



# CITY OF HOUSTON

**Sylvester Turner**

Mayor



HOUSTON AIRPORT SYSTEM

George Bush Intercontinental ~ William P. Hobby ~ Ellington Airport

Mario C. Diaz  
Director of Aviation

March 28, 2023

**SUBJECT: Addendum No. 3**

**REFERENCE:** Invitation To Bid (ITB) for the FAA Non-Standard Taxiways at William P. Hobby Airport; Solicitation No. H06-HOUTXY-2023-019; Project No. 770

**To:** All Prospective Bidders:

This Addendum is issued for the following reasons:

**I. Replace** the following pages with the attached documents outlined below.

1. Pages 18-19 Document 00410A Bid Form – Part A.
2. Pages 20-30 Document 00410B Bid Form – Part B.
3. Pages 457-466 L108 Underground Power Cable for Airports.
4. Pages 467-476 L110 Airport Underground Electrical Duct Banks and Conduits.
5. Pages 300-307 P-307 Cement Treated Permeable Base Course.

**II. Replace** the following documents with the attached documents outlined below.

1. Drawing No. GI002 - Revised.
2. Drawing No. GI101 - Revised.
3. Drawings No. GR101-102 - Revised.
4. Drawing No. GC012 - Revised.
5. Drawing No. E-001 - Revised.
6. Drawing No. EL102-P2 - Revised.
7. Drawing No. EL103-P2 - Revised.
8. Drawing No. EL501 - Revised.
9. Drawing No. EL511 - Revised.
10. Drawings No. XS301-302 - Revised.
11. Drawings No. XS311-312 - Revised.
12. Drawings No. XS321-322 - Revised.
13. Drawing No. XS331 - Revised.
14. Drawings No. XS341-343 - Revised.
15. Drawing No. XS351 - Revised.
16. Drawings No. XS371-372- Revised.

**III. Add** Drawing No. EL513-15 Airfield Electrical Details.

**IV. To Respond to Questions.**



March 28, 2023

FAA Non-Standard Taxiways at William P. Hobby Airport

Solicitation No. H06-HOUTXY-2023-019

Project No. 770

1. **Question:** Our staff and potential subcontractors are having difficulties accessing the project construction plans in the format provided, including the reduced size version. Can HAS fix them?

**Response:** The drawings will be uploaded in sections so that they are not as large.

2. **Question:** Based on our representation of the contract work in our project schedule, we can estimate the project could extend beyond the 18 months established in the bid documents. With this in mind will HAS consider adding additional time to the contract?

**Response:** No additional time will be added to the contract at this time.

3. **Question:** Will all the employees working at the airport be subject to E-Verify?

**Response:** HAS does not use E-Verify HAS uses TSC. Every Employee entering the secure area of the airport will be required to have an airport ID badge, a valid social security number is required. Two forms of valid ID are required. The details on what is accepted, and the rules can be found at: <https://www.fly2houston.com/biz/resources/badging>.

4. **Question:** Can you confirm what are the employee requirements to enter and work at the airport?

**Response:** The requirements can be found at: <https://www.fly2houston.com/biz/resources/badging>.

5. **Question:** Per the pre-bid Q & A the question was asked if pre-bid questions need to be requested via the document 00220 "Request for bid Information" or if an email is sufficient. The answer during the pre-bid stated that an email was sufficient. Please confirm that response.

**Response:** Confirmed, an email is sufficient to ask questions. Documents 00220 is not required.

6. **Question:** Section 00200-4 6.0 B states, "request for bid information must be received at least 10 days before the bid date..." Additionally section 20 of the General Provision section 20-15 "Discrepancies and Omissions" states "A bidder that has doubt as to the true meaning of a project requirement may submit to the Owner's Engineer a written request for interpretation no later than 7 days prior to bid opening." With a bid date of April 13th that would indicate that questions could be received up to April 3rd to 6th. However, the documents show the deadline for questions of March 17th. Please consider extending the deadline for questions. As we dig deeper into the plans and specs questions often arise. With a deadline of March 17th there may be additional questions then that go unaddressed.

**Response:** The deadline for questions has been extended until March 31, 2023, and the bid due date has been extended until April 20, 2023. (Please refer to Addendum No. 2, dated March 17, 2023.)



March 28, 2023

FAA Non-Standard Taxiways at William P. Hobby Airport

Solicitation No. H06-HOUTXY-2023-019

Project No. 770

7. **Question:** Was the pre-bid meeting attendance mandatory?

**Response:** No, the pre-bid meeting was not mandatory.

8. **Question:** How many airport designated escorts will be available for the contractor's operations?

**Response:** None. The contractor is responsible for making qualified/badged personnel available for movement area driver training. This will allow them to escort others.

9. **Question:** If airport designated escorts are not available or are not enough to support the contractor operations, can the contractor provide approved escorts to supplement the operations?

**Response:** Please refer to the response provided to Question Number 8.

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 the Addendum. Addendum will be incorporated into the Agreement as applicable. It is the responsibility of the bidder(s) to ensure that it has obtained all such letter(s). By submitting a bid on this project, bidder(s) shall be deemed to have received all Addendum and to have incorporated them into their bid.

If further clarification is needed regarding this solicitation, please contact Senior Procurement Specialist, David Martinez via email at [david.martinez@houstontx.gov](mailto:david.martinez@houstontx.gov).

DS  
DE

DocuSigned by:

*Cathy Vander Plaats*

02232028DE99414...

DS  
LP

Cathy Vander Plaats  
Aviation Procurement Officer  
Houston Airport System

CVP/dm

cc: Alfredo Oracion  
Dallas Evans  
Solicitation File

Attachments:

1. Document 00410A Bid Form – Part A.
2. Document 00410B Bid Form – Part B.
3. L108 Underground Power Cable for Airports.
4. L110 Airport Underground Electrical Duct Banks and Conduits.
5. P-307 Cement Treated Permeable Base Course.
6. Drawing No. GI002 - Revised.
7. Drawing No. GI101 - Revised.
8. Drawings No. GR101-102 - Revised.
9. Drawing No. GC012 - Revised.



March 28, 2023

FAA Non-Standard Taxiways at William P. Hobby Airport

Solicitation No. H06-HOUTXY-2023-019

Project No. 770

10. Drawing No. E-001 - Revised.
11. Drawing No. EL102-P2 - Revised.
12. Drawing No. EL103-P2 - Revised.
13. Drawing No. EL501 - Revised.
14. Drawing No. EL511 - Revised.
15. Drawings No. XS301-302 - Revised.
16. Drawings No. XS311-312 - Revised.
17. Drawings No. XS321-322 - Revised.
18. Drawing No. XS331 - Revised.
19. Drawings No. XS341-343 - Revised.
20. Drawing No. XS351 - Revised.
21. Drawings No. XS371-372- Revised.
22. Drawings No. EL513-15.



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: FAA Non-Standard Taxiways and Fuel Farm Relocation Project

Project No.: HAS No. 770

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 90 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 00470D - Bidder's DBE Participation Plan (*required for AIP funded project*)
  - ☒ Document 00480 – Form SCM-1 Reference Verification
  - ☒ Document 00481 – Non-Collusion Statement
  - ☒ *Document 00842 – Letter of Intent*
  - ☐ Others as listed: \_\_\_\_\_

00410-A1



**2.0 CONTRACT TIME**

- A.** If offer is accepted, Contractor shall achieve Date of Substantial Completion within 18 MONTHS after Date of Commencement of the Work, subject to adjustments of Contract Time as provided in the Contract.



Document 00410B

## BID FORM – PART B

**1.0 TOTAL BID PRICE HAS BEEN CALCULATED BY BIDDER, USING THE FOLLOWING COMPONENT PRICES AND PROCESS (PRINT OR TYPE NUMERICAL AMOUNTS):**

**A. BASE UNIT PRICE TABLE:**

### Bid Schedule A - Eligible

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
1	01410	TPDES Requirements	LS	1		
2	01505	Temporary Facilities and Controls	LS	1		
3	01555 - 1.04A	Traffic Control and Regulation (Excluding Flaggers)	LS	1		
4	01555 - 1.04B	Flaggers	LS	1		
5	C-100	Contractor Quality Control Program (CQCP)	LS	1		
6	C-102-5.1	Temporary Erosion Control	LS	1		
7	C-105-6.1	Mobilization (Max 5% of Total Bid)	LS	1		
8	P-101-5.1	Pavement Removal - Asphalt Pavement (Less than 3-in)	SY	18,186		
9	P-101-5.2	Pavement Removal - Asphalt Pavement (3-in to 6-in)	SY	21,536		
10	P-101-5.3	Pavement Removal - Asphalt Pavement (6-in to 10-in)	SY	2,531		
11	P-101-5.4	Pavement Removal - Asphalt Pavement (10-in to 20-in)	SY	2,520		
12	P-101-5.5	Pavement Removal - Concrete Pavement (10-in to 15-in)	SY	19,919		
13	P-101-5.6	Pavement Removal - Concrete Pavement (15-in to 20-in)	SY	36,141		
14	P-101-5.7	Cement Treated Base Removal (5-in to 10-in)	SY	27,122		
15	P-101-5.8	Cement Treated Base Removal (10-in to 15-in)	SY	25,935		



16	P-101-5.9	Cement Treated Base Removal (15-in to 20-in)	SY	6,132		
17	P-101-5.10	Cement Treated Base Removal (20-in to 30-in)	SY	2,531		
18	P-101-5.11	Econocrete Base Removal (10-in to 20-in)	SY	1,628		
19	P-101-5.12	Cold Milling (Variable Depth)	SY	2,300		
20	P-101-5.13	Miscellaneous Concrete Pad Removal	SY	334		
21	P-101-5.14	Remove Storm Drainage Line 12-in to 36-in Diameter	LF	1,428		
22	P-101-5.15	Remove Storm Drainage Line 42-in Diameter and Greater	LF	777		
23	P-101-5.16	Remove Trench Drain	LF	242		
24	P-101-5.17	Remove Storm Drainage Structure	EA	13		
25	P-101-5.18	Abandon Existing Storm Pipe	LF	431		
26	P-101-5.19	Remove Existing Headwall	EA	3		
27	P-151-4.1	Clearing and Grubbing	LS	1		
28	P-152-4.1	Unclassified Excavation	CY	119,713		
29	P-152-4.2	Unsuitable Excavation	CY	10,000		
30	P-155-8.1	Lime-Treated Subgrade (6-in)	SY	2,762		
31	P-155-8.2	Lime-Treated Subgrade (12-in)	SY	68,660		
32	P-155-8.3	Lime	TON	4,301		
33	P-209-5.1	Crushed Aggregate Base Course (6-in)	SY	2,762		
34	P-209-5.2	Crushed Aggregate Base Course (8-in)	SY	58,485		
35	P-209-5.3	Crushed Aggregate Base Course (15.5-in)	SY	231		
36	P-209-5.4	Crushed Aggregate Base Course (26-in)	SY	8,390		
37	P-209-5.5	Separation Geotextile	SY	69,846		



38	P-307-7.1	Cement-Treated Permeable Base (CTPB) (6-in)	SY	57,372		
39	P-401-8.1	Asphalt Surface Course	TON	935		
40	P-401-8.2	Asphalt Base Course	TON	495		
41	P-403-8.1	Asphalt Mixture Surface Course	TON	1,969		
42	P-501-8.1	16-in Concrete Pavement, Unreinforced	SY	43,131		
43	P-501-8.2	16-in Concrete Pavement, Reinforced	SY	12,947		
44	P-501-8.3	Concrete Panel Replacement	SY	683		
45	P-603-5.1	Emulsified Asphalt Tack Coat	GA	1,771		
46	P-620-5.1	Reflective Marking	SF	35,948		
47	P-620-5.2	Non-Reflective Marking	SF	56,238		
48	P-620-5.3	Temporary Marking	SF	6,798		
49	P-620-5.4	Marking Removal	SF	40,845		
50	P-620-5.5	Preformed Markings	SF	14,910		
51	D-701-5.1	Reinforced Concrete Pipe (Storm Sewer), Class V - 24-in	LF	563		
52	D-701-5.2	Reinforced Concrete Pipe (Storm Sewer), Class V - 36-in	LF	2,242		
53	D-701-5.3	Reinforced Concrete Pipe (Storm Sewer), Class V - 42-in	LF	1,579		
54	D-705-5.1	8-inch Perforated HDPE Underdrain in Turf	LF	11,704		
55	D-705-5.2	8-inch Non-Perforated HDPE Underdrain in Turf	LF	2,415		
56	D-705-5.3	8-inch Perforated HDPE Underdrain	LF	2,301		
57	D-705-5.4	8-inch Non-Perforated HDPE Underdrain	LF	2,302		
58	D-705-5.5	8-inch Non-Perforated HDPE Underdrain under Full-Strength Pavement	LF	150		
59	D-751-5.1	Aircraft Rated Manholes	EA	4		



60	D-751-5.2	Concrete Collar	EA	32		
61	D-751-5.3	Aircraft Rated Inlets 2- Grate	EA	10		
62	D-751-5.4	Underdrain Manhole	EA	24		
63	D-751-5.5	Underdrain Cleanout	EA	25		
64	D-751-5.6	Existing Inlet Cap	EA	2		
65	T-904-5.1	Sodding	SY	188,139		
66	T-905-5.1	Topsoil (Furnished from Off the Site)	CY	21,901		
67	L-100-5.1	Vendor Modifications to ALCMS Equipment	AL	1	\$ 20,403.12	\$ 20,403.12
68	L-100-5.2	Contractor Support of ALCMS Installation	LS	1		
69	L-105-5.1	Cable Removal	LF	60,000		
70	L-105-5.2	Removal of Existing Light Fixture and Foundation	EA	252		
71	L-105-5.3	Removal of Existing Guidance Sign and Foundation	EA	36		
72	L-105-5.4	Removal of Existing Electrical/Communications Structure	EA	56		
73	L-108-5.1	No. 8 AWG, 5kV, L-824C Cable, Installed in Duct Bank or Conduit	LF	82,500		
74	L-108-5.2	No. 6 AWG, Solid, Bare Copper Counterpoise Wire, Installed Above Conduit	LF	28,600		
75	L-108-5.3	Ground Rod 10' Section, Installed in place	EA	946		
76	L-108-5.4	No. 10 XHHW-2 Cable Installed in Conduit (FAA MALSR)	LF	750		
77	L-108-5.5	No. 4 XHHW-2 Cable Installed in Conduit(FAA MALSR)	LF	12,000		
78	L-108-5.6	No. 2 XHHW-2 Cable Installed in Conduit (FAA MALSR)	LF	8,000		
79	L-108-5.7	300 kcmil XHHW-2 Cable Installed in Conduit (FAA MALSR)	LF	9,000		



80	L-108-5.8	No. 1/0 Bare Copper Guard Wire (FAA MALSR)	LF	3,300		
81	L-110-5.1	Direct Buried 1-Way, 2" PVC Conduit, Installed in Turf	LF	16,500		
82	L-110-5.2	Concrete Encased Electrical Duct Bank 1-Way, 2" PVC Conduit	LF	7,700		
83	L-110-5.3	Concrete Encased Electrical Duct Bank 4-Way, 2" PVC Conduit	LF	4,400		
84	L-110-5.4	Concrete Encased Electrical Duct Bank 8-Way, 2" PVC Conduit	LF	440		
85	L-110-5.5	Direct Buried 2-Way, 4" PVC Conduit Installed in Turf	LF	440		
86	L-110-5.6	Concrete Encased, 3-Way, 4" PVC Conduit Installed in Pavement	LF	165		
87	L-110-5.7	Direct Buried 2-Way, 4" & 2-Way 2" PVC Conduit Installed in Turf	LF	440		
88	L-110-5.8	Direct Buried 3-Way, 4" PVC Conduit Installed in Turf	LF	660		
89	L-110-5.9	Direct Buried 1-Way, 4" PVC Conduit Installed in Turf	LF	715		
90	L-115-5.1	Electrical Manhole	EA	7		
91	L-115-5.2	L-867B Electrical Base Can in Turf	EA	2		
92	L-115-5.3	L-868B Electrical Base Can in Pavement	EA	3		
93	L-115-5.4	Electrical Handhole	EA	5		
94	L-115-5.5	Communications Manhole	EA	-		
95	L-115-5.6	Communications Handhole	EA	10		
96	L-115-5.7	Reduce Height of Existing Structure to Grade	EA	2		
97	L-120-5.1	Temporary Lighting Cable	LS	1		
98	L-120-5.2	Circuit Investigation and Tracing	LS	1		
99	L-120-5.3	Subsurface Utility Location	LS	1		



100	L-125-5.1	Install New 3/8" Steel Plate on Existing L-867 Base Can	EA	2		
101	L-125-5.2	Install New 3/4" Steel Plate on Existing L-868 Base Can	EA	16		
102	L-125-5.3	Install New L-861T(L) LED Taxiway Edge Light on New L-867 Base Can in Turf	EA	207		
103	L-125-5.4	Install New L-861T(L) LED Taxiway Edge Light on New L-867 Base Can in Shoulder Pavement	EA	28		
104	L-125-5.5	Install New L-861T(L) LED Taxiway Edge Light on Existing L-867 Base Can	EA	1		
105	L-125-5.6	Install New L-861 Medium Intensity Runway Edge Light on New L-867 Base Can in Shoulder Pavement	EA	4		
106	L-125-5.7	Install New L-862 High Intensity Runway Edge Light on New L-867 Base Can in Shoulder Pavement	EA	10		
107	L-125-5.8	Install New L-862E High Intensity Runway End/Threshold Light on New L-867B Base Can in New Shoulder Pavement	EA	3		
108	L-125-5.9	Install New L-862E High Intensity Runway End/Threshold Light on New L-867B Base Can Cored into Existing Blast Pad Pavement	EA	12		
109	L-125-5.10	Install New L-862E High Intensity Runway End/Threshold Light on Existing L-867B Base Can	EA	1		
110	L-125-5.11	Install New L-852C/D(L) LED Taxiway Centerline Light on New L-868B Base Can in New Full Strength Taxiway Pavement	EA	35		
111	L-125-5.12	Install New L-852C/D(L) LED Taxiway Centerline Light on New L-868B Base Can in New Full Strength Runway Pavement	EA	16		



112	L-125-5.13	Install New L-852G(L) LED In-Pavement Runway Guard Light on New L-868B Base Can in New Full Strength Pavement	EA	37		
113	L-125-5.14	Install New L-852T(L) LED In-Pavement Taxiway Edge on New L-868B Base Can in Existing Full Strength Pavement	EA	9		
114	L-125-5.15	Install New L-858(L) LED Airfield Lighting Sign, 1 Module, on New Foundation	EA	8		
115	L-125-5.16	Install New L-858(L) LED Airfield Lighting Sign, 2 Modules, on New Foundation	EA	9		
116	L-125-5.17	Install New L-858(L) LED Airfield Lighting Sign, 3 Modules, on New Foundation	EA	8		
117	L-125-5.18	Install New L-858(L) LED Airfield Lighting Sign, 4 Modules, on New Foundation	EA	14		
118	L-125-5.19	Install New L-804(L) Elevated Runway Guard Lights on New L-867 Base Can in Turf	EA	6		
119	L-125-5.20	Install New L-852S (L) In-Pavement Runway Stop Bar Lights on New L-868 Base Can in Full Strength Pavement	EA	14		
120	L-125-5.21	Install MALSR Light Bar (5 EMT-Mounted Lights)	LS	2		
121	L-125-5.22	10% Breakage Quantity (Parts)	LS	1		
122	SS-360-5.1	Continuously Reinforced Concrete Pavement (12-inch)	SY	2,226		
TOTAL BASE UNIT PRICES BID SCHEDULE A (ELIGIBLE)						\$ _____

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**B. CASH ALLOWANCE TABLE:**

Item No.	Spec Ref.	Cash Allowance Short Title	Cash Allowance in figures (1)
1.	01210, 1.02 A.	A. Existing Utility Line Relocation, Abandonment, or Removal B. Site Condition Specific Safety Conditions C. Airfield Safety Controls Allowance D. Contaminated Material Handling E. Additional Flagger and Barricades Associated with Phasing / Operations F. Building Permit: For obtaining the Building Permit from City of Houston	\$300,000.00
<b><u>TOTAL CASH ALLOWANCES</u></b>			[\$300,000.00]

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**D. TOTAL BID PRICE:** \$ \_\_\_\_\_  
(Add Totals for Stipulated Price, Base Unit Price, Extra Unit Price, Cash Allowance, and All Alternates, if any)

**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.

**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.

Footnotes for Tables A through C:

- (1) Fixed Unit Price determined prior to Bid. Cannot be adjusted by the Bidder.
- (2) Minimum Bid Price determined prior to Bid. Can be increased by the Bidder, but not decreased, by crossing out the Minimum and inserting revised price on the line above. **Cannot** be decreased by the Bidder.
- (3) Maximum Bid Price determined prior to Bid. Can be decreased by the Bidder, but not increased, by crossing out the Maximum and inserting revised price on the line above. A Bid that increases the Maximum Bid Price may be found non-conforming and non-responsive. **Cannot** be increased by the Bidder.
- (4) Fixed Range Bid Price determined prior to Bid. Unit Price can be adjusted by Bidder to any amount within the range defined by crossing out prices noted and noting revised price on the line above.



f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of 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. The Contractor shall maintain a minimum insulation resistance in accordance with paragraph 108-3.10e with isolation transformers connected in new circuits and new segments of existing circuits through the end of the contract warranty period when tested in accordance with AC 150/5340-26, *Maintenance Airport Visual Aid Facilities*, paragraph 5.1.3.1, Insulation Resistance Test.

**108-2.2 Cable.** Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge (AWG), L-824 Type C, 5,000 volts, non-shielded, with cross-linked polyethylene insulation. L-824 conductors for use on the L-830 secondary of airfield lighting series circuits shall be sized in accordance with the manufacturer's recommendations. All other conductors shall comply with FAA and National Electric Code (NEC) requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Commercial Item Description A-A-59544A and shall be type THWN-2, 75°C for installation in conduit and RHW-2, 75°C for direct burial installations. Conductors for parallel (voltage) circuits shall be type and size and installed in accordance with NFPA-70, National Electrical Code.

Unless noted otherwise, all 600-volt and less non-airfield lighting conductor sizes are based on a 75°C, THWN-2, 600-volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit/duct sizes are based on the use of THWN-2, 600-volt insulated conductors. The Contractor shall make the necessary increase in conduit/duct sizes for other types of wire insulation. In no case shall the conduit/duct size be reduced. The minimum power circuit wire size shall be #12 AWG.

Conductor sizes may have been adjusted due to voltage drop or other engineering considerations. Equipment provided by the Contractor shall be capable of accepting the quantity and sizes of conductors shown in the Contract Documents. All conductors, pigtails, cable step-down adapters, cable step-up adapters, terminal blocks and splicing materials necessary to complete the cable termination/splice shall be considered incidental to the respective part items provided.

Cable type, size, number of conductors, strand and service voltage shall be as specified in the Contract Document.

**108-2.3 Bare copper wire (counterpoise, bare copper wire ground and ground rods).** Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG bare solid copper wire for counterpoise and/or No. 6 AWG insulated stranded for grounding bond wire per ASTM B3 and ASTM B8, and shall be bare copper wire. For voltage powered circuits, the equipment grounding conductor shall comply with NEC Article 250.

Ground rods shall be sectional copper-clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 10 feet (2.54 m) long and 3/4 inch (19 mm) in diameter.

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Item L-108 UNDERGROUND

POWER CABLE FOR AIRPORTS

L-108-2

CITY OF HOUSTON AIRPORT SYSTEM

WILLIAM P. HOBBY AIRPORT

FAA NON-STANDARD TAXIWAYS PROJECT

ISSUED FOR BID

HAS NO. 770

MARCH 23, 2023



**108-2.4 Cable connections.** In-line connections or splices of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

**a. The cast splice.** Not used.

**b. The field-attached plug-in splice.** Field attached plug-in splices shall be installed as shown on the plans. The Contractor shall determine the outside diameter of the cable to be spliced and furnish appropriately sized connector kits and/or adapters. Tape shall be in accordance with the manufacturer's requirements. Primary Connector Kits manufactured by Amerace, "Super Kit", Integro "Complete Kit", or approved equal is acceptable.

**c. The factory-molded plug-in splice.** Not used.

**d. The taped or heat-shrink splice.** Not used.

**108-2.5 Splicer qualifications.** Every airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 volts AC. The Contractor shall submit to the RPR proof of the qualifications of each proposed cable splicer for the airport cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

**108-2.6 Concrete.** Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

**108-2.7 Flowable backfill.** Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

**108-2.8 Cable identification tags.** Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

**108-2.9 Tape.** Electrical tapes shall be Scotch™ Electrical Tapes –Scotch™ 88 (1-1/2 inch (38 mm) wide) and Scotch™ 130C® linerless rubber splicing tape (2-inch (50 mm) wide), as manufactured by the Minnesota Mining and Manufacturing Company (3M™), or an approved equivalent.

**108-2.10 Electrical coating.** Electrical coating shall be Scotchkote™ as manufactured by 3M™, or an approved equivalent.

**108-2.11 Existing circuits.** Whenever the scope of work requires connection to an existing circuit, the existing circuit's insulation resistance shall be tested, in the presence of the RPR. The test shall be performed per this item and prior to any activity that will affect the respective circuit. The Contractor shall record the results on forms acceptable to the RPR. When the work affecting the circuit is complete, the circuit's insulation resistance shall be checked again, in the presence of the RPR. The Contractor shall record the results on forms acceptable to the RPR. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the existing circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

**108-2.12 Detectable warning tape.** Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend

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Item L-108 UNDERGROUND

POWER CABLE FOR AIRPORTS

L-108-3

CITY OF HOUSTON AIRPORT SYSTEM

WILLIAM P. HOBBY AIRPORT

FAA NON-STANDARD TAXIWAYS PROJECT

ISSUED FOR BID

HAS NO. 770

MARCH 23, 2023



tape shall be polyethylene film with a metalized foil core and shall be 3-6 inches (75-150 mm) wide, or as shown on the plans. Detectable tape is incidental to the respective bid item. Detectable warning tape for communication cables shall be orange. Detectable warning tape color code shall comply with the APWA Uniform Color Code.

### CONSTRUCTION METHODS

**108-3.1 General.** The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Cable shall be run without splices, from fixture to fixture.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections unless otherwise authorized in writing by the RPR or shown on the plans.

Cable circuit identification markers shall be installed on both sides of the L-823 connectors installed and on both sides of slack loops where a future connector would be installed.

Provide not less than 3 feet (1 m) of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least one foot (30 cm) vertically above the top of the access structure. This requirement also applies where primary cable passes through empty light bases, junction boxes, and access structures to allow for future connections, or as designated by the RPR.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, hand holes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 inch (6 mm) in size. The cable circuit identification shall match the circuits noted on the construction plans.

**108-3.2 Installation in duct banks or conduits.** This item includes the installation of the cable in duct banks or conduit per the following paragraphs. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and that any potential interference is avoided.

Duct banks or conduits shall be installed as a separate item per Item L-110, Airport Underground Electrical Duct Banks and Conduit. The Contractor shall run a mandrel through

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Item L-108 UNDERGROUND

POWER CABLE FOR AIRPORTS

L-108-4

CITY OF HOUSTON AIRPORT SYSTEM

WILLIAM P. HOBBY AIRPORT

FAA NON-STANDARD TAXIWAYS PROJECT

ISSUED FOR BID

HAS NO. 770

MARCH 23, 2023



duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, light bases, 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 re-cleaned at the Contractor's expense. 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.

The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer's recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

The Contractor shall submit the recommended pulling tension values to the RPR prior to any cable installation. If required by the RPR, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the RPR. Cable pull tensions shall be recorded by the Contractor and reviewed by the RPR. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or NEC requirements (whichever is more restrictive) shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations.

Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

**108-3.3 Installation of direct-buried cable in trenches.** Not used.

**108-3.4 Cable markers for direct-buried cable.** Not used.

**108-3.5 Splicing.** Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

**a. Cast splices.** Not used.

**b. Field-attached plug-in splices.** These shall be assembled per the manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by one of the following methods: (1) wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint or (2) On connector kits equipped with water seal flap; roll-over water seal flap to sealing position on mating connector.

**c. Factory-molded plug-in splices.** Not used.



**d. Taped or heat-shrink splices.** Not used.

**e. Assembly.** Surfaces of equipment or conductors being terminated or connected shall be prepared in accordance with industry standard practice and manufacturer's recommendations. All surfaces to be connected shall be thoroughly cleaned to remove all dirt, grease, oxides, nonconductive films, or other foreign material. Paints and other nonconductive coatings shall be removed to expose base metal. Clean all surfaces at least 1/4 inch (6.4 mm) beyond all sides of the larger bonded area on all mating surfaces. Use a joint compound suitable for the materials used in the connection. Repair painted/coated surface to original condition after completing the connection.

**108-3.6 Bare counterpoise wire installation for lightning protection and grounding.** If shown on the plans or included in the job specifications, bare solid #6 AWG copper counterpoise wire shall be installed for lightning protection of the underground cables. The RPR shall select one of two methods of lightning protection for the airfield lighting circuit based upon sound engineering practice and lightning strike density.

**a. Equipotential.** The counterpoise size is as shown on the plans. The equipotential method is applicable to all airfield lighting systems; i.e. runway, taxiway, apron – touchdown zone, centerline, edge, threshold and approach lighting systems. The equipotential method is also successfully applied to provide lightning protection for power, signal and communication systems. The light bases, counterpoise, etc – all components - are bonded together and bonded to the vault power system ground loop/electrode.

Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables. The counterpoise is centered over the cable/conduit/duct to be protected.

The counterpoise conductor shall be installed no less than 8 inches (200 mm) minimum or 12 inches (300 mm) maximum above the raceway or cable to be protected, except as permitted below:

(1) The minimum counterpoise conductor height above the raceway or cable to be protected shall be permitted to be adjusted subject to coordination with the airfield lighting and pavement designs.

(2) The counterpoise conductor height above the protected raceway(s) or cable(s) shall be calculated to ensure that the raceway or cable is within a 45-degree area of protection, (45 degrees on each side of vertical creating a 90 degree angle).

The counterpoise conductor shall be bonded to each metallic light base, mounting stake, and metallic airfield lighting component.

All metallic airfield lighting components in the field circuit on the output side of the constant current regulator (CCR) or other power source shall be bonded to the airfield lighting counterpoise system.

All components rise and fall at the same potential; with no potential difference, no damaging arcing and no damaging current flow.

See AC 150/5340-30, Design and Installation Details for Airport Visual Aids and NFPA 780, Standard for the Installation of Lightning Protection Systems, Chapter 11, for a detailed description of the Equipotential Method of lightning protection.



Reference FAA STD-019E, Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment, Part 4.1.1.7.

**b. Isolation.** Not used.

**c. Common Installation requirements.** When a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

Grounding electrodes may be rods, ground dissipation plates, radials, or other electrodes listed in the NFPA 70 (NEC) or NFPA 780.

Where raceway is installed by the directional bore, jack and bore, or other drilling method, the counterpoise conductor shall be permitted to be installed concurrently with the directional bore, jack and bore, or other drilling method raceway, external to the raceway or sleeve.

The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet (150 m) apart around the entire circuit. The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode-grounding system. The connections shall be made as shown on the plans and in the specifications.

Where an existing airfield lighting system is being extended or modified, the new counterpoise conductors shall be interconnected to existing counterpoise conductors at each intersection of the new and existing airfield lighting counterpoise systems.

**d. Parallel Voltage Systems.** Provide grounding and bonding in accordance with NFPA 70, National Electrical Code.

**108-3.7 Counterpoise installation above multiple conduits and duct banks.** Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete area of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete area of protection measured 45 degrees each side of vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.

**108-3.8 Counterpoise installation at existing duct banks.** When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

**108-3.9 Exothermic bonding.** Bonding of counterpoise wire shall be by the exothermic welding process or equivalent method accepted by the RPR. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the RPR, the welding kits, materials and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer's recommendations and the following:

**a.** All slag shall be removed from welds.



**b.** Using an exothermic weld to bond the counterpoise to a lug on a galvanized light base is not allowed unless the base has been specially modified. Consult the manufacturer's installation directions for proper methods of bonding copper wire to the light base. See AC 150/5340-30 for galvanized light base exception.

**c.** If called for in the plans, all buried copper and weld material at weld connections shall be thoroughly coated with 6 mm of 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

**108-3.10 Testing.** The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the RPR. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the RPR. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase. The Contractor must maintain the test results throughout the entire project as well as during the warranty period that meet the following:

**a.** Earth resistance testing methods shall be submitted to the RPR for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the RPR. All such testing shall be at the sole expense of the Contractor.

**b.** Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The RPR shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the RPR the following:

**c.** That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.

**d.** That all affected circuits (existing and new) are free from unspecified grounds.

**e.** That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than 50 megohms. Verify continuity of all series airfield lighting circuits prior to energization.

**f.** That the insulation resistance to ground of all new non-grounded conductors of new multiple circuits or circuit segments is not less than 100 megohms.

**g.** That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.

**h.** That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

**i.** That the impedance to ground of each ground rod does not exceed 25 ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81, to verify this requirement. As an alternate, clamp-on style ground impedance test meters may be used to satisfy the impedance testing



requirement. Test equipment and its calibration sheets shall be submitted for review and approval by the RPR prior to performing the testing.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the RPR. Where connecting new cable to existing cable, insulation resistance tests shall be performed on the new cable prior to connection to the existing circuit.

Additional ground rods may be driven to improve testing results. There are no approved "repair" procedures for items that have failed testing other than complete replacement.

### METHOD OF MEASUREMENT

**108-4.1** Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet (meters) installed and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. The measurement for this item shall not include additional quantities required for slack. Cable and counterpoise slack is considered incidental to this item and is included in the Contractor's unit price. No separate measurement or payment will be made for cable or counterpoise slack. Heat shrink shall not be used on cable connections.

**108-4.2** Ground rods shall be paid for in 10-foot segments installed in place.

### BASIS OF PAYMENT

**108-5.1** Payment will be made at the contract unit price for cable and equipment ground installed in duct bank or conduit, or for counterpoise installed above conduit, in place by the Contractor and accepted by the RPR. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item.

Payment will be made under:

Item L-108-5.1	No. 8 AWG, 5 kV, L-824C Cable, Installed in Duct Bank or Conduit - per linear foot
Item L-108-5.2	No. 6 AWG, Solid, Bare Copper Counterpoise Wire, Installed Above Conduit - per linear foot
Item L-108-5.3	Ground Rod 10' Section, Installed in place - per each
<b>Item L-108-5.4</b>	<b>No. 10 XHHW-2 Cable Installed in Conduit (FAA MALSR) - per linear foot</b>
<b>Item L-108-5.5</b>	<b>No. 4 XHHW-2 Cable Installed in Conduit (FAA MALSR) - per linear foot</b>
<b>Item L-108-5.6</b>	<b>No. 2 XHHW-2 Cable Installed in Conduit (FAA MALSR) - per linear foot</b>
<b>Item L-108-5.7</b>	<b>300 kcmil XHHW-2 Cable Installed in Conduit (FAA MALSR) - per linear foot</b>



**Item L-108-5.8      No. 1/0 Bare Copper Guard Wire (FAA MALSR) - 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 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-53	Airport Lighting Equipment Certification Program

**Commercial Item Description**

A-A-59544A	Cable and Wire, Electrical (Power, Fixed Installation)
A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic

**ASTM International (ASTM)**

ASTM B3	Standard Specification for Soft or Annealed Copper Wire
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B33	Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes
ASTM D4388	Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes

**Mil Spec**

MIL-PRF-23586F	Performance Specification: Sealing Compound (with Accelerator), Silicone Rubber, Electrical
MIL-I-24391	Insulation Tape, Electrical, Plastic, Pressure Sensitive

**National Fire Protection Association (NFPA)**

NFPA-70	National Electrical Code (NEC)
NFPA-780	Standard for the Installation of Lightning Protection Systems

**American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)**

ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
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**Item L-108 UNDERGROUND**

**POWER CABLE FOR AIRPORTS      L-108-10**

**CITY OF HOUSTON AIRPORT SYSTEM**

**WILLIAM P. HOBBY AIRPORT**

**FAA NON-STANDARD TAXIWAYS PROJECT**

**ISSUED FOR BID**

**HAS NO. 770**

**MARCH 23, 2023**



Federal Aviation Administration Standard

FAA STD-019E

Lightning and Surge Protection, Grounding Bonding and Shielding  
Requirements for Facilities and Electronic Equipment

**END OF ITEM L-108**

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Item L-108 UNDERGROUND

POWER CABLE FOR AIRPORTS

L-108-11

CITY OF HOUSTON AIRPORT SYSTEM

WILLIAM P. HOBBY AIRPORT

FAA NON-STANDARD TAXIWAYS PROJECT

ISSUED FOR BID

HAS NO. 770

MARCH 23, 2023



**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.

**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

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Item L-110 AIRPORT UNDERGROUNDELECTRICAL

DUCT BANKS AND CONDUITS L-110-1

CITY OF HOUSTON AIRPORT SYSTEM

WILLIAM P. HOBBY AIRPORT

FAA NON-STANDARD TAXIWAYS PROJECT

ISSUED FOR BID

HAS NO. 770

MARCH 23, 2023



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. <sup>[L]</sup><sub>[SEP]</sub>
- 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 (75-150 mm) 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 (50 mm) 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 (75 mm) per 100 feet (30 m). 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 (0.5 m) below the subgrade; in other locations, the top of the duct bank or underground conduit shall be not less than 18 inches (0.5 m) 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 (6 mm) 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 (90 kg) 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 (1.5 m).

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 (75 mm) 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 (6.3 mm) sieve. Flowable backfill may alternatively be used

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 (60 cm).

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 (0.5 m) 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 (0.5 m) 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 (1 m) beyond the edges of the pavement or 3 feet (1 m) 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 (75 mm) thick prior to its initial set. The Contractor shall space the conduits not less than 3 inches (75 mm) 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 (75 mm) 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 (150 mm) 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 (1.5-m) 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 (1.5-m) 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 (75 to 150 mm) wide tape, 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch (75-mm) wide tape only for single conduit runs. Utilize the 6-inch (150-mm) wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches (600 mm) 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 (150 mm) nor more than 12 inches (300 mm) 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 (100 mm) 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 (6.3 mm) 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 (0.5 m) 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 (60 cm) 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 (75 mm) apart (measured from outside wall to outside wall) in a

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Item L-110 AIRPORT UNDERGROUNDELECTRICAL

DUCT BANKS AND CONDUITS L-110-6

CITY OF HOUSTON AIRPORT SYSTEM

WILLIAM P. HOBBY AIRPORT

FAA NON-STANDARD TAXIWAYS PROJECT

ISSUED FOR BID

HAS NO. 770

MARCH 23, 2023



horizontal direction and not less than 6 inches (150 mm) 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 (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) 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 (150 mm) 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 (1.5-m) 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 (60 cm) square and 4 - 6 inches (100 - 150 mm) thick extending approximately one inch (25 mm) 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 (61 m) 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 (100 mm) high and 3 inches (75 mm) wide with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) 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 (200 mm) 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 (100 mm) 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 and Embankment" except that the material used for backfill shall be select material not larger than 4 inches (100 mm) 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 (76 m) 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 and seeding 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.** Removed cable shall be disposed of properly off site at no cost to the owner.

## 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, the termination at the drainage structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

Underground conduit for electrical drain lines of the same size and type as shown shall be installed under this pay item, with no additional compensation for any additional depth of installation required compared to the electrical conduit system.



### 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. Furnishing all materials 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 is included herein.

Payment will be made under:

Item L-110-5.1	Direct Buried 1-Way, 2" PVC Conduit, Installed in Turf - per linear foot
Item L-110-5.2	Concrete Encased, 1-Way, 2" PVC Conduit - per linear foot
Item L-110-5.3	Concrete Encased, 4-Way, 2" PVC Conduit – per linear foot
Item L-110-5.4	Concrete Encased, 8-Way, 2" PVC Conduit – per linear foot
Item L-110-5.5	Direct Buried, 2-Way, 4" PVC Conduit Installed in Turf – per linear foot
Item L-110-5.6	Concrete Encased, <b>3-Way</b> , 4" PVC Conduit Installed in Pavement – per linear foot
<b>Item L-110-5.7</b>	<b>Direct Buried, 2-Way, 4" PVC &amp; 2-Way 2" PVC Conduit Installed in Turf – per linear foot</b>
<b>Item L-110-5.8</b>	<b>Direct Buried, 3-Way, 4" PVC Conduit Installed in Turf – per linear foot</b>
<b>Item L-110-5.9</b>	<b>Direct Buried, 1-Way, 4" PVC Conduit Installed in Turf – per linear foot</b>

### 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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Item L-110 AIRPORT UNDERGROUNDELECTRICAL  
 DUCT BANKS AND CONDUITS L-110-9  
 CITY OF HOUSTON AIRPORT SYSTEM  
 WILLIAM P. HOBBY AIRPORT  
 FAA NON-STANDARD TAXIWAYS PROJECT

ISSUED FOR BID  
 HAS NO. 770  
 MARCH 23, 2023



## 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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Item L-110 AIRPORT UNDERGROUNDELECTRICAL  
DUCT BANKS AND CONDUITS L-110-10  
CITY OF HOUSTON AIRPORT SYSTEM  
WILLIAM P. HOBBY AIRPORT  
FAA NON-STANDARD TAXIWAYS PROJECT

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### Item P-307 Cement Treated Permeable Base Course (CTPB)

#### DESCRIPTION

**307-1.1** This item shall consist of an open-graded drainable base composed of mineral aggregate, cement and water mixed in a central mixing plant and placed on a prepare subgrade or subbase course in accordance with these specifications and shall conform to the lines, grades, thickness, and typical cross sections shown in the plans.

#### MATERIALS

**307-2.1 Aggregate.** Coarse aggregate shall be crushed gravel or crushed stone and shall meet the gradation requirements of ASTM C33 Size 57. Fine aggregate shall consist of natural sand or manufactured sand meeting the requirements of ASTM C33. The aggregate shall meet the material requirements in the table below. Aggregate Material Requirements

Material Test	Requirement	Standard
<b>Coarse Aggregate</b>		
Resistance to Degradation	Loss: 40% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate <b>or</b> Magnesium Sulfate	Loss after 5 cycles: 10% maximum using Sodium sulfate - or - 15% maximum using magnesium sulfate	ASTM C88
Flat Particles, Elongated Particles, or Flat and Elongated Particles <sup>1</sup>	10% maximum, by weight, for fraction retained on the ½ inch sieve and 10% maximum, by weight, for the fraction passing the 1/2-inch sieve	ASTM D4791
Clay lumps and friable particles	Less than or equal to 3 percent	ASTM C142
<b>Fine Aggregate</b>		
Clay lumps and friable particles	Less than or equal to 3 percent	ASTM C142
Soundness of Aggregates by Use of Sodium Sulfate <b>or</b> Magnesium Sulfate	Loss after 5 cycles: 10% maximum using Sodium sulfate - or - 15% maximum using magnesium sulfate	ASTM C88

<sup>1</sup> A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).



**a. Aggregate base materials.** The Contractor shall take samples of the aggregate base stockpile in accordance with ASTM D75 to verify initial aggregate base requirements and gradation. Material shall meet the requirements in paragraph 307-2.1. This sampling and testing will be the basis for approval of the aggregate base quality requirements.

**b. Gradation requirements.** During production the Contractor shall take at least one aggregate sample per day in the presence of the RPR to check the final gradation. Sampling shall be per ASTM D75. Gradation testing shall be in accordance with ASTM C136 and C117. The gradation shall meet the requirements in paragraph 307-2.1

**307-2.3 Cement.** Cement shall conform to the requirements of ASTM C150, Type I or II; ASTM C595, Type IP, IL, or IS.

The Contractor shall furnish vendor's certified test reports for cement shipped to the project.

**307-2.4 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.

**307-2.5 Admixtures.** The use of any material to be added to the mixture shall be approved by the RPR.

**307-2.6 Curing Material.** Curing materials shall be a liquid membrane-forming compounds for curing concrete shall conform to the requirements of ASTM C309, Type 2, Class B.

**307-2.7 Bond Breaker.** Choke stone shall be an ASTM C33 Number 89 stone.

**307-2.8 Separation Geotextile.** Not used.

### COMPOSITION OF MIXTURE

**307-3.1 Mix design.** The Mix Design shall be composed of a mixture of aggregate, cement, and water meeting the following requirements:



**Mix Design Requirements**

<b>Material or Test</b>	<b>Requirements</b>	<b>Standard</b>	
7-day Compressive strength, psi	Between minimum 400 psi and maximum 800 psi	ASTM C31 and ASTM C39	Cylinders in accordance with ASTM C31 and test per ASTM C39
Coefficient of permeability (ft/day)	Between 500 to 1500 ft/day	AASHTO T215	
Water-Cement Ratio	Approx. 0.36		Cement content shall be adequate to hold the material together and meet strength requirements.
Coarse aggregate	Size #57.	ASTM C33	
Fine aggregate	Approximately 300 to 400 pounds per cubic yard		As necessary to meet stability while maintaining permeability

The mix design shall include a complete list of materials, including type, brand, source, and amount of cement, fine aggregate, coarse aggregate, water, and cementitious additives, if used. It shall also contain the 3, 5, 7, and 14 day compressive strength test results and the results of the permeability tests. Data shall be provided to the RPR for 7-day breaks to serve as a basis for field testing requirements and comparison.

If the Contractor makes a change in aggregate sources or type of cement, or if cementitious additives are added or deleted from the mix, production of the drainable base course shall be stopped and a new mix design shall be submitted to the RPR for approval at the Contractor's expense.

**307-3.2 Submittals.** At least 30 days prior to the placement of the CTPB, the Contractor shall submit certified test reports to the RPR for those materials proposed for use during construction, as well as the mix design information for the material. The certification shall show the specifications and tests for the material, the name of the testing laboratory, the date of the tests, and a statement that the materials comply with the applicable specifications. Tests shall be representative of the material to be used for the project. The submittal package shall include the following:

- a. Sources of materials, including aggregate, cement, cementitious additives, curing, and bond-breaking materials.
- b. Physical properties of the aggregates, cement, cementitious additives, curing, and bond-breaking materials.
- c. Mix design
  - Mix identification number
  - Aggregate gradation
  - Cement content
  - Water content



- Content of any additional cementitious materials or additives
- Compressive strength at 3,5, 7, and 14 days.
- Coefficient of Permeability

No drainable base course material shall be placed until the submittal is accepted in writing by the RPR.

During production, the Contractor shall submit batch tickets for each delivered load.

## CONSTRUCTION METHODS

**307-4.1 Control strip.** The first half-day of construction shall be considered the control strip. The Contractor shall demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of the specification. Control strips that do not meet specification requirements shall be removed and replaced at the Contractor's expense. Full operations shall not continue until the control strip has been accepted by the RPR. Upon acceptance of the control strip by the RPR, the Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the RPR.

When additional effort beyond that provided by the paver is required to seat the aggregate, additional compaction shall be initiated within 30 minutes following the placing and striking-off operations. The actual rolling pattern and sequence shall be established during placement of the control strip and approved by the RPR. In areas inaccessible to the paver and roller, hand operated vibrator-plate compactors may be used to seat the aggregate.

The additional compaction, if required, shall be one to three passes of a self-propelled, steel-wheel static roller with weight between 5 and 12 tons. The roller shall be in good condition and shall be capable of reversing without backlash and of compacting the CTPB without undue displacement or excessive crushing of the aggregate.

The control strip CTPB layer shall be considered acceptable when aggregate is completely coated with cement paste with no evidence of crushing; the surface is firm, unyielding and stable under construction traffic; and the layer meets the field permeability per paragraph 307-3.1.

**307-4.2 Weather limitations.** The CTPB material shall not be mixed or placed while the air temperature is below 40°F or when conditions indicate that the temperature may fall below 35°F within 24 hours. The CTPB shall not be placed on frozen underlying courses or mixed when aggregate is frozen. The CTPB may not be placed when rainfall is occurring or where rain is imminent. Any CTPB material that has become excessively wet by rain during transport and/or placement will be rejected.

**307-4.3 Equipment.** All equipment necessary to mix, transport, place, compact, and finish the CTDB material shall be furnished by the Contractor and approved by the RPR. The equipment will be inspected by the RPR prior to the start of construction operations.

**307-4.4 Preparation of the underlying course.** The underlying course shall be checked and accepted by the RPR before placing operations begin. Prior to placing the material, the final grade should be firm, moist and free of frost. Use of chemicals to eliminate frost will not be permitted. The underlying course shall be wetted in advance of placing the lean concrete base course.

**307-4.5 Mixing.** The batch plant site, layout, equipment, and provisions for transporting material shall assure a continuous supply of material to the work. Stockpiles shall be constructed in a manner that prevents segregation and intermixing of deleterious materials. Free access to the plant must be provided



to the RPR at all times for inspection of the plant's equipment and operation and for sampling the CTPB mixture and its components.

The mixers shall be examined daily by the Contractor and periodically by the RPR for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pick-up and throw-over blades shall be replaced as necessary to provide adequate mixing. Aggregate and cement may be proportioned either by weight or volume, and shall be mixed sufficiently to prevent the forming of cement balls when water is added. Batching weights shall be within a tolerance of 1% for cement and 2% for aggregates. The mixing time shall be that required to produce a uniform mixture of aggregate, cement, and water.

**307-4.6 Hauling.** The CTPB mixture shall be transported from the plant to the job site in trucks or other hauling equipment having beds that are smooth and clean. Truck bed covers shall be provided to protect the CTPB during transport from rain. CTPB material that becomes wet during transport will be rejected.

The elapsed time between the start of moist mixing and the time the CTPB is deposited in-place at the work site shall not exceed (a) 30 minutes when the CTPB is hauled in non-agitating trucks, or (b) 45 minutes when the CTPB is hauled in transit mixers. Re-tempering the CTPB material by adding water or by other means shall not be permitted.

**307-4.7 Placing.** The CTPB material shall be placed using a mechanical spreader or an asphalt paver. The CTPB shall be installed in a single 6 inch lift. The spreader shall be capable of placing a uniform, full-depth layer of material across the full width of the base in one pass. When two or more spreaders are required, they shall be operated so that spreading progresses along the full width of the base in a uniform manner, and the placement is no more than 1 hour apart.

**304-4.8 Finishing.** Shape the finished surface of the lean concrete base layer to the specified lines, grades, and cross-section.

**307-4.9 Compaction.** Immediately upon completion of the spreading operations, the CTPB material shall be compacted using the approved compaction equipment and roller pattern/sequence, as determined in the approved control strip. Sufficient rollers shall be furnished to handle the output of the plant. If the rolling pattern/sequence results in undue displacement of the surface, or causes crushing of the aggregate, work shall be stopped until the cause(s) can be determined and corrections are made.

A large asphalt paving machine with dual tamping bars may be used in lieu of rolling if approved during the control strip.

In all places not accessible to the rollers (or the alternative paving machine), the CTPB material shall be compacted with approved mechanical hand-operated tampers.

When additional effort beyond that provided by the paver is required to seat the aggregate, additional compaction shall be initiated within 30 minutes following the placing and striking-off operations

**307-4.10 Joints.** The formation of all joints shall be made in such a manner as to ensure a continuous bond between old and new sections of the course. All joints shall present the same texture and smoothness as other sections of the course.

All contact surfaces of previously constructed courses shall be cleaned of all dirt or other objectionable material and thoroughly moistened with water prior to placing new material.

