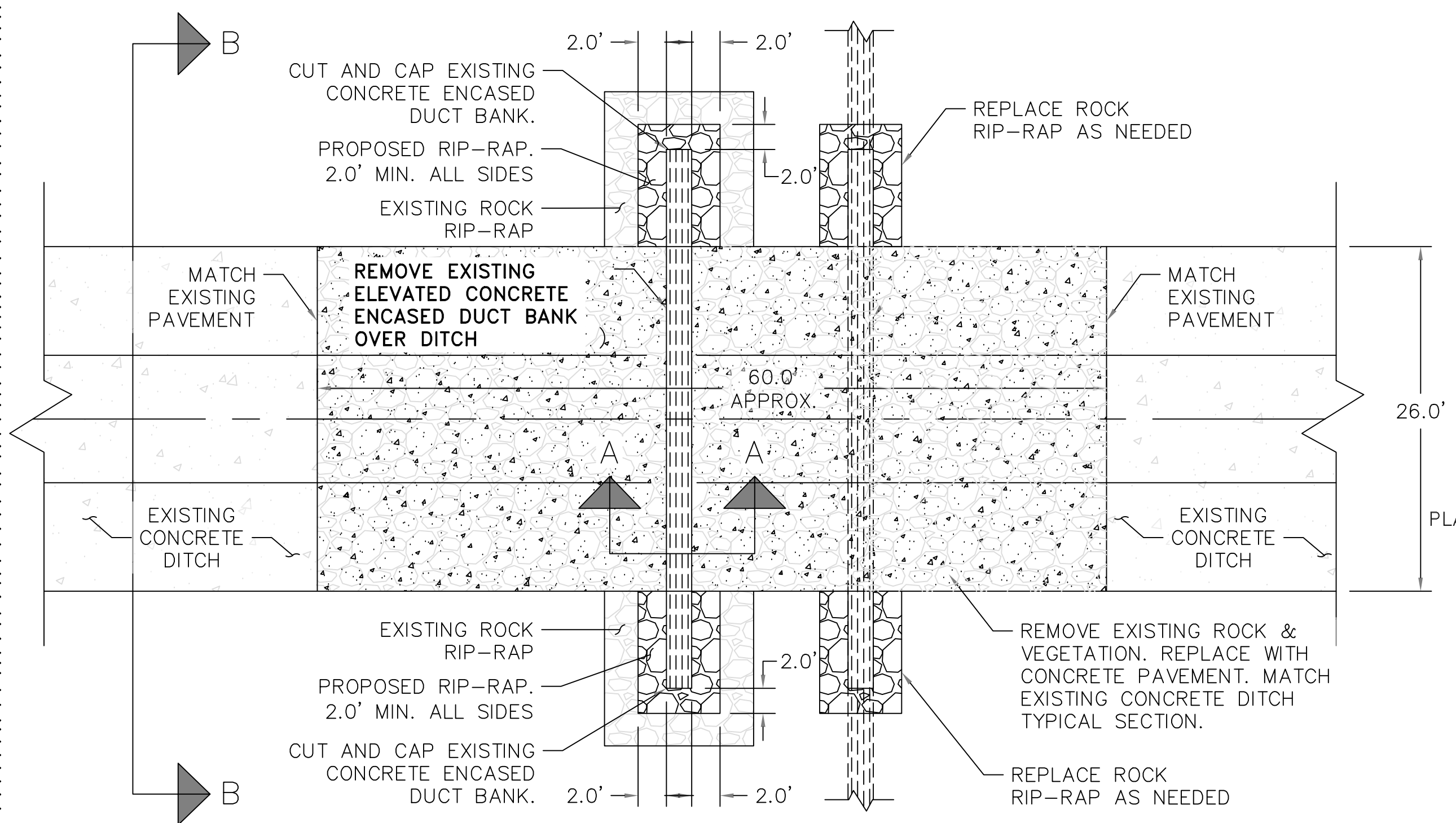


APPROVED BY: JEF
DIRECTOR
HOUSTON AIRPORT SYSTEM

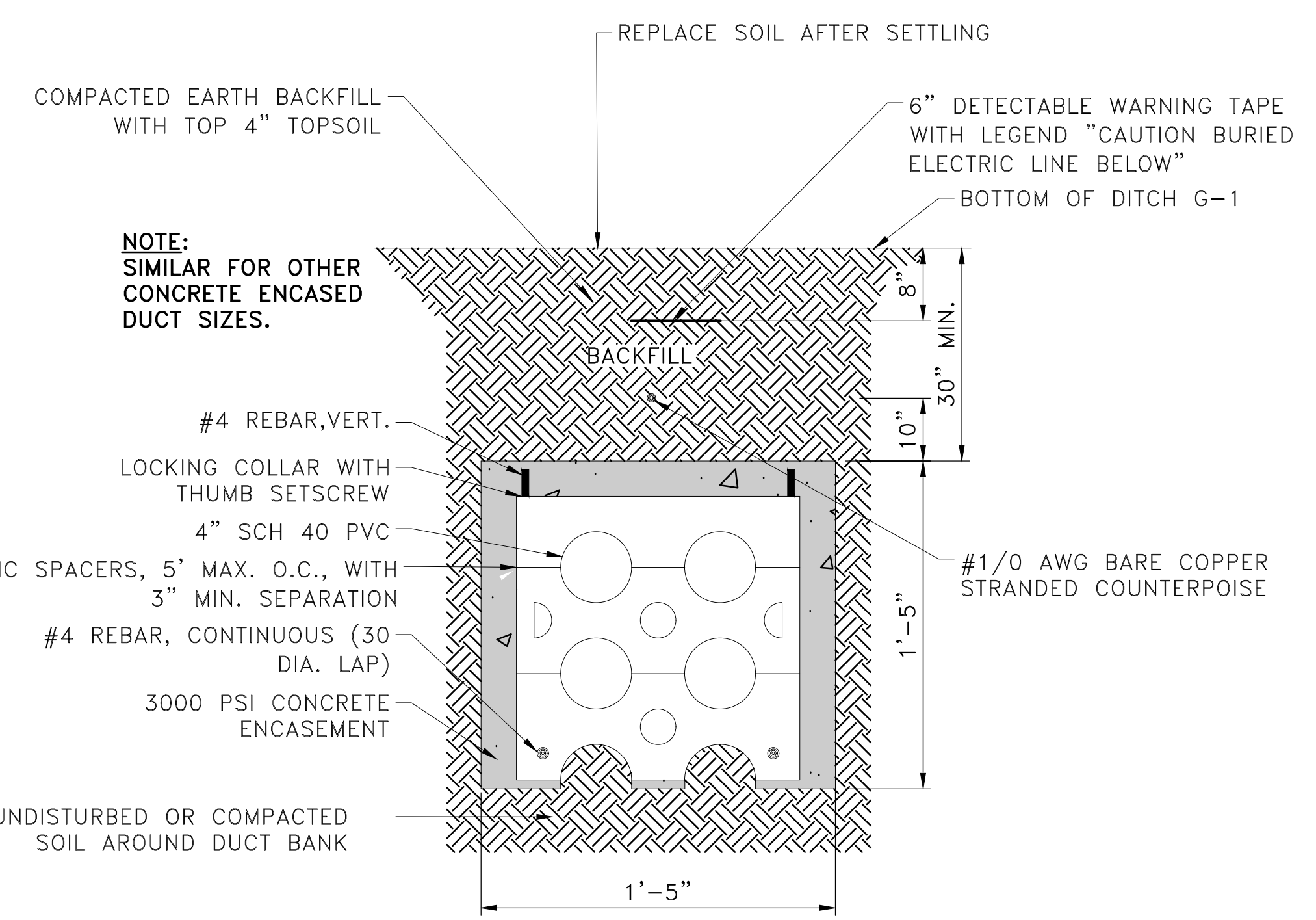
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A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	E05.11

FAA DUCT AND TRENCH NOTES:

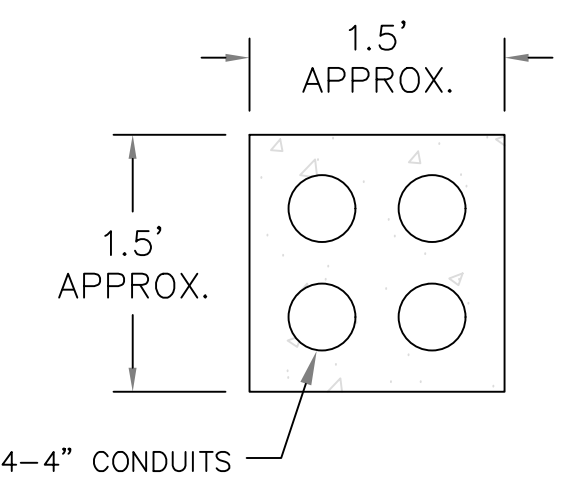
- TRENCHING AND BACKFILLING SHALL BE PERFORMED IN ACCORDANCE WITH FAA SPECIFICATION FAA-C-1391E.
- LIGHTNING, SURGE PROTECTION AND GROUNDING SYSTEMS SHALL BE PERFORMED IN ACCORDANCE WITH FAA STANDARD FAA-STD-019F.
- ADJUST THE DEPTH OF THE ELECTRICAL DUCTS AS REQUIRED TO MAINTAIN THE MINIMUM COVER REQUIREMENT INDICATED AND AVOID EXISTING UTILITIES.
- INSTALL COPPERCLAD 3/4" X 10'-0" GROUND RODS AT EACH MANHOLE, HANDHOLE, AND PULLBOX; AT 90' ON CENTER MAXIMUM SPACING; AND AT EACH END OF THE ELECTRICAL DUCT OR CONDUIT RUN.
- GROUND RODS SHALL BE DRIVEN VERTICALLY FULL DEPTH PLUS 1'-6" COVER MINIMUM.
- GROUND ROD SPACING SHALL VARY BY 10% TO 20% TO PREVENT RESONANCE.
- GROUND RODS SHALL BE OFFSET 6' FROM DUCT COUNTERPOISE.
- CONNECT COUNTERPOISE GROUND RODS AND WIRES WITH EXOTHERMIC WELDS.
- INSTALL DUCT MARKERS EVERY 200' ALONG A RUN AND AT EACH CHANGE OF DIRECTION.
- ALL CONDUIT UNDER PAVED AREAS SHALL BE CONCRETE ENCASED.
- INSTALL CONDUIT SPACERS WITH LOCKING COLLARS AT 5' O.C. SPACING INTERVALS. INSTALL #4 REINFORCING BARS MINIMUM 6" INTO SOIL TO ANCHOR THE ASSEMBLY PRIOR TO PLACING THE CONCRETE ENCASEMENT.