**307-4.11 Curing.** The completed drainage layer shall be moist cured for a period of twelve hours followed by application of an impervious membrane curing compound in accordance with paragraph 307-2.6.



**307-4.12 Surface Tolerance.** The Contractor shall perform smoothness and grade checks daily. Any area not meeting smoothness and grade shall be corrected by the Contractor at the Contractor's expense. The Contractor shall provide smoothness and grade data to the RPR on a daily basis.

**a. Smoothness.** The finished surface shall not vary more than  $\pm 3/8$ -inch when tested with a 12-foot straightedge applied parallel with and at right angles to the centerline, and, moved continuously forward at half the length of the 12-foot straightedge for the full length of each line on a 25-foot grid. The Contractor shall correct any high spots more than  $3/8$  inch in 12-foot with a grinding machine or remove and replace the material at the Contractor's expense. Any areas that have been ground shall have curing compound reapplied.

**b. Grade.** The grade shall be measured on a 25-foot grid and shall be within 0 to -0.05 feet of the specified grade. When the surface is more than  $1/2$  inch above the grade shown in the plans, the surface shall be corrected at the Contractor's expense to an elevation that falls within a tolerance of  $1/4$  inch.

**307-4.13 Field Permeability.** One test shall be performed by the Contractor in the presence of the RPR for 1200 square yards. Test locations will be determined on a random basis in accordance with ASTM D3665. The permeability of the base will be determined in accordance with ASTM C1701.

**307-4.14 Bond breaker.** Prior to placing the overlaying concrete pavement, a bond breaker shall be placed on the surface to prevent bonding. Choke stone per paragraph 307-2.7 shall be an ASTM C33 Number 89 stone placed in a layer approximately  $1/4$ -inch to  $1/2$  inch (6 to 12 mm) thick.

**307-4.15 Maintenance.** The completed drainable base shall be maintained by the Contractor in a condition to meet all specification requirements until the pavement has been placed. Placement of the pavement shall be made within thirty (30) calendar days after placement of the drainage layer. The CTPB shall not be opened to traffic until specimens made in accordance with ASTM C31 and tested in accordance with ASTM C39 show that a 7-day compressive strength of 500 psi has been achieved.

## MATERIAL ACCEPTANCE

**307-5.1 Sampling and testing.** All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the RPR for each 600 square yards. Sampling locations will be determined by the RPR on a random basis per ASTM D3665. The Contractor shall bear the cost of providing curing facilities for the strength specimens.

**a. Compressive Strength.** One sample CTPB will be taken for compressive strength for each 600 square yards in accordance with ASTM C172. Two test cylinders will be made and cured from the sample per ASTM C31 and the 7-day compressive strength of each cylinder determined per ASTM C39. The compressive strength will be computed by averaging the two 7-day compressive strengths.

The Contractor shall provide for the initial curing of cylinders in accordance with ASTM C31 during the 24 hours after molding.

**b. Thickness.** One core shall be drilled by the Contractor for thickness determination for each 600 square yards. Thickness will be determined by measuring the depth of core hole.

Core holes shall be filled by the Contractor with CTPB material or non-shrink grout.



## METHOD OF MEASUREMENT

**307-6.1 Measurement.** The quantity of CTPB to be paid for shall be the number of square yards of material placed and accepted in the completed base course.

## BASIS OF PAYMENT

**307-7.1 Payment.** Payment will be made at the contract unit price per square yard for Cement Treated Permeable Base Course (CTPB) as measured by RPR. This price shall be full compensation for furnishing all materials, for all preparation, mixing, placing, compacting curing and placement of overlaying bond breaker; and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-307-7.1	Cement Treated Permeable Base Course (CTPB) (6") - per square yard
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## 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 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 C150	Standard Specification for Portland Cement
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C174	Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1701	Standard Test Method for Infiltration Rate of In Place Pervious Concrete
ASTM D3665	Standard Practice for Random Sampling of Construction Materials

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Item P-307 Cement Treated Permeable  
Base Course (CTPB)  
CITY OF HOUSTON AIRPORT SYSTEM  
WILLIAM P. HOBBY AIRPORT  
FAA NON-STANDARD TAXIWAYS PROJECT

P-307-7

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MARCH 23, 2023



ASTM C174	Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C150	Standard Specification for Portland Cement
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
American Association of State Highway and Transportation Officials (AASHTO)	
M288	Standard Specification for Geosynthetic Specification for Highway Applications
T215	Standard Method of Test for Permeability of Granular Soils (Constant Head),

**END ITEM P-307**




INDEX OF SHEETS – VOLUME 1


PAGE NO.	SHEET NO.	SHEET TITLE
GENERAL INFORMATION		
1	G1001	COVER SHEET
2	G1002	INDEX OF SHEETS
3	G1003	ABBREVIATIONS AND GENERAL LEGEND
4	G1101	PROJECT SITE PLAN
5	G1102	HORIZONTAL CONTROL PLAN
6	G1103	HORIZONTAL CONTROL PLAN
7	GR101	BORING LOG PLAN
8	GR102	BORING LOG PLAN
9	GR501	BORING LOG DETAILS
10	GR502	BORING LOG DETAILS
11	GR503	BORING LOG DETAILS
CONSTRUCTION PHASING		
12	GC001	GENERAL PHASING NOTES
13	GC002	GENERAL PHASING NOTES
14	GC011	STAGING AREA AND SITE ACCESS PLAN
15	GC012	OVERALL PHASING PLAN AND SEQUENCE OF CONSTRUCTION
16	GC101–P1	OVERALL PHASING PLAN – PHASE 1
17	GC102–P1	DETAILED PHASING PLAN – PHASE 1
18	GC201–P2	OVERALL PHASING PLAN – PHASE 2
19	GC202–P2	DETAILED PHASING PLAN – PHASE 2
20	GC301–P3	OVERALL PHASING PLAN – PHASE 3
21	GC302–P3	DETAILED PHASING PLAN – PHASE 3
22	GC401–P4	OVERALL PHASING PLAN – PHASE 4
23	GC402–P4	DETAILED PHASING PLAN – PHASE 4
24	GC501–P5	OVERALL PHASING PLAN – PHASE 5
25	GC502–P5	DETAILED PHASING PLAN – PHASE 5
26	GC601–P6A	OVERALL PHASING PLAN – PHASE 6A
27	GC602–P6A	DETAILED PHASING PLAN – PHASE 6A
28	GC603–P6B	OVERALL PHASING PLAN – PHASE 6B
29	GC604–P6B	DETAILED PHASING PLAN – PHASE 6B
30	GC901	PHASING DETAILS
TESC PLANS		
31	CE001	EROSION CONTROL GENERAL NOTES
32	CE002	IRRIGATION NOTES
33	CE101–P1	EROSION CONTROL PLAN – PHASE 1
34	CE102–P2	EROSION CONTROL PLAN – PHASE 2
35	CE103–P3	EROSION CONTROL PLAN – PHASE 3
36	CE104–P4	EROSION CONTROL PLAN – PHASE 4
37	CE105–P5	EROSION CONTROL PLAN – PHASE 5
38	CE106–P6	EROSION CONTROL PLAN – PHASE 6
39	CE501	EROSION CONTROL DETAILS
CIVIL DEMOLITION		
40	CD101–P1	CIVIL DEMOLITION PLAN – PHASE 1
41	CD102–P2	CIVIL DEMOLITION PLAN – PHASE 2
42	CD103–P2	CIVIL DEMOLITION PLAN – PHASE 2
43	CD104–P3	CIVIL DEMOLITION PLAN – PHASE 3
44	CD105–P4	CIVIL DEMOLITION PLAN – PHASE 4
45	CD106–P5	CIVIL DEMOLITION PLAN – PHASE 5
46	CD107–P6	CIVIL DEMOLITION PLAN – PHASE 6A
47	CD108–P6	CIVIL DEMOLITION PLAN – PHASE 6B
48	CD109–P6	CIVIL DEMOLITION PLAN – PHASE 6B
49	CD501	CIVIL DEMOLITION DETAILS
50	CD502	CIVIL DEMOLITION DETAILS
CIVIL GEOMETRY		
51	CS001	TYPICAL PAVEMENT SECTIONS
52	CS002	TYPICAL PAVEMENT SECTIONS
53	CS003	TYPICAL PAVEMENT SECTIONS
54	CS004	TYPICAL PAVEMENT SECTIONS
55	CS101–P1	GEOMETRY PLAN – PHASE 1
56	CS102–P2	GEOMETRY PLAN – PHASE 2
57	CS103–P2	GEOMETRY PLAN – PHASE 2
58	CS104–P3	GEOMETRY PLAN – PHASE 3
59	CS105–P4	GEOMETRY PLAN – PHASE 4
60	CS106–P5	GEOMETRY PLAN – PHASE 5
61	CS107–P6	GEOMETRY PLAN – PHASE 6A
62	CS108–P6	GEOMETRY PLAN – PHASE 6B
63	CS201	TAXIWAY PROFILES
64	CS202	TAXIWAY PROFILES
65	CS203	TAXIWAY PROFILES
66	CS204	TAXIWAY PROFILES
67	CS205	TAXIWAY PROFILES
68	CS206	SERVICE ROAD PROFILES
CIVIL GRADING AND DRAINAGE		
69	CG001	OVERALL GRADING AND DRAINAGE PLAN (PHASES 1 THROUGH 4)
70	CG002	OVERALL GRADING AND DRAINAGE PLAN (PHASES 5 AND 6)
71	CG101–P1	GRADING AND DRAINAGE PLAN – PHASE 1
72	CG102–P2	GRADING AND DRAINAGE PLAN – PHASE 2
73	CG103–P2	GRADING AND DRAINAGE PLAN – PHASE 2
74	CG104–P3	GRADING AND DRAINAGE PLAN – PHASE 3
75	CG105–P4	GRADING AND DRAINAGE PLAN – PHASE 4
76	CG106–P5	GRADING AND DRAINAGE PLAN – PHASE 5

PAGE NO.	SHEET NO.	SHEET TITLE
77	CG107–P6	GRADING AND DRAINAGE PLAN – PHASE 6A AND 6B
78	CG201	STORM DRAIN PROFILES
79	CG202	STORM DRAIN PROFILES
80	CG203	STORM DRAIN PROFILES
81	CG501	STORM DRAIN DETAILS
82	CG502	STORM DRAIN DETAILS
83	CU001	UNDERDRAIN NOTES
84	CU101–P1	UNDERDRAIN PLAN – PHASE 1
85	CU102–P2	UNDERDRAIN PLAN – PHASE 2
86	CU103–P2	UNDERDRAIN PLAN – PHASE 3
87	CU104–P3	UNDERDRAIN PLAN – PHASE 3
88	CU105–P4	UNDERDRAIN PLAN – PHASE 4
89	CU106–P5	UNDERDRAIN PLAN – PHASE 5
90	CU107–P6	UNDERDRAIN PLAN – PHASE 6A
91	CU501	UNDERDRAIN PLAN DETAILS
92	CU502	UNDERDRAIN PLAN DETAILS
93	CU503	UNDERDRAIN PLAN DETAILS
CIVIL PAVING		
94	CP101–P1	PAVEMENT JOINTING & REINFORCEMENT PLAN – PHASE 1
95	CP102–P1	PAVEMENT JOINTING & REINFORCEMENT PLAN – PHASE 1
96	CP103–P2	PAVEMENT JOINTING & REINFORCEMENT PLAN – PHASE 2
97	CP104–P2	PAVEMENT JOINTING & REINFORCEMENT PLAN – PHASE 2
98	CP105–P3	PAVEMENT JOINTING & REINFORCEMENT PLAN – PHASE 3
99	CP106–P3	PAVEMENT JOINTING & REINFORCEMENT PLAN – PHASE 3
100	CP107–P4	PAVEMENT JOINTING & REINFORCEMENT PLAN – PHASE 4
101	CP108–P5	PAVEMENT JOINTING & REINFORCEMENT PLAN – PHASE 5
102	CP109–P6	PAVEMENT JOINTING & REINFORCEMENT PLAN – PHASE 6A
103	CP110–P6	PAVEMENT JOINTING & REINFORCEMENT PLAN – PHASE 6A & 6B
104	CP501	PAVEMENT JOINTING DETAILS
105	CP502	PAVEMENT JOINTING DETAILS
106	CP503	PAVEMENT JOINTING DETAILS
107	CP504	PAVEMENT JOINTING DETAILS
108	CP505	PAVEMENT JOINTING DETAILS
109	CP701–P1	PAVEMENT SPOT ELEVATION PLAN – PHASE 1
110	CP702–P1	PAVEMENT SPOT ELEVATION PLAN – PHASE 1
111	CP703–P2	PAVEMENT SPOT ELEVATION PLAN – PHASE 2
112	CP704–P2	PAVEMENT SPOT ELEVATION PLAN – PHASE 2
113	CP705–P3	PAVEMENT SPOT ELEVATION PLAN – PHASE 3
114	CP706–P3	PAVEMENT SPOT ELEVATION PLAN – PHASE 3
115	CP707–P4	PAVEMENT SPOT ELEVATION PLAN – PHASE 4
116	CP708–P5	PAVEMENT SPOT ELEVATION PLAN – PHASE 5
117	CP709–P6	PAVEMENT SPOT ELEVATION PLAN – PHASE 6A
118	CP710–P6	PAVEMENT SPOT ELEVATION PLAN – PHASE 6A
CIVIL PAVEMENT MARKING		
119	CM101–P1	PAVEMENT MARKING PLAN – PHASE 1
120	CM102–P2	PAVEMENT MARKING PLAN – PHASE 2
121	CM103–P2	PAVEMENT MARKING PLAN – PHASE 2
122	CM104–P3	PAVEMENT MARKING PLAN – PHASE 3
123	CM105–P4	PAVEMENT MARKING PLAN – PHASE 4
124	CM106–P5	PAVEMENT MARKING PLAN – PHASE 5
125	CM107–P6	PAVEMENT MARKING PLAN – PHASE 6A
126	CM108–P6	PAVEMENT MARKING PLAN – PHASE 6B
127	CM109–P6	PAVEMENT MARKING PLAN – PHASE 6B
128	CM501	PAVEMENT MARKING DETAILS
129	CM502	PAVEMENT MARKING DETAILS
130	CM503	PAVEMENT MARKING DETAILS
131	CM504	PAVEMENT MARKING DETAILS
132	CM505	PAVEMENT MARKING DETAILS
133	CM506	PAVEMENT MARKING DETAILS
AIRFIELD ELECTRICAL GENERAL INFORMATION		
134	E–001	AIRFIELD ELECTRICAL NOTES AND LEGEND
ELECTRICAL PHASING		
135	E–101–P1	AIRFIELD ELECTRICAL PHASING PLAN – PHASE 1
136	E–101–P2	AIRFIELD ELECTRICAL PHASING PLAN – PHASE 2
137	E–101–P3	AIRFIELD ELECTRICAL PHASING PLAN – PHASE 3
138	E–101–P4	AIRFIELD ELECTRICAL PHASING PLAN – PHASE 4
139	E–101–P5	AIRFIELD ELECTRICAL PHASING PLAN – PHASE 5
140	E–101–P6	AIRFIELD ELECTRICAL PHASING PLAN – PHASE 6A
AIRFIELD ELECTRICAL DEMOLITION		
141	ED101–P1	AIRFIELD ELECTRICAL DEMOLITION PLAN – PHASE 1
142	ED102–P2	AIRFIELD ELECTRICAL DEMOLITION PLAN – PHASE 2
143	ED103–P2	AIRFIELD ELECTRICAL DEMOLITION PLAN – PHASE 2
144	ED104–P3	AIRFIELD ELECTRICAL DEMOLITION PLAN – PHASE 3
145	ED105–P4	AIRFIELD ELECTRICAL DEMOLITION PLAN – PHASE 4
146	ED106–P5	AIRFIELD ELECTRICAL DEMOLITION PLAN – PHASE 5
147	ED107–P6	AIRFIELD ELECTRICAL DEMOLITION PLAN – PHASE 6A
148	ED108–P6	AIRFIELD ELECTRICAL DEMOLITION PLAN – PHASE 6B
149	ED109–P6	AIRFIELD ELECTRICAL DEMOLITION PLAN – PHASE 6B
AIRFIELD ELECTRICAL LIGHTING AND SIGNAGE		
150	EL101–P1	AIRFIELD ELECTRICAL LIGHTING AND SIGNAGE PLAN – PHASE 1
151	EL102–P2	AIRFIELD ELECTRICAL LIGHTING AND SIGNAGE PLAN – PHASE 2
152	EL103–P2	AIRFIELD ELECTRICAL LIGHTING AND SIGNAGE PLAN – PHASE 2

153	EL104–P3	AIRFIELD ELECTRICAL LIGHTING AND SIGNAGE PLAN – PHASE 3
154	EL105–P4	AIRFIELD ELECTRICAL LIGHTING AND SIGNAGE PLAN – PHASE 4
155	EL106–P5	AIRFIELD ELECTRICAL LIGHTING AND SIGNAGE PLAN – PHASE 5
156	EL107–P6	AIRFIELD ELECTRICAL LIGHTING AND SIGNAGE PLAN – PHASE 6A
157	EL108–P6	AIRFIELD ELECTRICAL LIGHTING AND SIGNAGE PLAN – PHASE 6B
158	EL109–P6	AIRFIELD ELECTRICAL LIGHTING AND SIGNAGE PLAN – PHASE 6B
159	EL501	AIRFIELD ELECTRICAL DETAILS
160	EL502	AIRFIELD ELECTRICAL DETAILS
161	EL503	AIRFIELD ELECTRICAL DETAILS
162	EL504	AIRFIELD ELECTRICAL DETAILS
163	EL505	AIRFIELD ELECTRICAL DETAILS
164	EL506	AIRFIELD ELECTRICAL DETAILS
165	EL507	AIRFIELD ELECTRICAL DETAILS
166	EL508	AIRFIELD ELECTRICAL DETAILS
167	EL509	AIRFIELD ELECTRICAL DETAILS
168	EL510	AIRFIELD ELECTRICAL DETAILS
169	EL511	AIRFIELD ELECTRICAL DETAILS
170	EL512	AIRFIELD ELECTRICAL DETAILS
171	EL513	AIRFIELD ELECTRICAL DETAILS
172	EL514	AIRFIELD ELECTRICAL DETAILS
173	EL515	AIRFIELD ELECTRICAL DETAILS
CROSS SECTIONS		
174	XS301	TAXIWAY CROSS SECTIONS
175	XS302	TAXIWAY CROSS SECTIONS
176	XS311	TAXIWAY CROSS SECTIONS
177	XS312	TAXIWAY CROSS SECTIONS
178	XS321	TAXIWAY CROSS SECTIONS
179	XS322	TAXIWAY CROSS SECTIONS
180	XS331	TAXIWAY CROSS SECTIONS
181	XS341	TAXIWAY CROSS SECTIONS
182	XS342	TAXIWAY CROSS SECTIONS
183	XS343	TAXIWAY CROSS SECTIONS
184	XS351	TAXIWAY CROSS SECTIONS
185	XS371	TAXIWAY CROSS SECTIONS
186	XS372	TAXIWAY CROSS SECTIONS



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NO.	DESCRIPTION	DATE	BY
0	ISSUED FOR BID	02/24/2023	SC
1	ADDENDUM	03/23/2023	SC

FAA NON-STANDARD TAXIWAYS PROJECT

INDEX OF PLANS

PROJECT MGR: S. CHILDERS  
DESIGNER: B. BARTLETT  
DRAWN BY: B. BARTLETT  
CHECKED BY: A. CELESTAIN  
SCALE: AS SHOWN  
DATE: 03/23/2023



APPROVED BY: DATE:

DIRECTOR  
HOUSTON AIRPORT SYSTEM

PROJECT NO: 770  
C.I.P. NO: 3-48-0110-044  
H.A.S. NO: N/A  
SHEET NO: G1002  
of

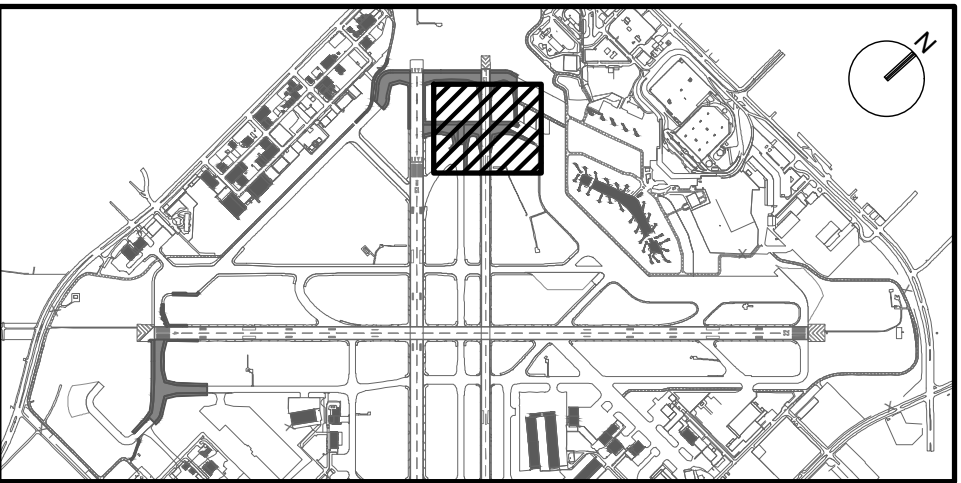
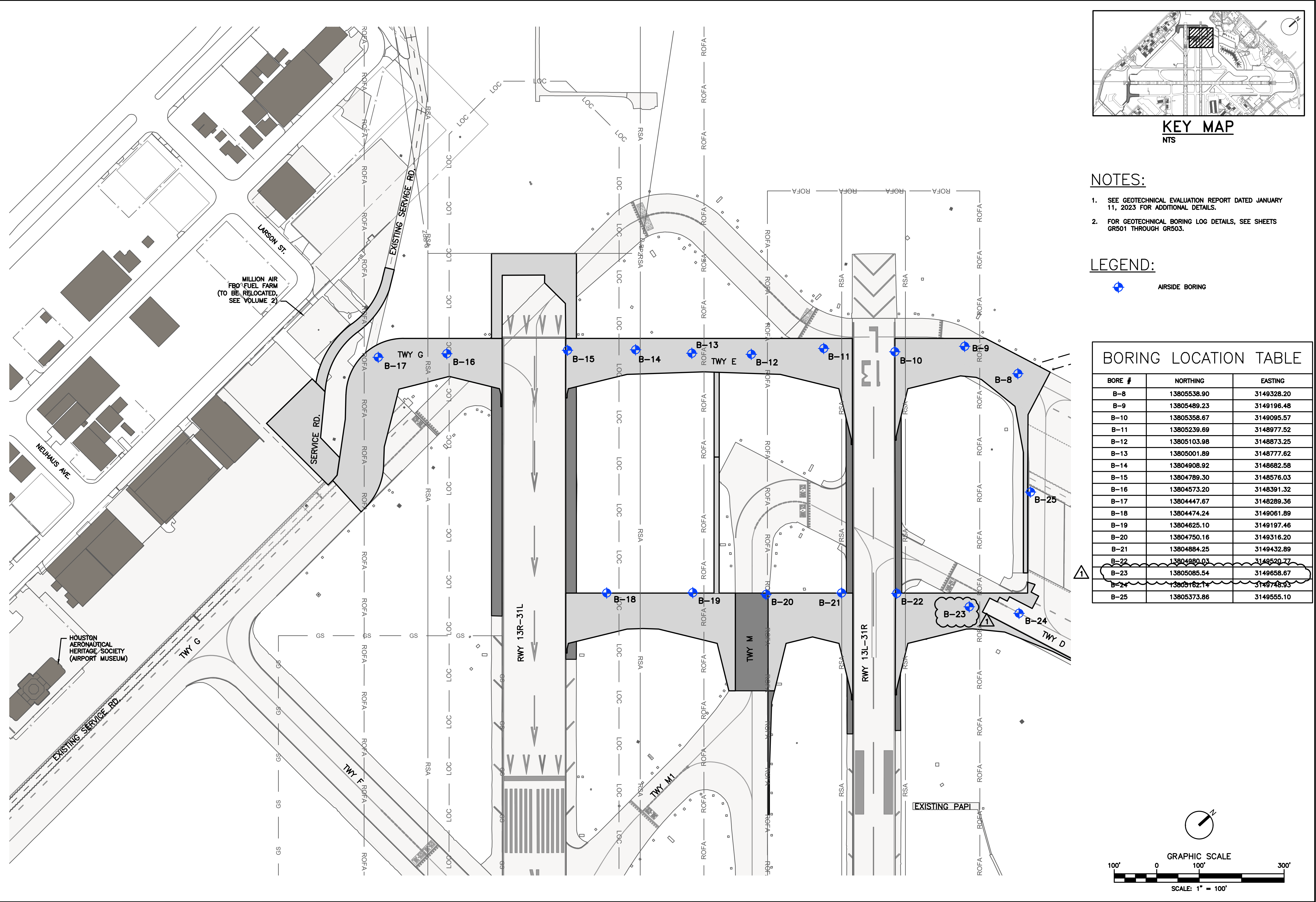
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KEY MAP  
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- NOTES:
- SEE GEOTECHNICAL EVALUATION REPORT DATED JANUARY 11, 2023 FOR ADDITIONAL DETAILS.
  - FOR GEOTECHNICAL BORING LOG DETAILS, SEE SHEETS GR501 THROUGH GR503.

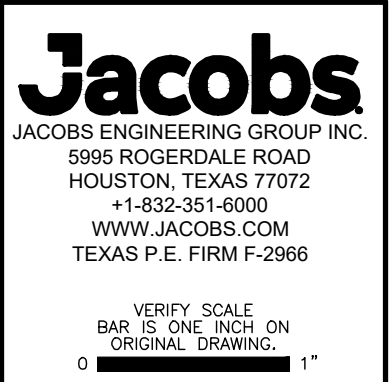
LEGEND:

 AIRSIDE BORING

BORING LOCATION TABLE		
BORE #	NORTHING	EASTING
B-8	13805538.90	3149328.20
B-9	13805489.23	3149196.48
B-10	13805358.67	3149095.57
B-11	13805239.69	3148977.52
B-12	13805103.98	3148873.25
B-13	13805001.89	3148777.62
B-14	13804908.92	3148682.58
B-15	13804789.30	3148576.03
B-16	13804573.20	3148391.32
B-17	13804447.67	3148289.36
B-18	13804474.24	3149061.89
B-19	13804625.10	3149197.46
B-20	13804750.16	3149316.20
B-21	13804884.25	3149432.89
B-22	13804880.03	3148520.77
B-23	13805085.54	3149658.67
B-24	13805162.14	3149748.93
B-25	13805373.86	3149555.10



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1	ADDENDUM	03/23/2023	SC

PROJECT MGR: S. CHILDERS


DESIGNER: B. BARTLETT

DRAWN BY: B. BARTLETT

CHECKED BY: A. CELESTAIN

SCALE: AS SHOWN

DATE: 03/23/2023



THOMAS L. MILLS III  
103660  
REGISTERED PROFESSIONAL ENGINEER  
STATE OF TEXAS  
03/23/2023

APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

DIRECTOR  
HOUSTON AIRPORT SYSTEM

PROJECT NO: 770

C.I.P. NO: 3-48-0110-044

H.A.S. NO: N/A

SHEET NO: GR101

of

FAA NON-STANDARD TAXIWAYS PROJECT

BORING LOG PLAN

PROJECT MGR: S. CHILDERS


DESIGNER: B. BARTLETT

DRAWN BY: B. BARTLETT

CHECKED BY: A. CELESTAIN

SCALE: AS SHOWN

DATE: 03/23/2023



THOMAS L. MILLS III  
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REGISTERED PROFESSIONAL ENGINEER  
STATE OF TEXAS  
03/23/2023

APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

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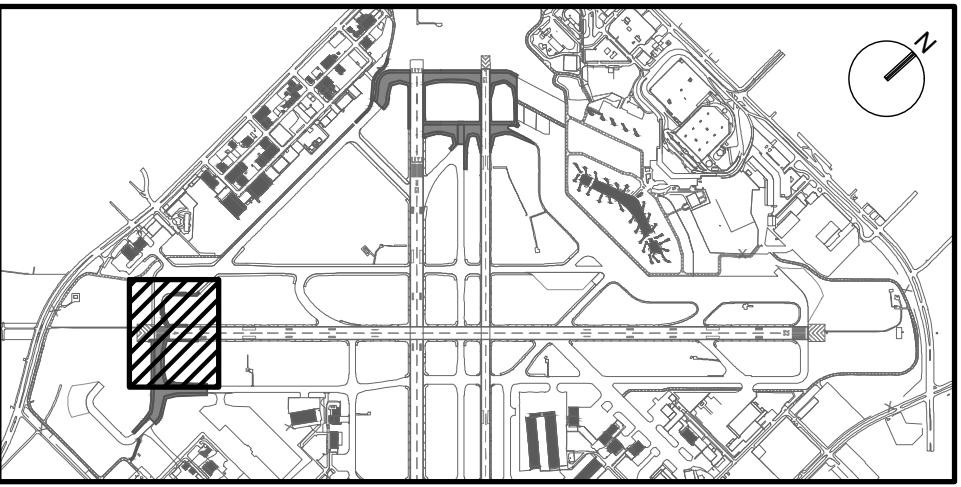
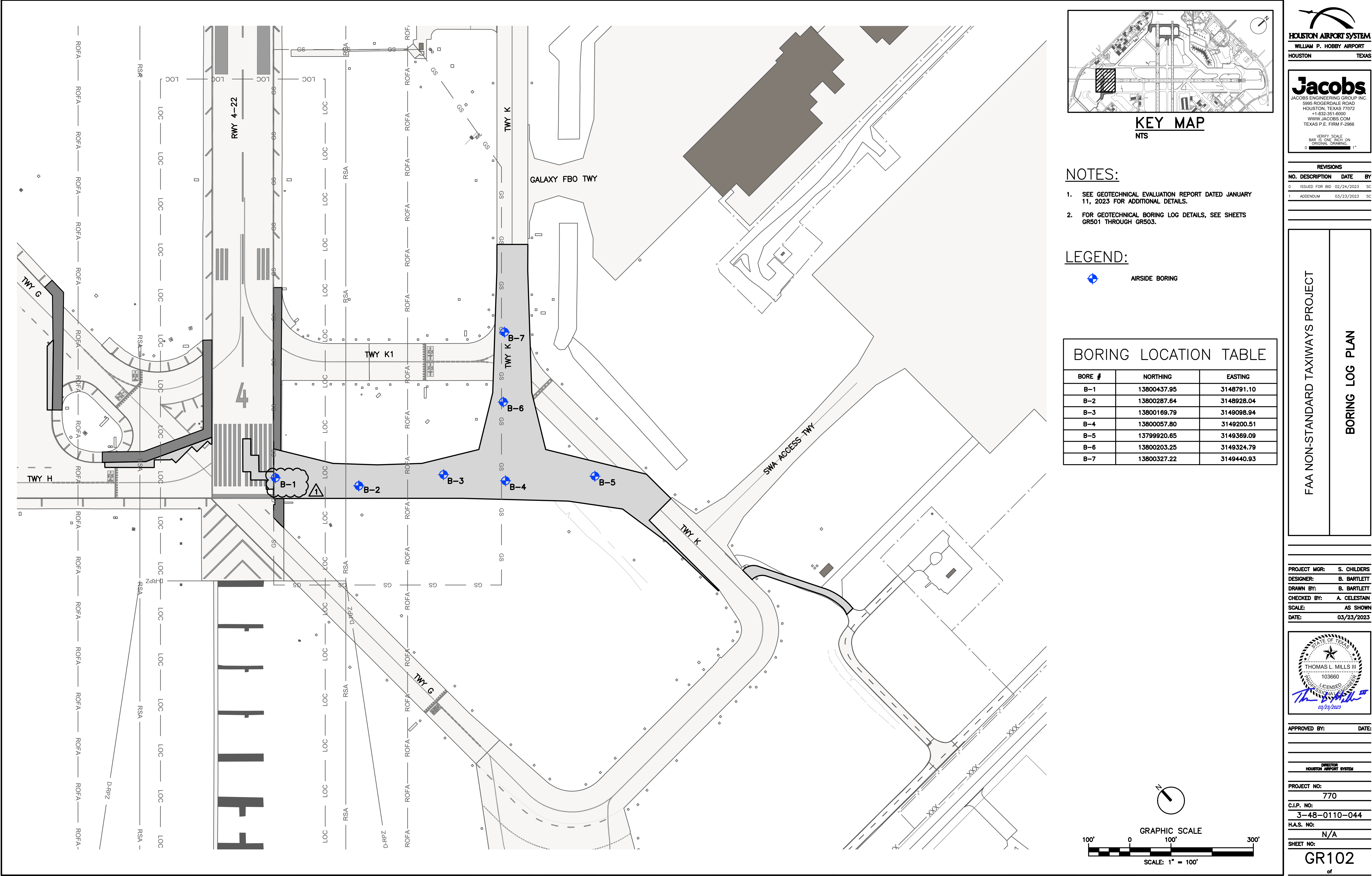
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H.A.S. NO: N/A

SHEET NO: GR101

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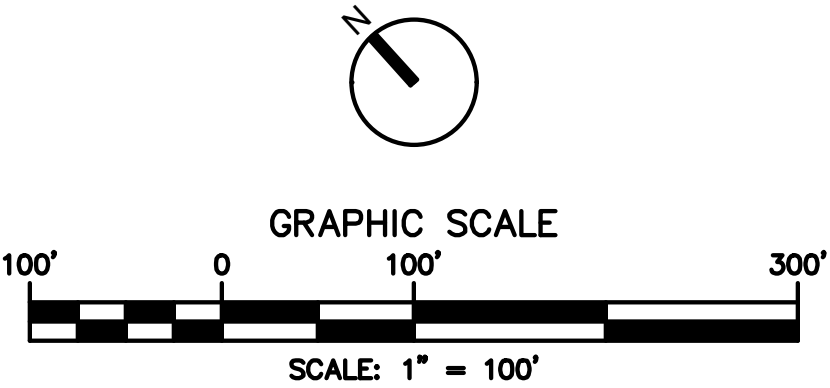
KEY MAP  
NTS


- NOTES:
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  - FOR GEOTECHNICAL BORING LOG DETAILS, SEE SHEETS GR501 THROUGH GR503.

LEGEND:


 AIRSIDE BORING

BORING LOCATION TABLE		
BORE #	NORTHING	EASTING
B-1	13800437.95	3148791.10
B-2	13800287.64	3148928.04
B-3	13800169.79	3149098.94
B-4	13800057.80	3149200.51
B-5	13799920.65	3149369.09
B-6	13800203.25	3149324.79
B-7	13800327.22	3149440.93





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DATE: 03/23/2023



THOMAS L. MILLS III  
103660  
LICENSED PROFESSIONAL ENGINEER  
03/23/2023

APPROVED BY: DATE:

DIRECTOR  
HOUSTON AIRPORT SYSTEM

PROJECT NO: 770

C.I.P. NO: 3-48-0110-044

H.A.S. NO: N/A

SHEET NO: GR102 of







EXISTING AIRFIELD ELECTRICAL LEGEND	
SYMBOL	DESCRIPTION
	EXISTING CONDUIT IN PAVEMENT OR TURF
	EXISTING POWER DUCTBANK
	EXISTING POWER MANHOLE
	EXISTING HANDHOLE
	EXISTING JUNCTION CAN
	EXISTING AIRFIELD LIGHT CAN
	EXISTING AIRFIELD SIGN

AIRFIELD ELECTRICAL DEMOLITION LEGEND	
SYMBOL	DESCRIPTION
	EXISTING CONDUIT TO BE REMOVED
	EXISTING TAXIWAY EDGE LIGHT AND BASE CAN TO BE REMOVED
	EXISTING RUNWAY EDGE LIGHT, IN-PVMT HOLD LIGHT AND BASE CAN TO BE REMOVED
	INSTALL NEW STEEL COVER ON EXISTING LIGHT CAN
	INSTALL NEW STEEL COVER ON EXISTING LIGHT CAN TO RETAIN CIRCUIT
	EXISTING AIRFIELD SIGN AND FOUNDATION TO BE REMOVED
	EXISTING RUNWAY END LIGHTS AND BASE CAN TO BE REMOVED
	EXISTING HANDHOLE TO BE REMOVED
	EXISTING MANHOLE TO BE REMOVED
	INSTALL CONDUIT END CAP AND PULL STRING
	PAVEMENT DEMOLITION

CIRCUIT TABLE		
CIRCUIT ABBREVIATION ON PLANS	CIRCUIT COVERAGE	REGULATOR LOCATION
TW D/E	TAXIWAY D AND E EDGE LIGHTS	NORTH VAULT
TW G/F	TAXIWAY G, G1, G2, G3, AND F EDGE LIGHTS	NORTH VAULT
TW K CL	TAXIWAY K CENTERLINE LIGHTS	SOUTH VAULT
TW K CL (SMGCS)	TAXIWAY K CENTERLINE SMGCS LIGHTS	SOUTH VAULT
TW K	TAXIWAY K, K1, K2, R EDGE LIGHTS	SOUTH VAULT
TW M	TAXIWAY M, M1, M3 EDGE LIGHTS	NORTH VAULT
SC-NW	SIGN CIRCUIT - NORTHWEST QUADRANT	NORTH VAULT
SC-SW	SIGN CIRCUIT - SOUTHWEST QUADRANT	SOUTH VAULT
RGL-NW	RUNWAY GUARD LIGHTS - NORTHWEST QUADRANT	NORTH VAULT
RGL-SW	RUNWAY GUARD LIGHTS - SOUTHWEST QUADRANT	SOUTH VAULT
RW 13R-31L EDGE	RUNWAY 13R-31L EDGE LIGHTS	NORTH VAULT
RW 13L-31R EDGE	RUNWAY 13L-31R EDGE LIGHTS	NORTH VAULT
RW 4-22 EDGE	RUNWAY 4-22 EDGE LIGHTS	SOUTH VAULT

GENERAL NOTES:

1. ALL WORK, EQUIPMENT AND MATERIALS MUST COMPLY WITH FAA REQUIREMENTS, NFPA 70, ANSI C2, HOUSTON AIRPORT SYSTEM, AND THE CITY OF HOUSTON BUILDING CODE.
2. PROVIDE ALL LABOR, PARTS AND MATERIAL REQUIRED FOR A COMPLETE, PROPERLY WORKING ELECTRICAL LIGHTING AND SIGNAGE SYSTEM AS DESCRIBED AND INDICATED.
3. ALL WORK SHALL BE PERFORMED DURING AIRPORT OPERATING CONDITIONS AND AS SCHEDULED BY HOUSTON AIRPORT SYSTEMS OPERATIONS. UNLESS OTHERWISE INDICATED, ALL SIGNS AND LIGHTING SYSTEMS SHALL BE READY FOR USE EVERY NIGHT AND FOR EVERY LOW VISIBILITY PERIOD EXCEPT AS SHOWN AS CLOSED IN THE PHASING DRAWINGS.
4. NOTIFY ENGINEER OF ANY SIGNIFICANT DIFFERENCES BETWEEN DRAWINGS AND FIELD CONDITIONS.DEVIATIONS, PARTICULARLY REGARDING CIRCUIT ROUTING, ARE ANTICIPATED AND WILL REQUIRE COORDINATION WITH THE RESIDENT PROJECT REPRESENTATIVE.
5. PROVIDE REINFORCING FOR CONCRETE ENCASED DUCT BANKS UNDER RUNWAY AND TAXIWAY PAVEMENT. EXTEND REINFORCEMENT 5" BEYOND OUTSIDE EDGE OF SHOULDER.
6. ALL REMOVED/DEMOLISHED ITEMS SHALL HAVE THEIR ASSOCIATED BASE CANS AND/OR FOUNDATIONS REMOVED AS WELL, BACKFILL OF THE VOID CREATED TO GRADE IS INCIDENTAL TO THE DEMOLITION ITEM.
7. COORDINATE WITH H.A.S. STAFF TO LOCK OUT/TAG OUT APPROPRIATE C.C.R. PRIOR TO WORKING ON AIRFIELD CIRCUITING.
8. UNLESS OTHERWISE NOTED, ALL MATERIALS INSTALLED AS A PART OF THE PROJECT SHALL BE NEW.

LEGEND NOTE:

1. ANY FIXTURE WITH AN ASTERISK AFTER IT REQUIRES A CONCRETE BOXOUT. COORDINATE WITH CIVIL FOR THIS INSTALLATION.

LEGEND: NORTH VAULT  
CIRCUIT LEGEND:

- CIRCUIT NO.

4XXX

FIXTURE NO.

CIRCUIT NO.

18XXX

FIXTURE NO.
- 1 13R-31L TDZ1(2)  
2 13R-31L TDZ2(2)  
3 13R-31L CENTERLINE(2)  
4 13R-31L EDGE(2)  
5 TW M/M1/M3 EDGE(2)  
6 TW G/F EDGE(2)  
7 TW D/E EDGE(2)  
8 TW M1/M3 CENTERLINE(2)  
9 TW H CENTERLINE(2)  
10 TW H CENTERLINE SMGCS(2)  
11 TW H EDGE(2)  
12 TW Z CENTERLINE1(2)  
13 TW Z CENTERLINE2(2)  
14 TW Y/Z CENTERLINE SMGCS(2)  
15 TW Y CENTERLINE(2)  
16 RGL NW(2)  
17 RGL NE(2)  
18 SIGNS NW(2)  
19 SIGNS NE(2)

AIRFIELD ELECTRICAL LEGEND		
SPECIFICATION SECTION	SYMBOL	DESCRIPTION
L-125		INSTALL L-850C(L), BI-DIRECTIONAL, CLEAR/CLEAR OR CLEAR/AMBER, LED IN-PAVEMENT R/W EDGE LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW L-868, SIZE B BASE CAN. C = CLEAR, Y = YELLOW. NO DESIGNATION INDICATES CLEAR/CLEAR.
L-125		INSTALL L-861, BI-DIRECTIONAL, CLEAR/AMBER, R/W EDGE LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW L-868, SIZE B BASE CAN. C = CLEAR, Y = YELLOW. NO DESIGNATION INDICATES CLEAR/CLEAR.
L-125		INSTALL L-862(L), ELEVATED LED R/W EDGE LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW ADJUSTABLE DEPTH L-867, SIZE B BASE CAN. C = CLEAR, Y = YELLOW. NO DESIGNATION INDICATES CLEAR/CLEAR.
L-125		INSTALL L-862E(L), BI-DIRECTIONAL, GREEN/RED, ELEVATED LED R/W THRESHOLD/END LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW ADJUSTABLE DEPTH L-867, SIZE B BASE CAN.
L-125		INSTALL L-862E, BI-DIRECTIONAL, RED/RED, ELEVATED R/W THRESHOLD/END LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW ADJUSTABLE DEPTH L-867, SIZE B BASE CAN.
L-125		INSTALL L-852C/D(L), IN-PAVEMENT BI-DIRECTIONAL, GREEN/GREEN LED T/W CENTERLINE LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW L-868, SIZE B BASE CAN. SMALL SOLID AREA DENOTES DIRECTION OF LIGHT BEAM.
L-125		INSTALL L-804, LED ELEVATED R/W GUARD LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-867 CONNECTOR KIT. MOUNTED ON A NEW L-868, SIZE B BASE CAN.
L-125		INSTALL L-852G(L), LED R/W IN-PAVEMENT GUARD LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW L-868, SIZE B BASE CAN.
L-125		INSTALL L-852S(L), LED R/W IN-PAVEMENT STOP BAR LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW L-868, SIZE B BASE CAN.
L-125		INSTALL L-861T(L), ELEVATED LED T/W EDGE LIGHT, OVERALL HEIGHT 14", WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW L-867, SIZE B BASE CAN.
L-125		INSTALL L-852T(L), IN-PAVEMENT LED T/W EDGE LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER ON A NEW L-868B BASE CAN IN EXISTING SHOULDER PAVEMENT.
L-125		SIGN ID NUMBER, SEE SHEET EL501 FOR SIGN TABLE. INSTALL L-858(L) LED, AIRFIELD GUIDANCE SIGN, MOUNTED ON A CONCRETE FOUNDATION WITH AN L-867, SIZE B, 24" DEEP BASE CAN, WITH PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. SN01 REPRESENTS SIGN NUMBER. RE-PURPOSED HOU SIGN NUMBER, SEE SHEET EL501 FOR SIGN TABLE.
L-125		TYPICAL SIGN LEGENDS
L-108		CIRCUIT DESIGNATIONS AS SHOWN ON PLANS
L-110		INSTALL ONE-WAY, TWO-INCH PVC SCHEDULE 40, UNLESS NOTED OTHERWISE, CONCRETE ENCASED UNDER PAVEMENT AND EXTERNAL 1/C #6 AWG SOLID TINNED SOFT DRAWN COPPER COUNTERPOISE WIRE. NUMBER SHOWN INDICATES NUMBER OF CONDUITS IN DUCTBANK.
L-110		INSTALL TWO-WAY, FOUR-INCH PVC SCHEDULE 40, UNLESS NOTED OTHERWISE, CONCRETE ENCASED UNDER PAVEMENT AND EXTERNAL 1/C #1/0 AWG BARE GUARD WIRE.
L-110		INSTALL 2" PVC DRAIN LINE FOR ELECTRICAL STRUCTURES
L-110		CONNECT AND INSTALL BACKFLOW PREVENTER IN STORM WATER STRUCTURE
L-115		INSTALL L-867 BASE CAN IN TURF, SHOULDER PAVEMENT OR L-868 BASE CAN IN FULL STRENGTH PAVEMENT AS NOTED ON THE PLANS.
L-115		INSTALL AIRCRAFT-RATED ELECTRICAL MANHOLE.
L-115		INSTALL AIRCRAFT-RATED ELECTRICAL OR COMMUNICATION HANDHOLE.
L-115		INSTALL AIRCRAFT-RATED FAA ELECTRICAL HANDHOLE.

HOUSTON AIRPORT SYSTEM  
WILLIAM P. HOBBY AIRPORT  
HOUSTON TEXAS

Jacobs

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HOUSTON, TEXAS 77072  
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WWW.JACOBS.COM  
TEXAS P.E. FIRM F-2966

VERIFY SCALE  
BAR IS ONE INCH ON  
ORIGINAL DRAWING.

0 1"

REVISIONS

NO.	DESCRIPTION	DATE	BY
0	ISSUED FOR BD	02/24/2023	SC
1	ADDENDUM	03/23/2023	SC

FAA NON-STANDARD TAXIWAYS PROJECT

AIRFIELD ELECTRICAL NOTES AND LEGENDS

PROJECT MGR:

DESIGNER: N. DERES

DRAWN BY: K. ALMOND

CHECKED BY:

SCALE: AS SHOWN

DATE: 03/23/2023

3.23.23

APPROVED BY:

DATE:

DIRECTOR  
HOUSTON AIRPORT SYSTEM

PROJECT NO:  
770

C.I.P. NO:  
3-48-0110-044

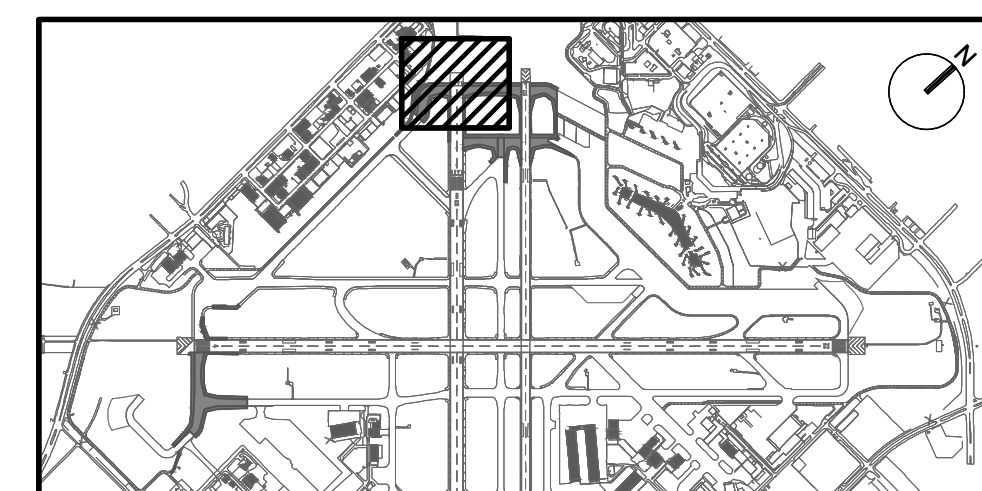
H.A.S. NO:  
N/A

SHEET NO:  
E-001

of

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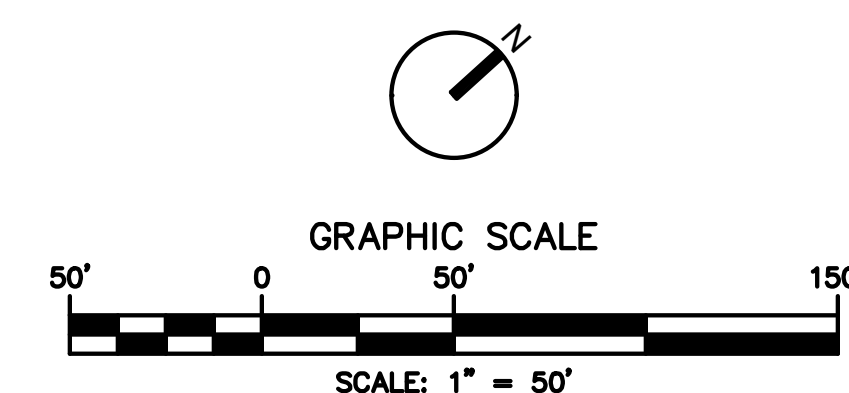


FAA NON-STANDARD TAXIWAYS PROJECT

AIRFIELD ELECTRICAL LIGHTING & SIGNAGE PLAN  
- PHASE 2

STATE OF TEXAS  
JAMES A. McDONALD  
119579  
LICENSED  
PROFESSIONAL ENGINEER  
3.23.23

EL102-P2  
of



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NO.	DESCRIPTION	DATE	BY
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1	ADDENDUM	03/23/2023	SC

FAA NON-STANDARD TAXIWAYS PROJECT

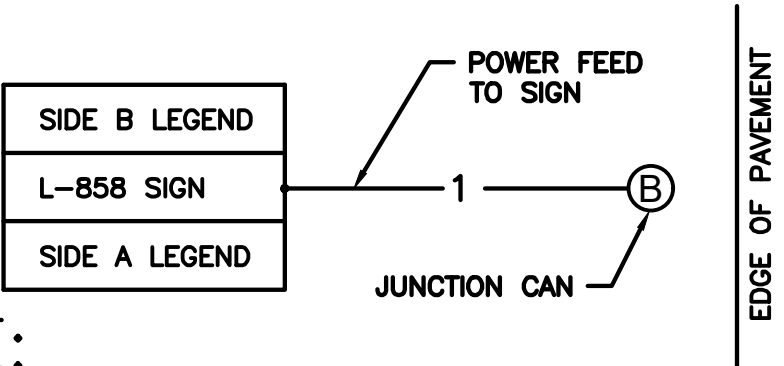
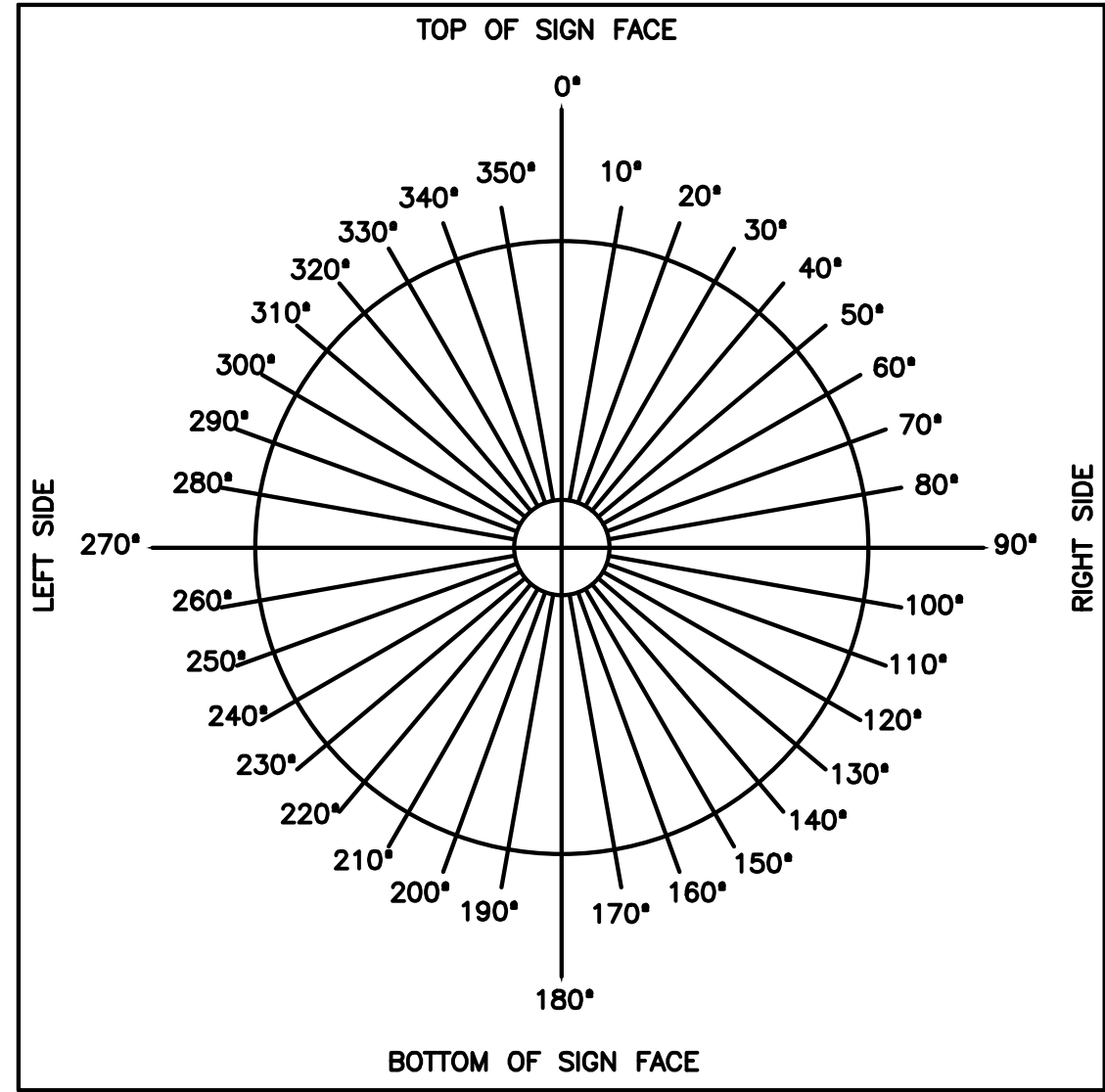
AIRFIELD ELECTRICAL DETAILS

PROJECT MGR:  
DESIGNER:  
DRAWN BY:  
CHECKED BY:  
SCALE: AS SHOWN  
DATE: 03/23/2023



APPROVED BY: DATE:  
  
DIRECTOR  
HOUSTON AIRPORT SYSTEM  
PROJECT NO: 770  
C.I.P. NO: 3-48-0110-044  
H.A.S. NO: N/A  
SHEET NO: EL501  
of

SIGN TABLE												
SIGN ID	SIGN LEGEND		SIGN TYPE		MODULES	ISOLATION TRANSFORMER SIZE	ARROW ORIENTATION	COMMENTS	REPURPOSED HOU SIGN #	SHEET REFERENCE	NORTHING	EASTING
	SIDE A	SIDE B	SIDE A	SIDE B								
SN01			L/R	X	4	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	105	EL102-P2	13,804,584.720	3,148,308.767
SN02			X/L/Y	R/L	4	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	110	EL102-P2	13,804,958.596	3,148,646.817
SN03			L/R	X	4	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	111	EL104-P3	13,805,251.375	3,148,912.188
SN04			X/L/Y	R/L	4	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	192	EL104-P3	13,805,477.067	3,149,115.864
SN05			R	Y	2	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	104	EL103-P2	13,803,610.959	3,148,728.338
SN06			X/L/Y	R/L	4	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	106	EL102-P2	13,804,470.799	3,148,434.926
SN07			Y	X	1	100W	270° LT	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	107	EL102-P2	13,804,546.746	3,148,565.415
SN08			X	Y	1	100W	90° RT	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	108	EL102-P2	13,804,706.838	3,148,710.262
SN09			L/R	X	4	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	109	EL102-P2	13,804,858.173	3,148,757.855
SN10			X/L/Y	R/L	4	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	200	EL104-P3	13,805,138.818	3,149,036.638
SN11			Y	X	1	100W	270° LT	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	112	EL104-P3	13,805,121.631	3,149,152.533
SN12			X	Y	1	100W	90° RT	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	190	EL104-P3	13,805,250.314	3,149,269.698
SN13			L/R	X	4	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	191	EL104-P3	13,805,364.301	3,149,240.600
SN14			X/L/Y	R/L	4	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	114	EL103-P2	13,804,556.328	3,149,091.997
SN15			L/Y	X	2	100W	90° RT	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	113	EL101-P1	13,804,652.495	3,149,178.975
SN16			L/R	R/L/Y	4	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	118	EL101-P1	13,804,849.334	3,149,357.003
SN17			X/L/Y	R/L	4	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	189	EL101-P1	13,805,074.760	3,149,560.892
SN18			X	Y	1	100W	90° RT	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	119	EL103-P2	13,804,308.277	3,149,153.097
SN19			L/R	Y/L/X	4	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	116	EL103-P2	13,804,455.818	3,149,202.948
SN20			L/Y	L/Y	3	100W	270° LT: 90° RT / 45° RT	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	100	EL101-P1	13,804,523.010	3,149,374.835
SN21			X/Y/L	R/L	4	100W	270° LT	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	187	EL101-P1	13,804,734.118	3,149,485.189
SN22			Y	X	1	100W	270° LT	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	186	EL101-P1	13,804,726.768	3,149,583.584
SN23			X	Y	1	100W	90° RT	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	185	EL101-P1	13,804,866.735	3,149,710.023
SN24			L/R	X	4	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	188	EL101-P1	13,804,961.977	3,149,685.702
SN25			Y	R	2	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	115	EL101-P1	13,804,404.919	3,149,414.947
SN26			R	Y	2	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	54	EL101-P1	13,804,327.681	3,149,600.610
SN27			L/R	X	3	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	74	EL106-P5	13,800,753.367	3,148,548.044
SN28			X	Y	2	100W	90° RT	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	76	EL106-P5	13,800,672.715	3,148,751.116
SN29			Y	X	2	100W	270° LT	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	77	EL106-P5	13,800,528.478	3,148,911.893
SN30			X/L/Y	R/L	3	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	5	EL106-P5	13,800,371.702	3,148,963.945
SN31			Y/L	X	2	100W	270° LT	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	64	EL107-P6	13,800,251.178	3,149,099.626
SN32			X/L/Y	R/L	3	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	75	EL106-P5	13,800,645.719	3,148,437.446
SN33			L/R	X	3	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	6	EL107-P6	13,800,260.678	3,148,863.511
SN34			L/Y	L/Y	3	100W	90° LT : 45° RT	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	81	EL107-P6	13,799,867.269	3,149,280.447
SN35			L/Y	L/X	3	100W	270° LT : 90° RT	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	65	EL107-P6	13,800,155.061	3,149,418.718
SN36			Y	R	2	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	80	EL107-P6	13,800,192.023	3,149,203.532
SN37			R	Y	2	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	83	EL107-P6	13,800,005.052	3,149,142.372
SN38			L/Y	L/X	3	100W	315° LT : 135° RT	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	100	EL101-P1	13,804,292.452	3,149,424.579
SN39			R	X	1	100W	—	AIRFIELD SIGN, LED, SIZE 2, STYLE 5	103	EL101-P1	13,804,670.259	3,149,192.345



NOTE:  
1. SEE SHEET EL505, DETAIL 3 FOR AIRFIELD SIGN REFERENCE POINT.

2. SIGN LEGEND DETAIL  
NTS

1. NEW SIGN TABLE  
NTS



LIGHT FIXTURE LOCATION TABLE				
FIXTURE ID	NORTHING	EASTING	LENS COLOR	
1601	13804574.57	3148323.75	AMBER	
1602	13804555.28	3148341.36	YELLOW	
1603	13804548.20	3148349.19	YELLOW	
1604	13804542.31	3148355.71	YELLOW	
1605	13804535.82	3148362.86	YELLOW	
1606	13804529.34	3148370.06	YELLOW	
1607	13804522.87	3148377.22	YELLOW	
1608	13804516.38	3148384.39	YELLOW	
1609	13804509.90	3148391.56	YELLOW	
1610	13804503.55	3148398.85	YELLOW	
1611	13804497.07	3148406.02	YELLOW	
1612	13804485.55	3148422.22	AMBER	
1613	13805463.20	3149127.45	AMBER	
1614	13805447.43	3149148.82	YELLOW	
1615	13805440.38	3149156.42	YELLOW	
1616	13805434.45	3149162.86	YELLOW	
1617	13805427.98	3149170.14	YELLOW	
1618	13805421.51	3149177.30	YELLOW	
1619	13805415.02	3149184.48	YELLOW	
1620	13805408.54	3149191.65	YELLOW	
1621	13805402.05	3149198.82	YELLOW	
1622	13805395.57	3149205.99	YELLOW	
1623	13805389.09	3149213.16	YELLOW	
1624	13805362.74	3149217.06	AMBER	
1701	13805060.82	3149572.56	AMBER	
1702	13805045.45	3149593.28	YELLOW	
1703	13805038.19	3149601.32	YELLOW	
1704	13805032.24	3149607.90	YELLOW	
1705	13805025.63	3149615.21	YELLOW	
1706	13805018.98	3149622.56	YELLOW	
1707	13805012.37	3149629.87	YELLOW	
1708	13805005.76	3149637.20	YELLOW	
1709	13804999.13	3149644.53	YELLOW	
1710	13804992.51	3149651.86	YELLOW	
1711	13804972.06	3149670.72	AMBER	
2001	13800292.93	3148892.66	YELLOW	
2002	13800300.22	3148899.26	YELLOW	
2003	13800307.51	3148905.85	YELLOW	
2004	13800314.81	3148912.45	YELLOW	
2005	13800322.09	3148919.05	YELLOW	
2006	13800329.39	3148925.84	YELLOW	
2007	13800336.68	3148932.24	YELLOW	
2008	13800343.97	3148938.84	YELLOW	
2101	13800154.46	3149205.71	RED	
2102	13800141.49	3149206.53	RED	
2103	13800128.51	3149207.34	RED	
2104	13800116.54	3149208.09	RED	
2105	13800102.56	3149208.97	RED	
2106	13800089.59	3149209.79	RED	
2107	13800078.08	3149208.13	RED	
2108	13800070.66	3149201.42	RED	
2109	13800063.24	3149194.72	RED	
2110	13800055.83	3149188.01	RED	
2111	13800048.41	3149181.30	RED	
2112	13800041.00	3149174.59	RED	
2113	13800033.58	3149167.88	RED	
2501	13800795.52	3148893.92	CLEAR/YELLOW	
2502	13800657.22	3148767.91	CLEAR/YELLOW	
2503	13800509.69	3148634.79	GREEN/RED	
2504	13800501.12	3148640.52	GREEN/RED	
2505	13800494.41	3148647.94	GREEN/RED	
2506	13800487.66	3148655.37	GREEN/RED	
2507	13800413.91	3148736.93	GREEN/RED	
2508	13800407.21	3148744.35	GREEN/RED	
2509	13800400.50	3148751.76	GREEN/RED	
2510	13800393.79	3148759.18	GREEN/RED	
2511	13800537.53	3148888.42	CLEAR/YELLOW	
2512	13800681.30	3149019.20	CLEAR/YELLOW	

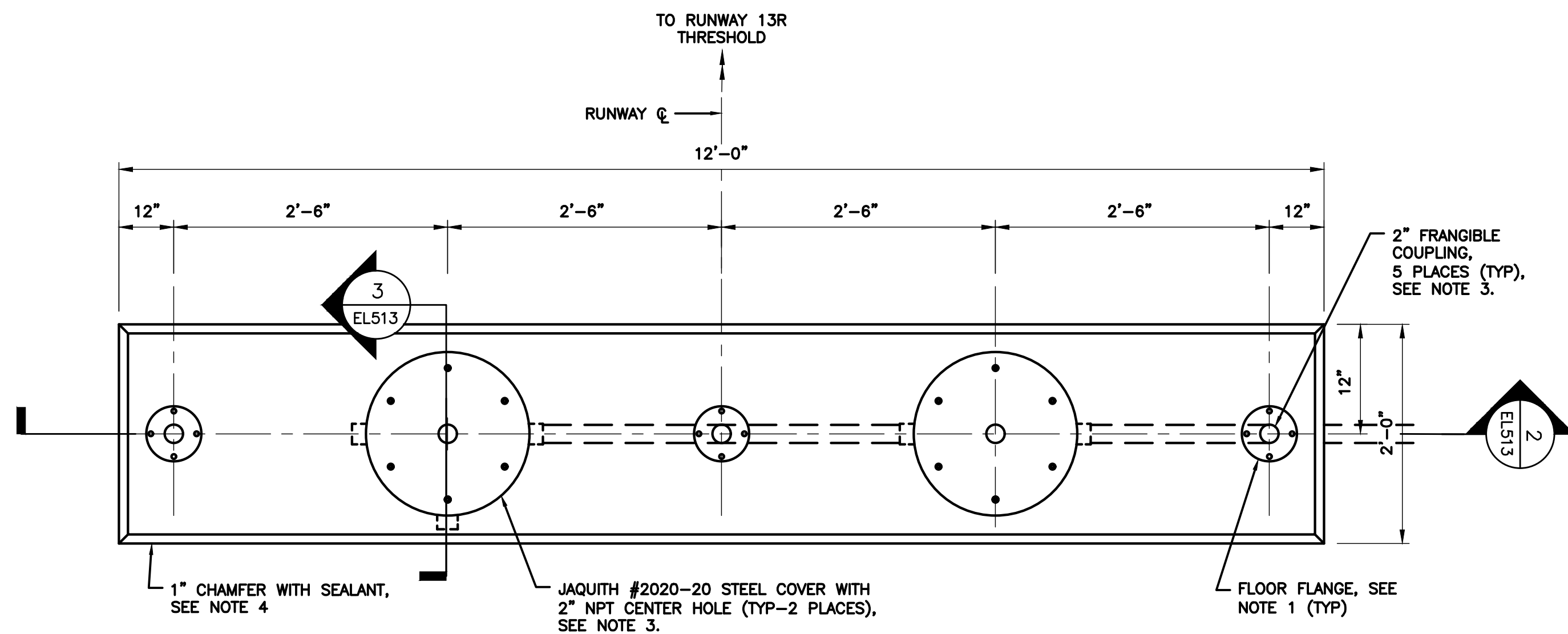
LIGHT FIXTURE LOCATION TABLE				
FIXTURE ID	NORTHING	EASTING	LENS COLOR	
2600	13800387.10	3148768.61	BLUE	
2601	13800358.14	3148790.10	BLUE	
2602	13800328.52	3148822.82	BLUE	
2603	13800299.19	3148855.25	BLUE	
2604	13800275.64	3148881.28	BLUE	
2605	13800251.97	3148907.44	BLUE	
2606	13800228.37	3148933.53	BLUE	
2607	13800204.18	3148960.27	BLUE	
2608	13800179.98	3148987.02	BLUE	
2609	13800155.78	3149013.75	BLUE	
2610	13800122.27	3149050.39	BLUE	
2611	13800088.77	3149087.82	BLUE	
2612	13800054.20	3149124.03	BLUE	
2613	13800029.96	3149149.48	BLUE	
2614	13799971.15	3149211.31	BLUE	
2615	13799946.99	3149237.04	BLUE	
2616	13799912.33	3149273.07	BLUE	
2617	13799878.84	3149300.72	BLUE	
2618	13799845.35	3149328.37	BLUE	
2619	13799811.85	3149356.02	BLUE	
2620	13799769.25	3149364.47	BLUE	
2621	13799726.65	3149372.92	BLUE	
2622	13799684.05	3149381.37	BLUE	
2623	13799638.00	3149384.70	BLUE	
2624	13799591.97	3149388.36	BLUE	
2625	13799545.94	3149391.90	BLUE	
2626	13799499.75	3149396.35	BLUE	
2627	13800489.37	3148849.58	BLUE	
2628	13800451.91	3148874.94	BLUE	
2629	13800414.65	3148900.12	BLUE	
2630	13800376.95	3148925.59	BLUE	
2631	13800352.40	3148950.82	BLUE	
2632	13800327.93	3148976.13	BLUE	
2633	13800303.45	3149001.46	BLUE	
2634	13800280.08	3149028.95	BLUE	
2635	13800256.77	3149056.49	BLUE	
2636	13800233.47	3149084.01	BLUE	
2637	13800212.05	3149123.69	BLUE	
2638	13800190.65	3149163.32	BLUE	
2639	13800169.28	3149202.91	BLUE	
2640	13800194.51	3149240.19	BLUE	
2641	13800219.75	3149277.48	BLUE	
2642	13800244.99	3149314.78	BLUE	
2643	13800315.66	3149383.10	BLUE	
2644	13800386.33	3149451.43	BLUE	
2645	13800457.02	3149518.75	BLUE	
2646	13800392.98	3149590.40	BLUE	
2647	13800318.13	3149526.81	BLUE	
2648	13800243.21	3149463.17	BLUE	
2649	13800168.18	3149399.67	BLUE	
2650	13800121.58	3149374.03	BLUE	
2651	13800085.84	3149355.21	BLUE	
2652	13800049.31	3149335.49	BLUE	
2653	13800008.14	3149363.39	BLUE	
2654	13799966.97	3149391.28	BLUE	
2655	13799925.76	3149419.11	BLUE	
2656	13799879.43	3149450.46	BLUE	
2657	13799841.16	3149469.06	BLUE	
2658	13799799.43	3149477.23	BLUE	
2659	13799605.13	3148777.19	BLUE	
2660	13799603.45	3148743.70	BLUE	
2661	13799601.77	3148710.22	BLUE	
2806	13800545.23	3148791.20	GREEN (D)	
2807	13800536.04	3148783.92	YELLOW (D)	
2808	13800526.61	3148778.23	GREEN (D)	
2809	13800515.22	3148773.26	YELLOW (D)	
2810	13800503.95	3148770.06	GREEN (D)	
2811	13800492.35	3148768.36	YELLOW (D)	

LIGHT FIXTURE LOCATION TABLE				
FIXTURE ID	NORTHING	EASTING	LENS COLOR	
2812	13800482.09	3148768.12	GREEN	(D)
2813	13800468.98	3148769.55	YELLOW	(D)
2814	13800458.57	3148772.12	GREEN	(D)
2815	13800447.63	3148776.33	YELLOW	(D)
2816	13800436.50	3148782.47	GREEN	(D)
2817	13800427.10	3148789.47	YELLOW	(D)
2818	13800418.06	3148798.31	GREEN	(D)
2819	13800389.97	3148829.46	YELLOW	(C)
2820	13800361.85	3148860.49	GREEN	(C)
2821	13800333.74	3148891.53	YELLOW	(C)
2822	13800305.63	3148922.60	GREEN	(C)
2823	13800277.51	3148953.67	YELLOW	(C)
2824	13800249.40	3148984.74	GREEN	(C)
2825	13800221.29	3149015.81	YELLOW	(C)
2826	13800193.19	3149046.89	GREEN	(C)
2827	13800165.08	3149077.96	YELLOW	(C)
2828	13800136.97	3149109.03	GREEN	(C)
2829	13800100.80	3149149.66	YELLOW	(D)
2830	13800100.80	3149149.66	GREEN	(D)
2831	13800094.14	3149160.24	YELLOW	(D)
2832	13800089.01	3149171.64	GREEN	(D)
2833	13800085.51	3149183.63	YELLOW	(D)
2834	13800083.70	3149196.00	GREEN	(D)
2835	13800083.67	3149209.02	GREEN/YELLOW	(D)
2836	13800085.49	3149221.87	GREEN	(D)
2837	13800088.63	3149232.94	GREEN	(D)
2838	13800093.63	3149244.47	GREEN	(D)
2839	13800100.16	3149255.08	GREEN	(D)
2840	13800108.12	3149264.75	GREEN	(D)
2841	13800117.24	3149273.33	GREEN	(D)
2842	13800149.05	3149301.85	GREEN	(C)
2843	13800182.50	3149332.45	GREEN	(C)
2844	13800216.40	3149363.08	GREEN	(C)
2845	13800249.70	3149393.22	GREEN	(C)
2846	13800283.30	3149423.62	GREEN	(C)
2847	13800316.45	3149453.61	GREEN	(C)
2848	13800350.47	3149484.39	GREEN	(C)
2849	13800386.17	3149516.65	GREEN	(C)
2850	13800422.86	3149549.89	GREEN	(C)
2851	13800459.20	3149582.76	GREEN	(C)
4001	13804715.85	3148458.46	RED/RED	
4002	13804708.46	3148451.72	RED/RED	
4003	13804701.07	3148444.99	RED/RED	
4004	13804693.70	3148438.25	RED/RED	
4005	13804562.60	3148582.68	RED/YELLOW	
4006	13804430.85	3148728.28	RED/YELLOW	
4007	13804300.24	3148872.06	RED/YELLOW	
4008	13804796.27	3148531.66	RED/RED	
4009	13804803.66	3148538.41	RED/RED	
4010	13804811.05	3148545.16	RED/RED	
4011	13804818.84	3148552.27	RED/RED	
4012	13804688.04	3148697.39	RED/YELLOW	
4013	13804556.28	3148842.87	RED/YELLOW	
4014	13804425.56	3148986.77	RED/YELLOW	
6001	13803871.80	3148460.90	BLUE	
6002	13803915.43	3148391.44	BLUE	
6003	13803959.03	3148453.69	BLUE	
6004	13804002.64	3148450.06	BLUE	
6005	13804046.24	3148446.31	BLUE	
6006	13804089.82	3148442.56	BLUE	
6007	13804121.40	3148435.48	BLUE	
6008	13804153.06	3148428.38	BLUE	
6009	13804185.27	3148421.15	BLUE	
6010	13804218.97	3148393.31	BLUE	
6011	13804252.12	3148365.94	BLUE	
6012	13804285.72	3148338.19	BLUE	
6013	13804326.63	3148295.24	BLUE	
6014	13804362.19	3148268.47	BLUE	

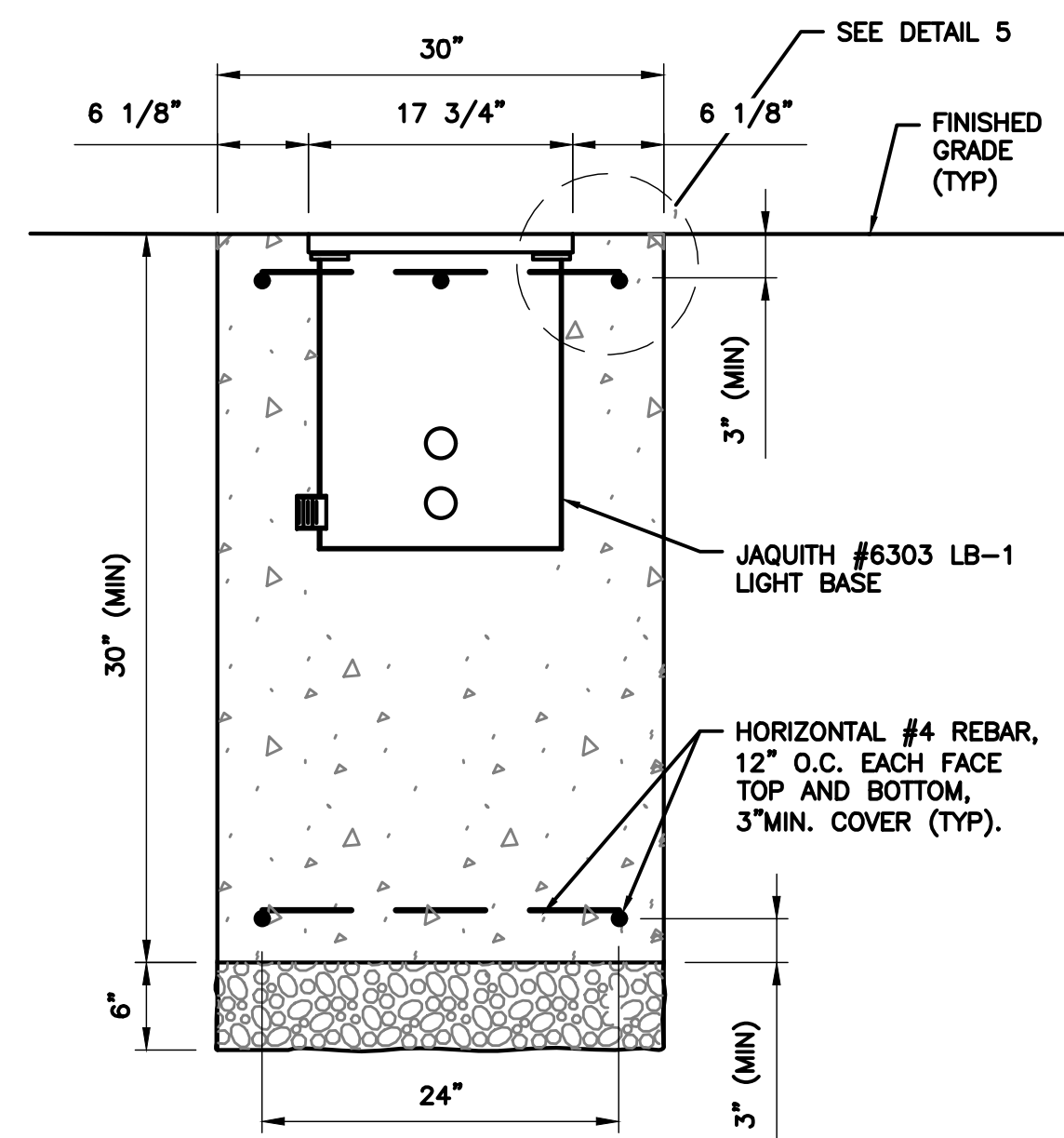


GENERAL NOTES:

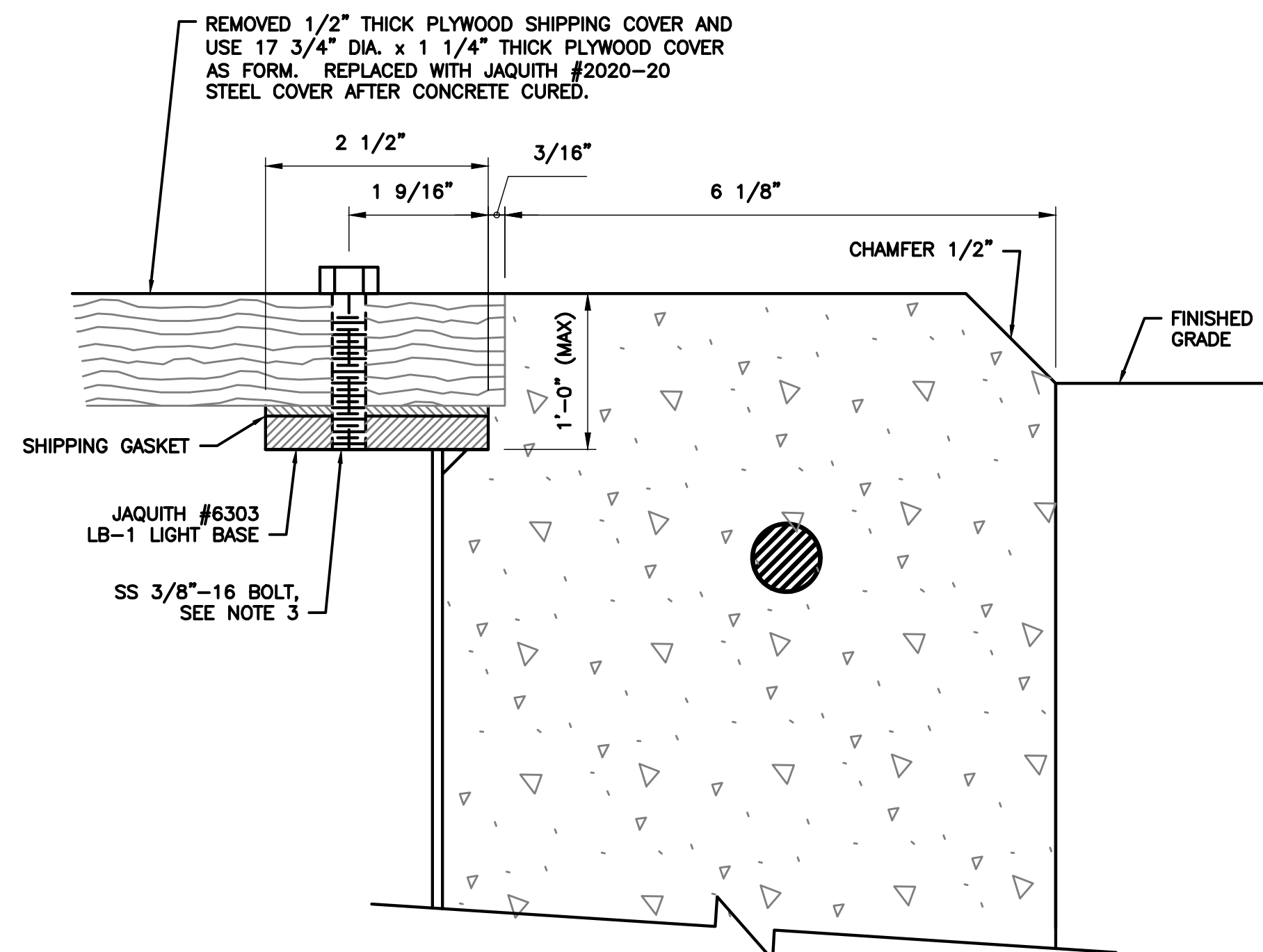
1. FLOOR FLANGE WAS STAINLESS STEEL. USED APPROVED STAINLESS STEEL EXPANSION ANCHOR BOLTS TO SECURE FLOOR FLANGE TO FOUNDATION.
2. INSTALLED FRANGIBLE COUPLINGS AND 40 INCH HIGH EMT POSTS. PRIOR TO CASTING FOUNDATION TO ASSURE PROPER ALIGNMENT AND SPACING OF EACH LIGHT FIXTURE. ALL POSTS ARE PLUMB, LEVEL, AND SPACED 2 FT, 6 INCHES (+/- 3/4 INCH), CENTER TO CENTER, AT TOP. POSTS WHICH ARE CAST OUTSIDE OF THIS TOLERANCE MAY RESULT IN REJECTION AND REPLACEMENT OF THE FOUNDATION AT THE CONTRACTOR'S EXPENSE. UPON COMPLETION OF THE FOUNDATION, REMOVED COUPLINGS AND EMT AND TEMPORARILY CAPPED EXPOSED CONDUIT ENTRANCES UNTIL LIGHT FIXTURE INSTALLATION.
3. APPLIED ANTI-SEIZE COMPOUND ON ALL LIGHT BASE COVER BOLTS AND ALL FRANGIBLE COUPLINGS. BUFFED EMT WITH SANDPAPER AND APPLY ANTI-SEIZE COMPOUND PRIOR TO INSERTING INTO FRANGIBLE COUPLING.
4. INSTALL LIGHTS AT SAME ELEVATION AS SURVEYED PRIOR TO THE START OF CONSTRUCTION; HEIGHT OF EMT POSTS MAY CHANGE DUE TO ELEVATION OF CONCRETE FOUNDATION BEING FLUSH WITH BLAST PAD OVERRUN.



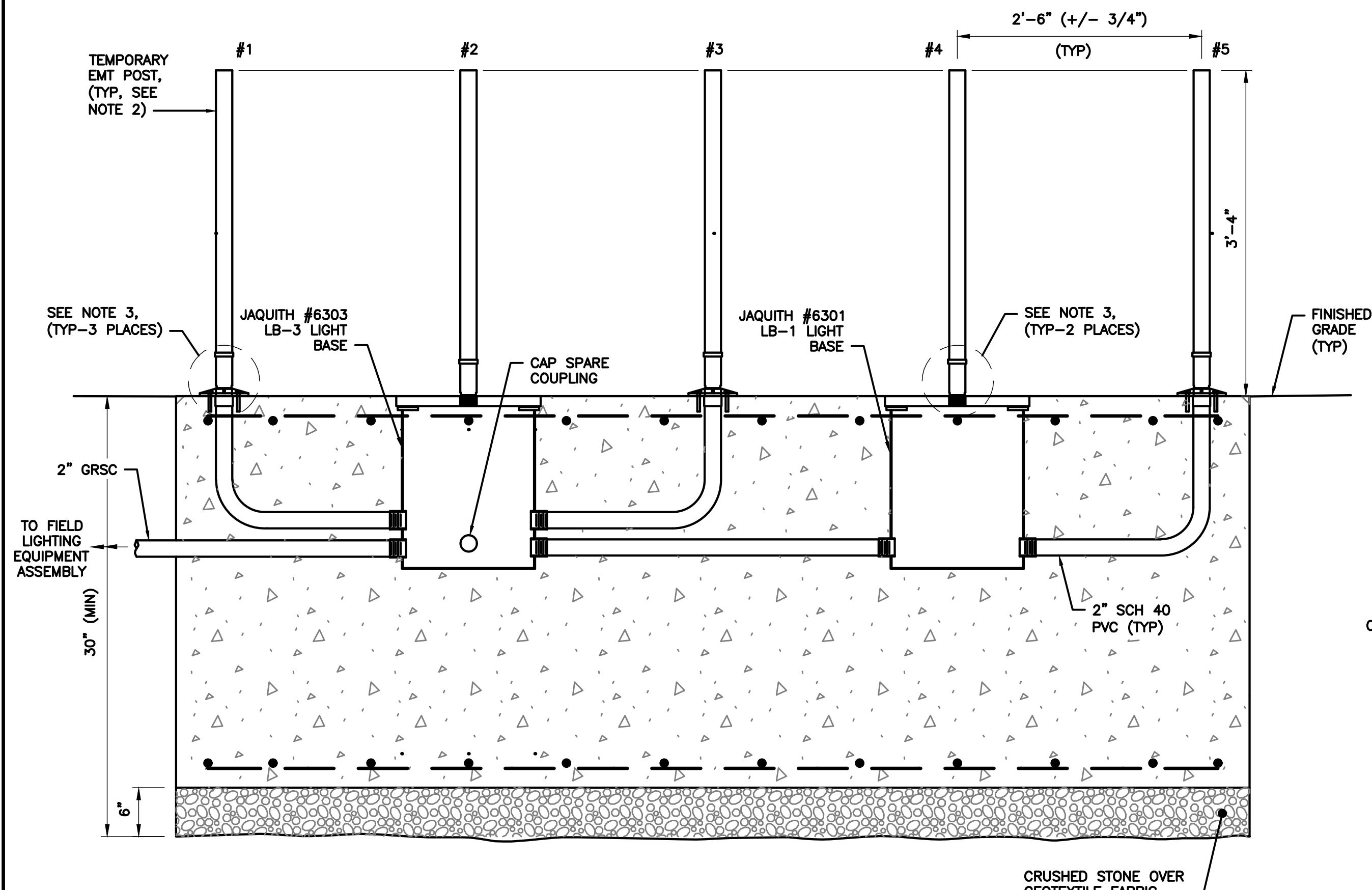
1 FRANGIBLE LIGHT BAR FOUNDATION PLAN MALSF STATION 12+00  
NTS



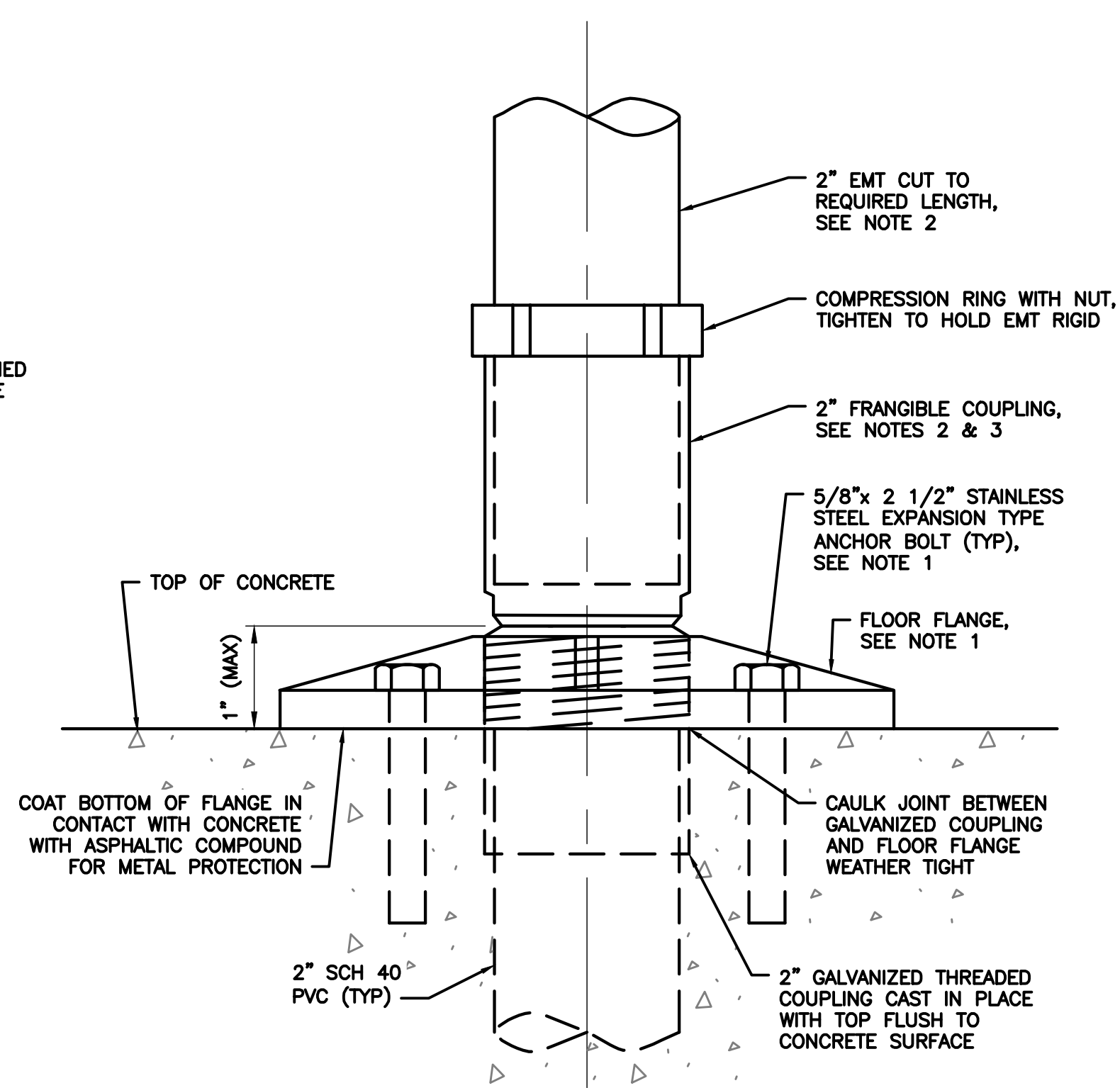
FRANGIBLE LIGHT BAR  
FOUNDATION — PLAN VIEW



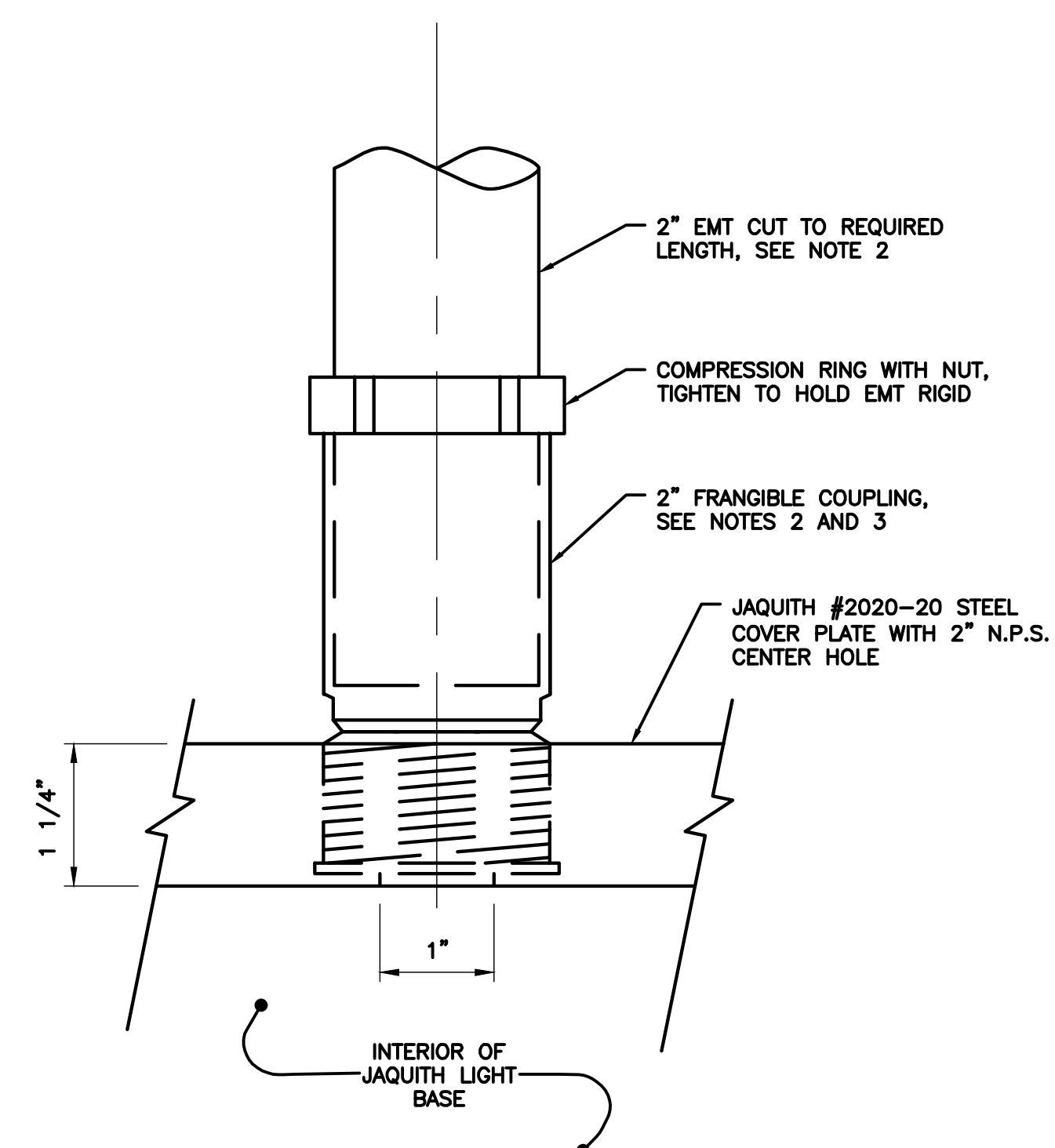
## 5 LIGHT BASE & FOUNDATION DETAIL



2 FRANGIBLE LIGHT BAR FOUNDATION – SECTION VIEW

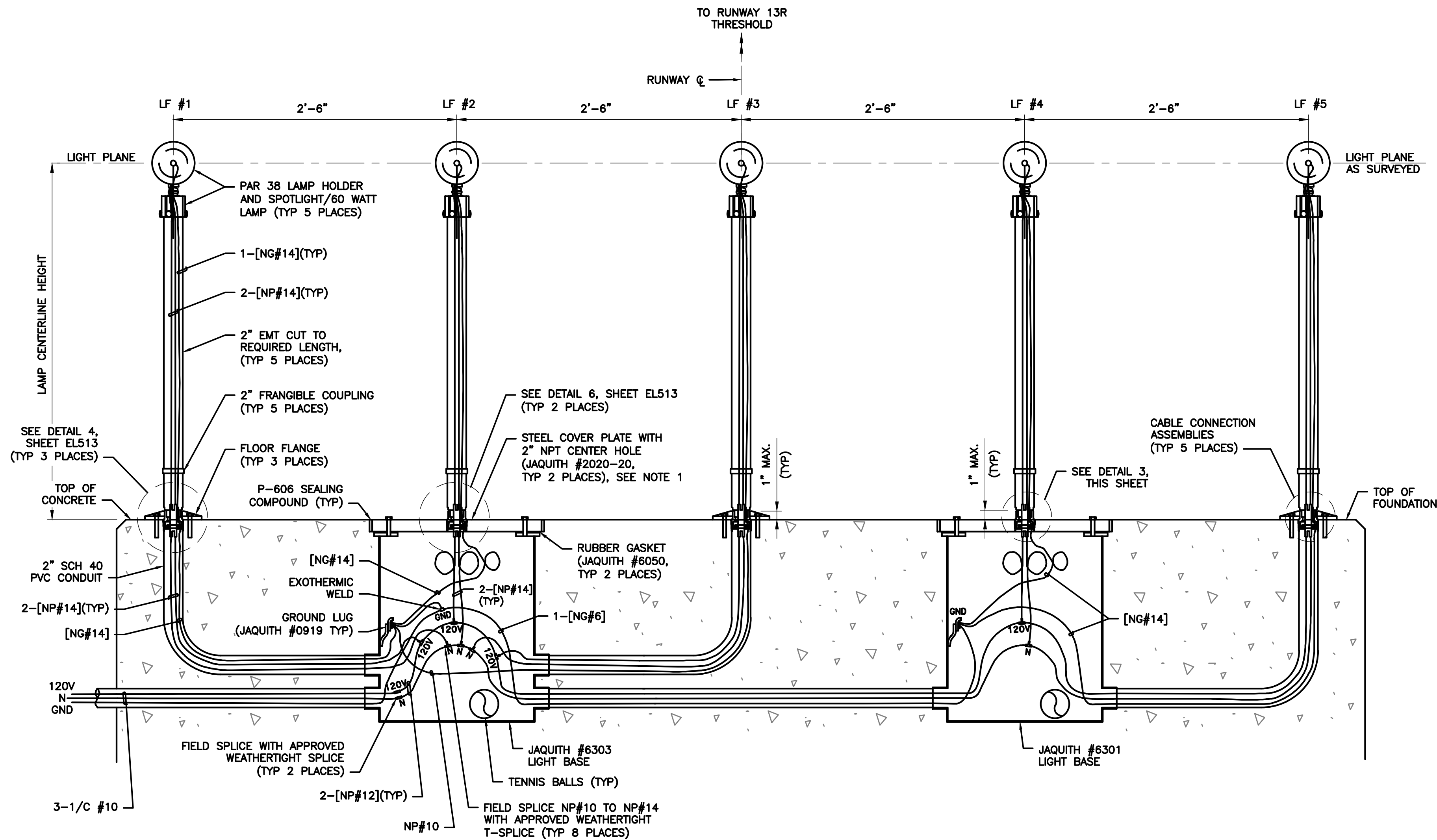


4 FLOOR FLANGE/FRANGIBLE  
COUPLING INTERFACE  
(LIGHT FIXTURE #1, #3, AND #5)  
NTS

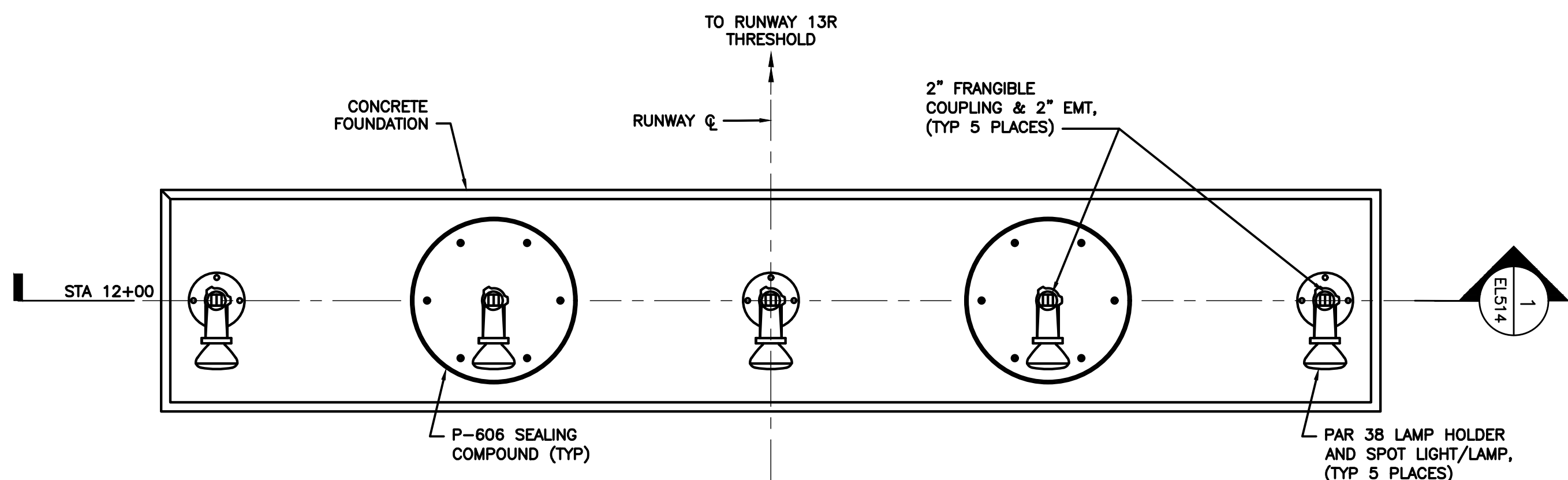


6 LIGHT BASE COVER/FRANGIBLE  
COUPLING INTERFACE  
(LIGHT FIXTURE #2, AND #4)  
NTS

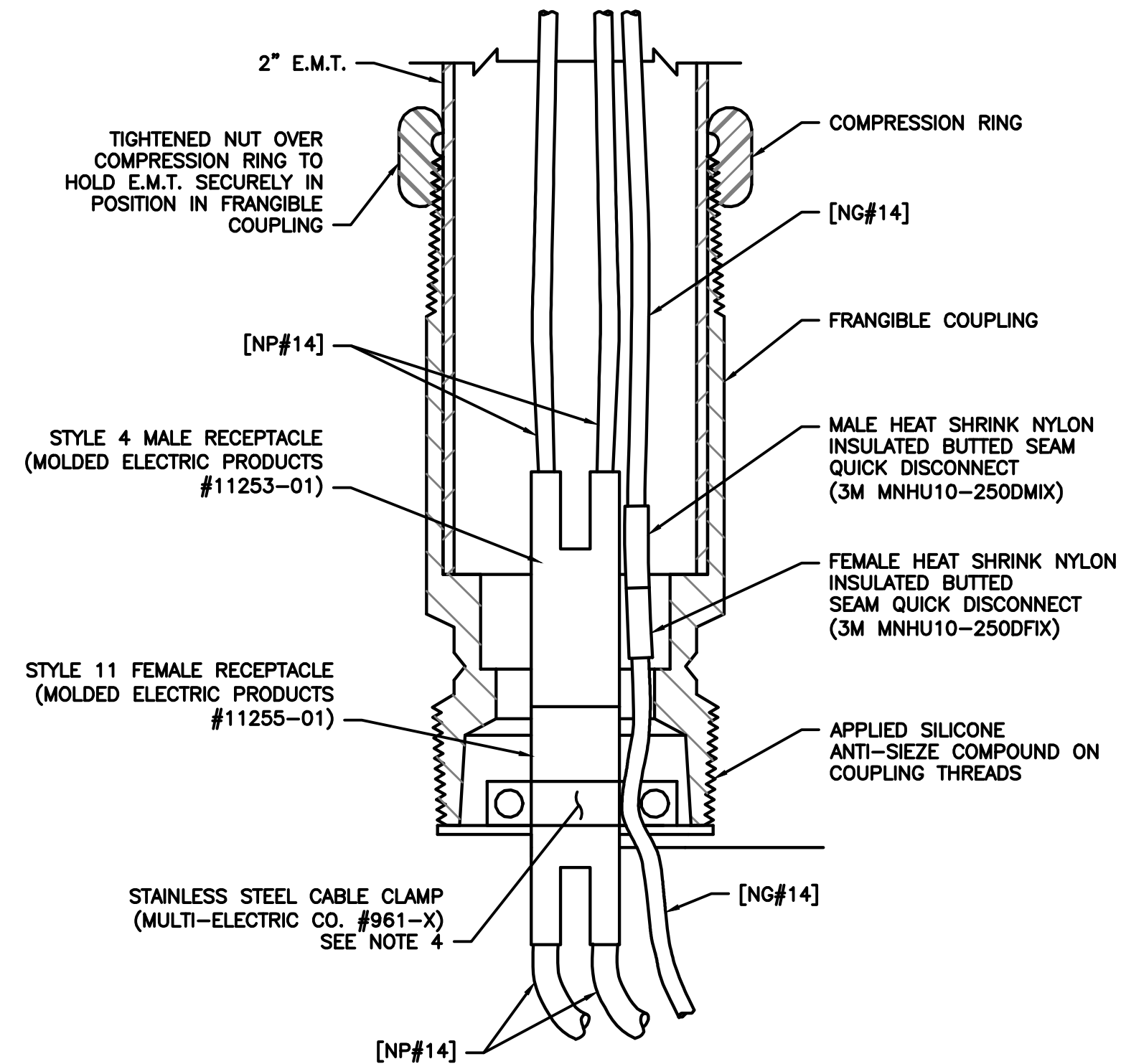




1 EMT MOUNTED LIGHT BAR ELEVATION MALSF STA 12+00  
NTS



2 FRANGIBLE EMT MOUNTED LIGHT BAR PLAN MALSF STA 12+00  
NTS



3 CABLE CONNECTION ASSEMBLY DETAIL  
NTS

#### GENERAL NOTES:

1. REMOVED TEMPORARY 1 1/4" PLYWOOD COVERS AND 1/4" THICK FOAM STRIPS PRIOR TO INSTALLING PERMANENT GASKETS AND LIGHT BASE COVERS.
2. APPLY AN APPROVED P-606 SEALING COMPOUND AROUND ALL LIGHT BASE COVERS TO PREVENT WATER INCURSION.
3. USED ANTI-SIEZE COMPOUND ON ALL LIGHT BASE COVER BOLTS AND ALL FRANGIBLE COUPLINGS.
4. CLAMP CABLE TO FRANGIBLE COUPLINGS TO PREVENT CABLE/RECEPTACLE FROM SLIDING BACK INTO CONDUIT BELOW WHEN DISCONNECTED.