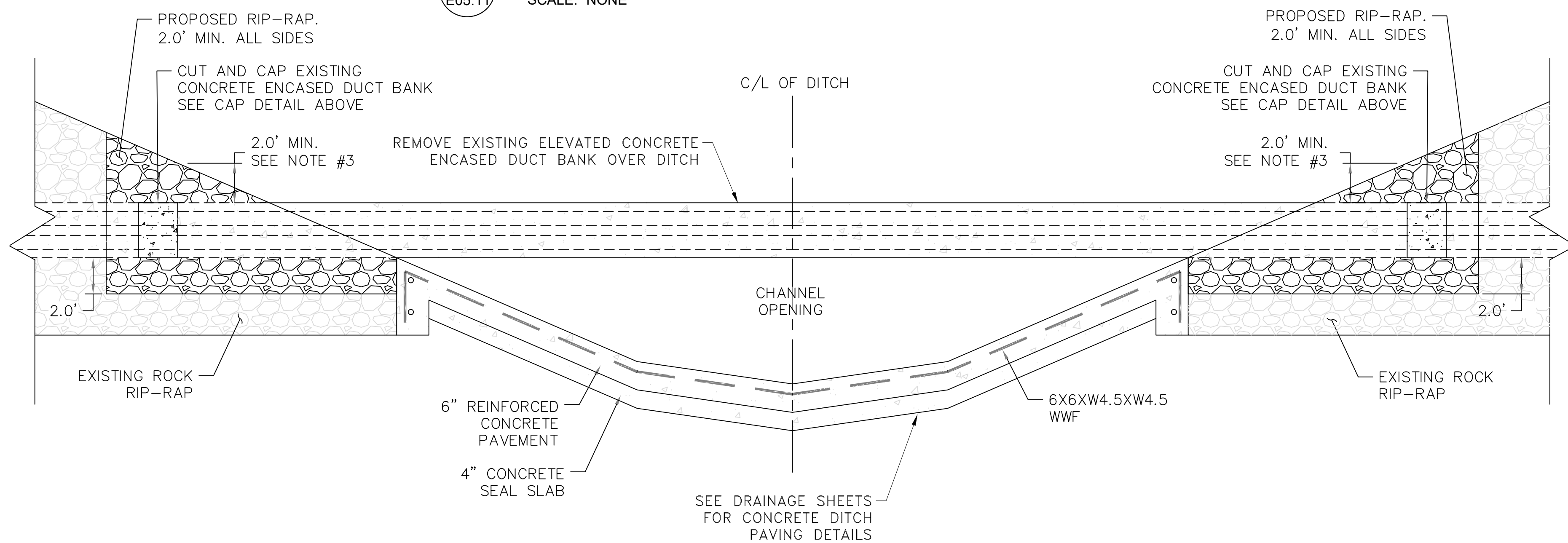
1 FAA DUCT BANK AT "G-1" DITCH PLAN VIEW
SCALE: NONE



2 4-WAY 4" PVC DUCT BANK - FAA STYLE
SCALE: NONE



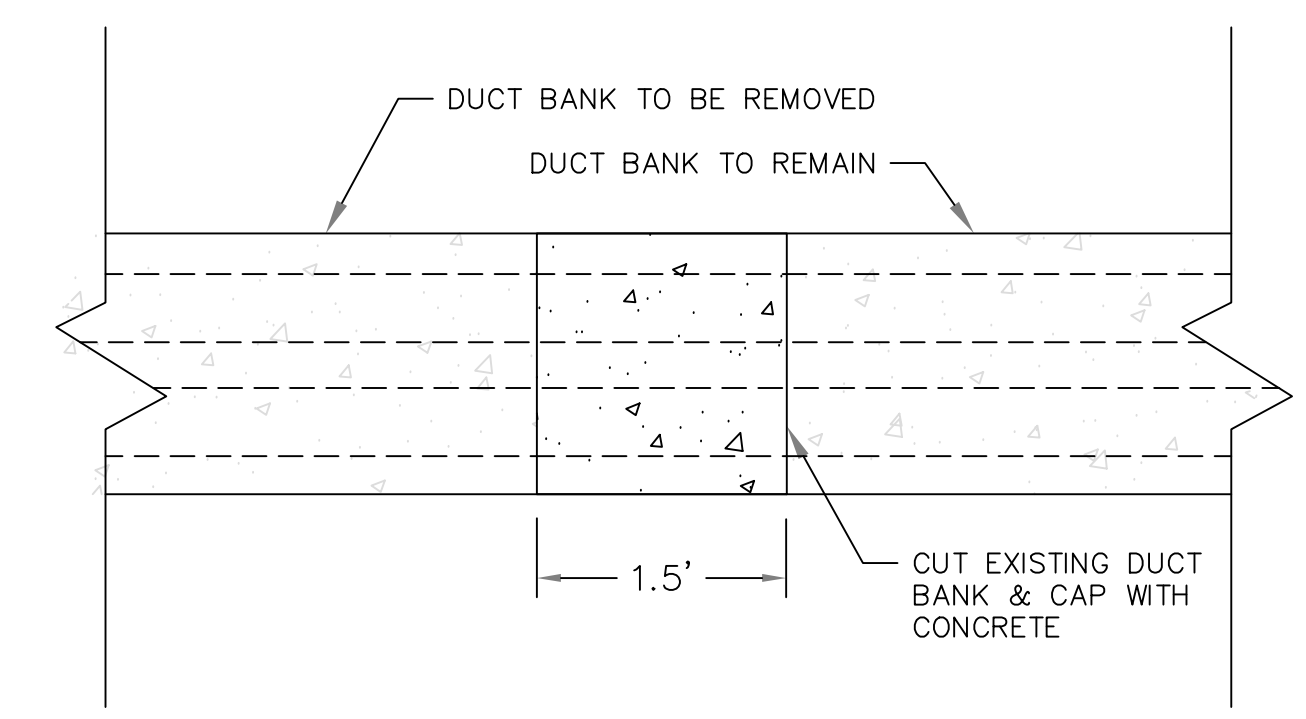
3 FAA DUCT BANK AT "G-1" DITCH SECTION A-A
SCALE: NONE



4 FAA DUCT BANK AT "G-1" DITCH SECTION B-B
SCALE: NONE

NOTES:

- NEW CONCRETE PAVEMENT SHALL MATCH EXISTING CONCRETE THICKNESS AND SLOPE. NEW PAVEMENT SHALL CONFORM TO FAA STANDARD SPECIFICATION P-610.
- FAA APPROVAL (IN WRITING) SHALL BE REQUIRED PRIOR TO ANY UTILITY OR PAVEMENT REMOVAL.
- EXISTING DUCT BANK TO BE CUT AND CAPPED AT A LOCATION WHERE 2.0' MINIMUM RP RAP COVERAGE CAN BE ESTABLISHED.



5 FAA DUCT BANK AT CONCRETE END CAP
SCALE: NONE

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