REVISIONS			
NO.	DESCRIPTION	DATE	BY
0	ISSUED FOR BID	02/24/2023	SC
1	ADDENDUM	03/23/2023	SC

FAA NON-STANDARD TAXIWAYS PROJECT	
AIRFIELD ELECTRICAL DETAILS	

PROJECT MGR:	
DESIGNER:	
DRAWN BY:	
CHECKED BY:	
SCALE:	AS SHOWN
DATE:	03/23/2023



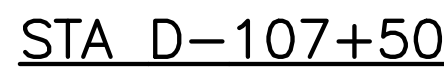
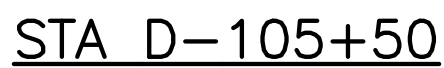
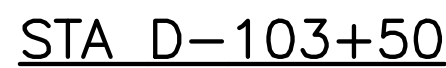
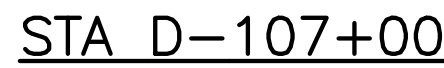
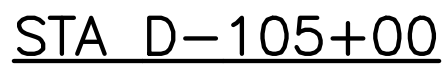
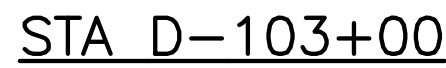
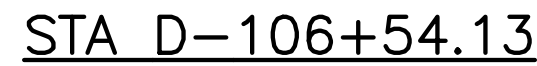
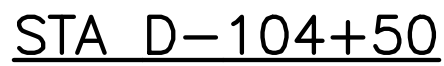
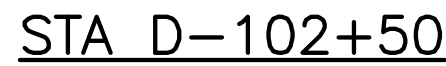
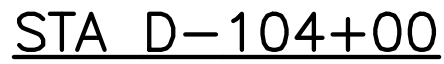
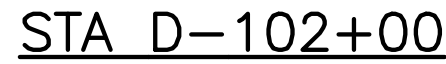
APPROVED BY: DATE:

DIRECTOR	HOUSTON AIRPORT SYSTEM
PROJECT NO:	770
C.I.P. NO:	3-48-0110-044
H.A.S. NO:	N/A
SHEET NO:	EL514

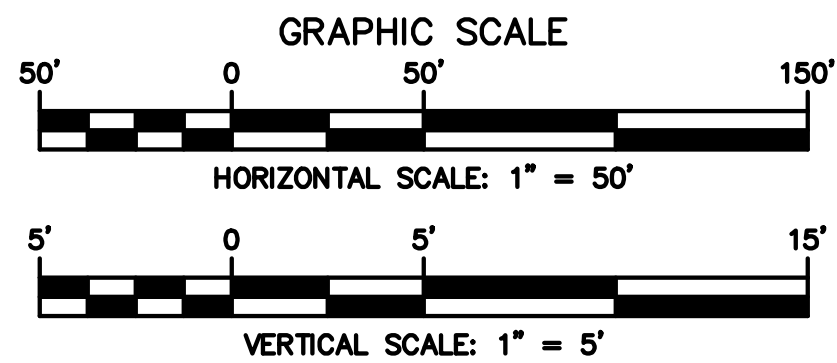
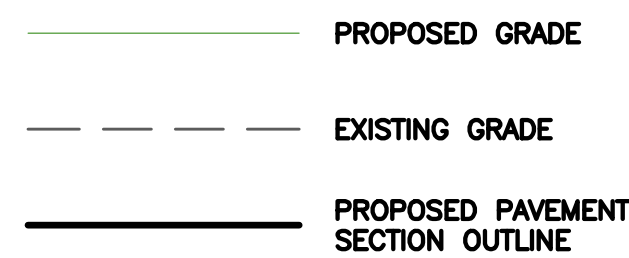








LEGEND:



REVISIONS			
NO.	DESCRIPTION	DATE	BY
0	ISSUED FOR BID	02/24/2023	SC
1	ADDENDUM	03/23/2023	SC

FAA NON-STANDARD TAXIWAYS PROJECT

## CROSS SECTIONS – TAXIWAY D

PROJECT MGR:	S. CHILDERS
DESIGNER:	B. BARTLETT
DRAWN BY:	S. WAZIRI
CHECKED BY:	R. EHTESHAM
SCALE:	AS SHOWN
DATE:	03/23/2023



APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

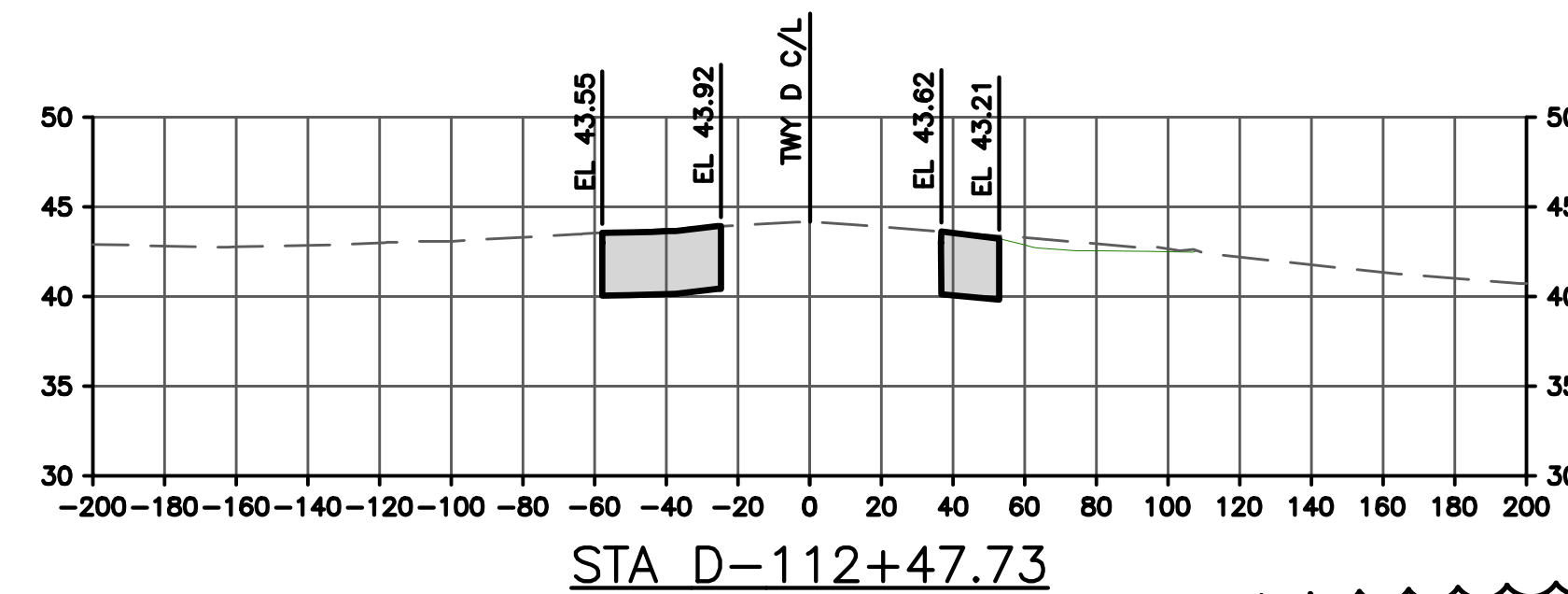
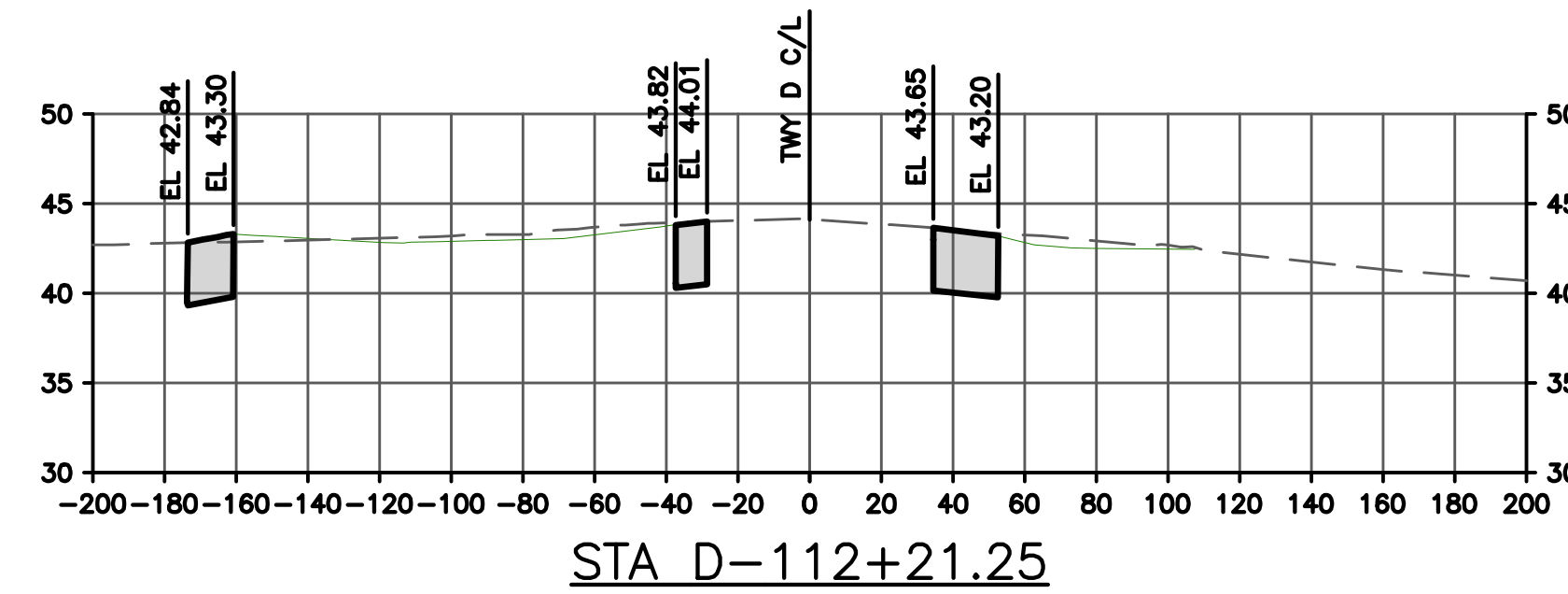
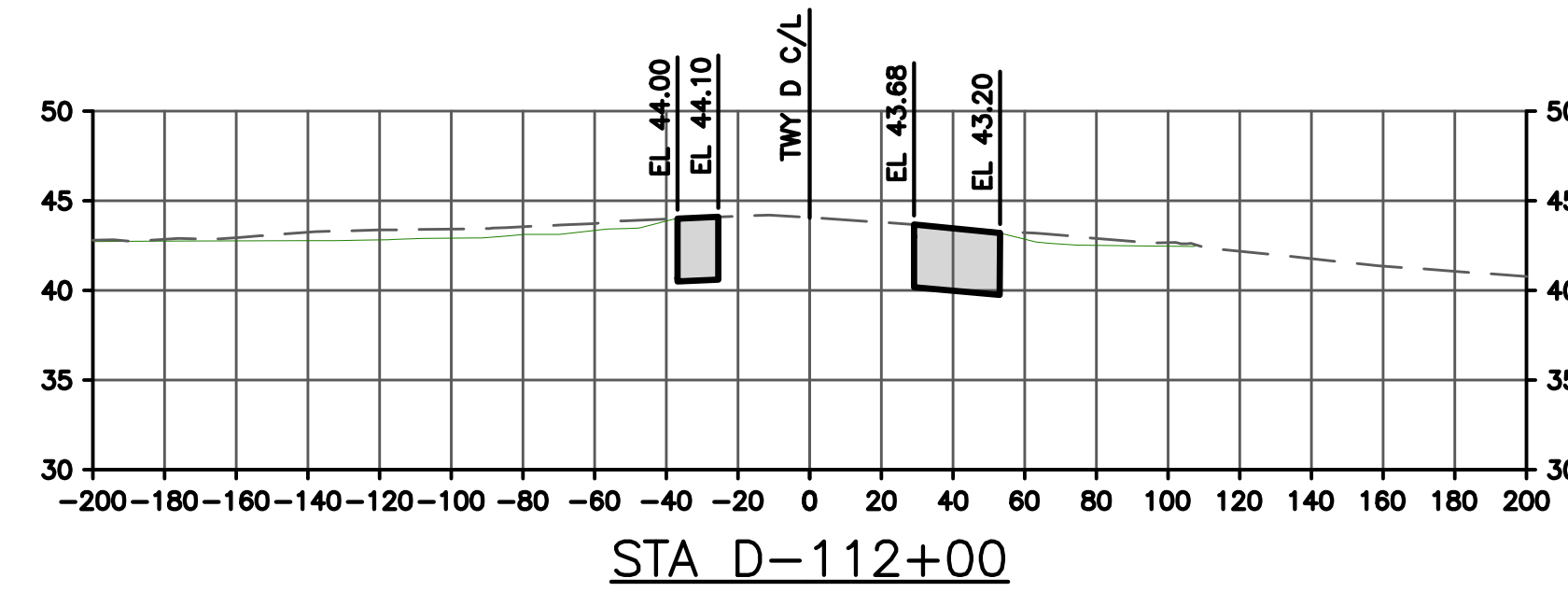
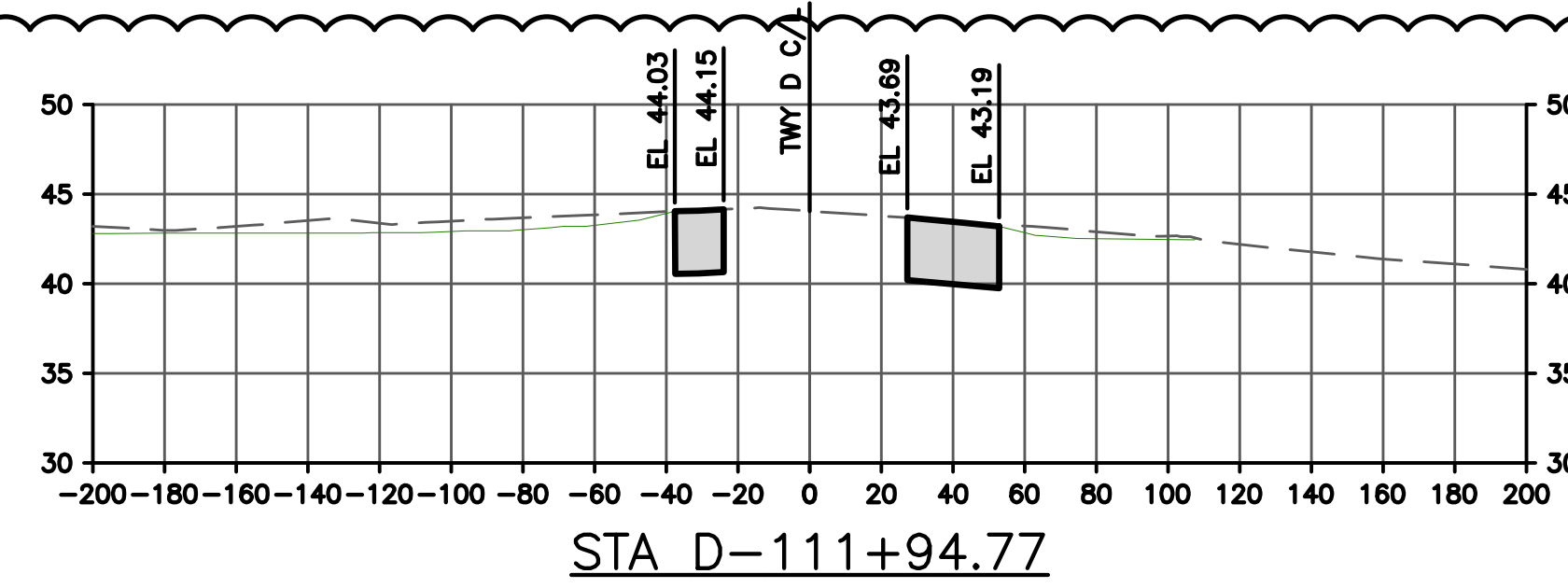
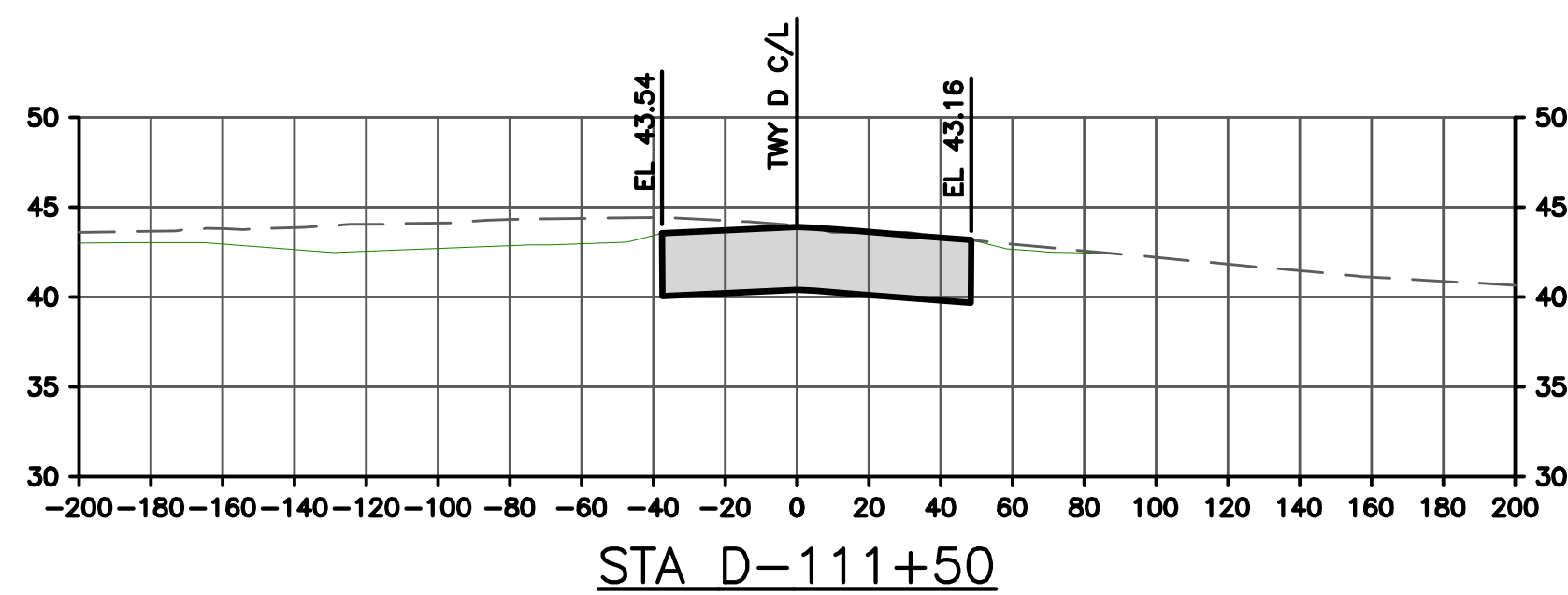
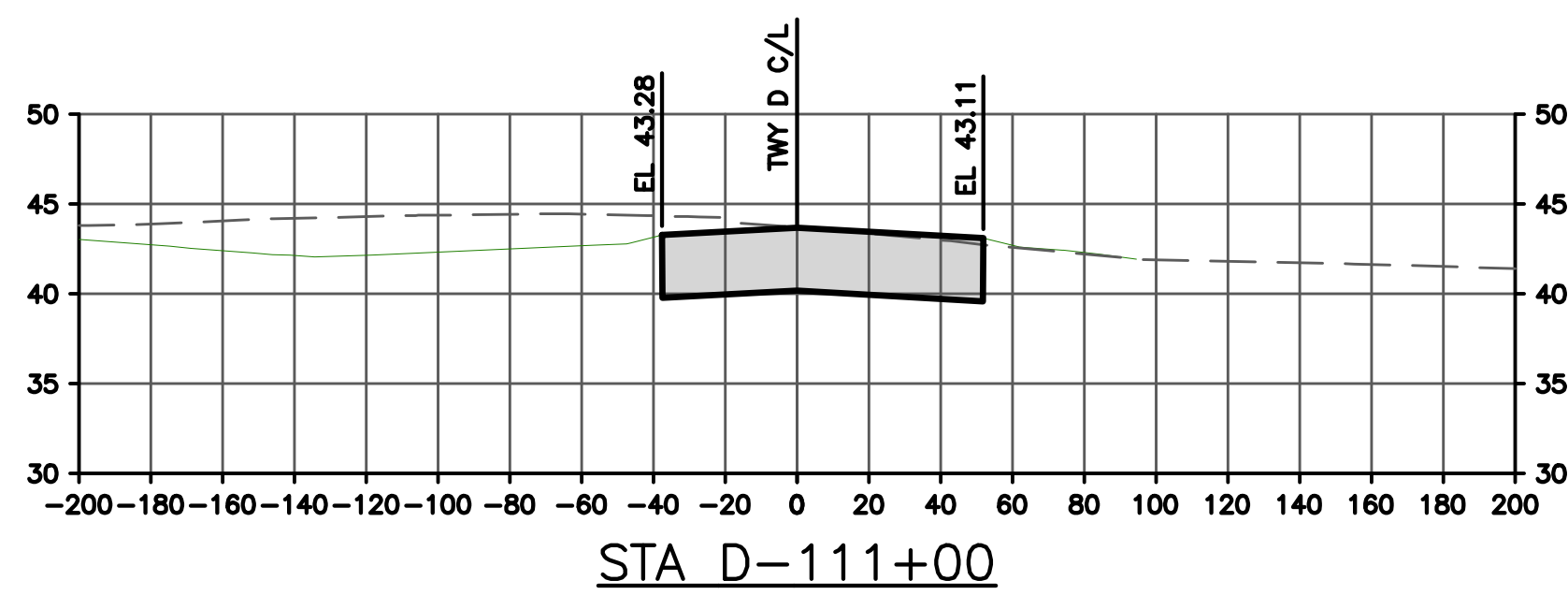
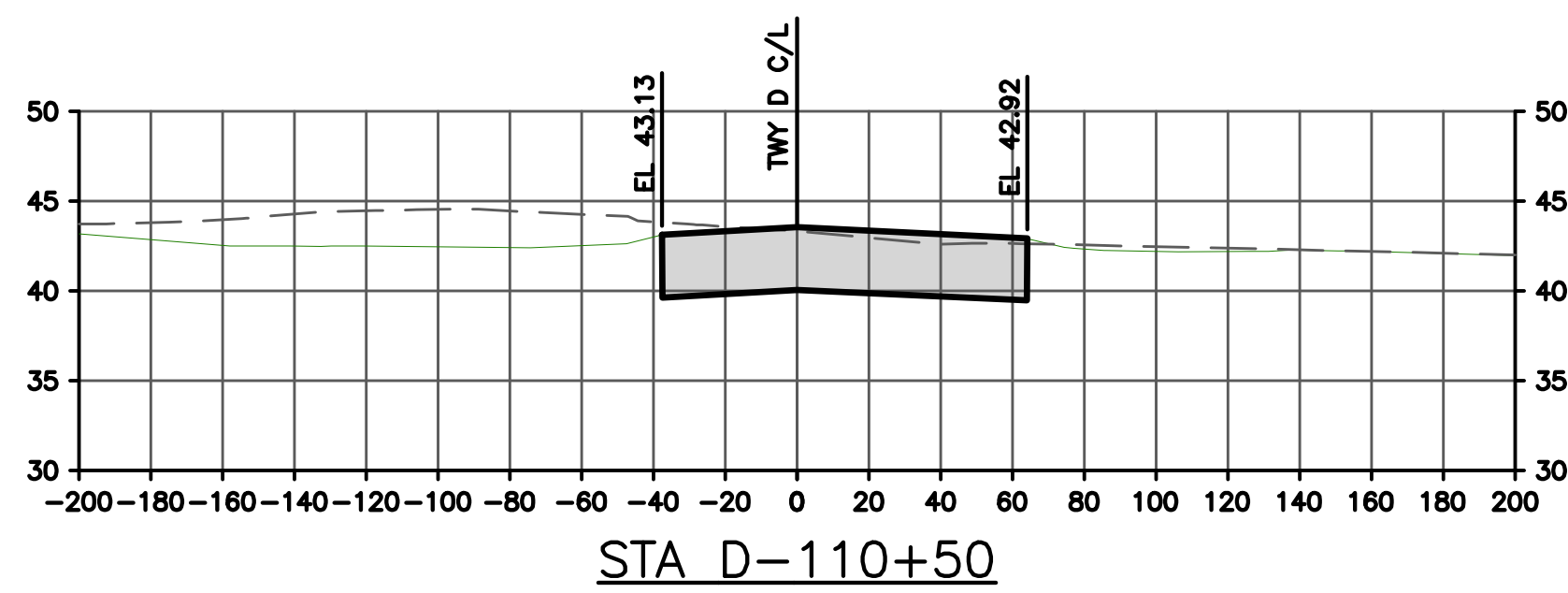
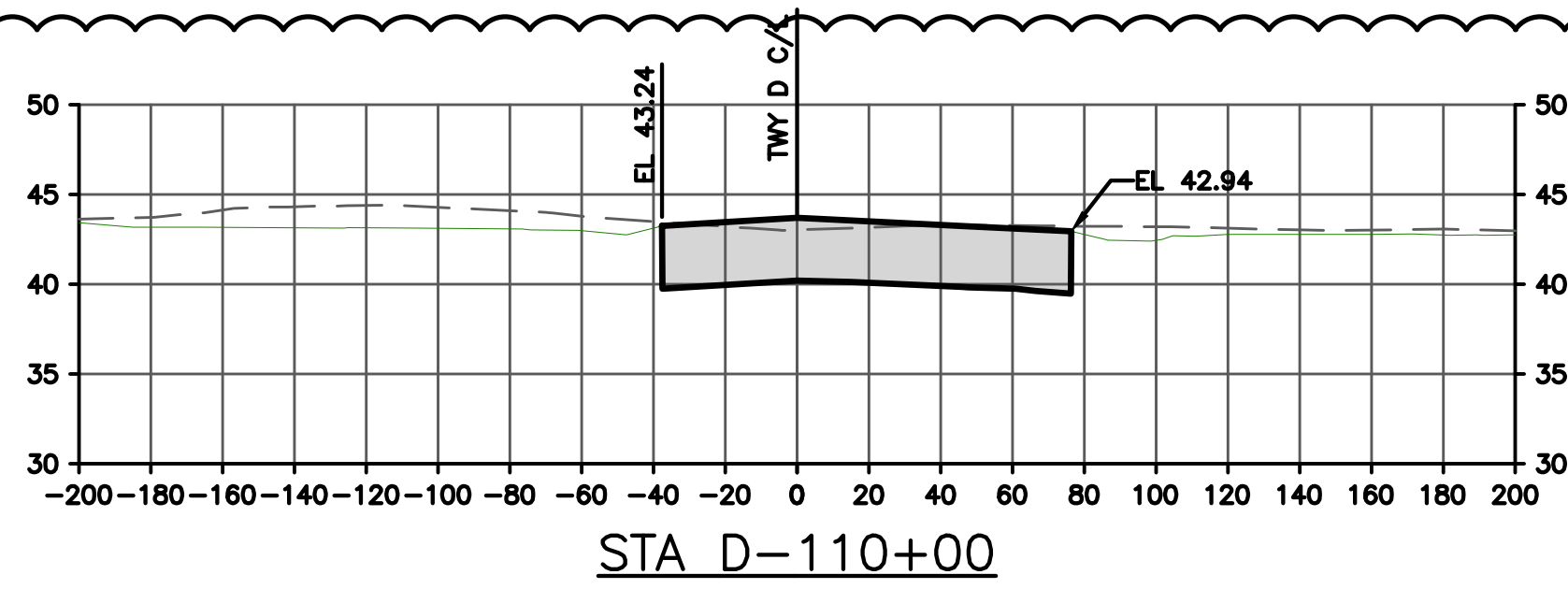
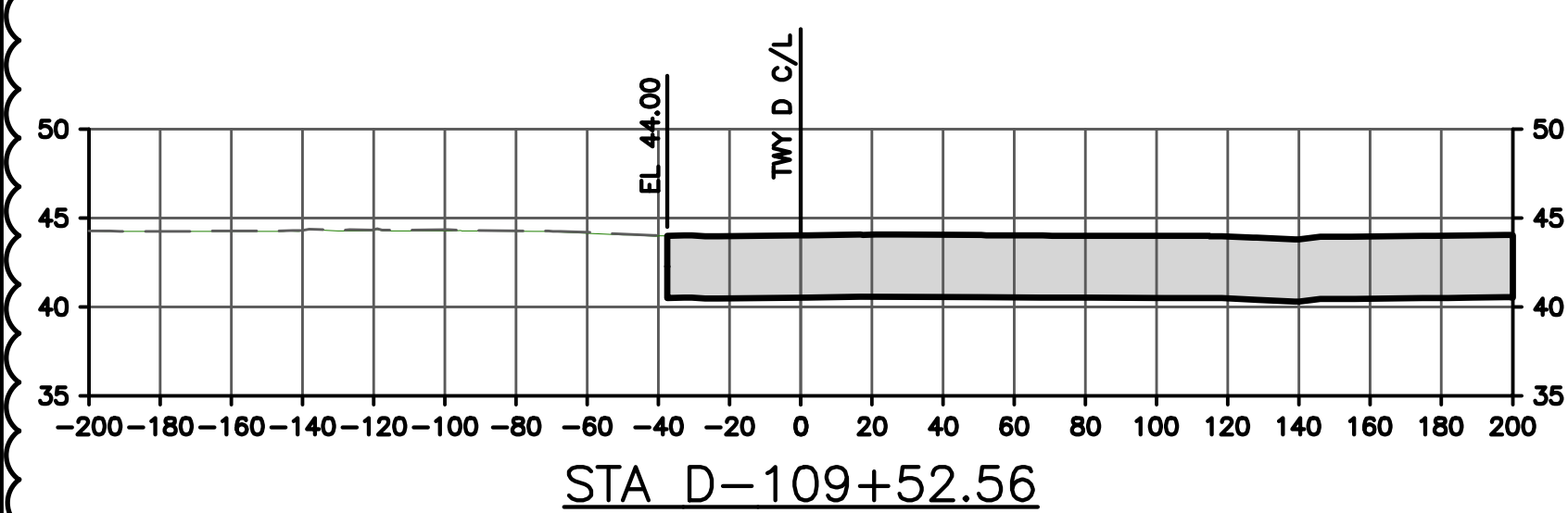
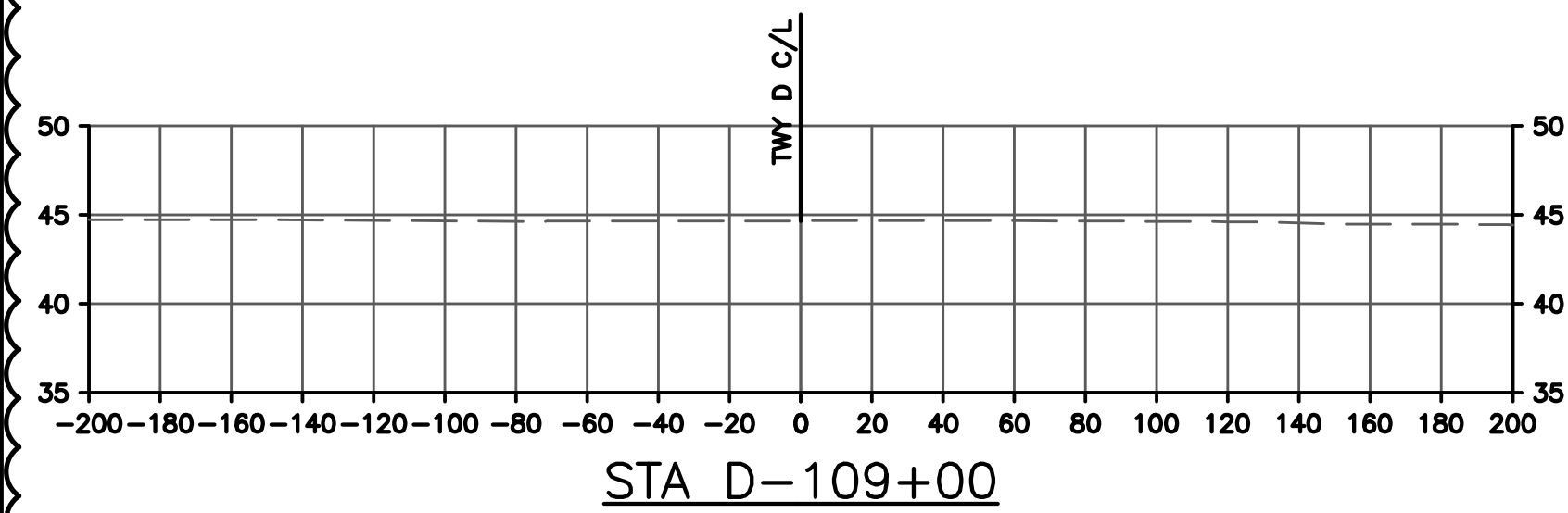
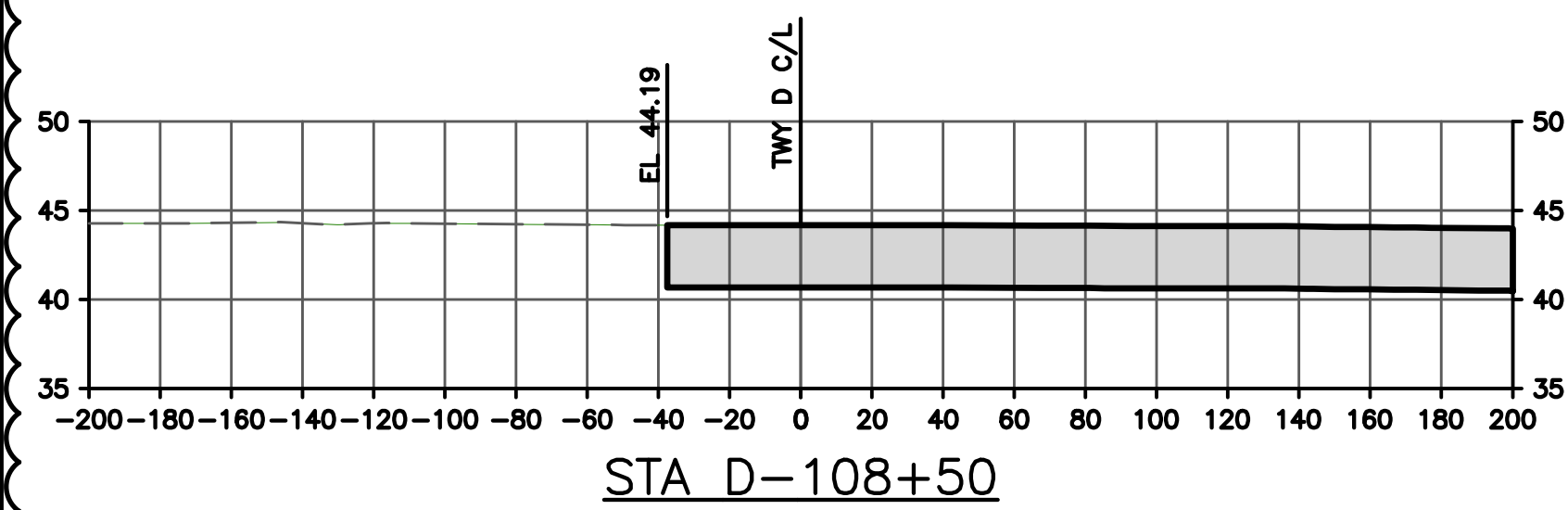
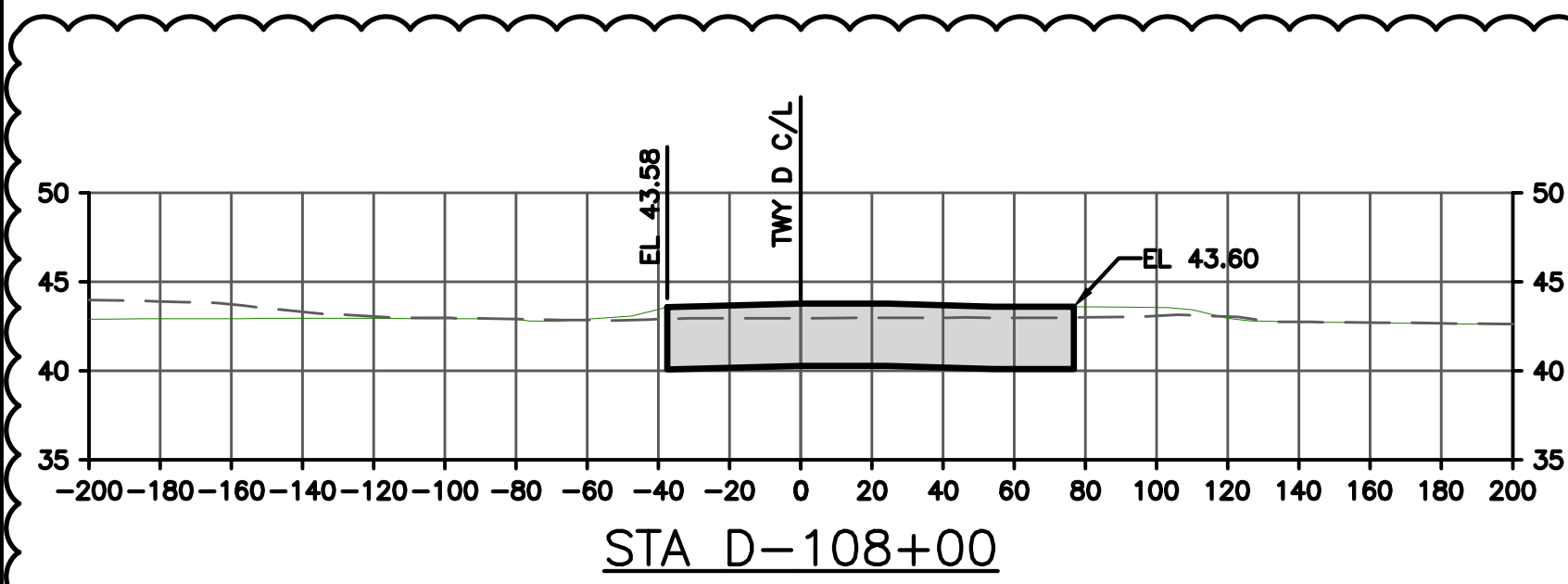
**DIRECTOR  
HOUSTON AIRPORT SYSTEM**

PROJECT NO:  
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C.I.P. NO:  
3-48-0110-044  
H.A.S. NO:  
N/A  
SHEET NO:

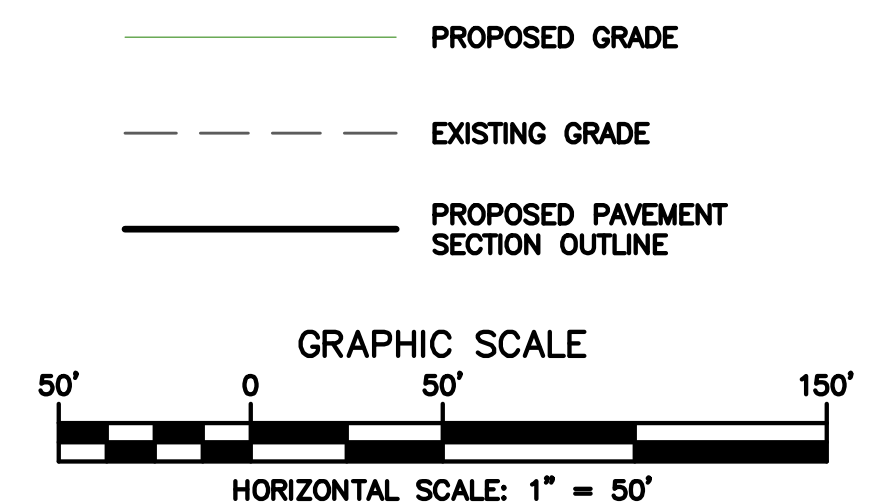
XS301  
of

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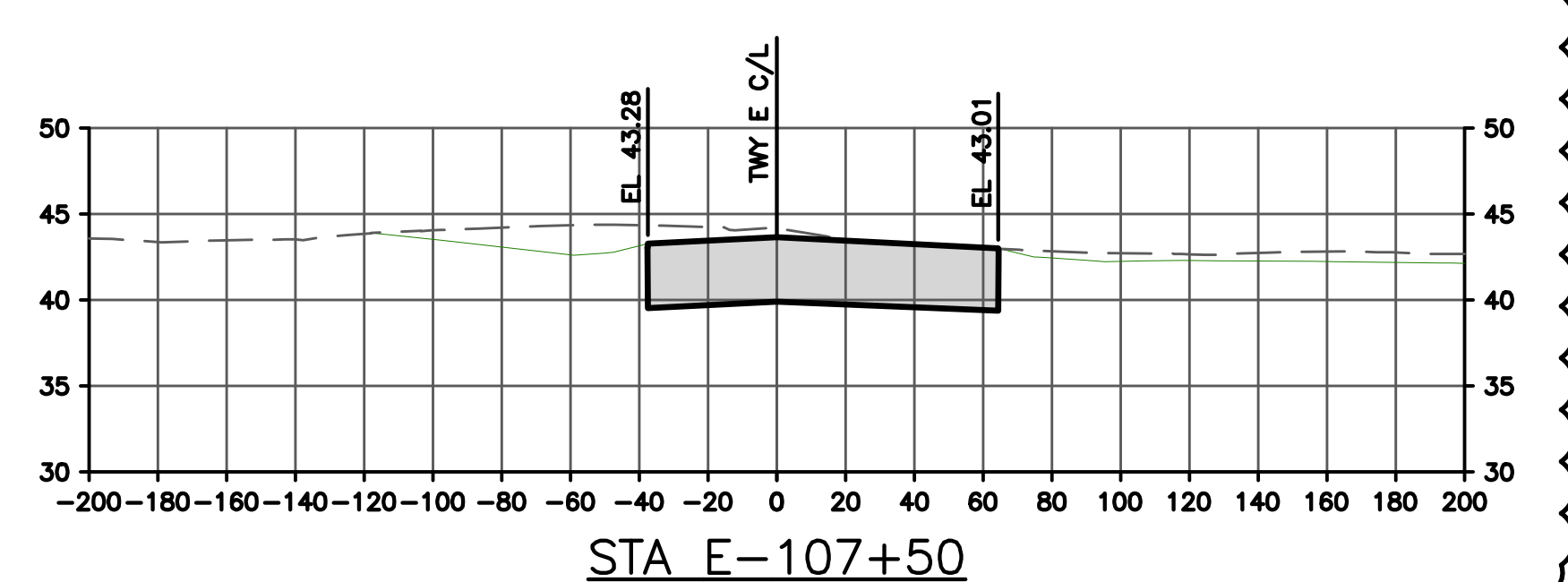
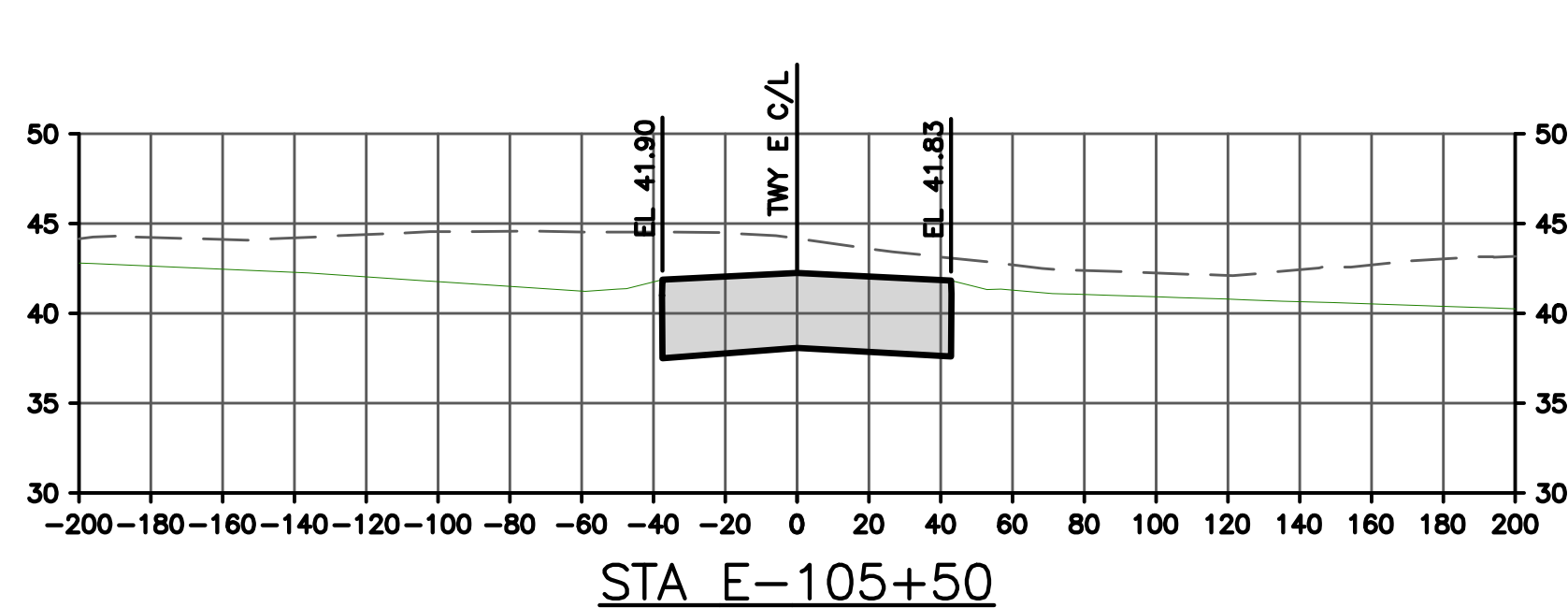
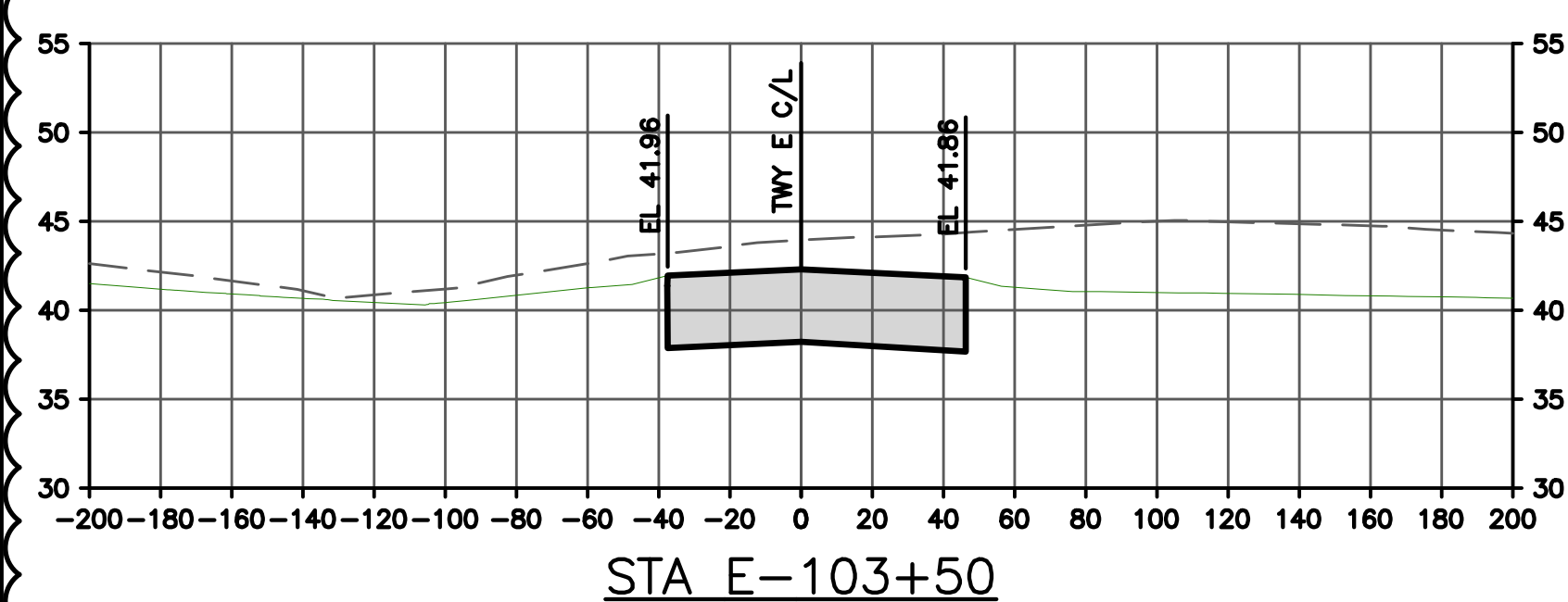
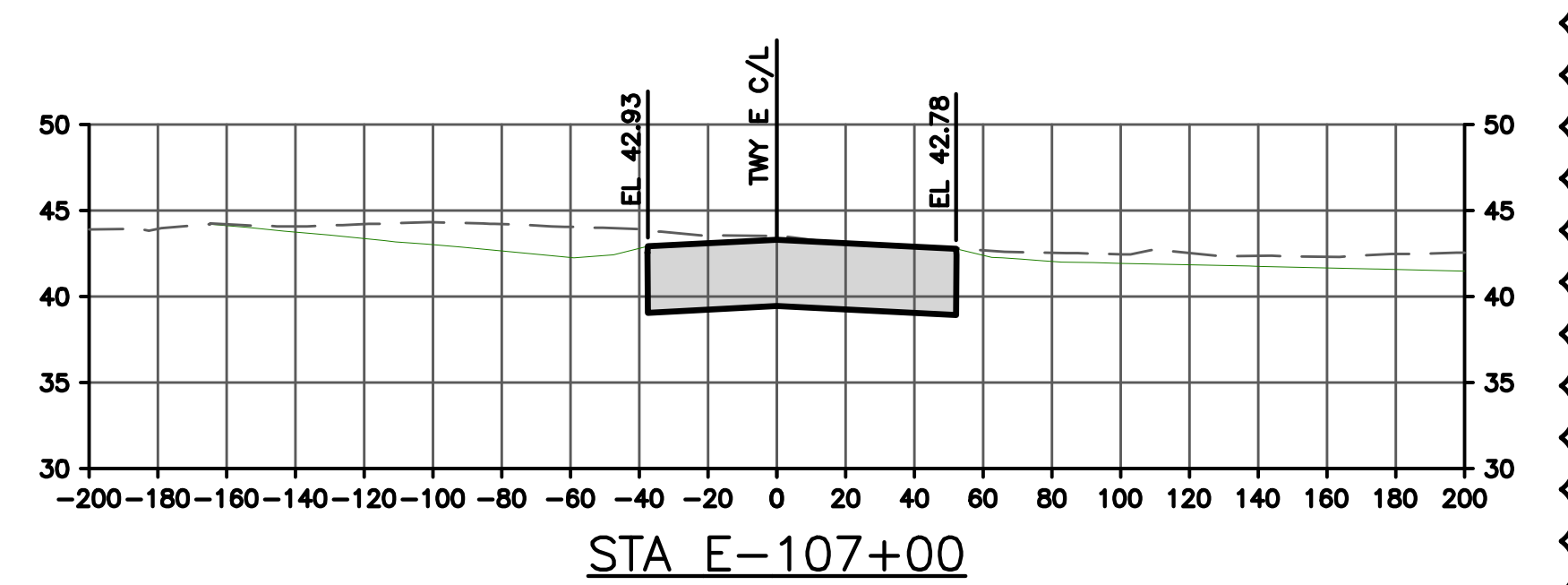
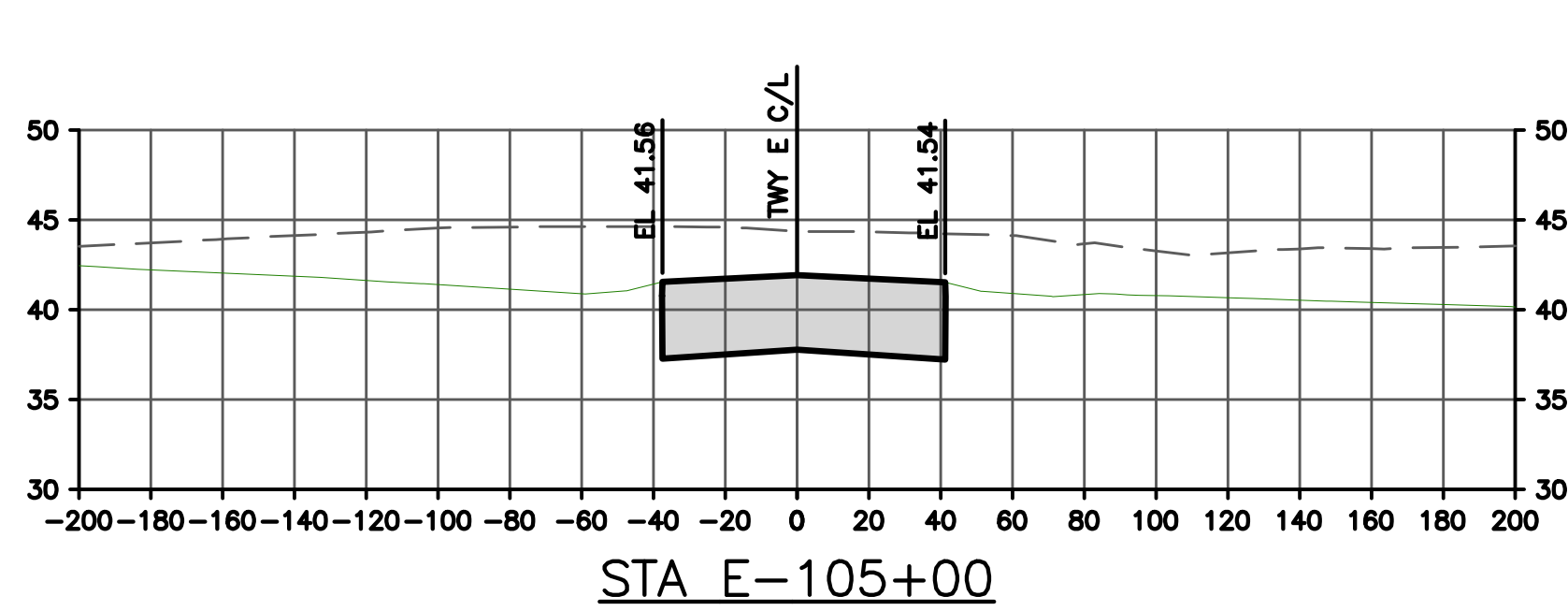
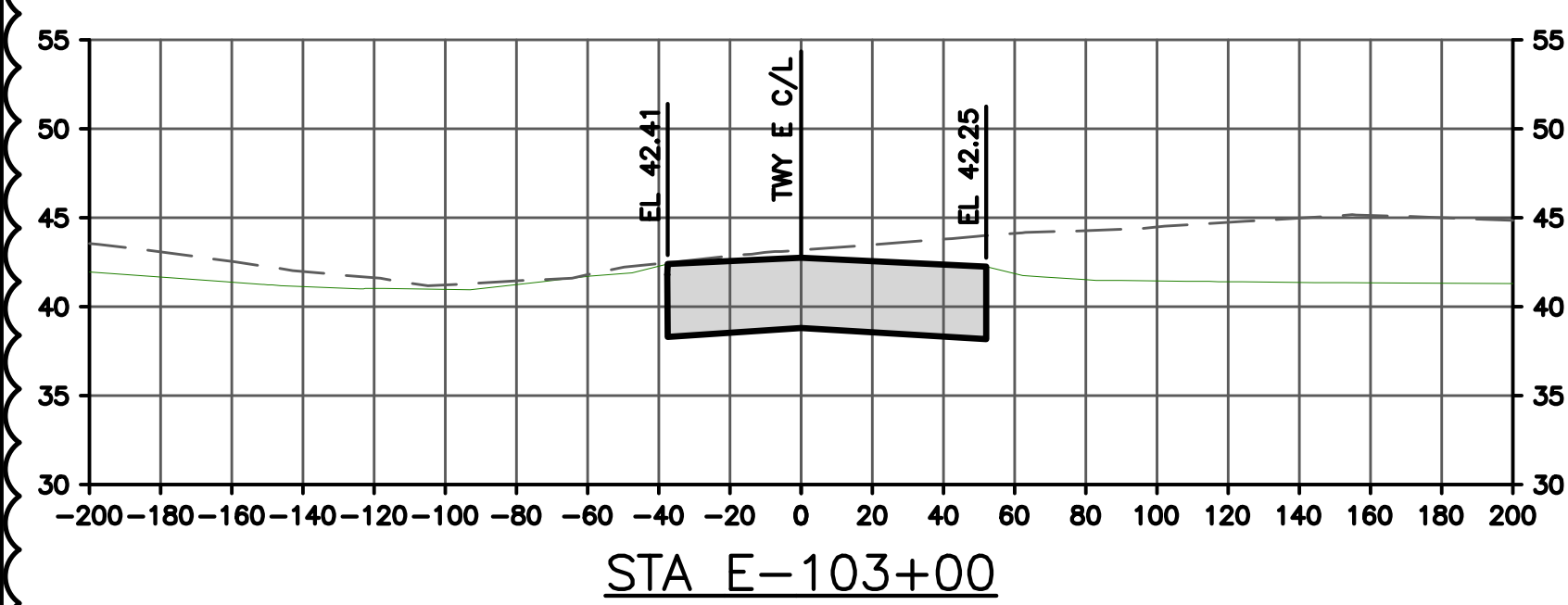
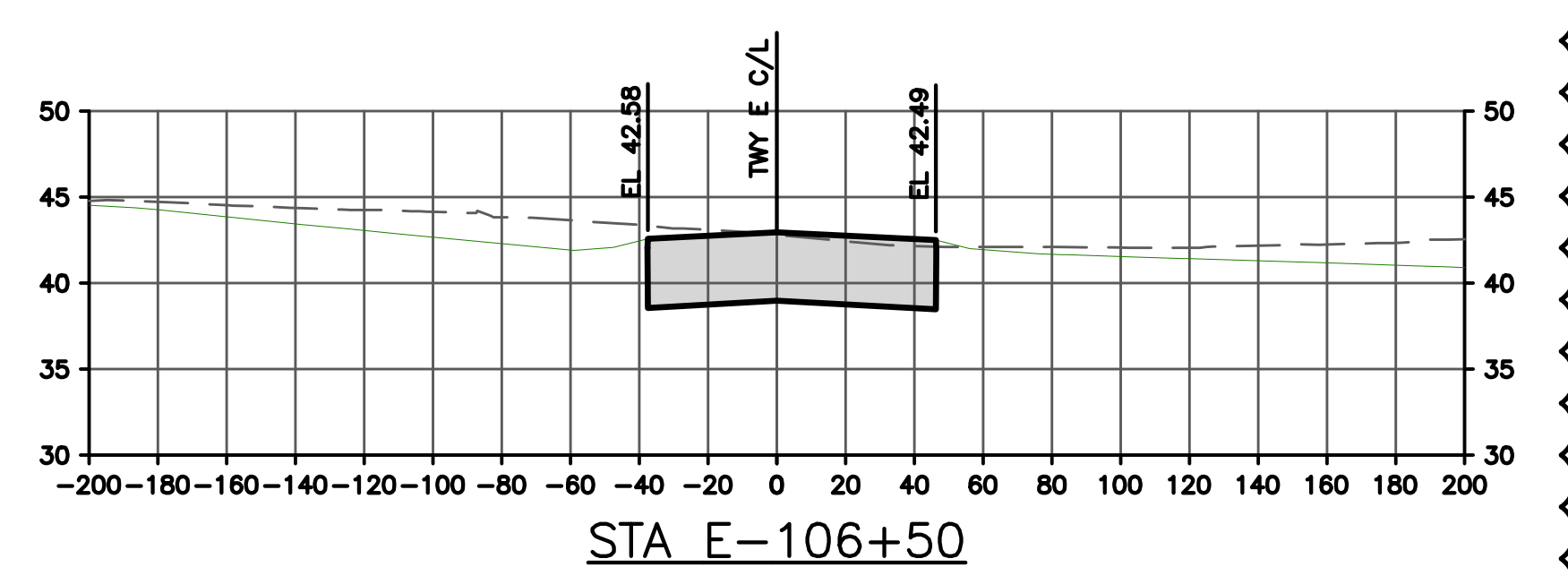
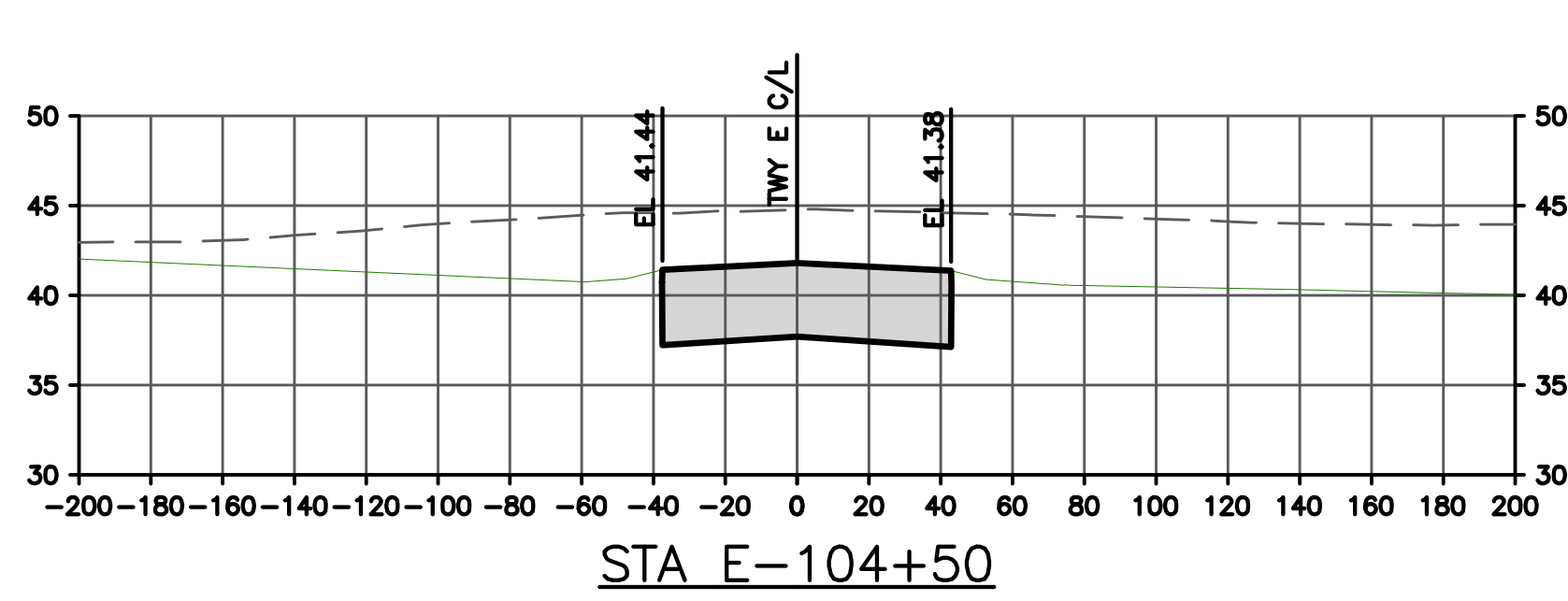
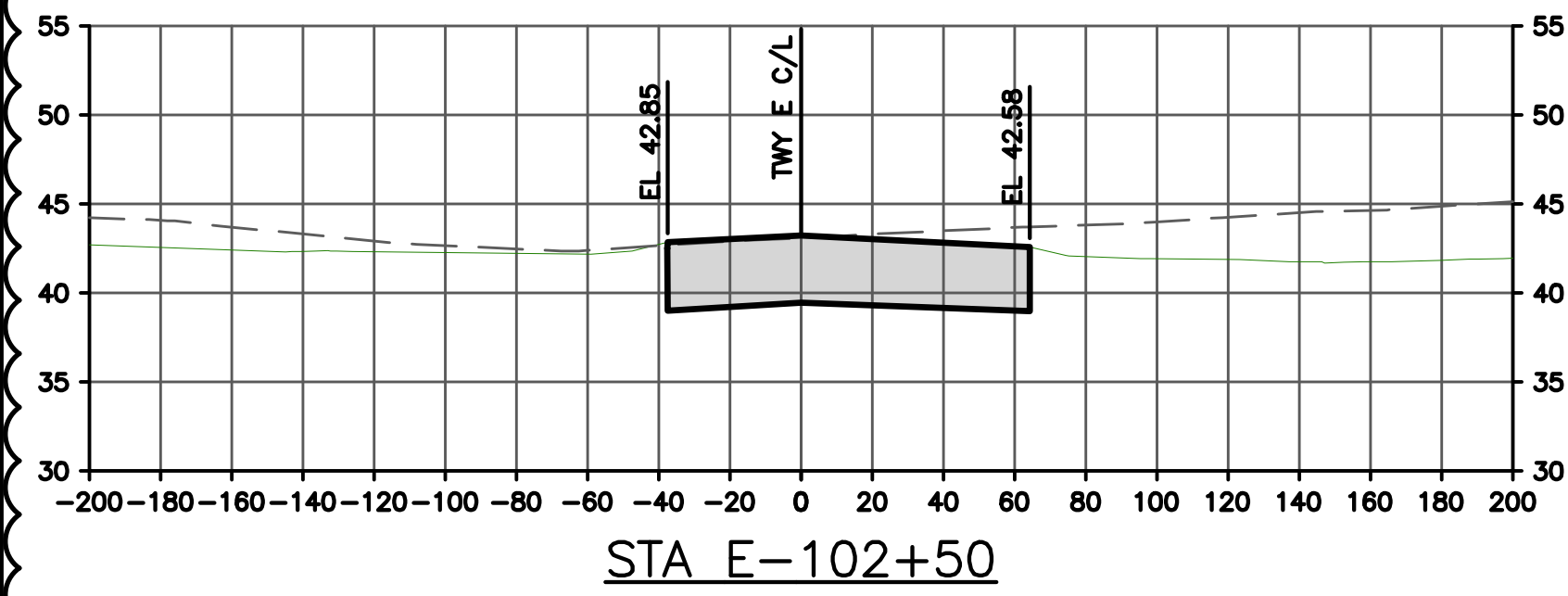
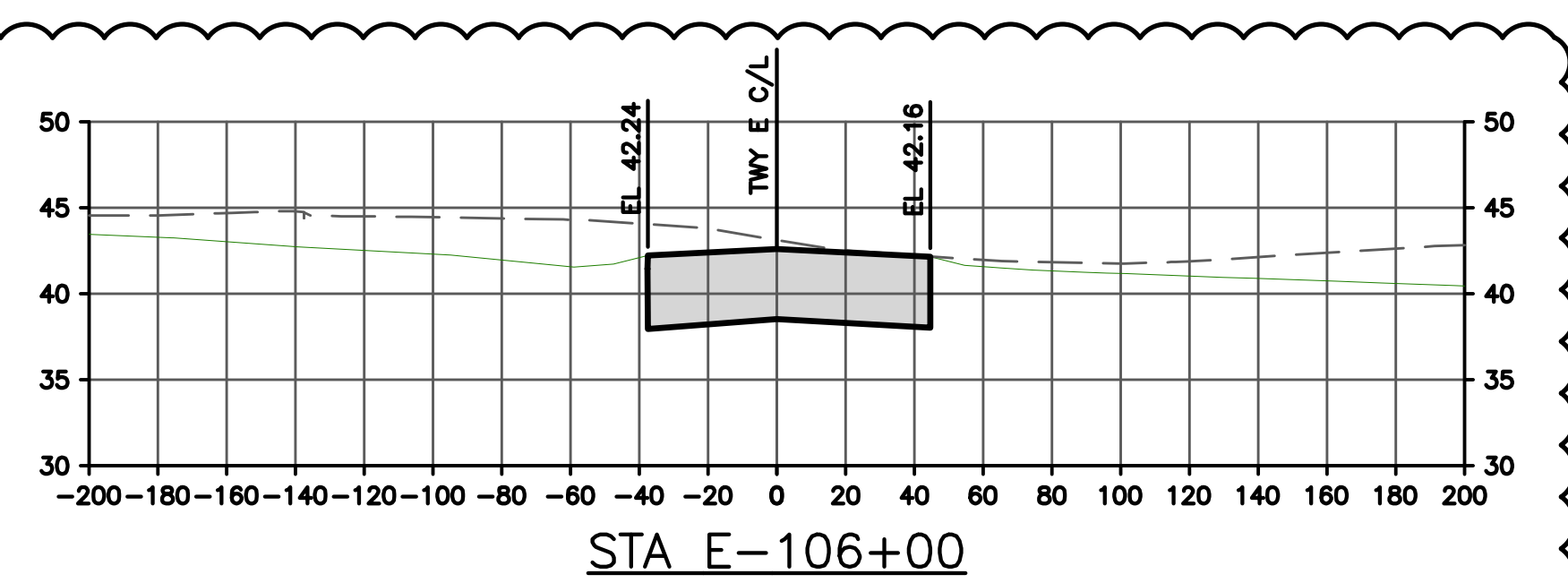
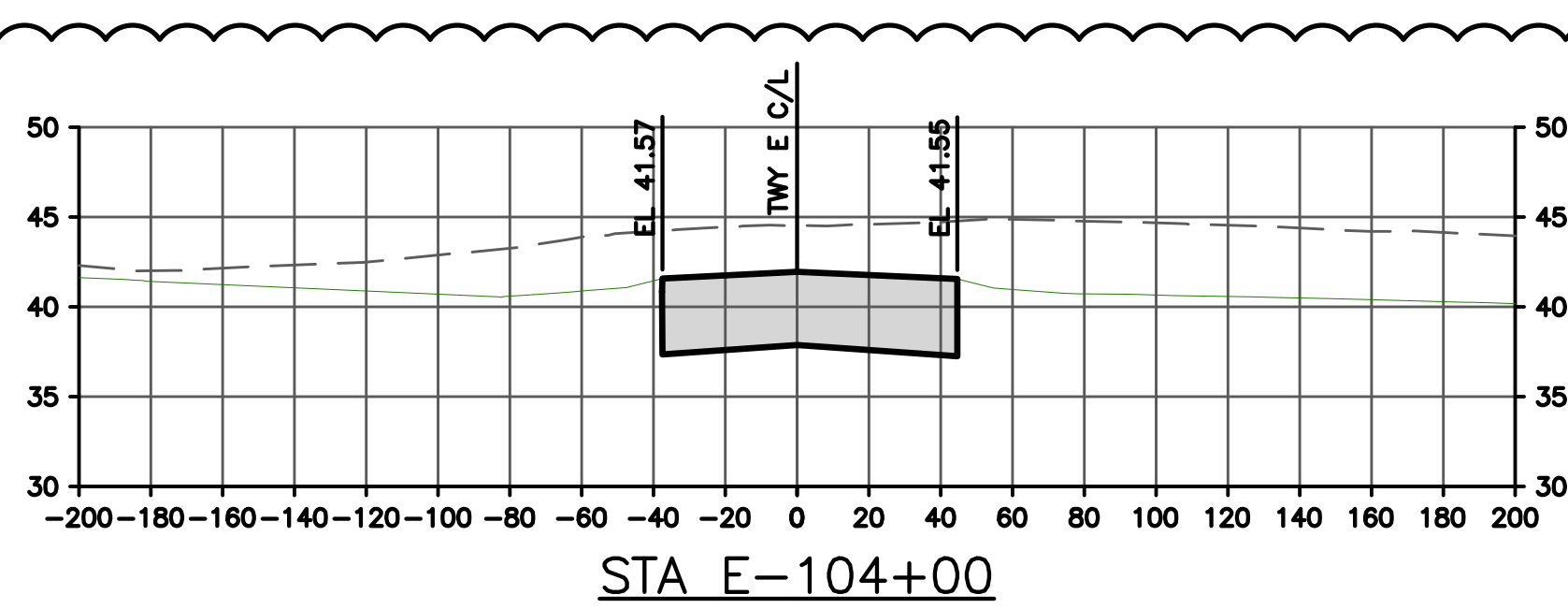
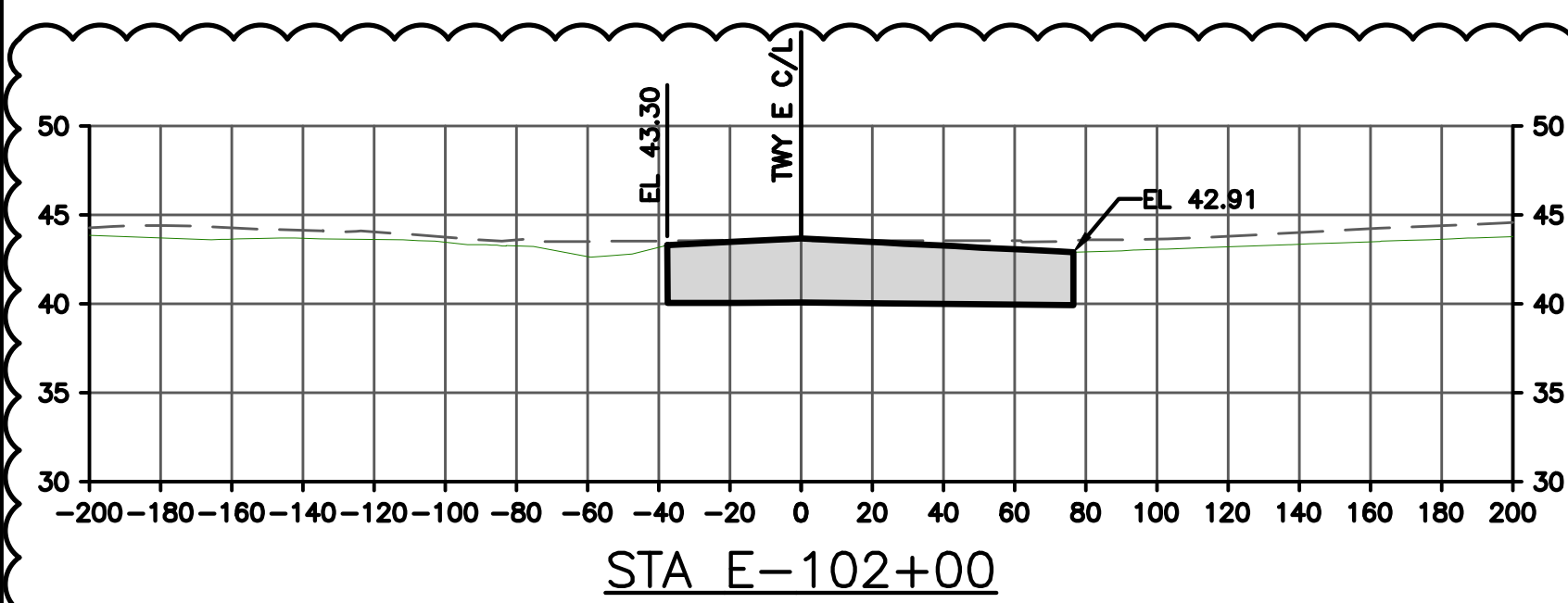






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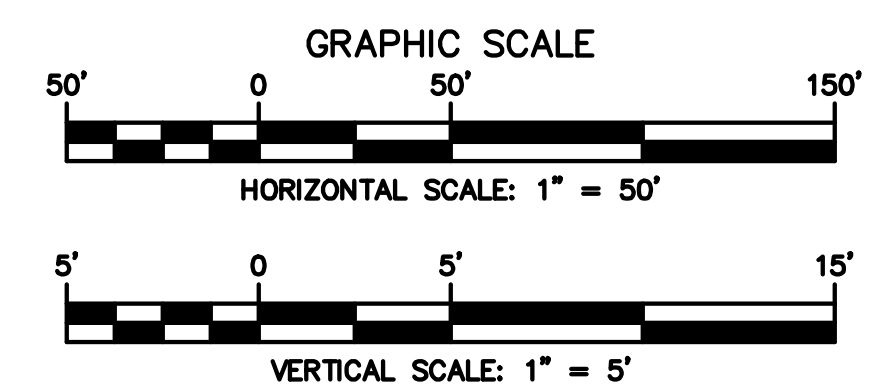


LEGEND:

 PROPOSED GRADE  
 EXISTING GRADE  
 PROPOSED PAVEMENT SECTION OUTLINE

— — — — EXISTING GRADE

PROPOSED PAVEMENT  
SECTION OUTLINE



REVISIONS		
DESCRIPTION	DATE	BY
ISSUED FOR BID	02/24/2023	SC
ADDENDUM	03/23/2023	SC

## FAA NON-STANDARD TAXIWAYS PROJECT

## CROSS SECTIONS – TAXIWAY E

PROJECT MGR:	S. CHILDERS
DESIGNER:	B. BARTLETT
OWNED BY:	S. WAZIRI
CHECKED BY:	R. EHTESHAM
FILE:	AS SHOWN
DATE:	03/23/2023



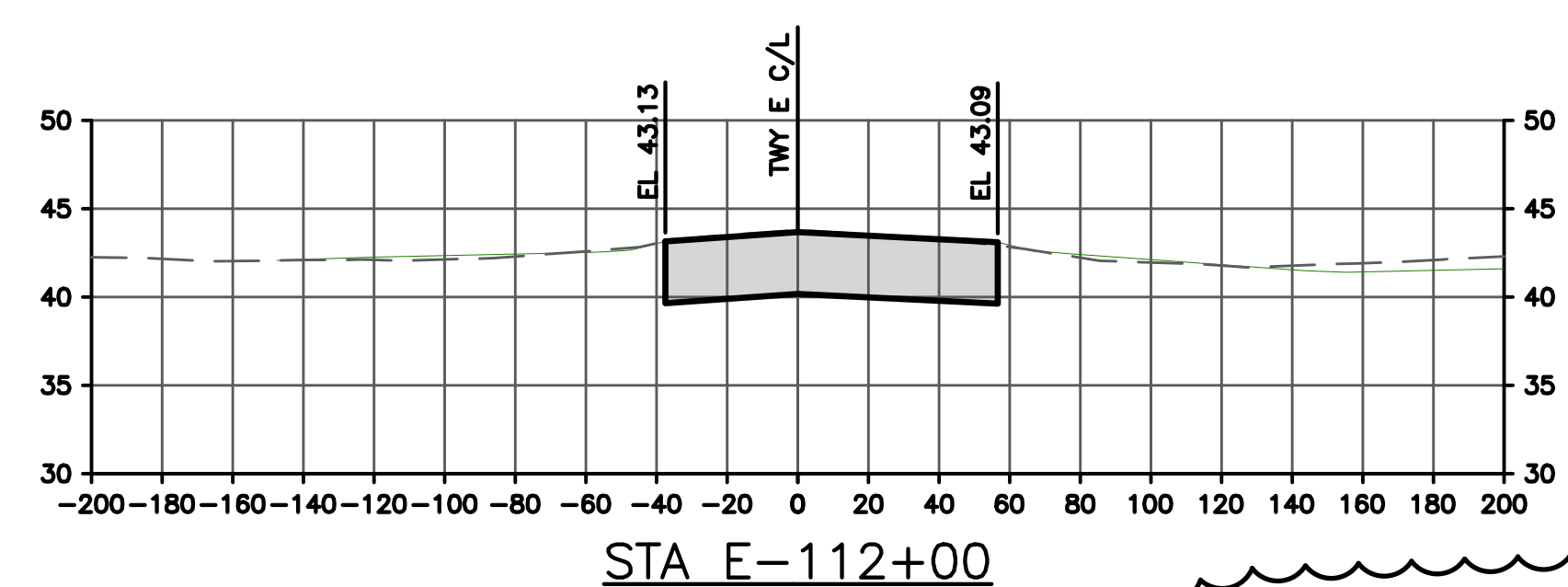
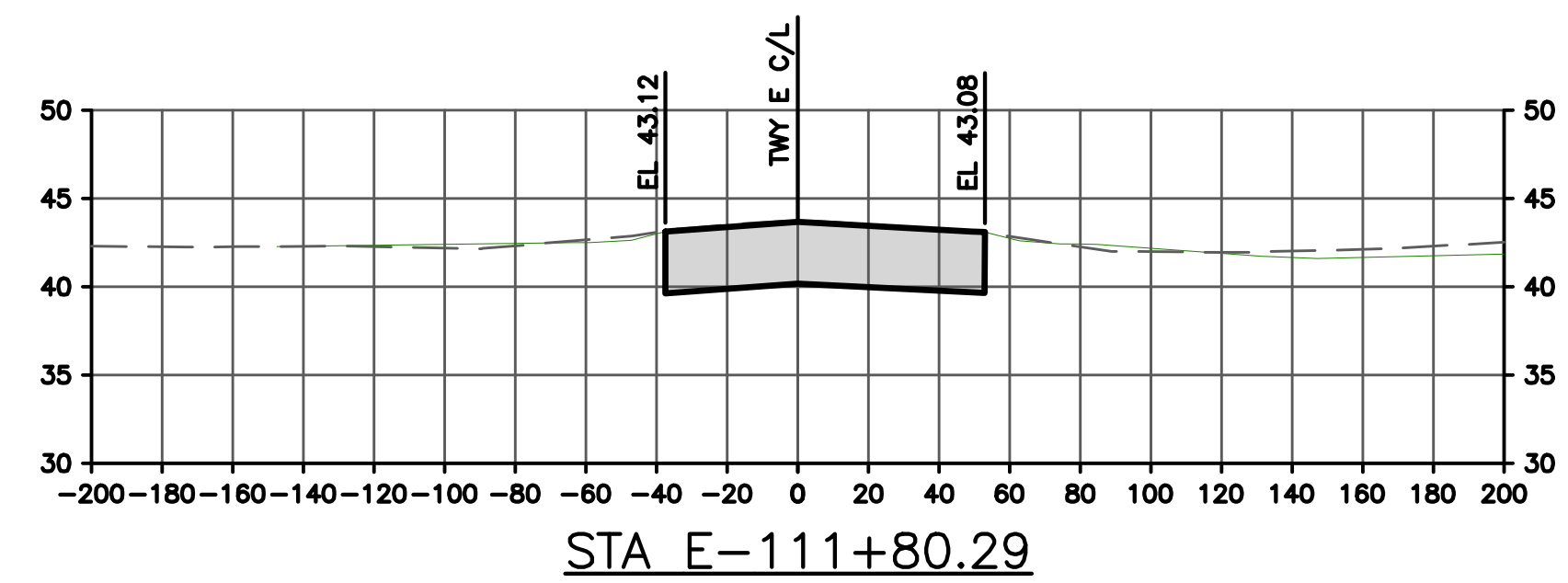
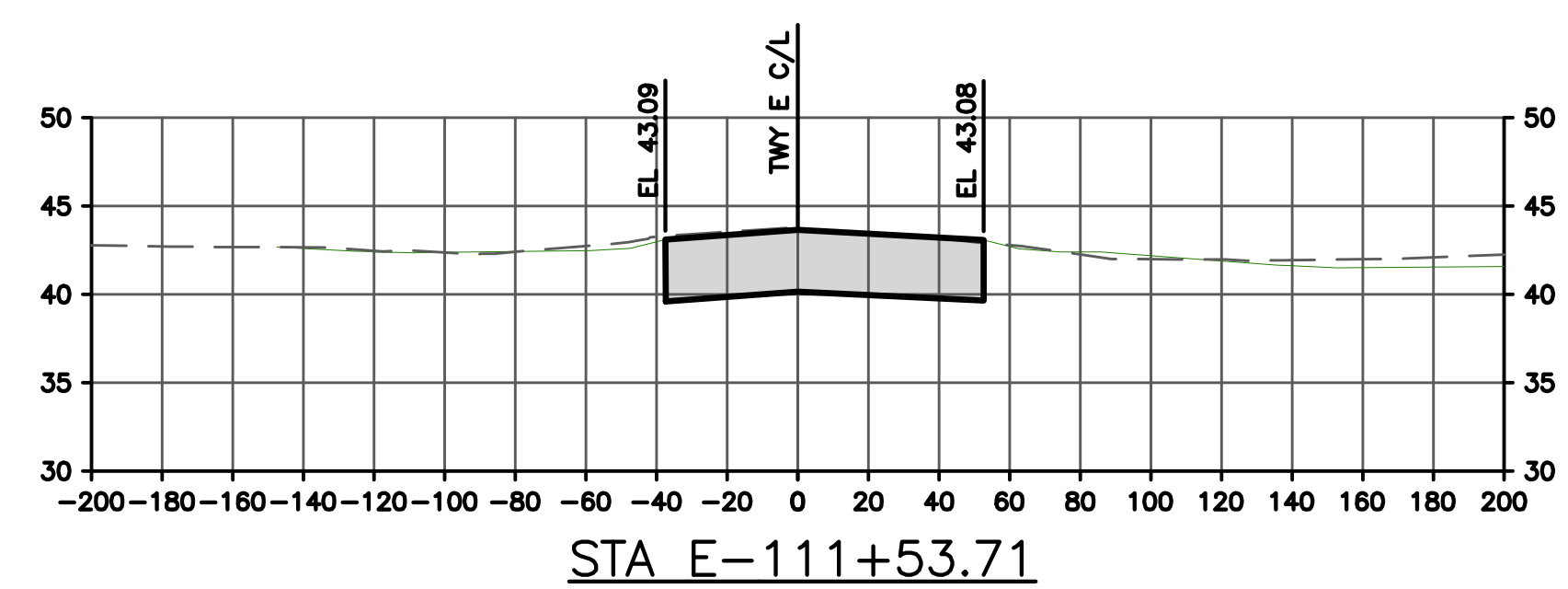
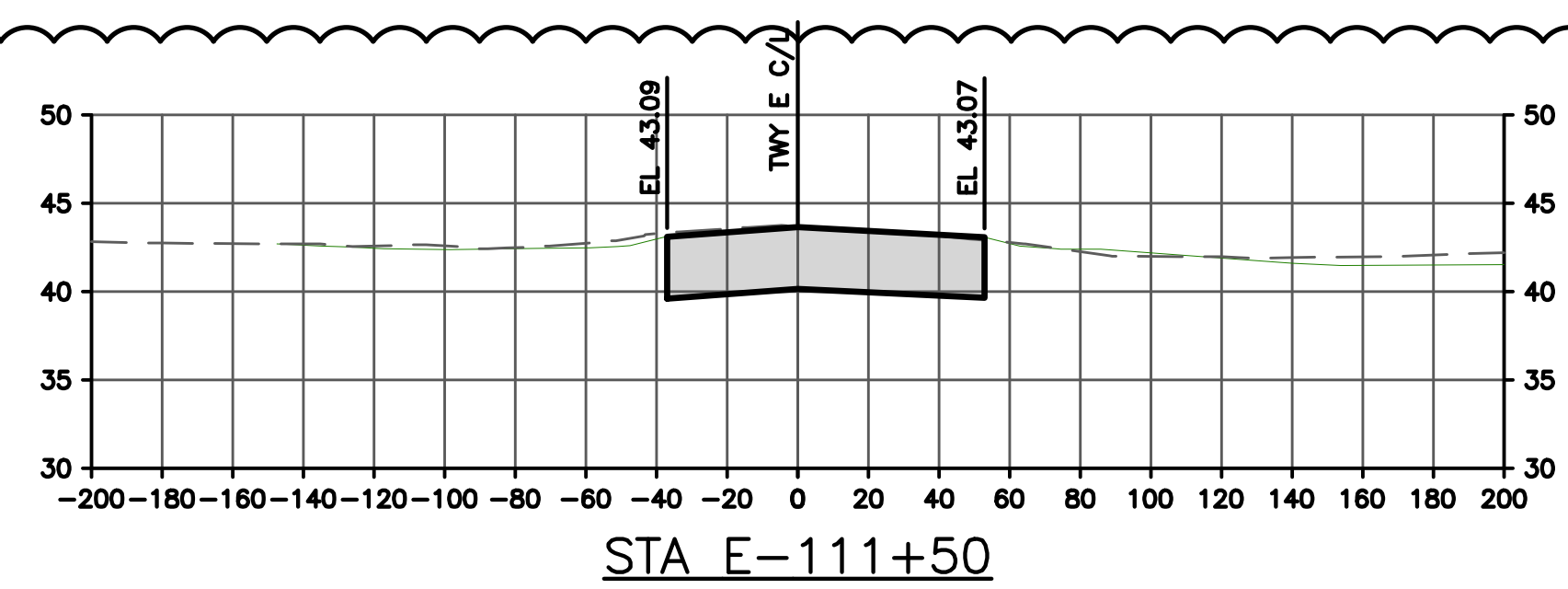
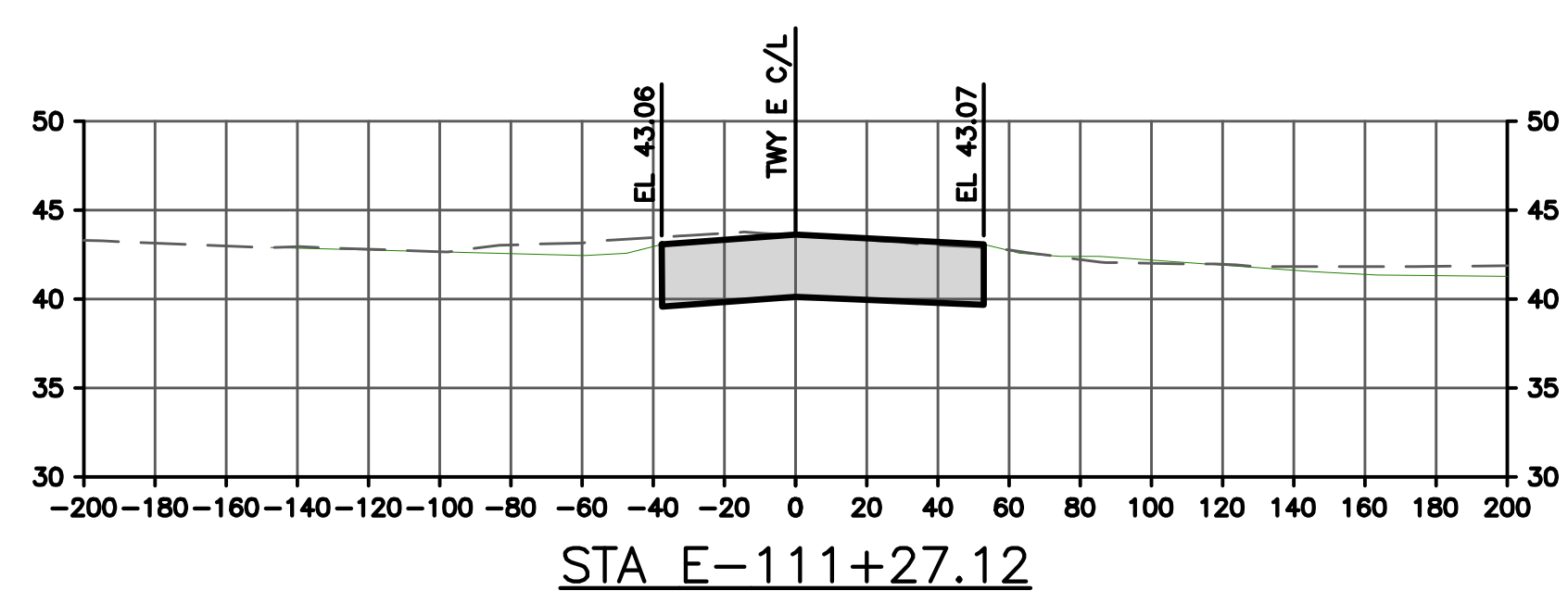
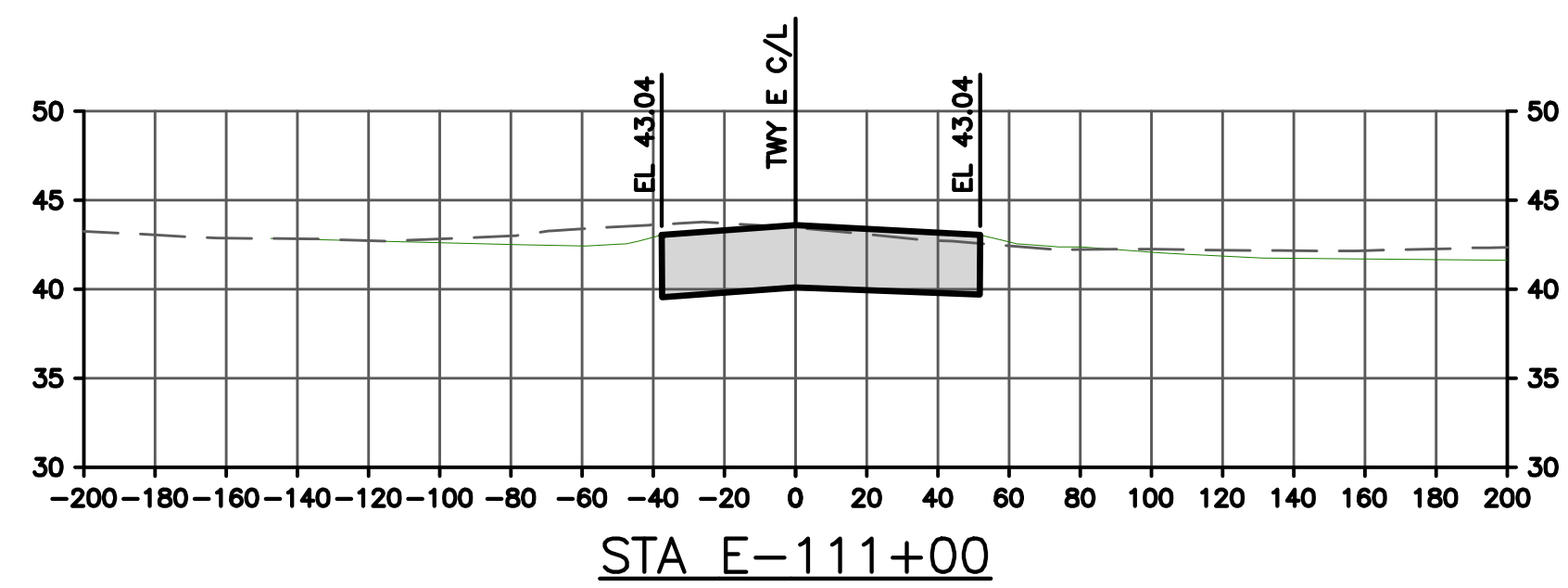
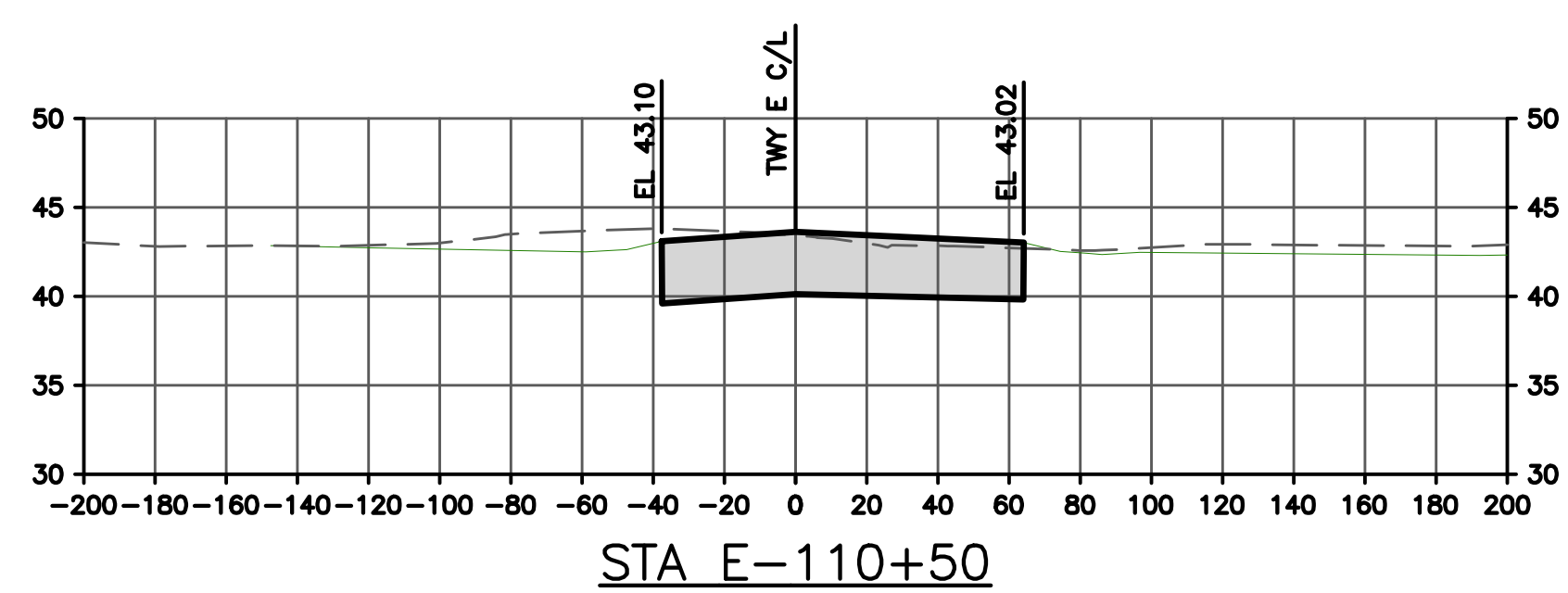
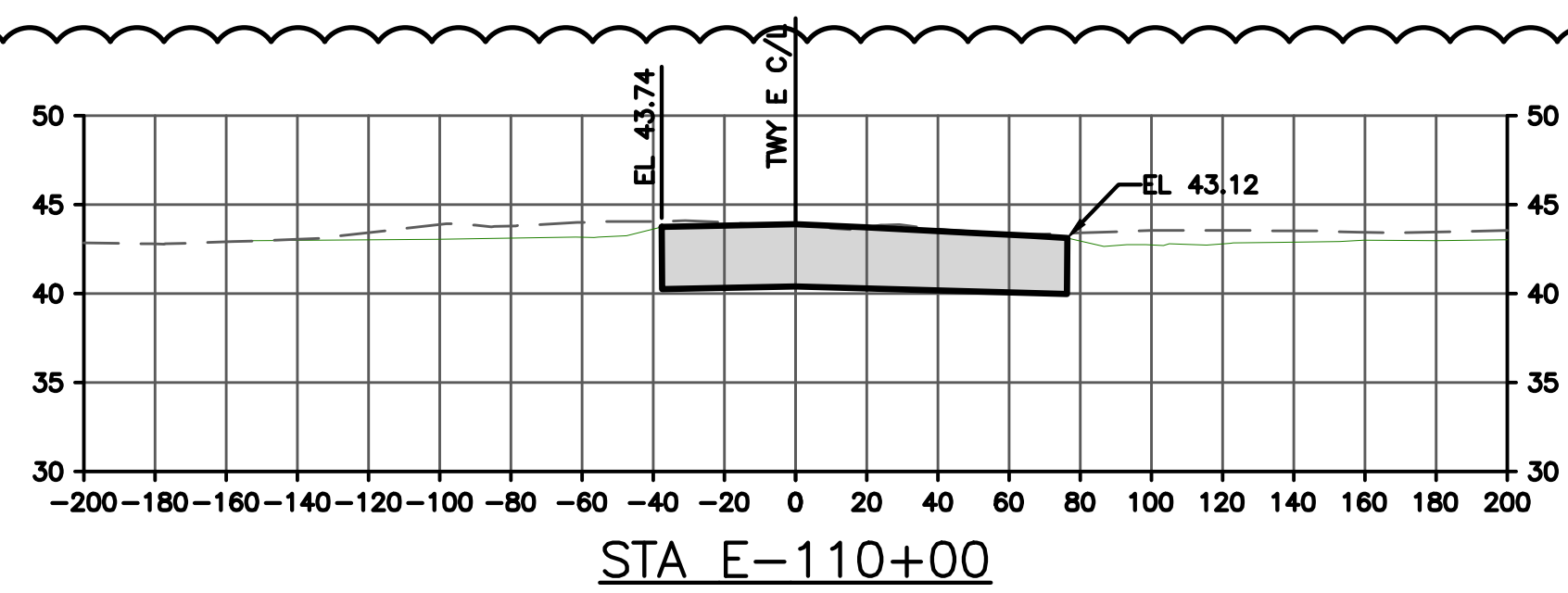
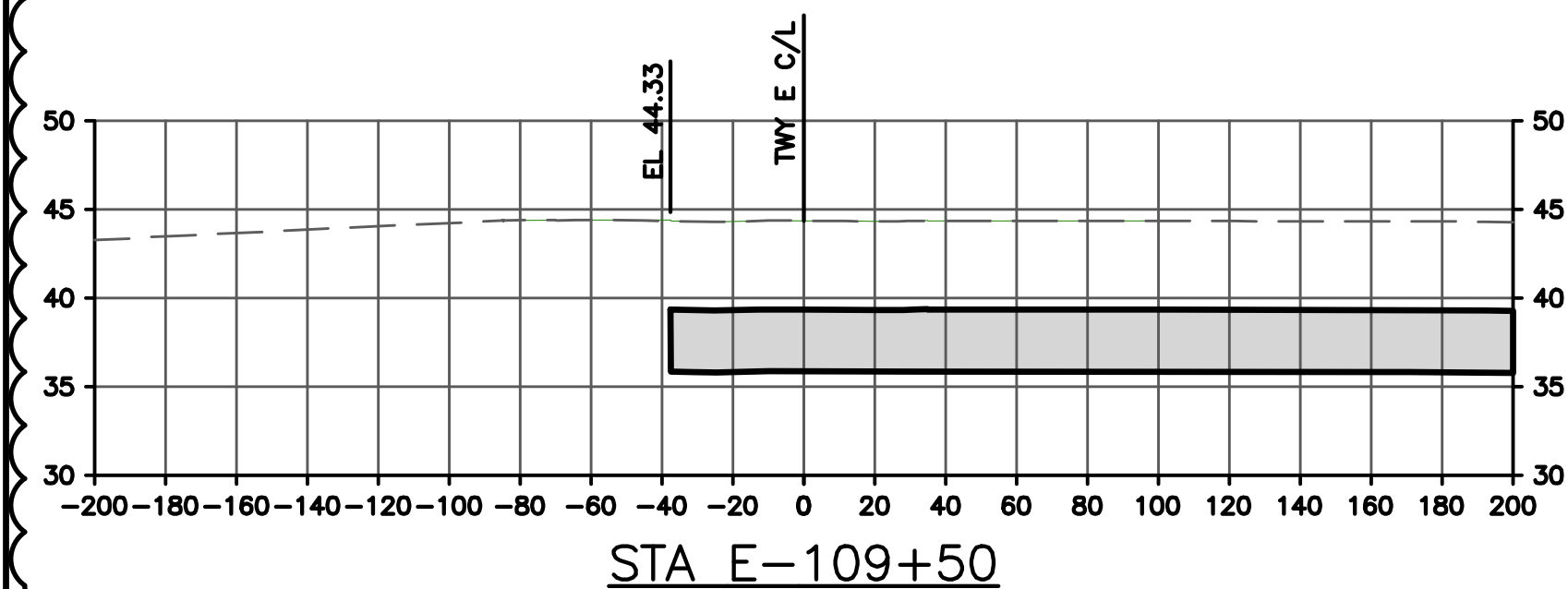
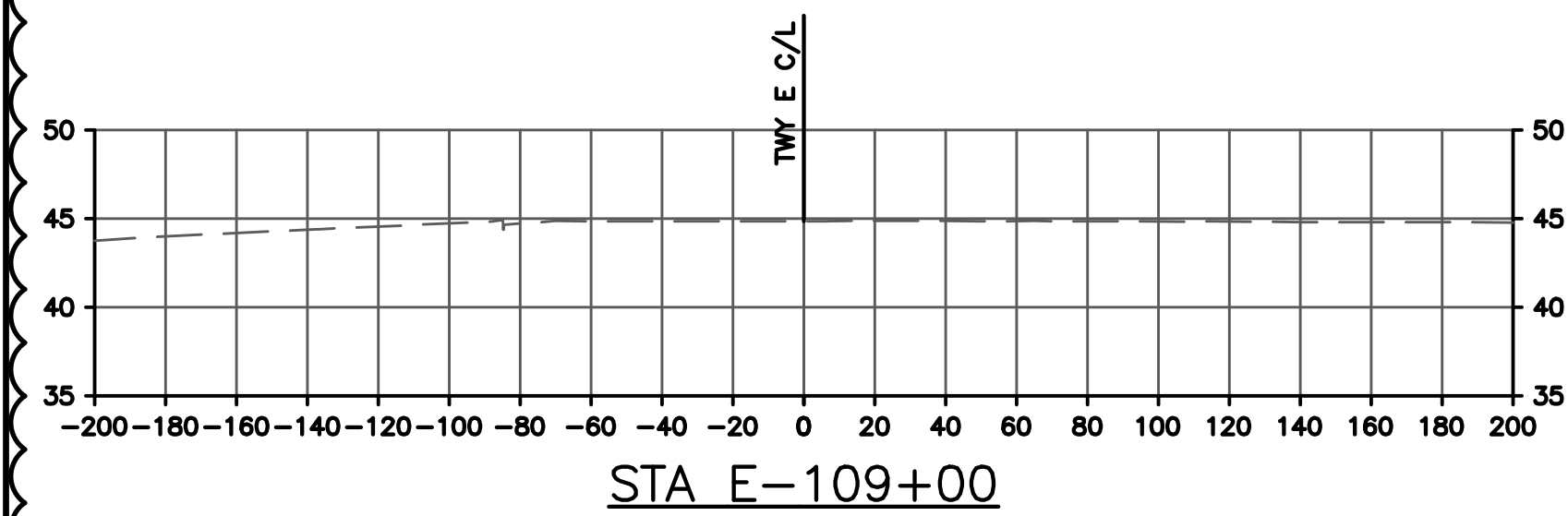
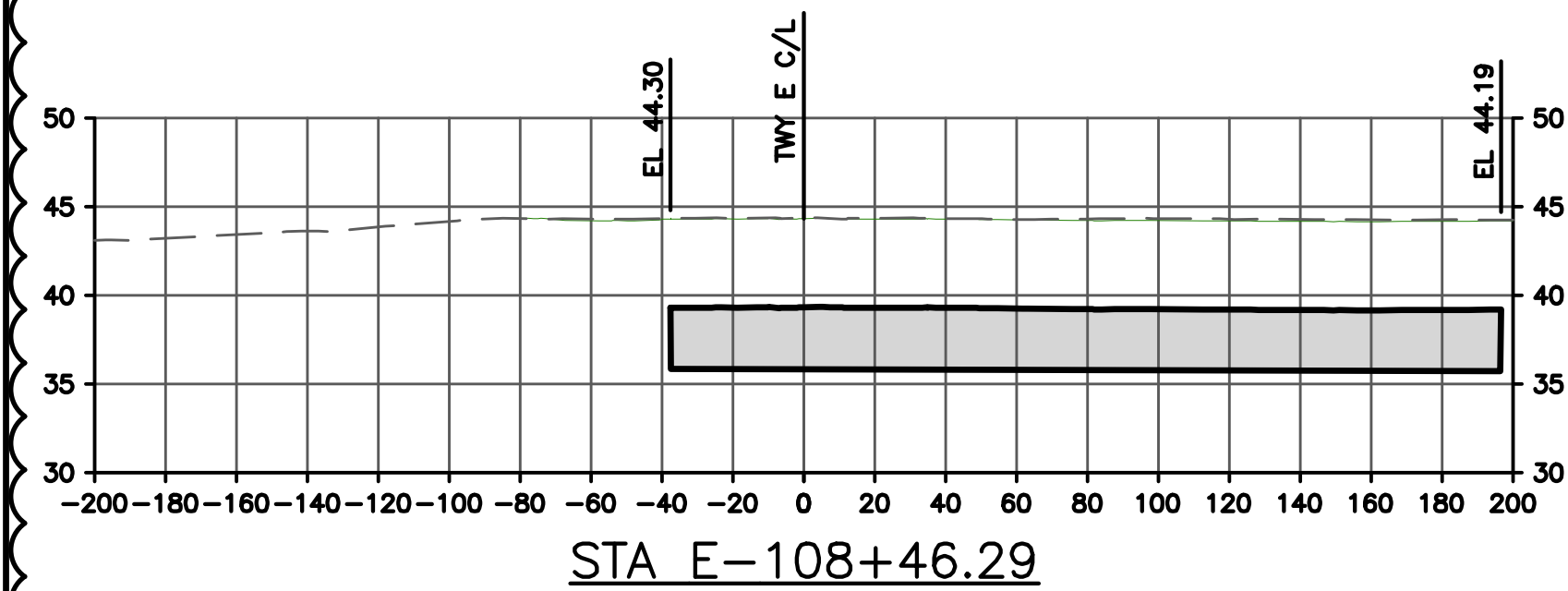
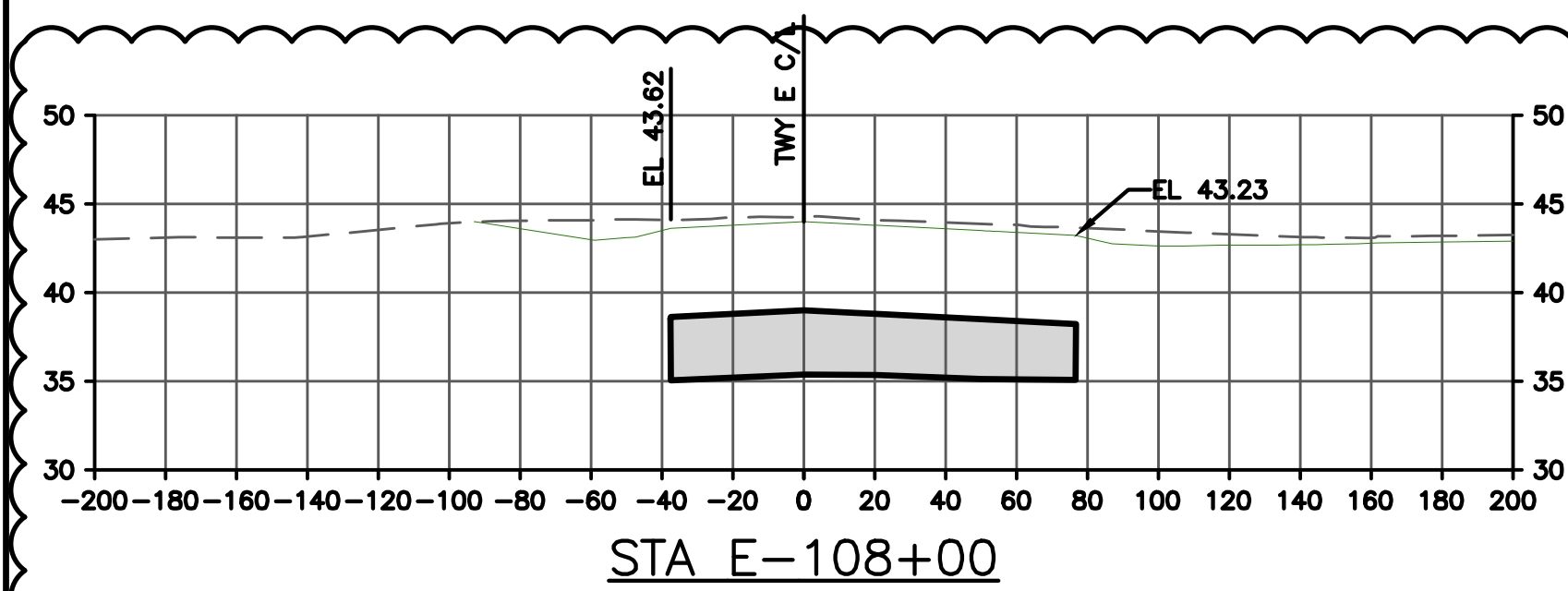
APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**DIRECTOR  
HOUSTON AIRPORT SYSTEM**

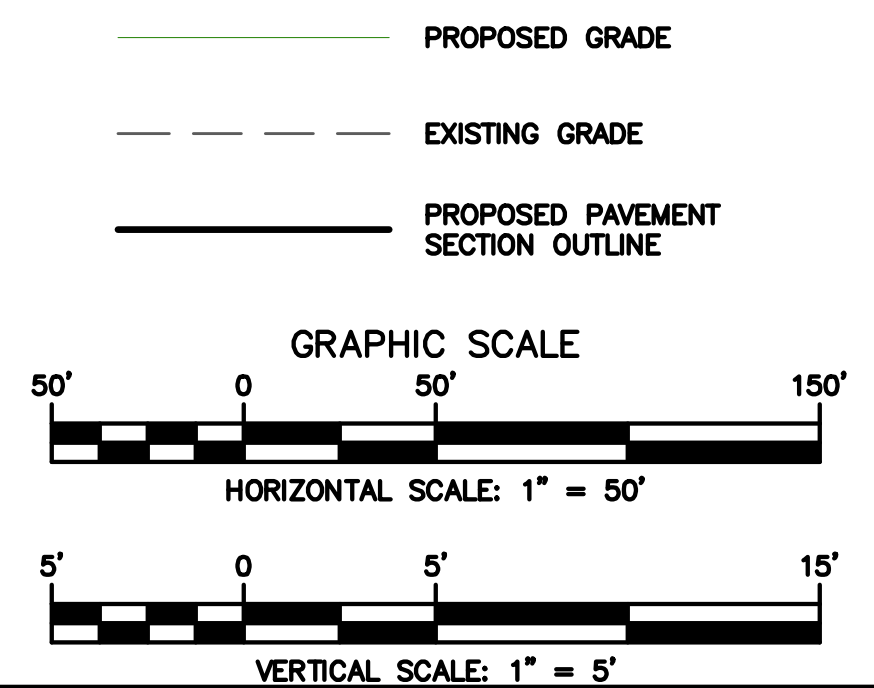
SUBJECT NO: 770  
 P. NO: 3-48-0110-044  
 S. NO: N/A  
 SET NO:

KS311  
of





LEGEND:

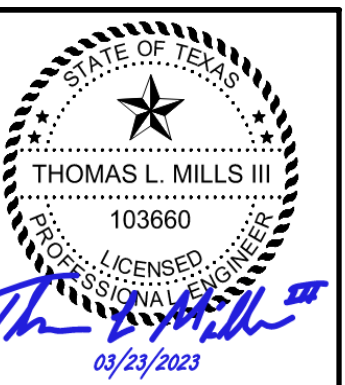


REVISIONS		
DESCRIPTION	DATE	BY
ISSUED FOR BID	02/24/2023	SC
ADDENDUM	03/23/2023	SC

FAA NON-STANDARD TAXIWAYS PROJECT

## CROSS SECTIONS - TAXIWAY E

PROJECT MGR:	S. CHILDERS
DESIGNER:	B. BARTLETT
OWNED BY:	S. WAZIRI
CHECKED BY:	R. EHTESHAM
FILE:	AS SHOWN
DATE:	03/23/2023



APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**DIRECTOR**  
**HOUSTON AIRPORT SYSTEM**

PROJECT NO: 770  
P. NO: 3-48-0110-044  
S. NO: N/A  
ET NO:

XS312  
of





HOUSTON AIRPORT SYSTEM  
WILLIAM P. HOBBY AIRPORT  
HOUSTON TEXAS

**Jacobs**  
JACOBS ENGINEERING GROUP INC.  
5995 ROGERDALE ROAD  
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+1-832-351-6000  
WWW.JACOBS.COM  
TEXAS P.E. FIRM F-2966

VERIFY SCALE  
BAR IS ONE INCH ON  
ORIGINAL DRAWING.  
0 1"

REVISIONS			
NO.	DESCRIPTION	DATE	BY
0	ISSUED FOR BID	02/24/2023	SC
1	ADDENDUM	03/23/2023	SC

FAA NON-STANDARD TAXIWAYS PROJECT

CROSS SECTIONS – TAXIWAY G

PROJECT MGR: S. CHILDERS  
DESIGNER: B. BARTLETT  
DRAWN BY: S. WAZIRI  
CHECKED BY: R. EHTESHAM  
SCALE: AS SHOWN  
DATE: 03/23/2023

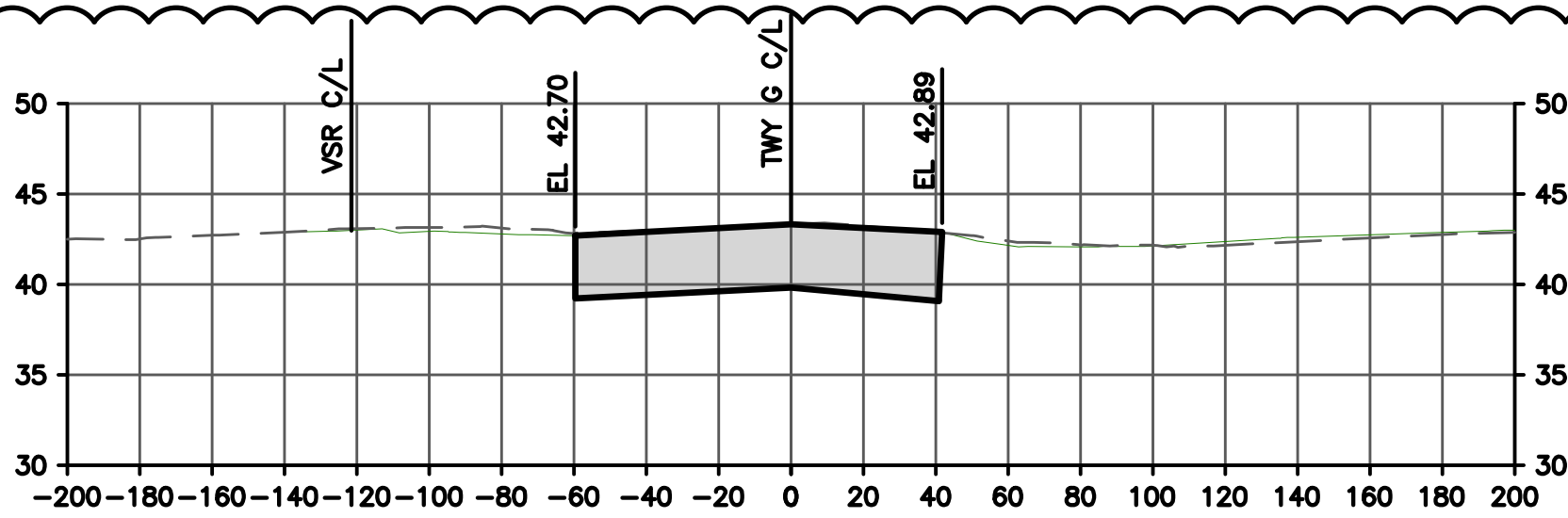


APPROVED BY: DATE:

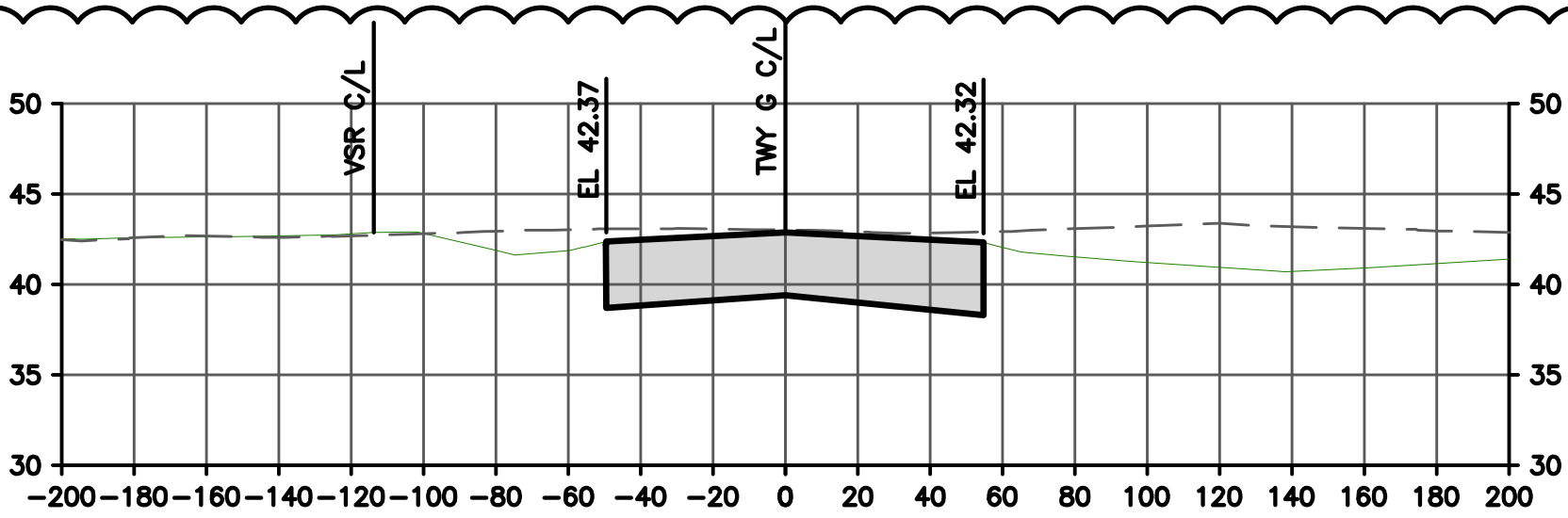
DIRECTOR  
HOUSTON AIRPORT SYSTEM

PROJECT NO: 770  
C.I.P. NO: 3-48-0110-044  
H.A.S. NO: N/A  
SHEET NO:

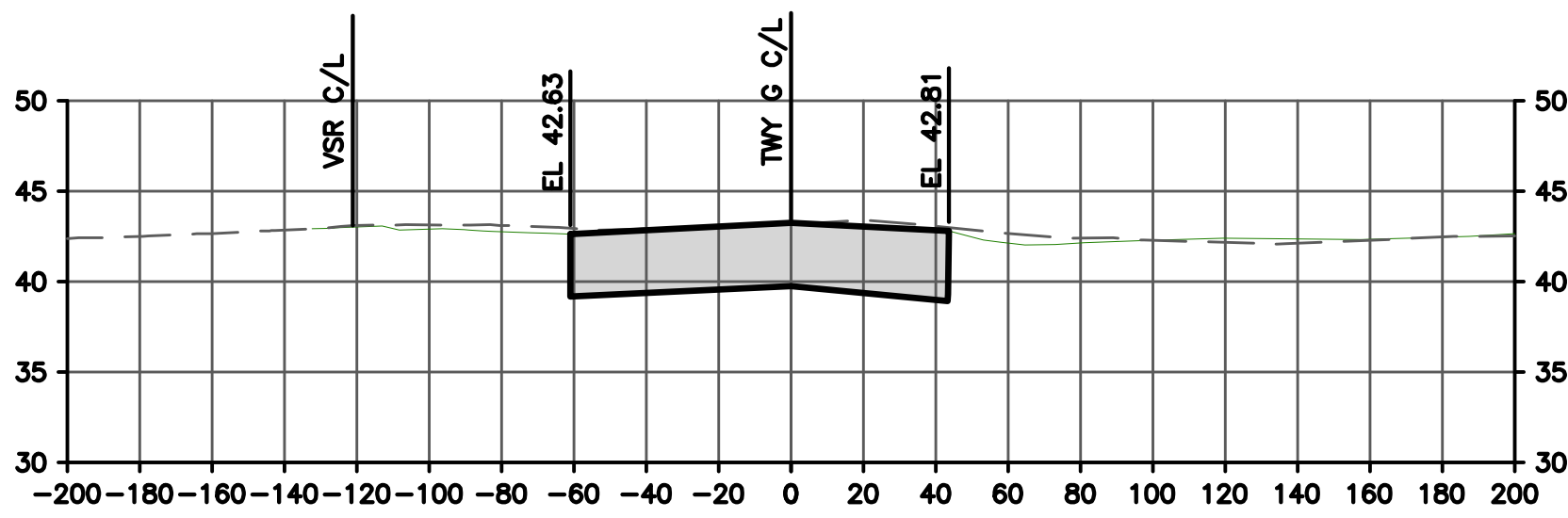
**XS321**  
of



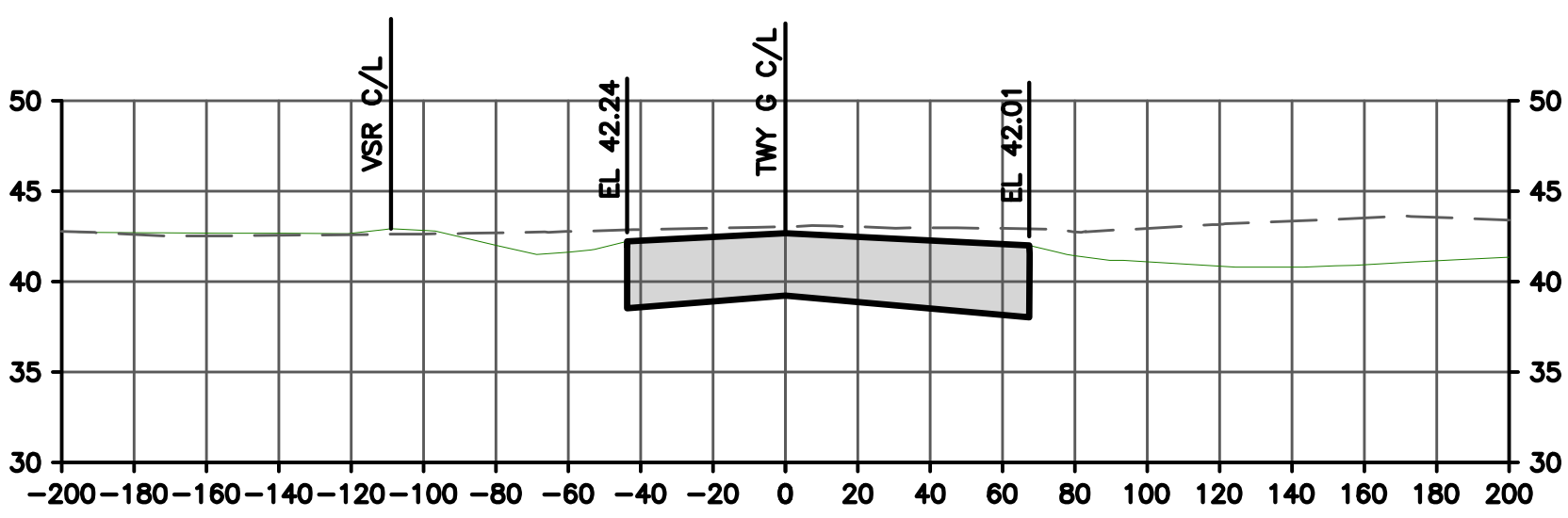
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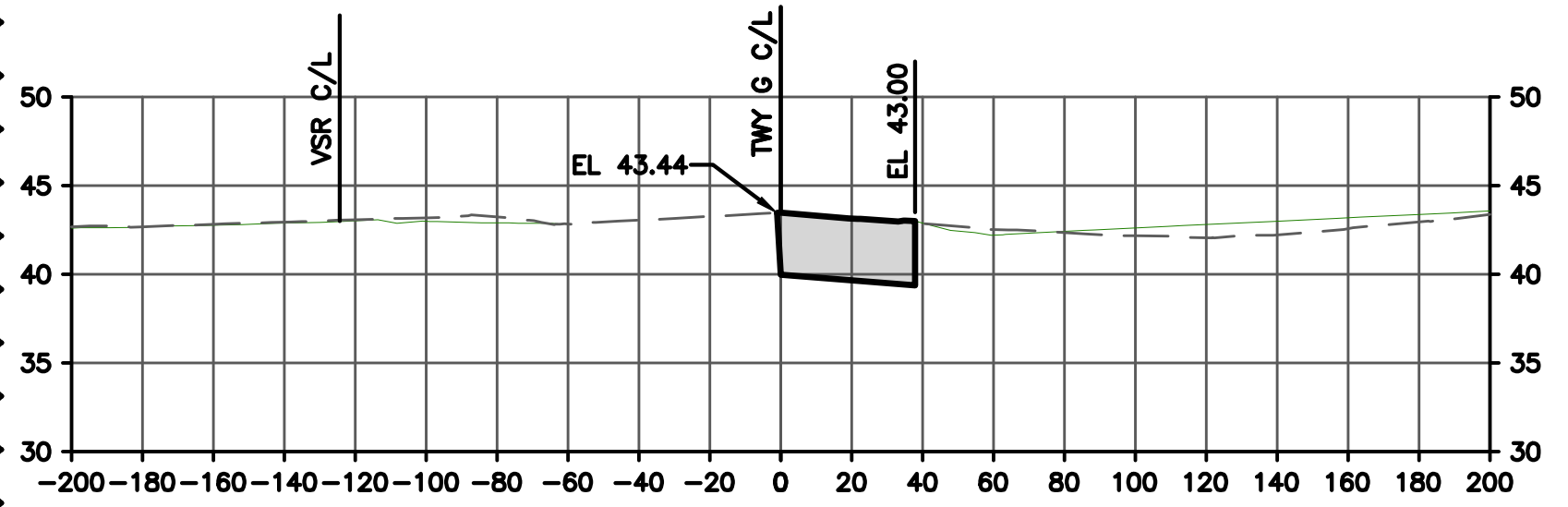
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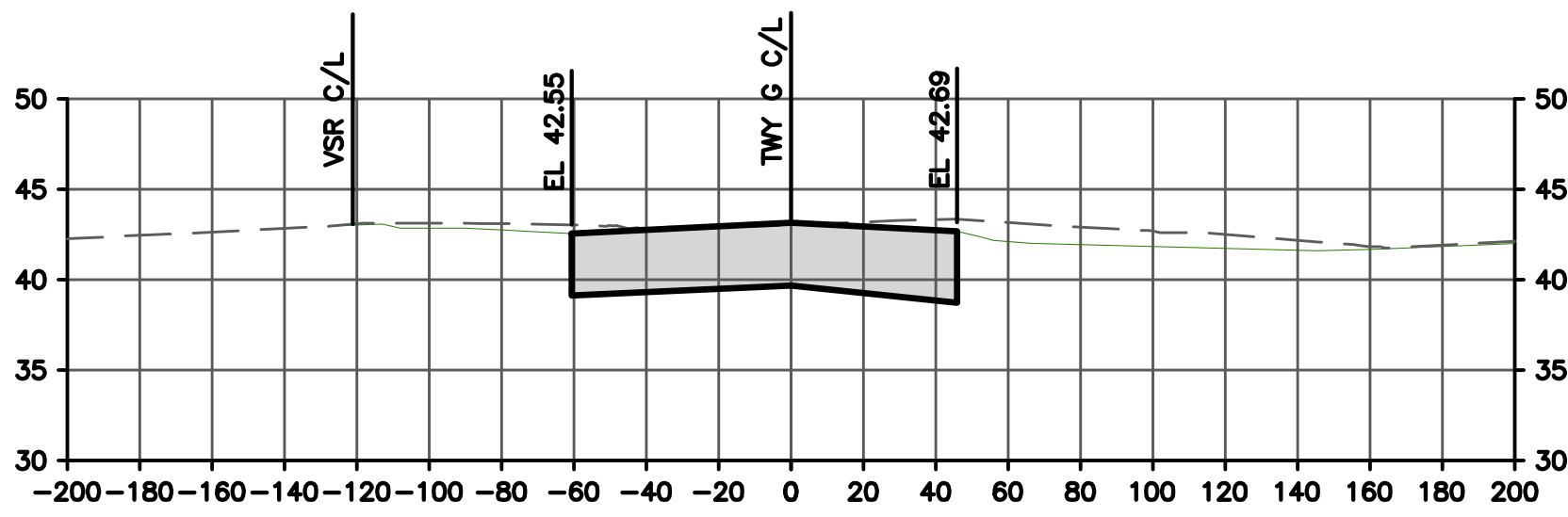
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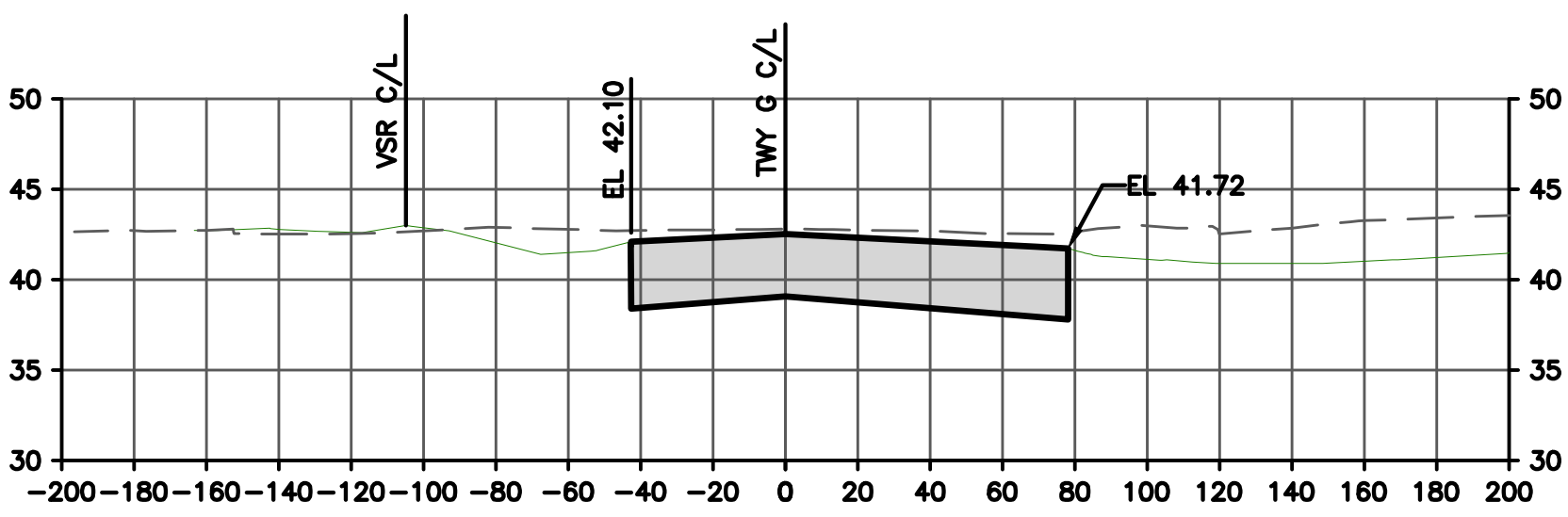
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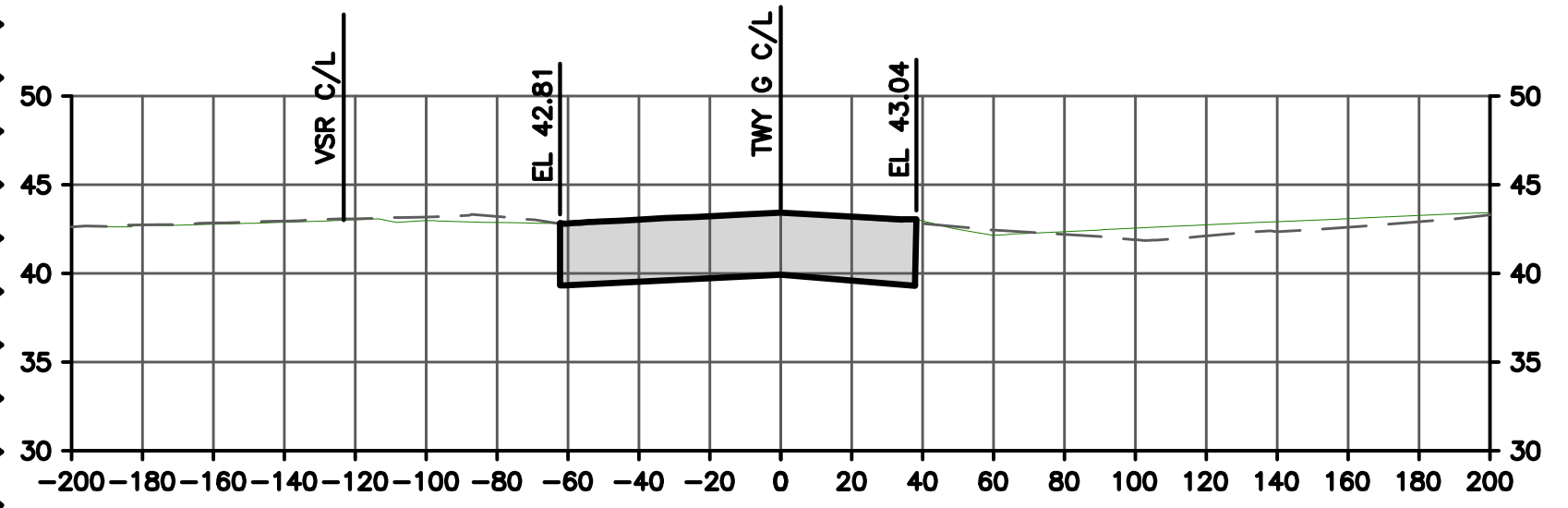
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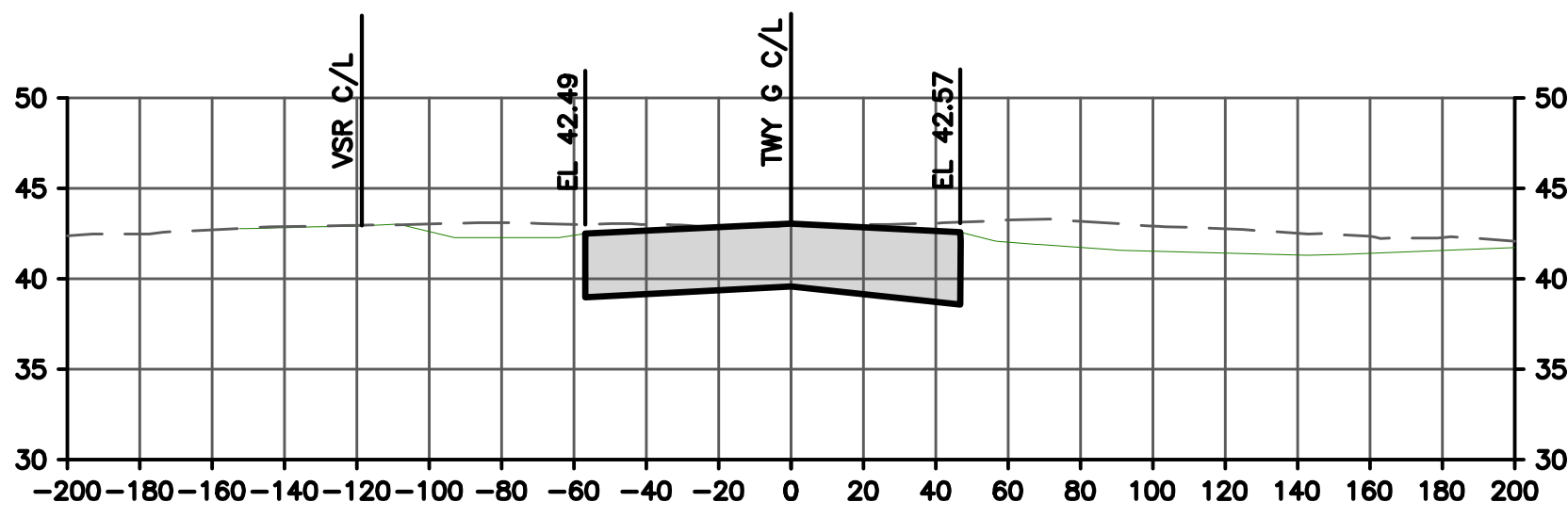
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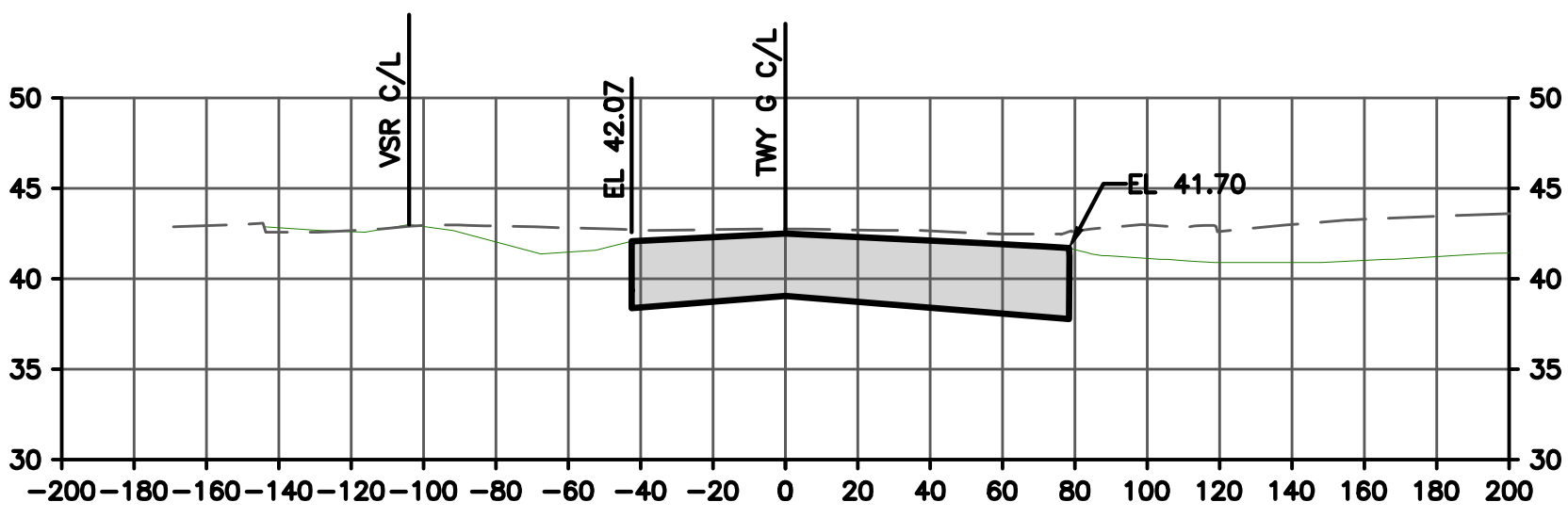
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STA G-103+00



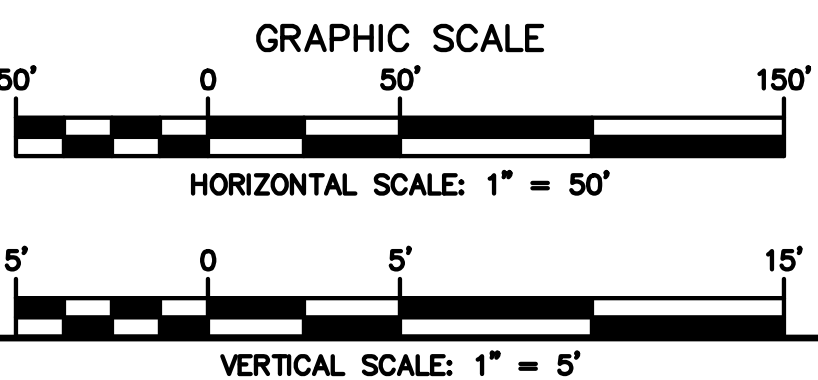
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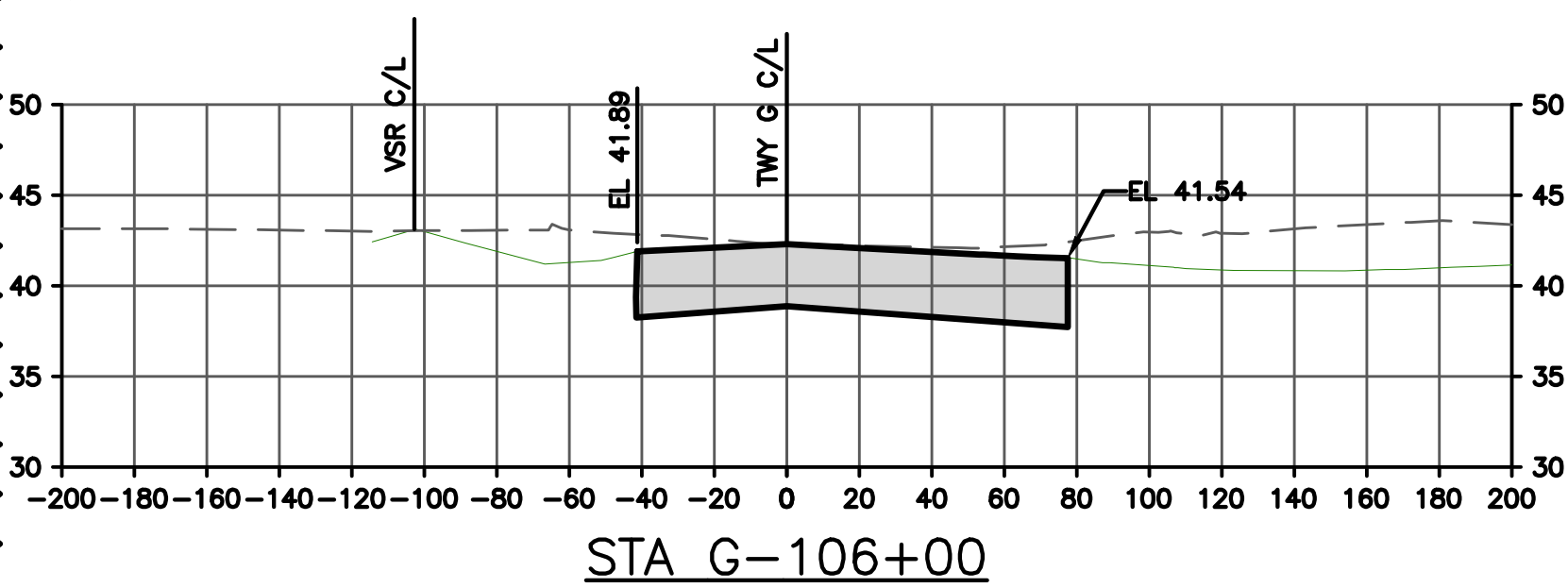
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LEGEND:

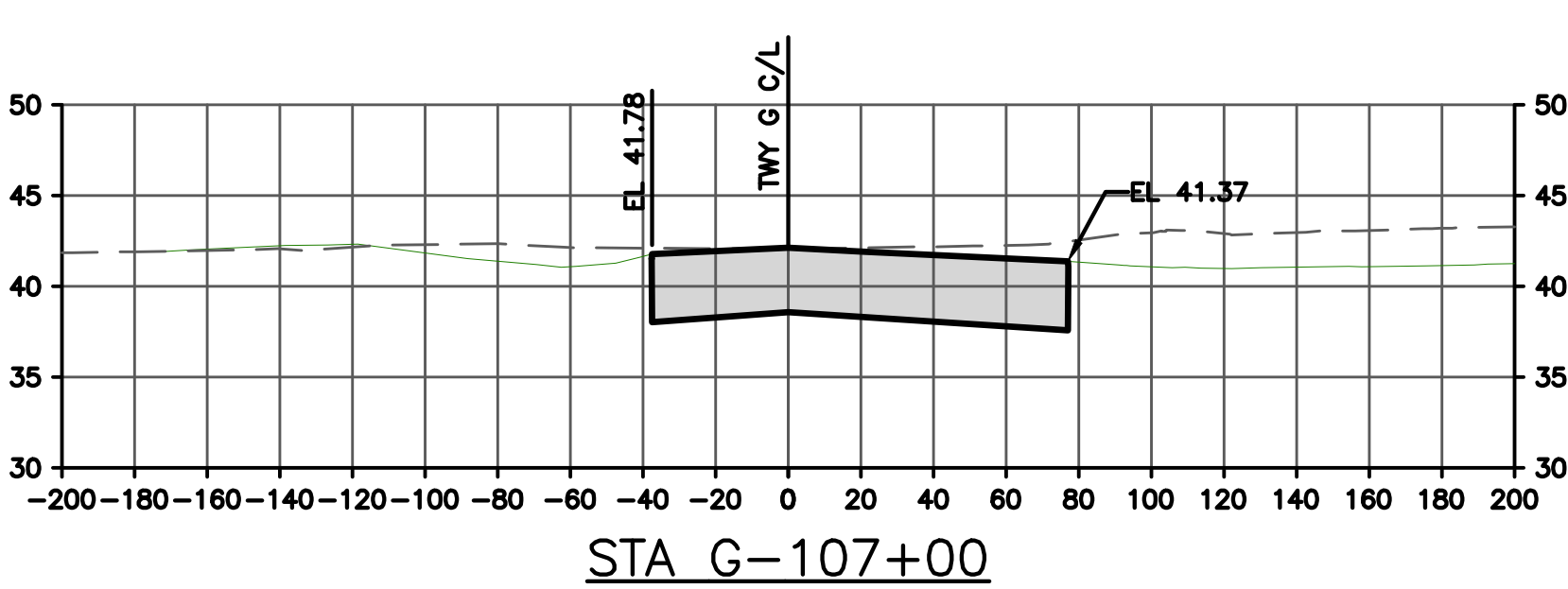
- PROPOSED GRADE
- EXISTING GRADE
- PROPOSED PAVEMENT SECTION OUTLINE



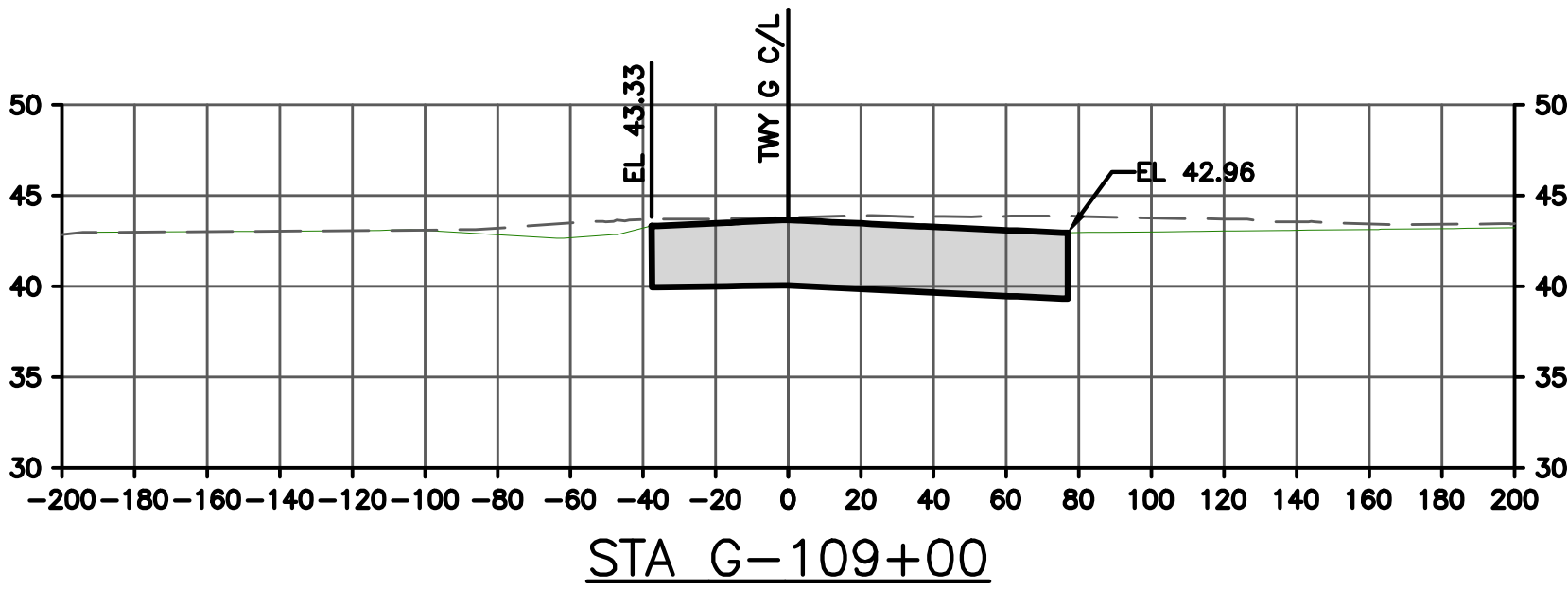




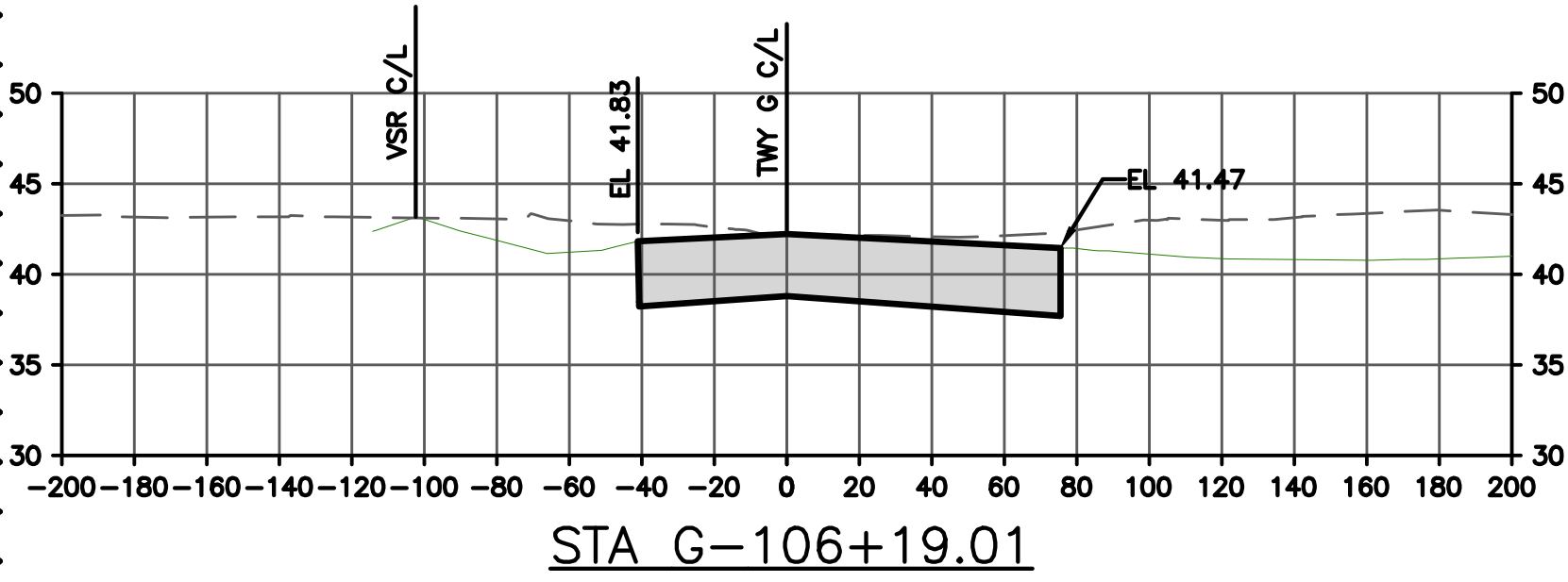
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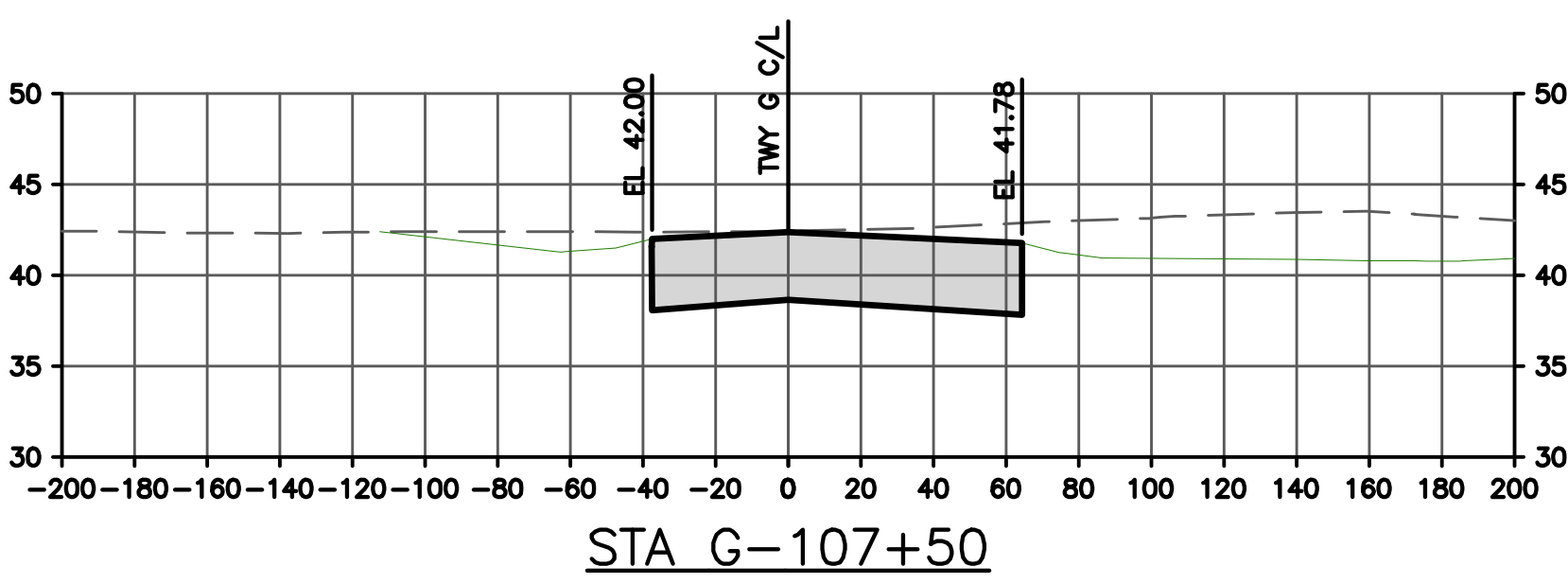
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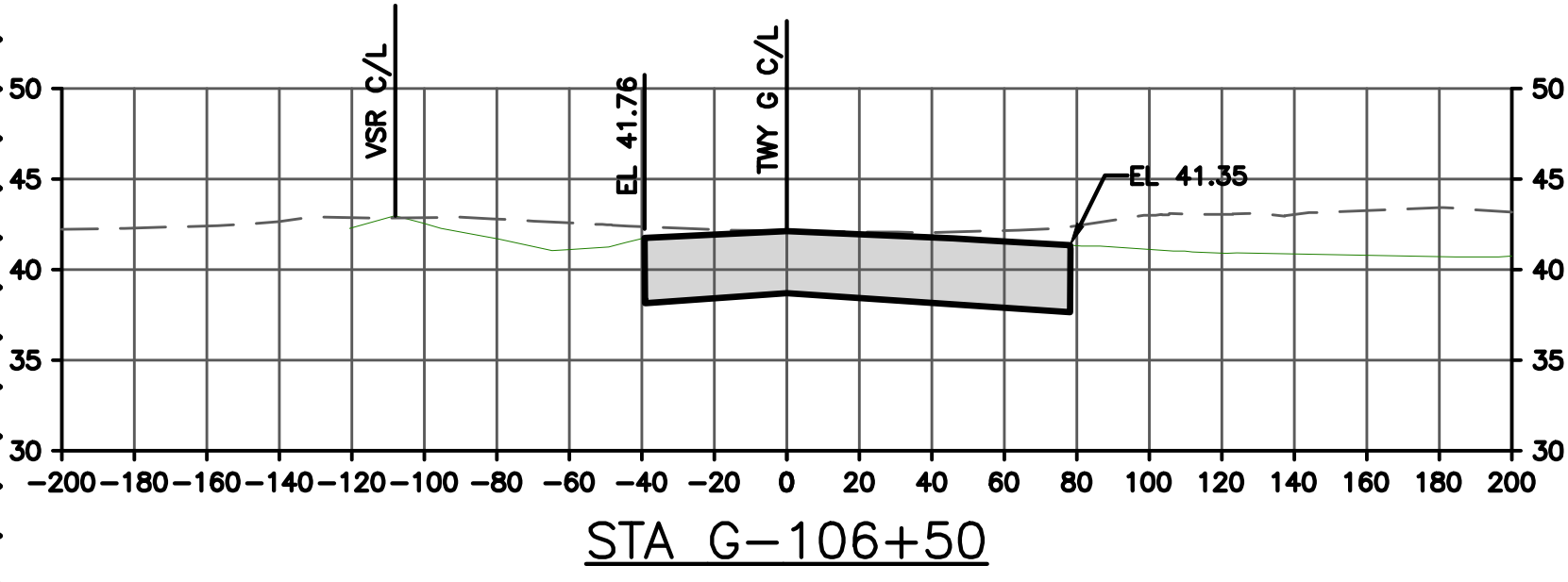
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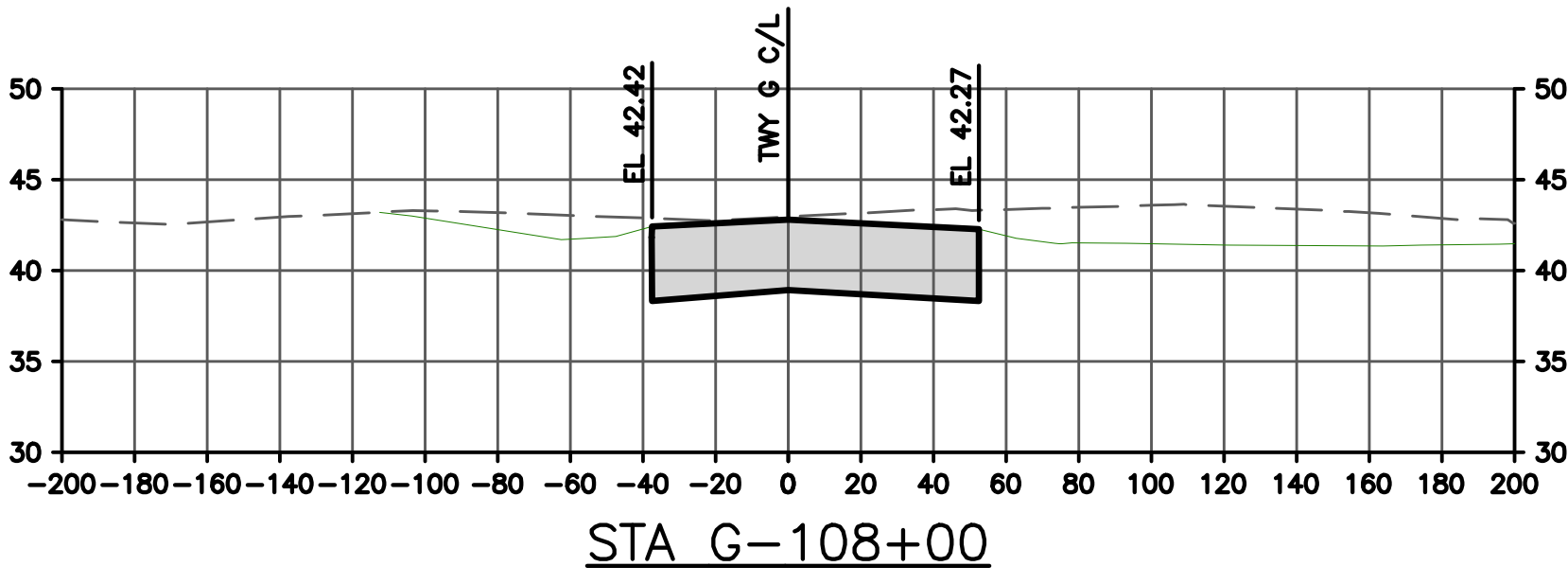
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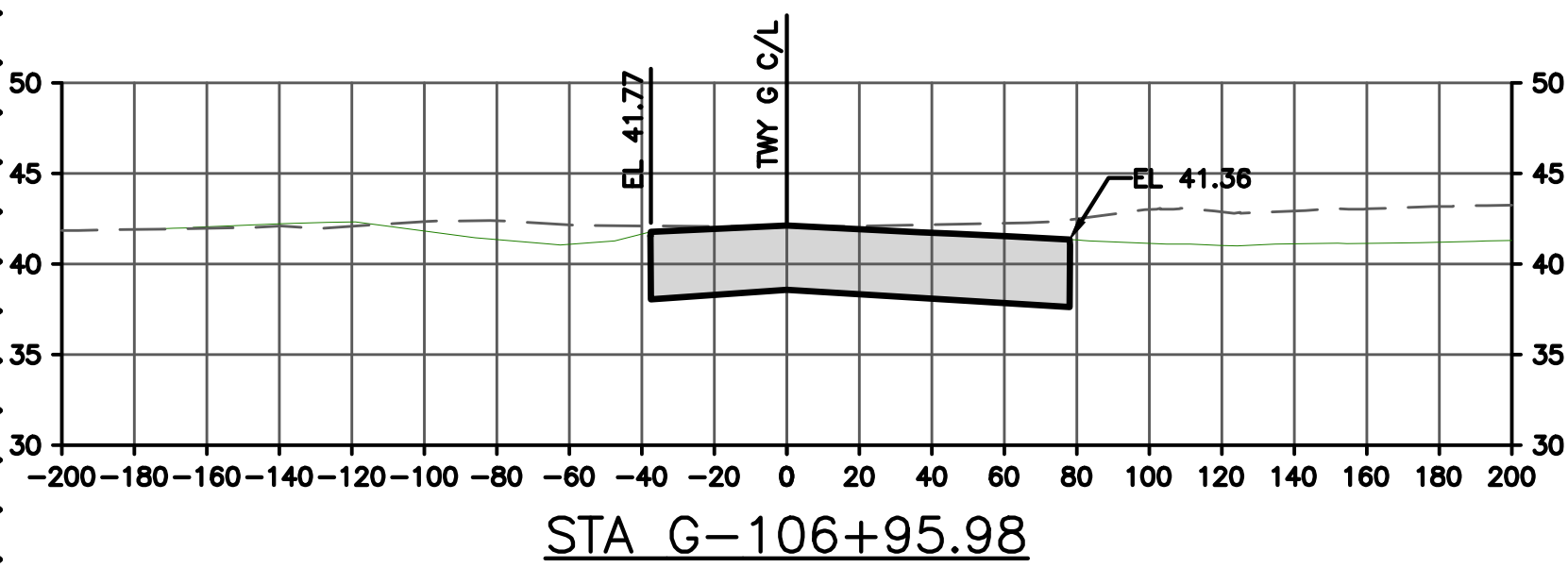
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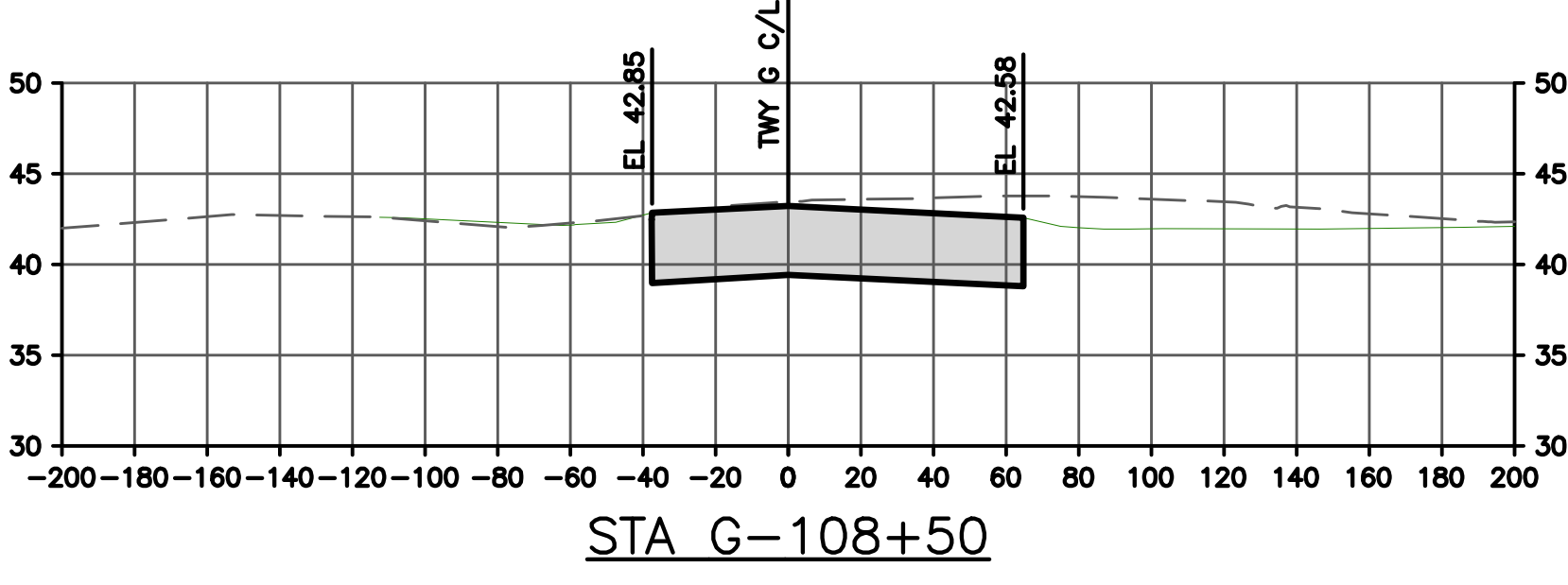
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STA G-108+00



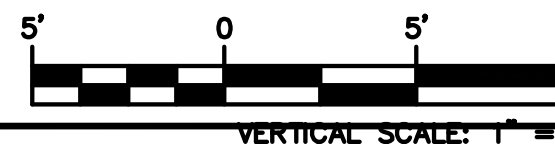
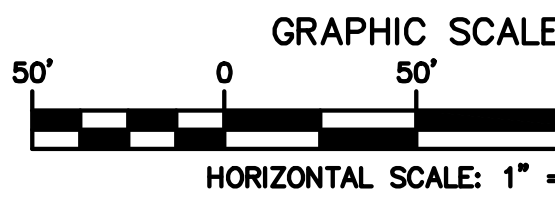
STA G-106+95.98



STA G-108+50

LEGEND:

- PROPOSED
- EXISTING G
- PROPOSED SECTION 0



HOUSTON AIRPORT SYSTEM  
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HOUSTON TEXAS

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+1-832-351-6000  
WWW.JACOBS.COM  
TEXAS P.E. FIRM F-2966

VERIFY SCALE  
BAR IS ONE INCH ON  
ORIGINAL DRAWING.  
0 1"

REVISIONS			
NO.	DESCRIPTION	DATE	BY
0	ISSUED FOR BID	02/24/2023	SC
1	ADDENDUM	03/23/2023	SC

FAA NON-STANDARD TAXIWAYS PROJECT

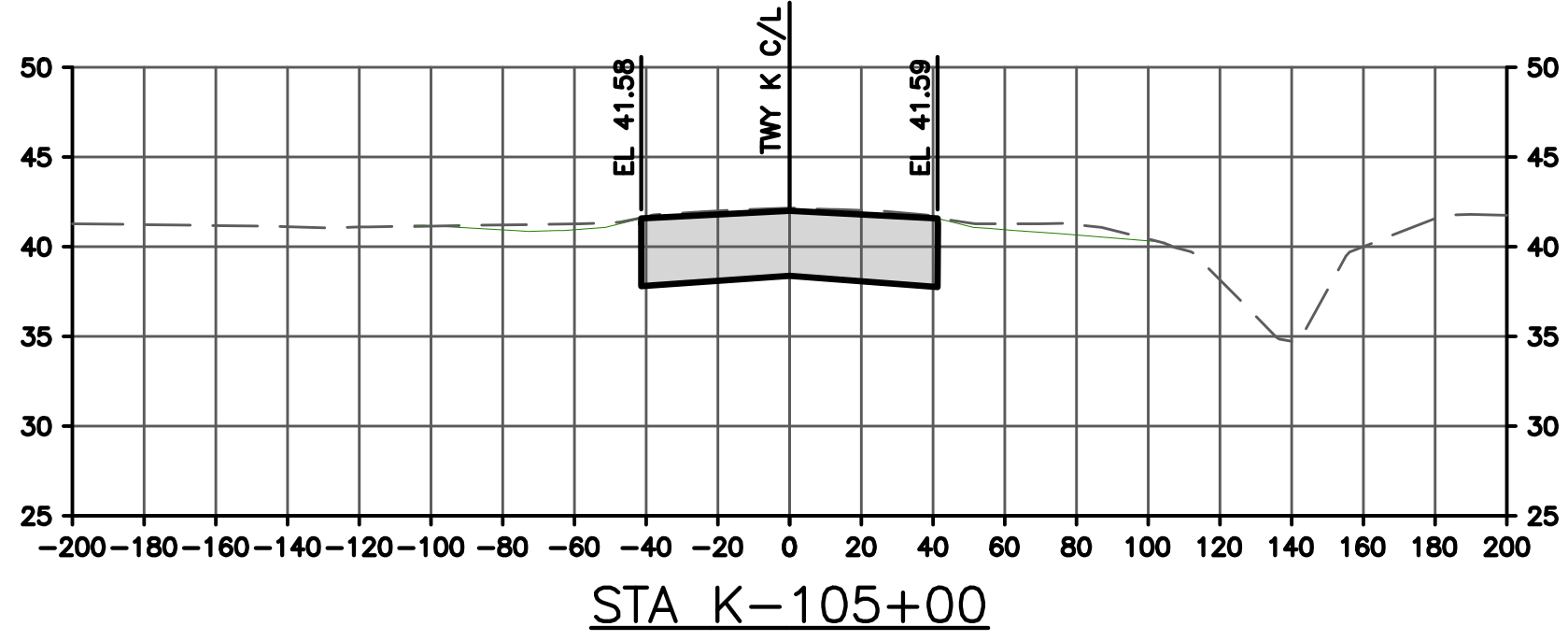
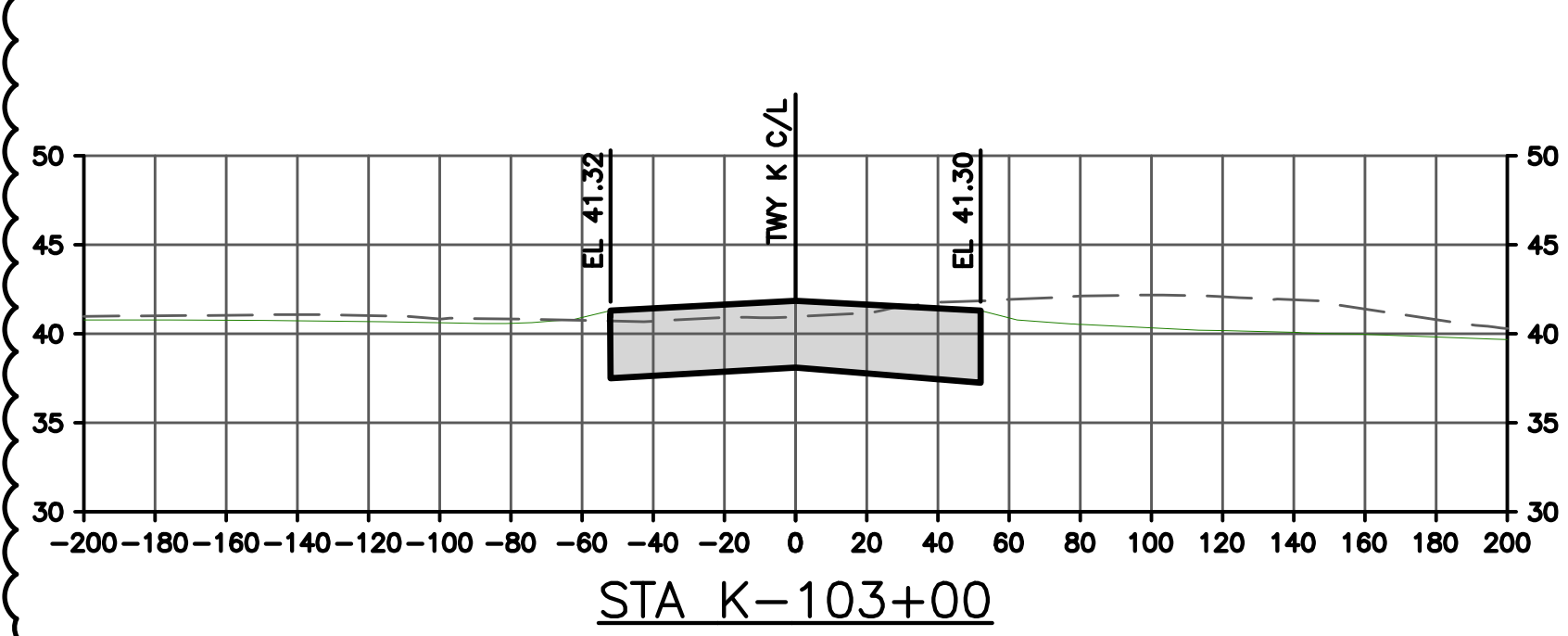
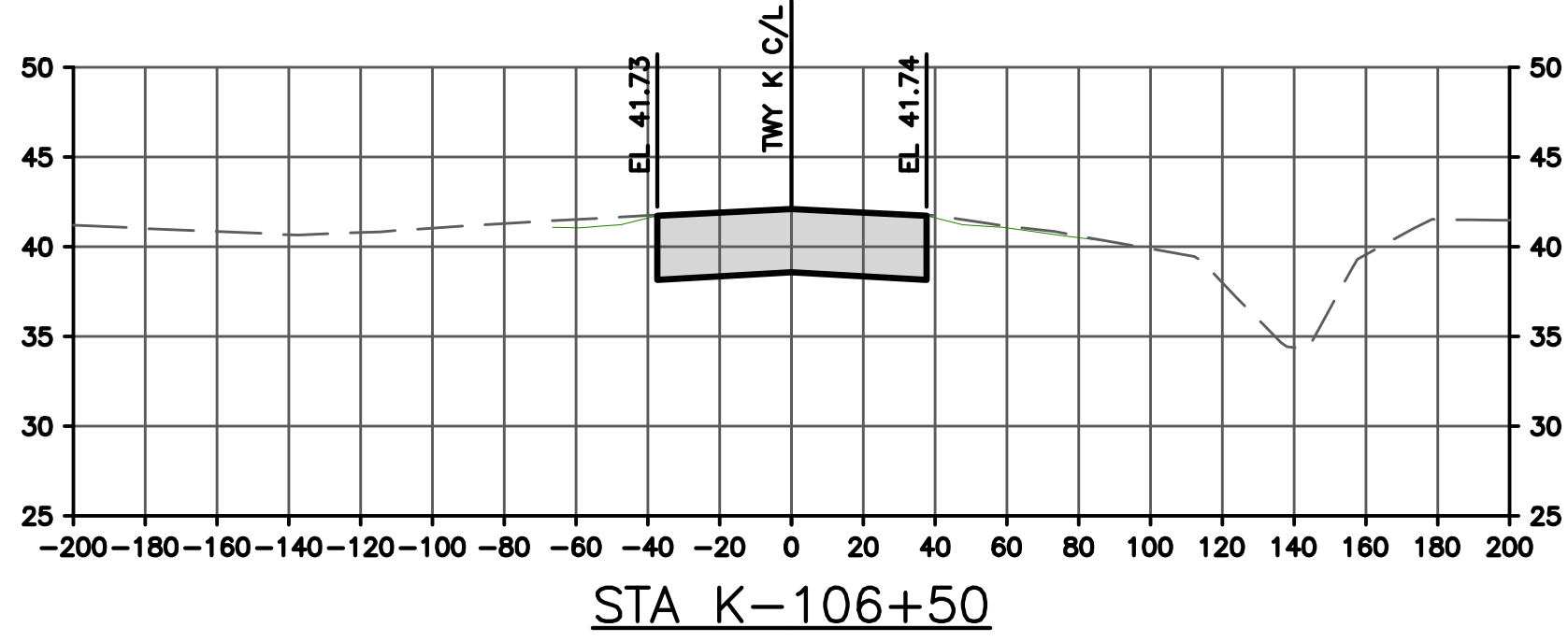
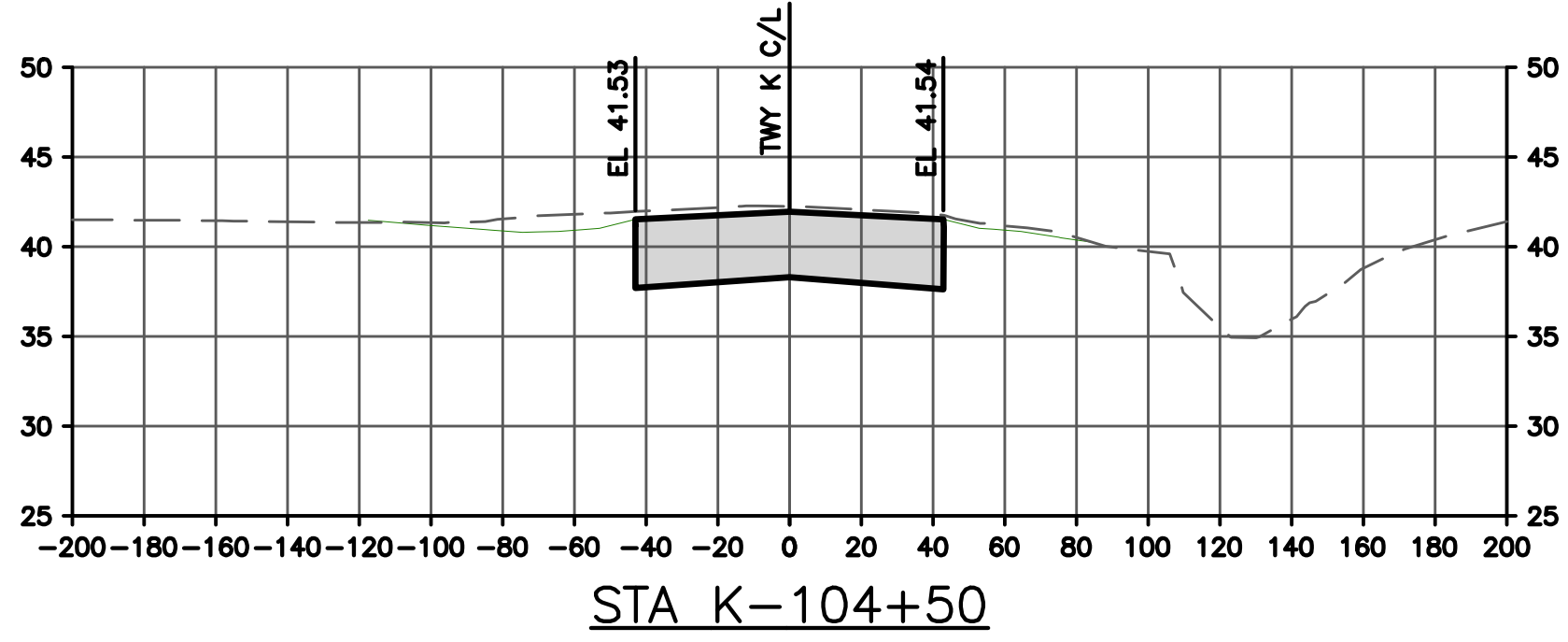
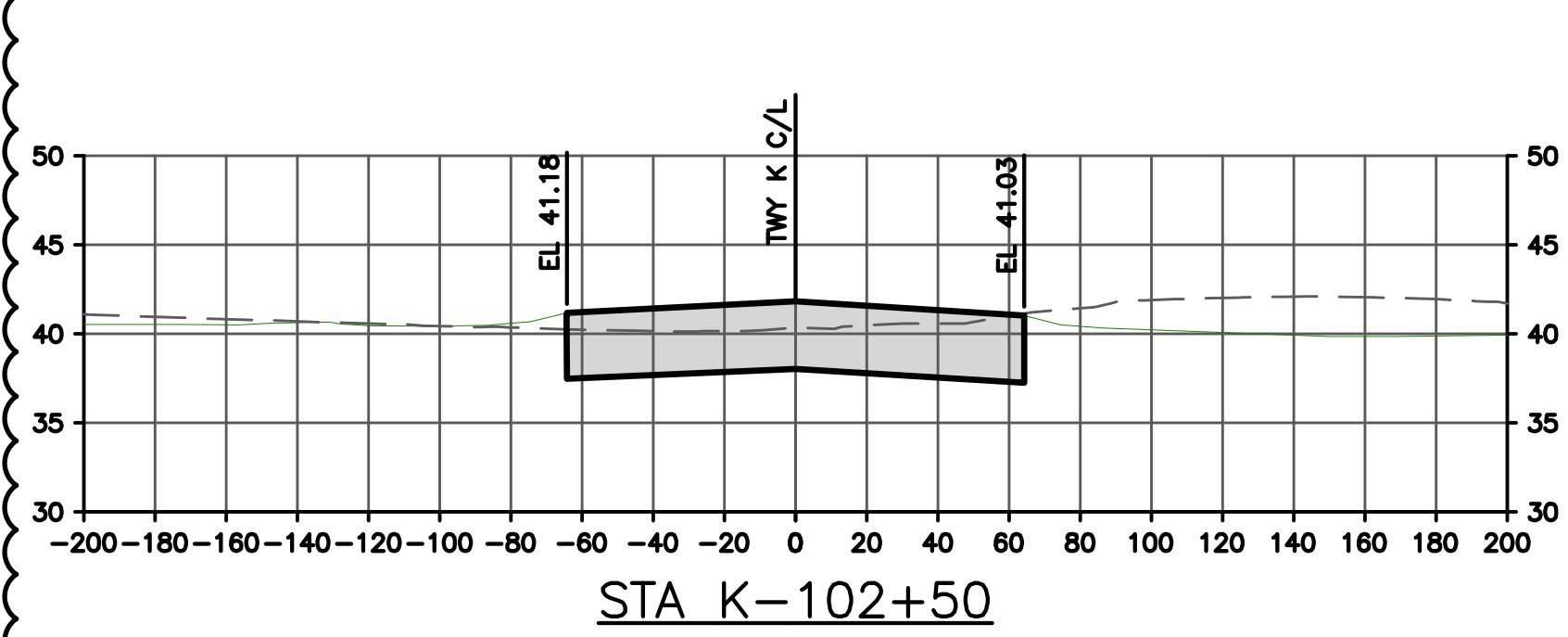
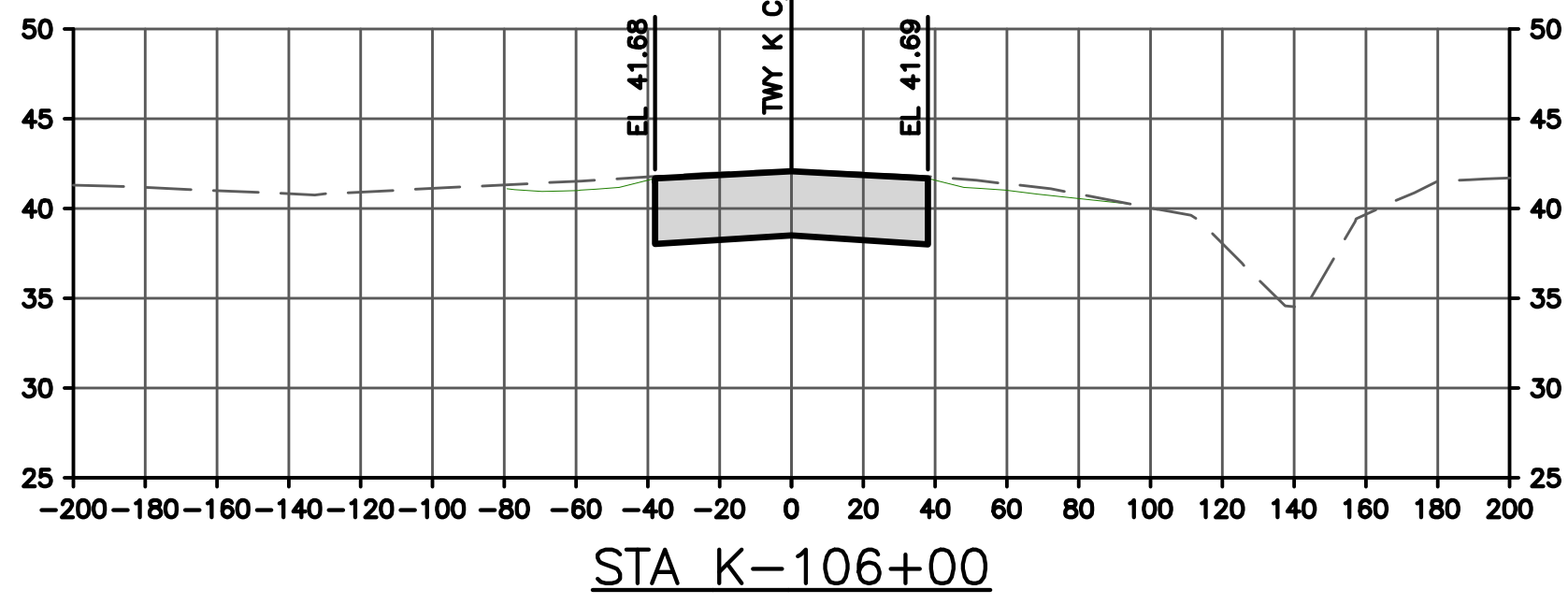
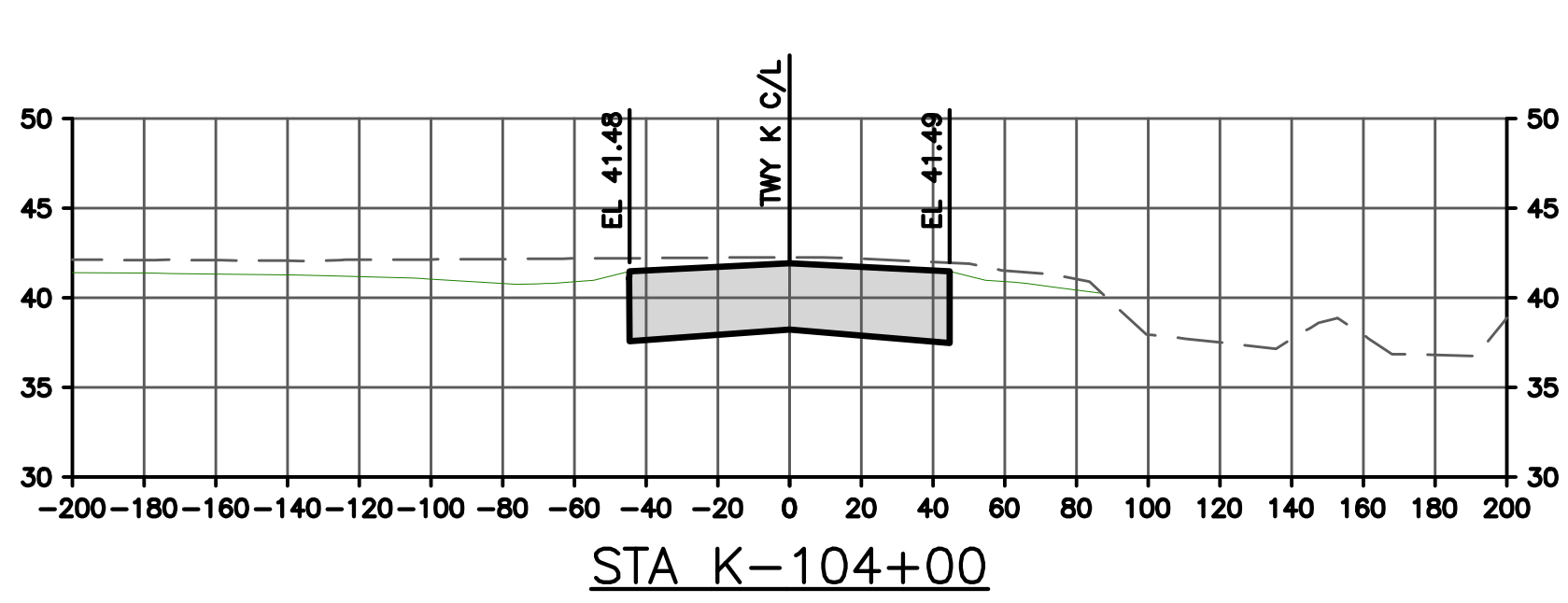
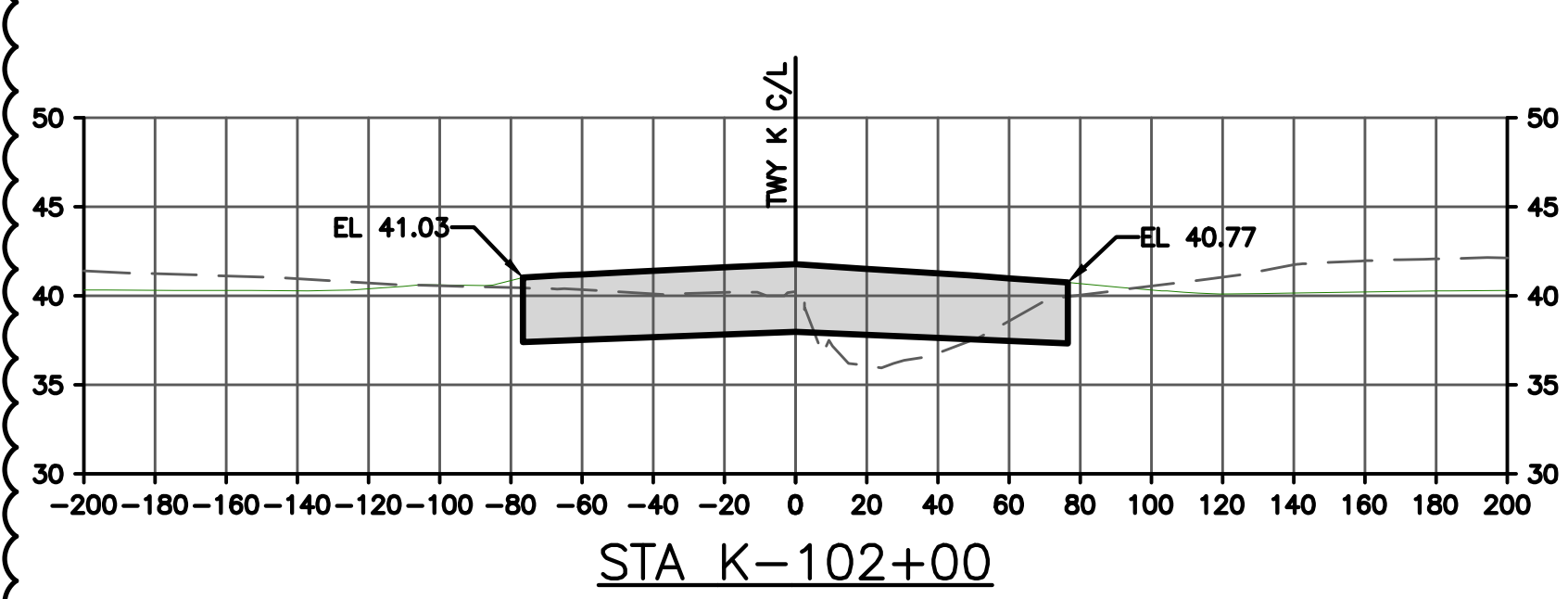
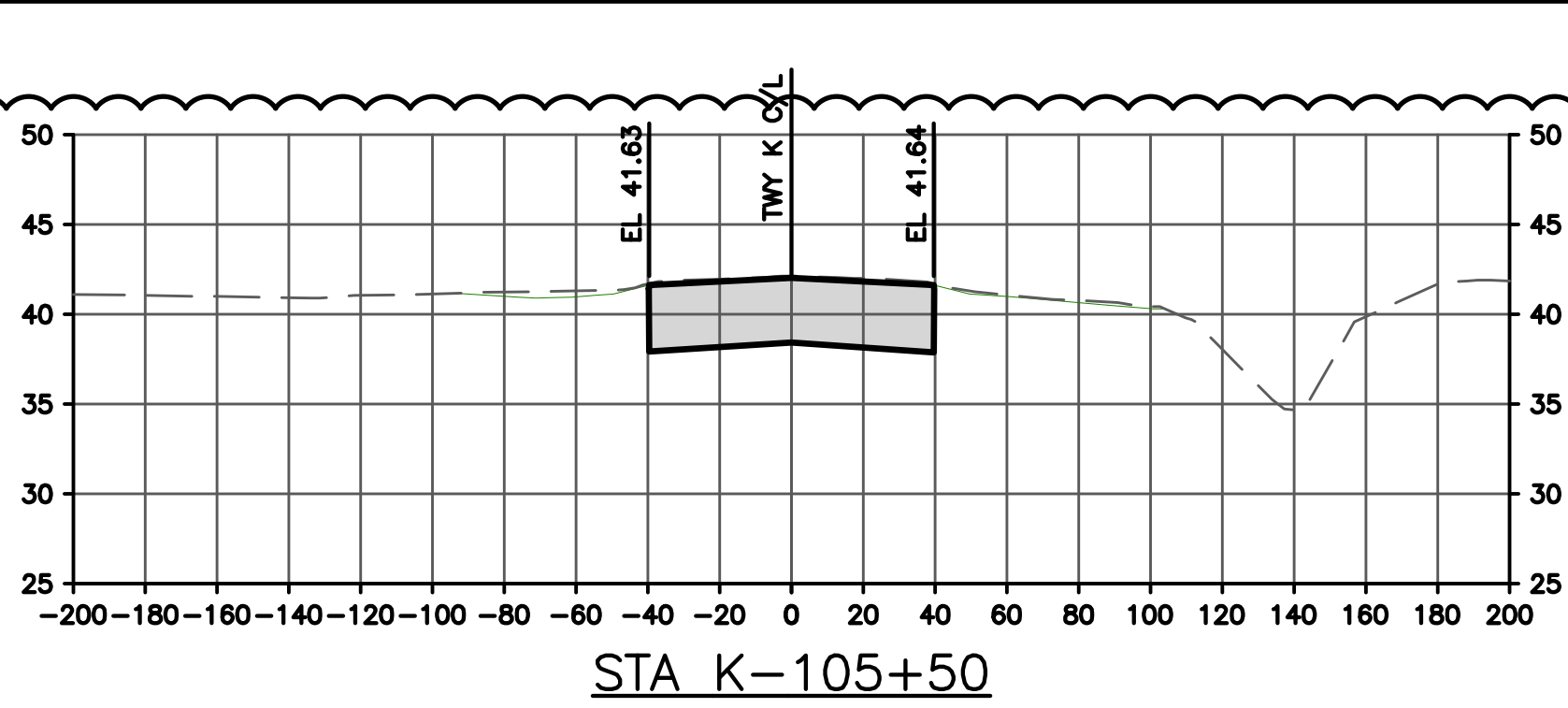
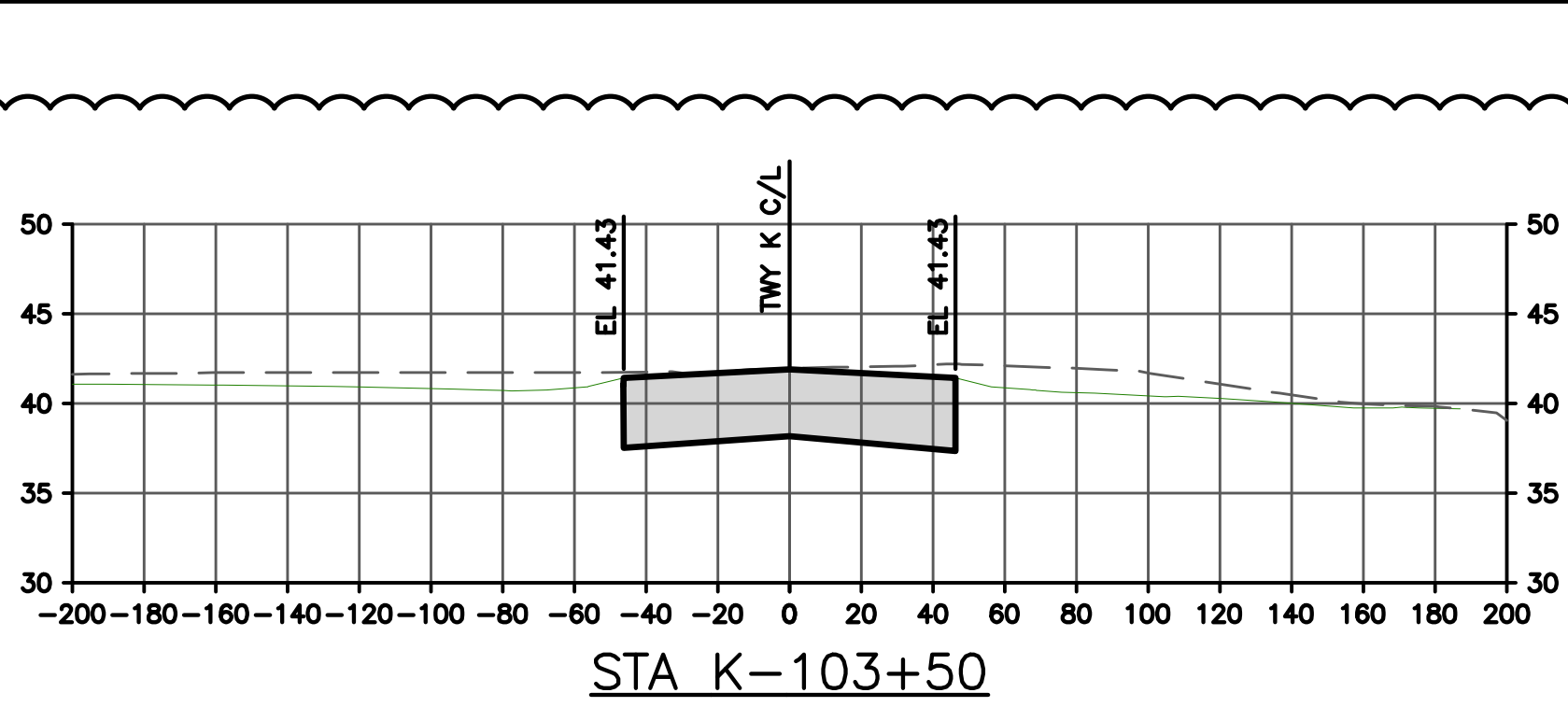
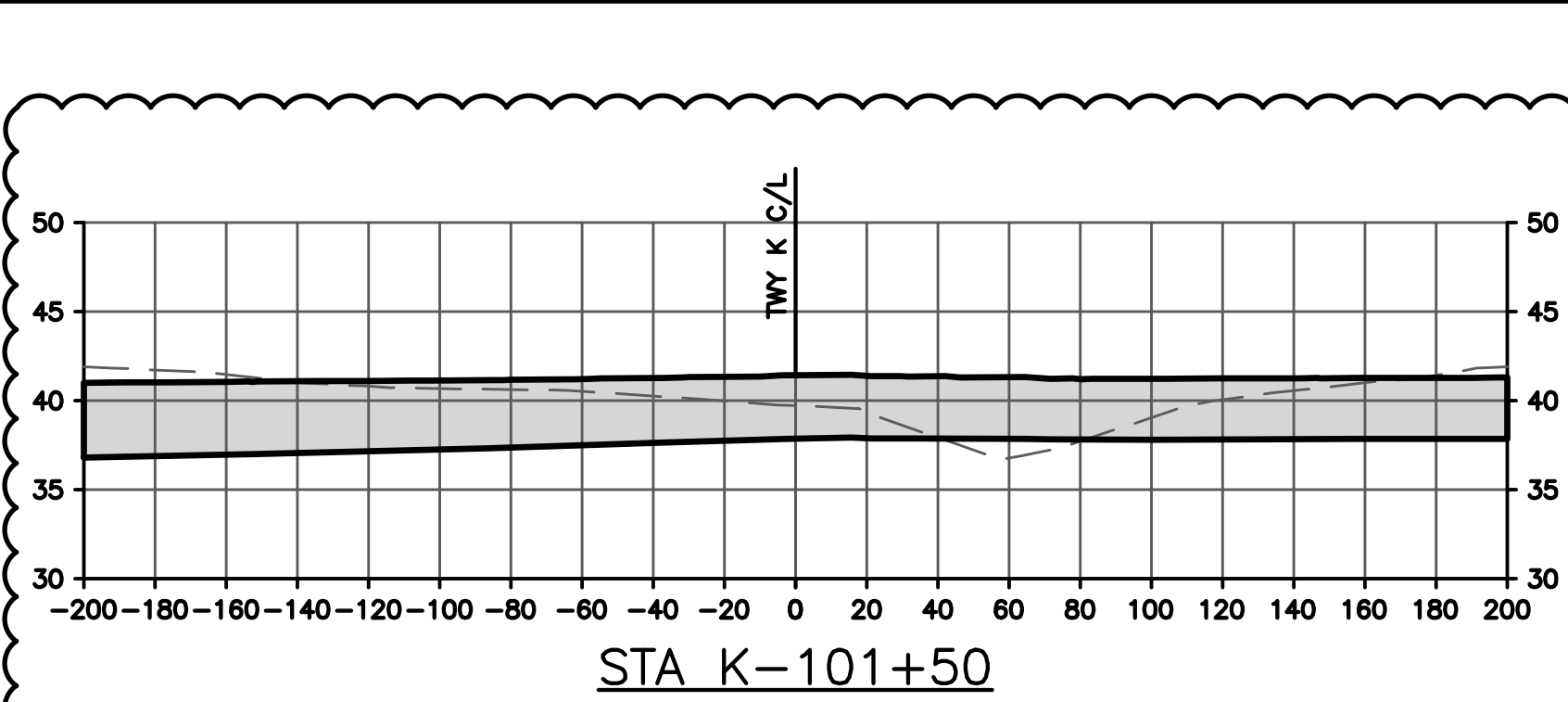
CROSS SECTIONS – TAXIWAY G

PROJECT MGR:	S. CHILDERS
DESIGNER:	B. BARTLETT
DRAWN BY:	S. WAZIRI
CHECKED BY:	R. EHTESHAM
SCALE:	AS SHOWN
DATE:	03/23/2023



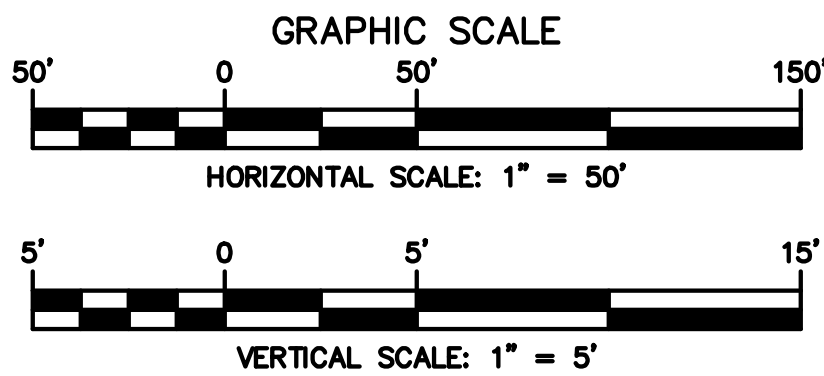
APPROVED BY:	DATE:
DIRECTOR HOUSTON AIRPORT SYSTEM	
PROJECT NO:	770
C.I.P. NO:	3-48-0110-044
H.A.S. NO:	N/A
SHEET NO:	XS322
	of





LEGEND:

- PROPOSED GRADE
- EXISTING GRADE
- PROPOSED PAVEMENT SECTION OUTLINE



HOUSTON AIRPORT SYSTEM  
WILLIAM P. HOBBY AIRPORT  
HOUSTON TEXAS

**Jacobs**  
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HOUSTON, TEXAS 77072  
41-832-351-6000  
WWW.JACOBS.COM  
TEXAS P.E. FIRM F-2966

VERIFY SCALE  
BAR IS ONE INCH ON  
ORIGINAL DRAWING.  
0 1"

REVISIONS			
NO.	DESCRIPTION	DATE	BY
0	ISSUED FOR BID	02/24/2023	SC
1	ADDENDUM	03/23/2023	SC

FAA NON-STANDARD TAXIWAYS PROJECT

CROSS SECTIONS – TAXIWAY K

PROJECT MGR:	S. CHILDERS
DESIGNER:	B. BARTLETT
DRAWN BY:	S. WAZIRI
CHECKED BY:	R. EHTESHAM
SCALE:	AS SHOWN
DATE:	03/23/2023

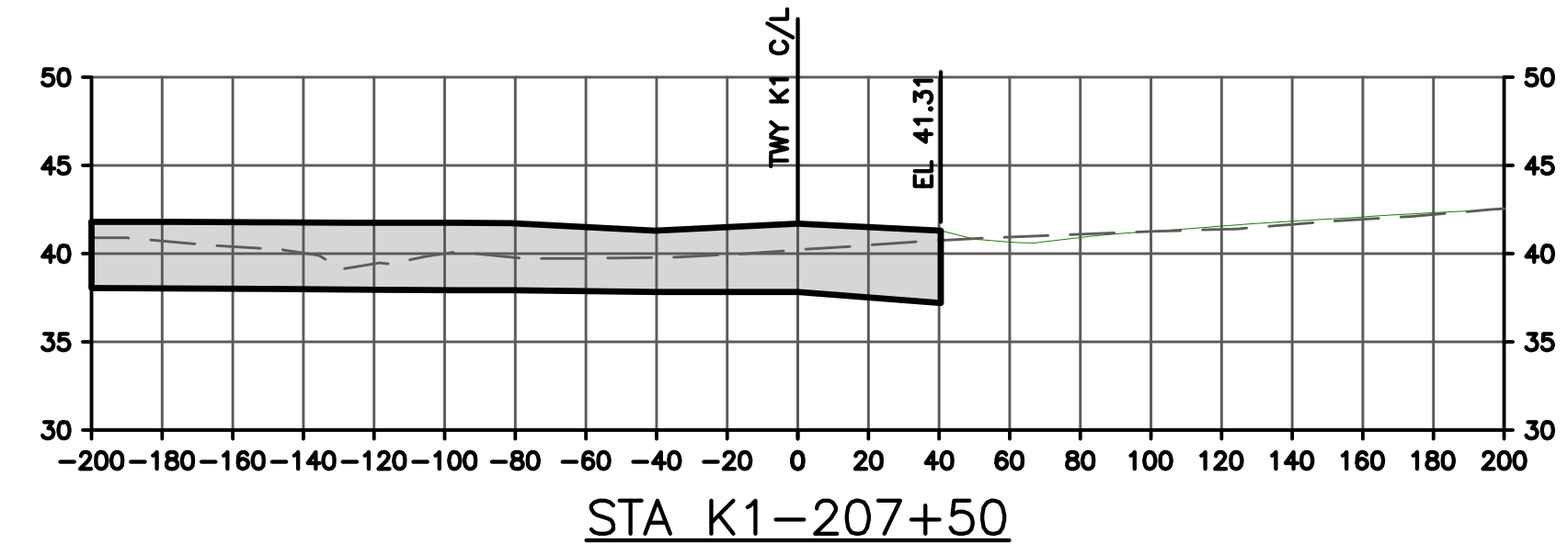
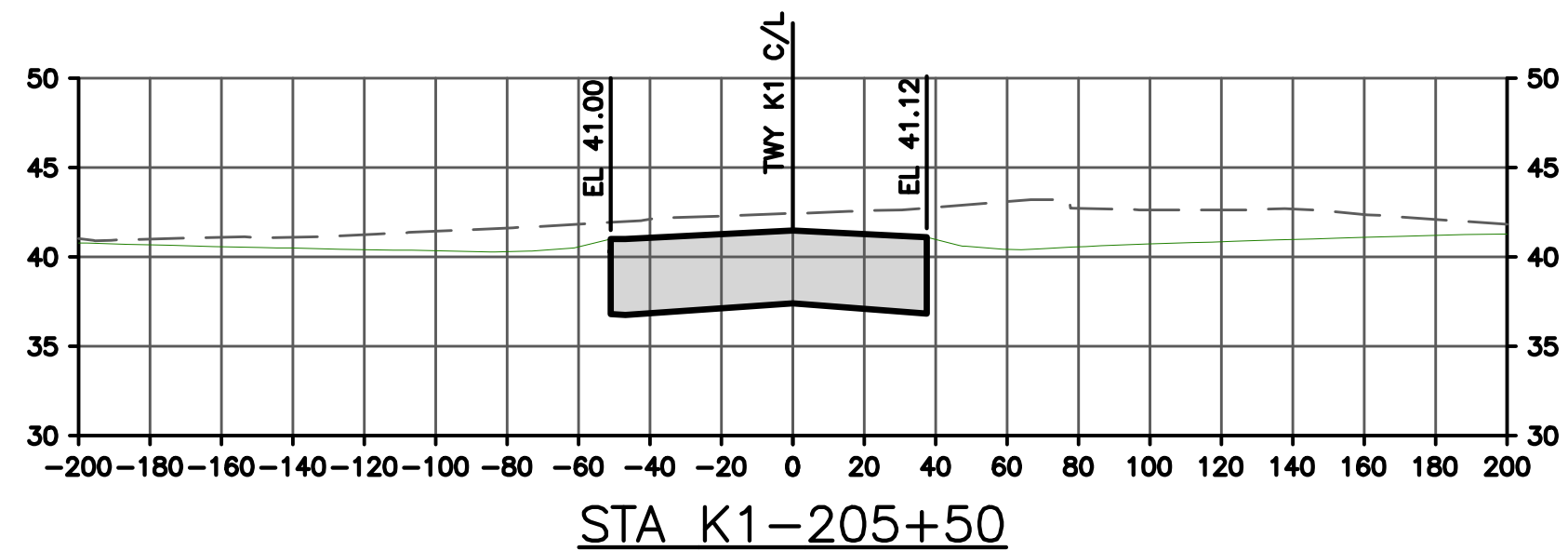
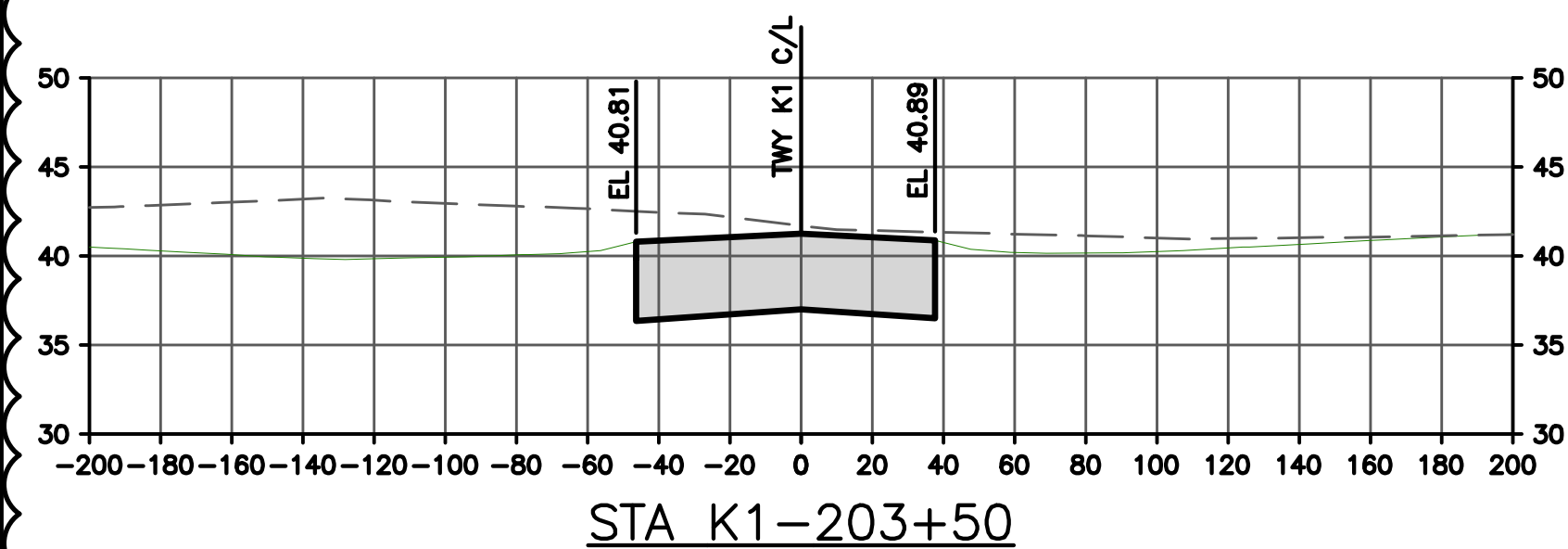
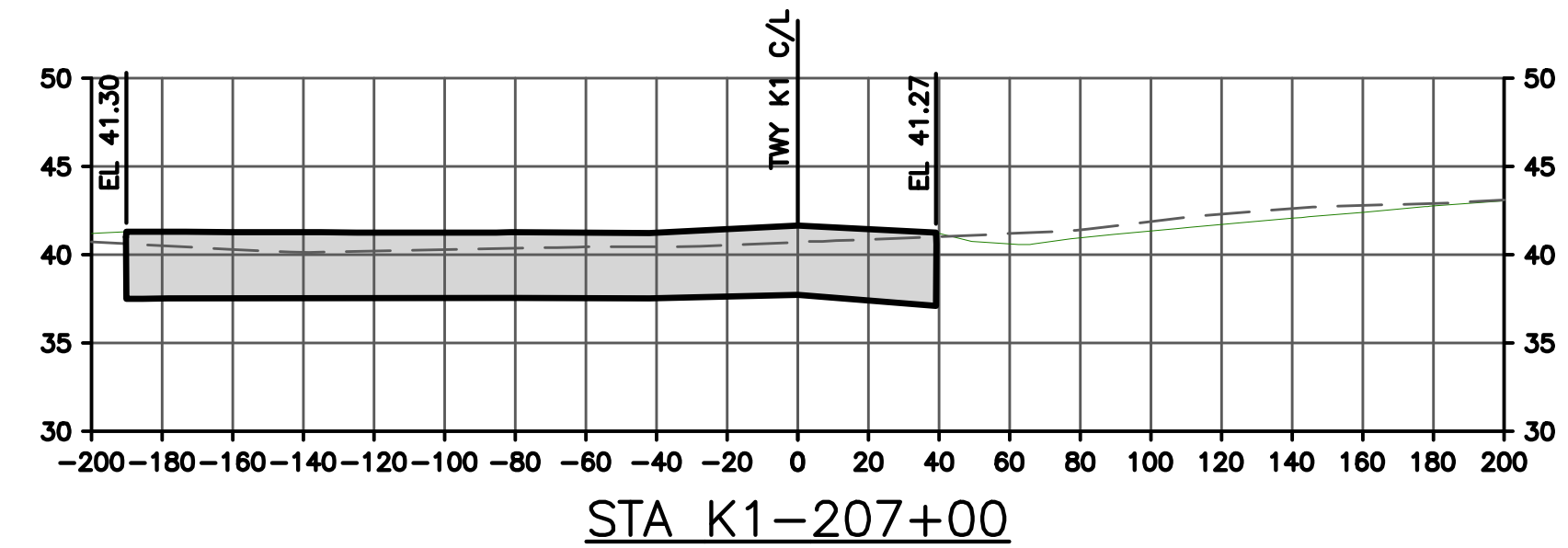
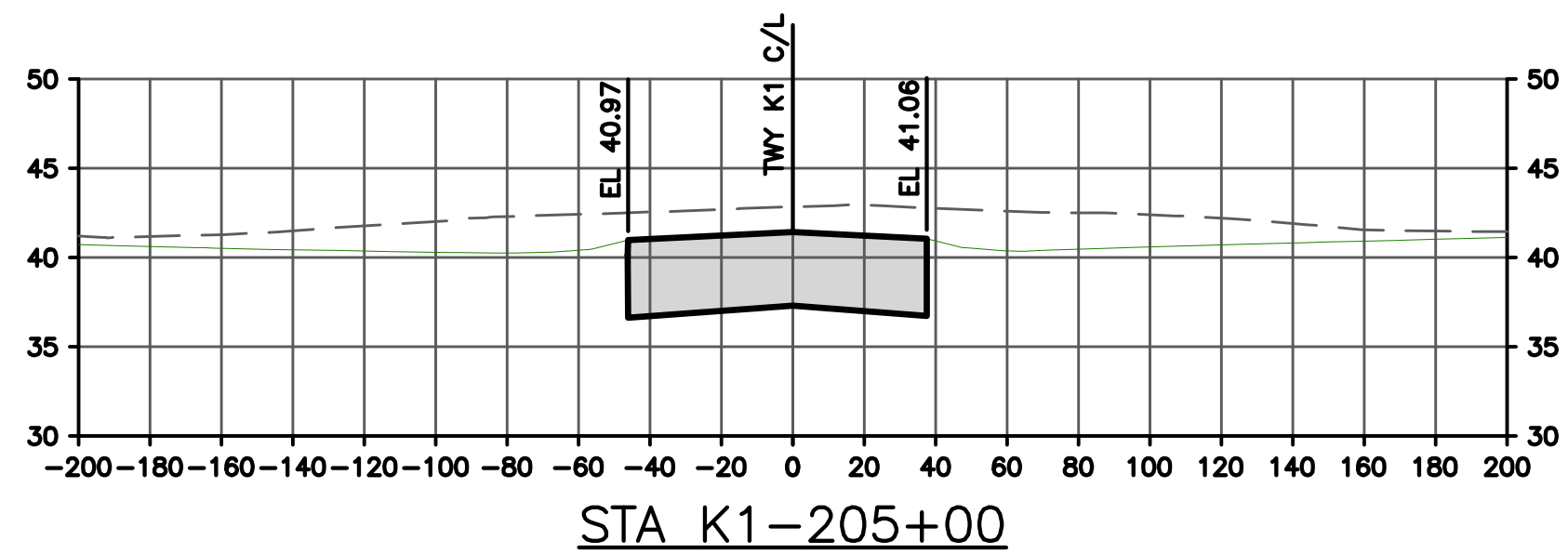
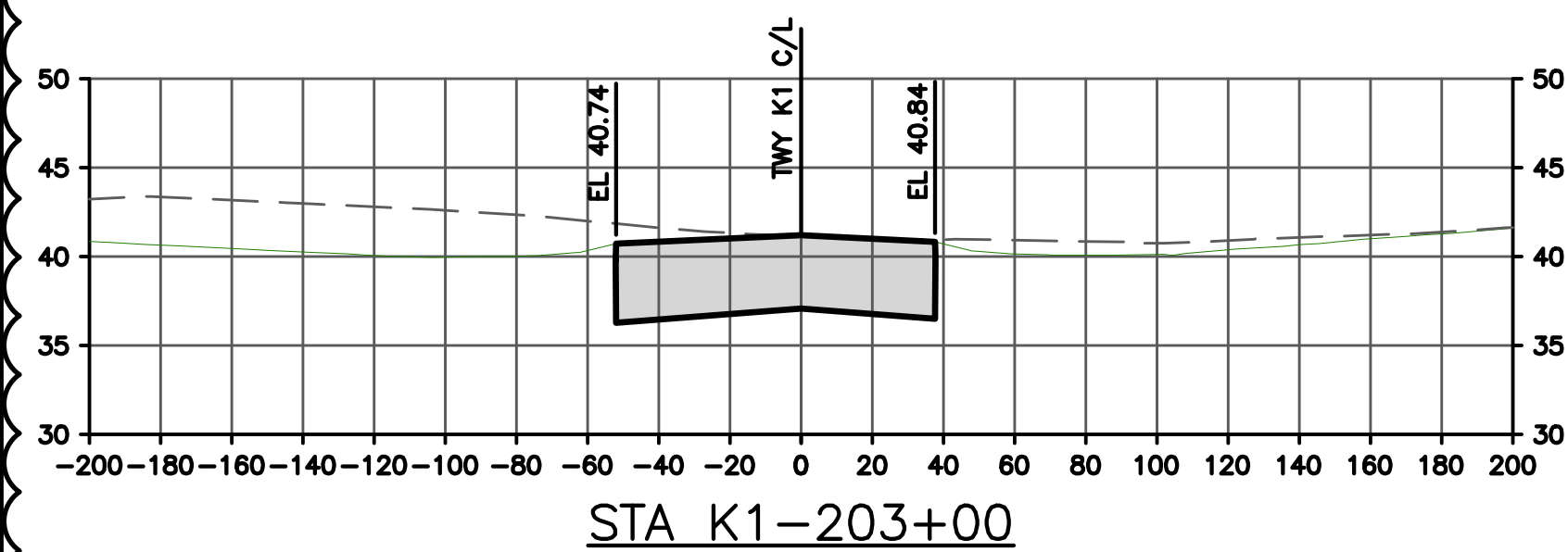
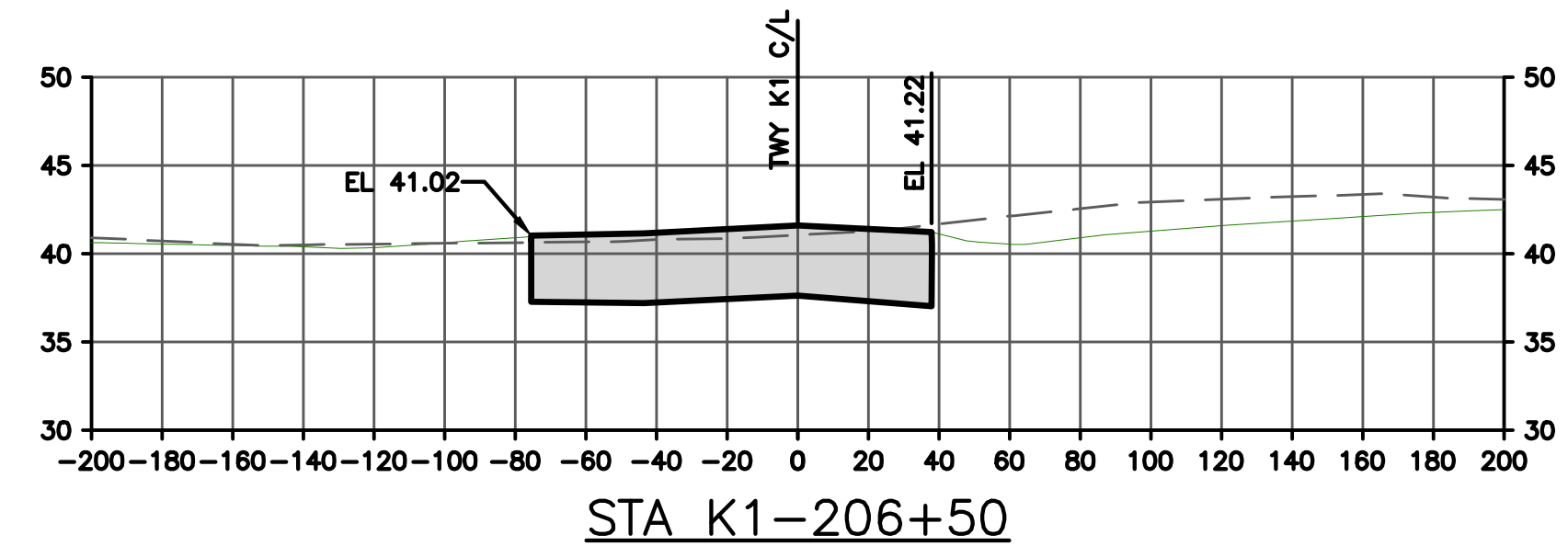
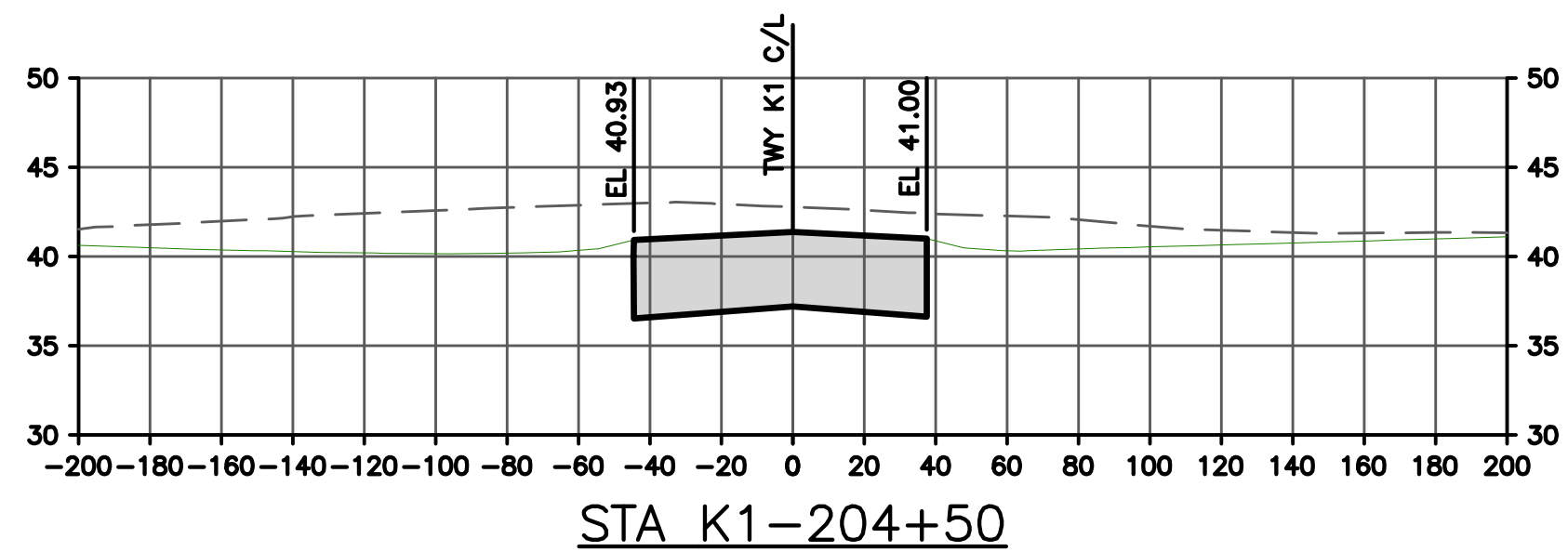
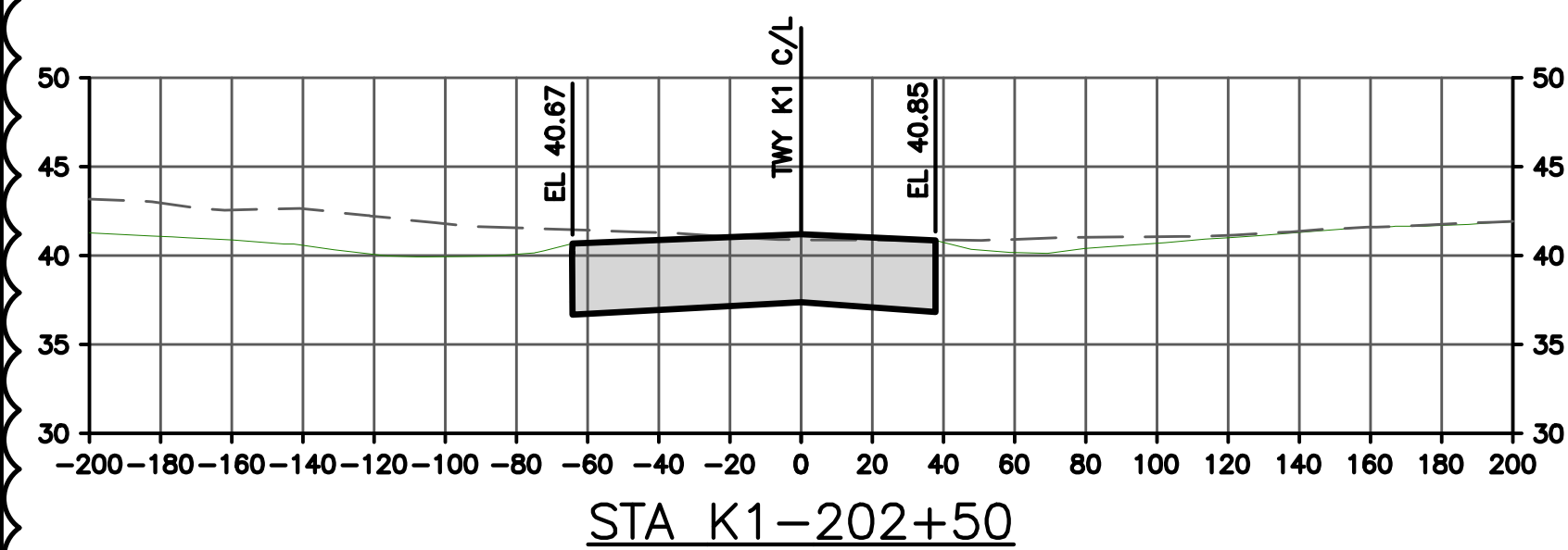
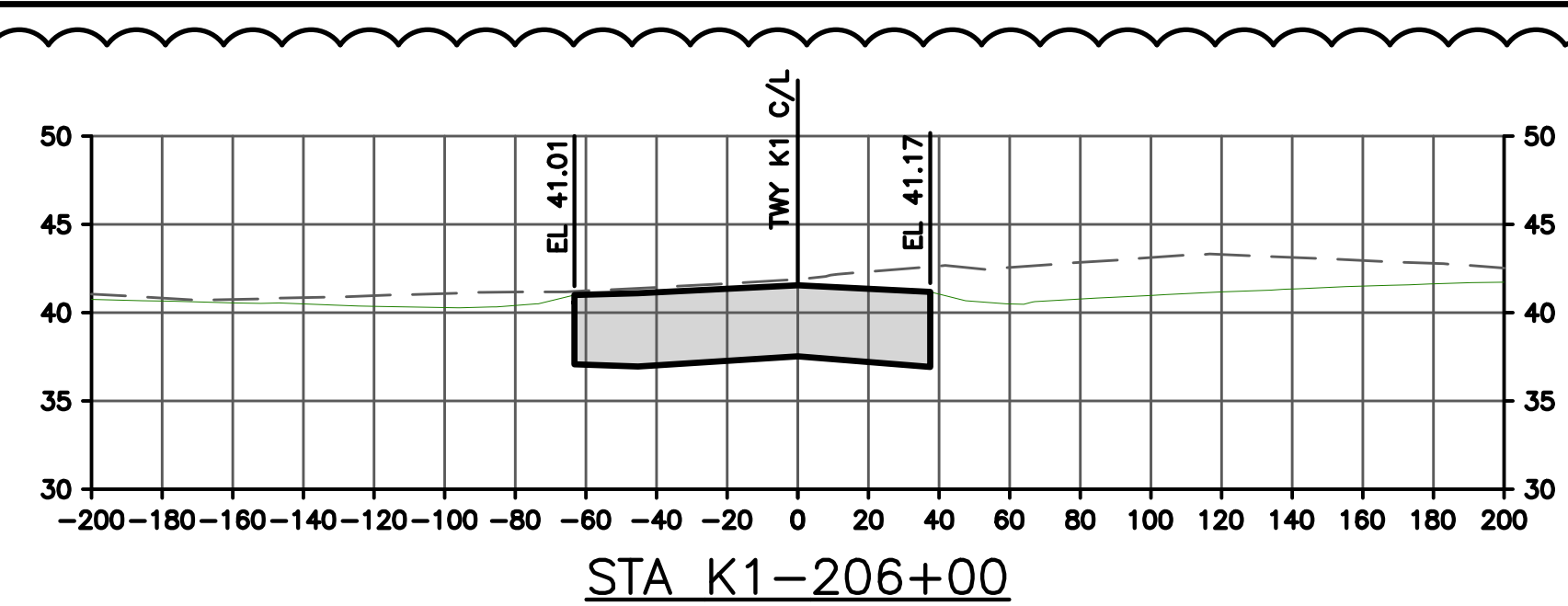
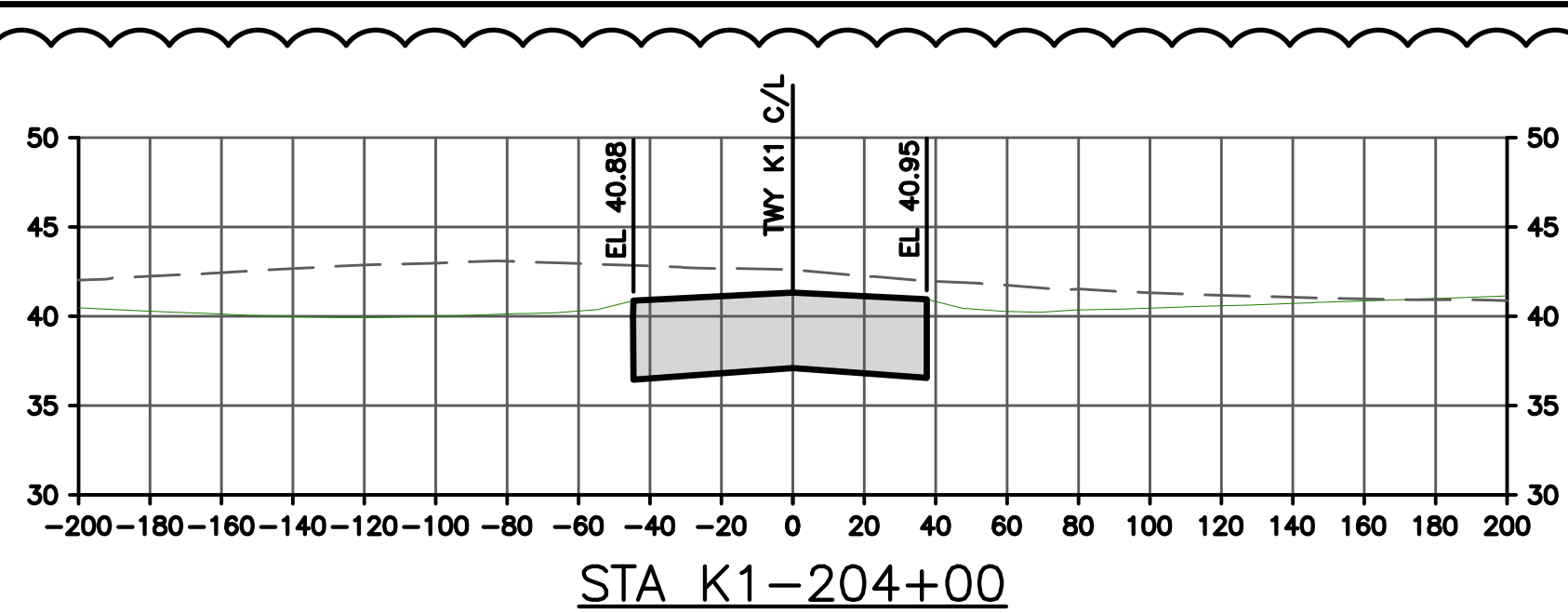
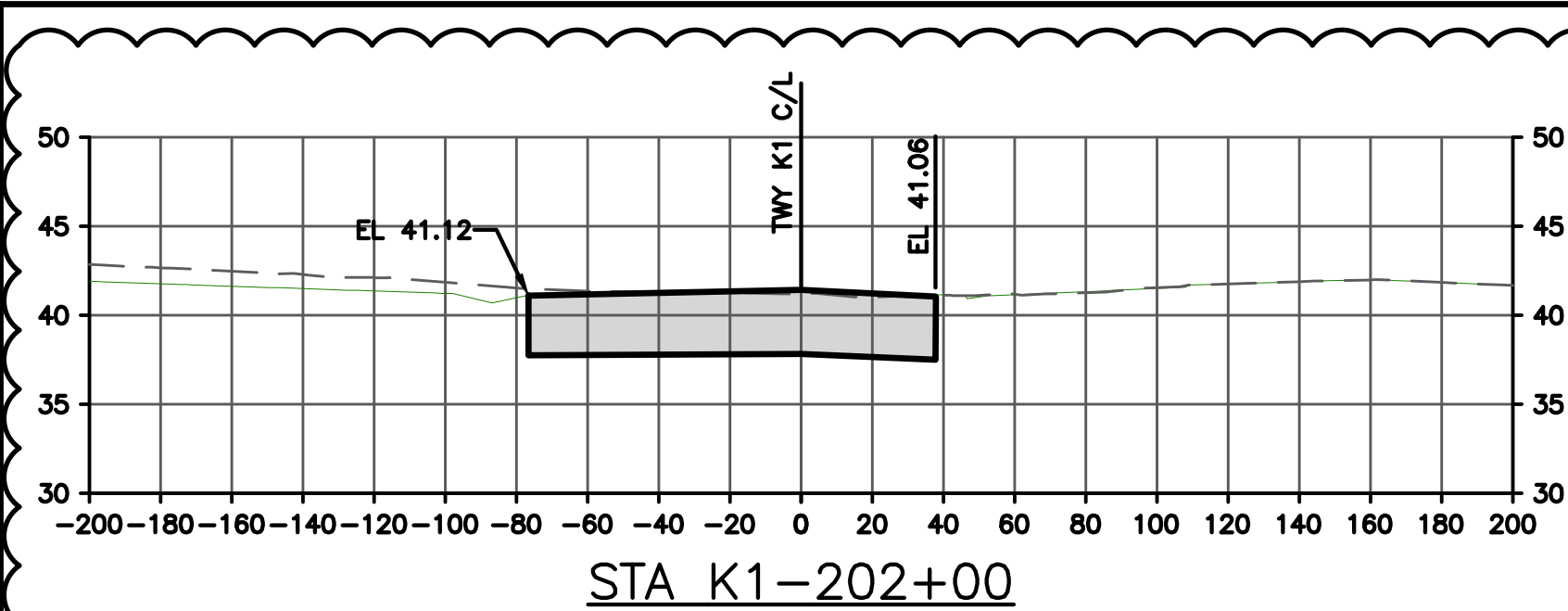


APPROVED BY:	DATE:
DIRECTOR	HOUSTON AIRPORT SYSTEM

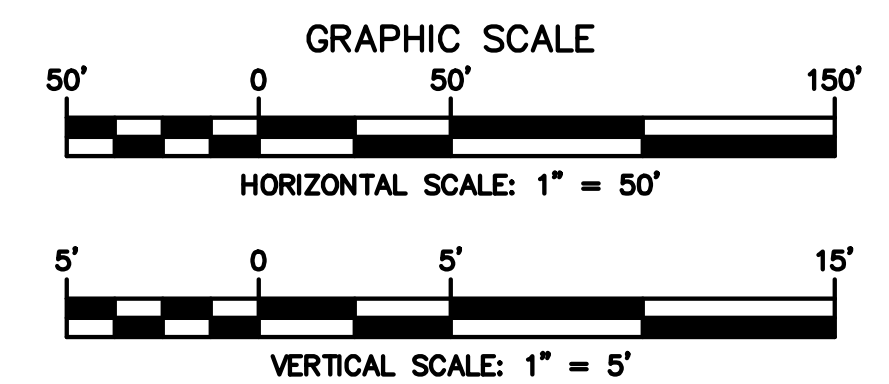
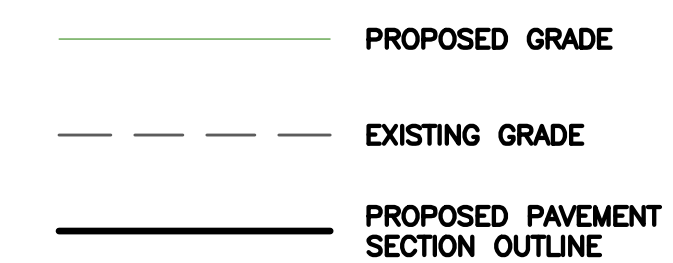
PROJECT NO:	770
C.I.P. NO:	3-48-0110-044
H.A.S. NO:	N/A
SHEET NO:	

XS331  
of





LEGEND:

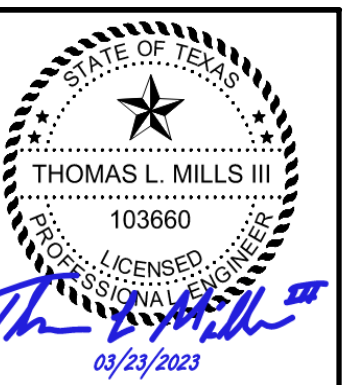


REVISIONS		
DESCRIPTION	DATE	BY
ISSUED FOR BID	02/24/2023	SC
ADDENDUM	03/23/2023	SC

FAA NON-STANDARD TAXIWAYS PROJECT

### CROSS SECTIONS - TAXIWAY K1

PROJECT MGR:	S. CHILDERS
DESIGNER:	B. BARTLETT
OWNED BY:	S. WAZIRI
CHECKED BY:	R. EHTESHAM
FILE:	AS SHOWN
DATE:	03/23/2023



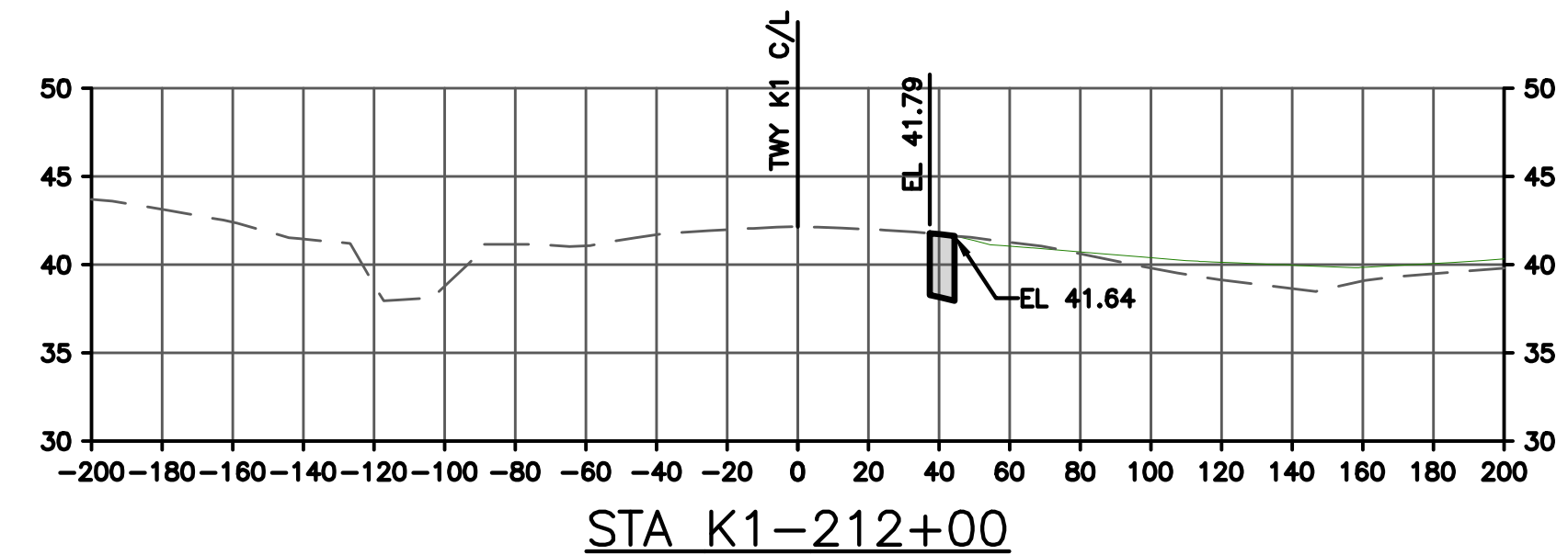
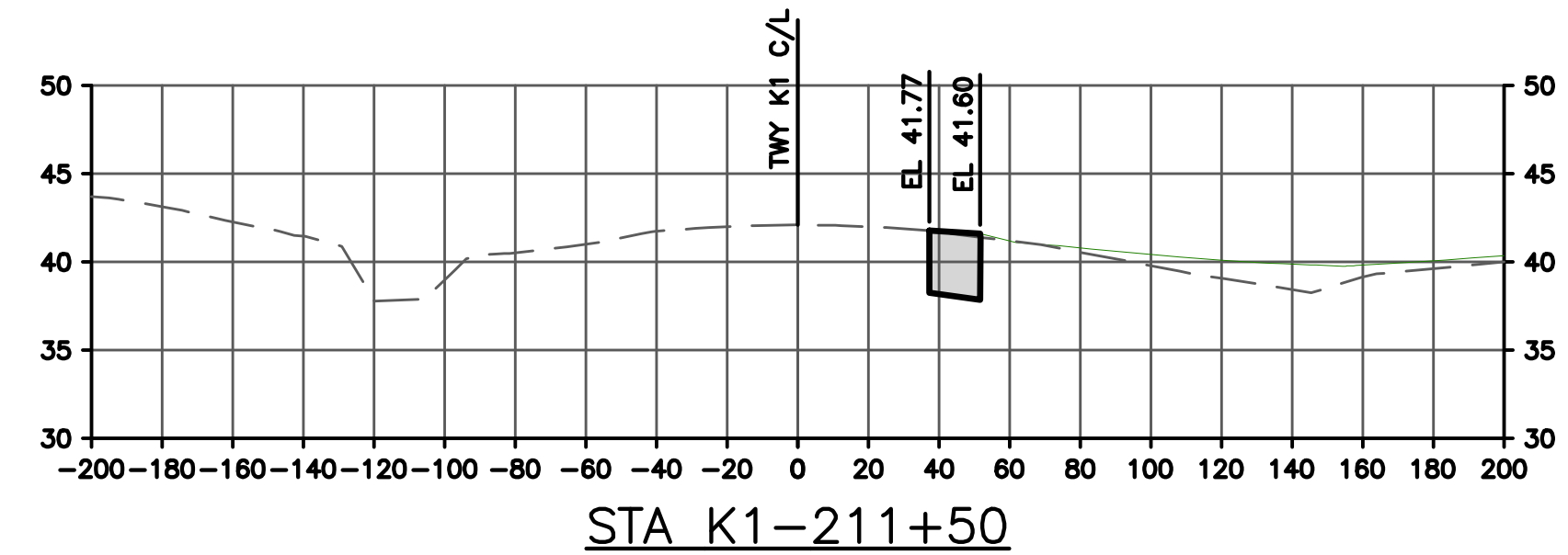
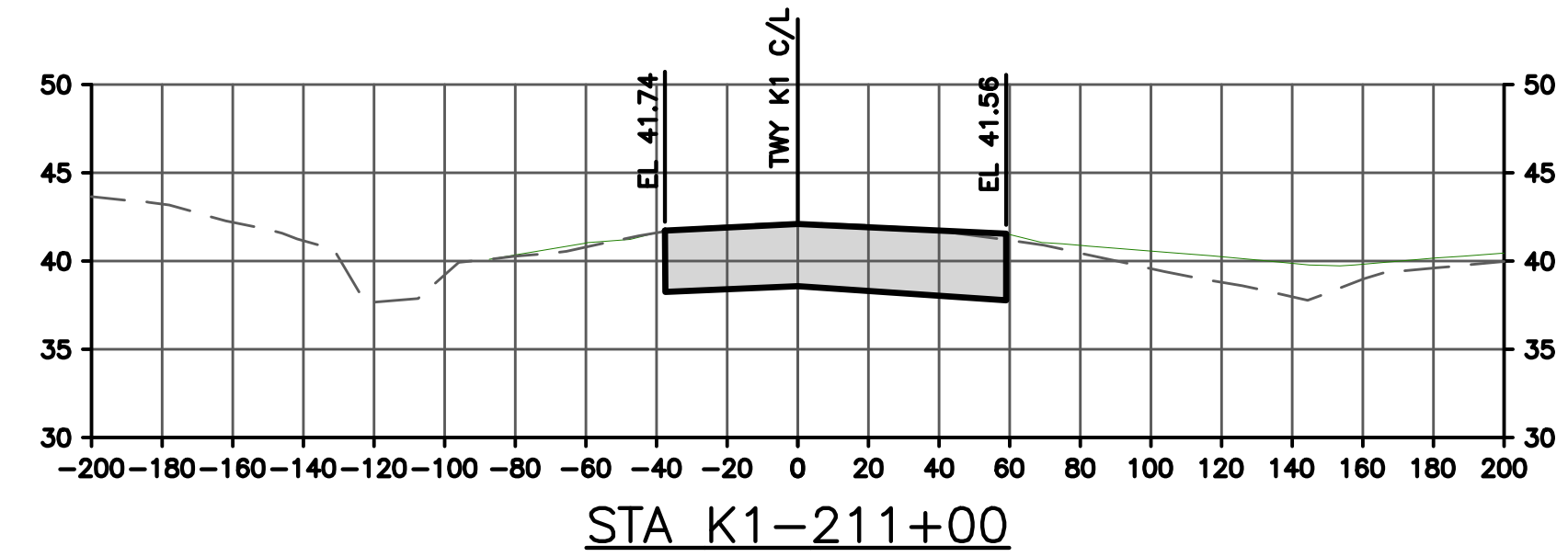
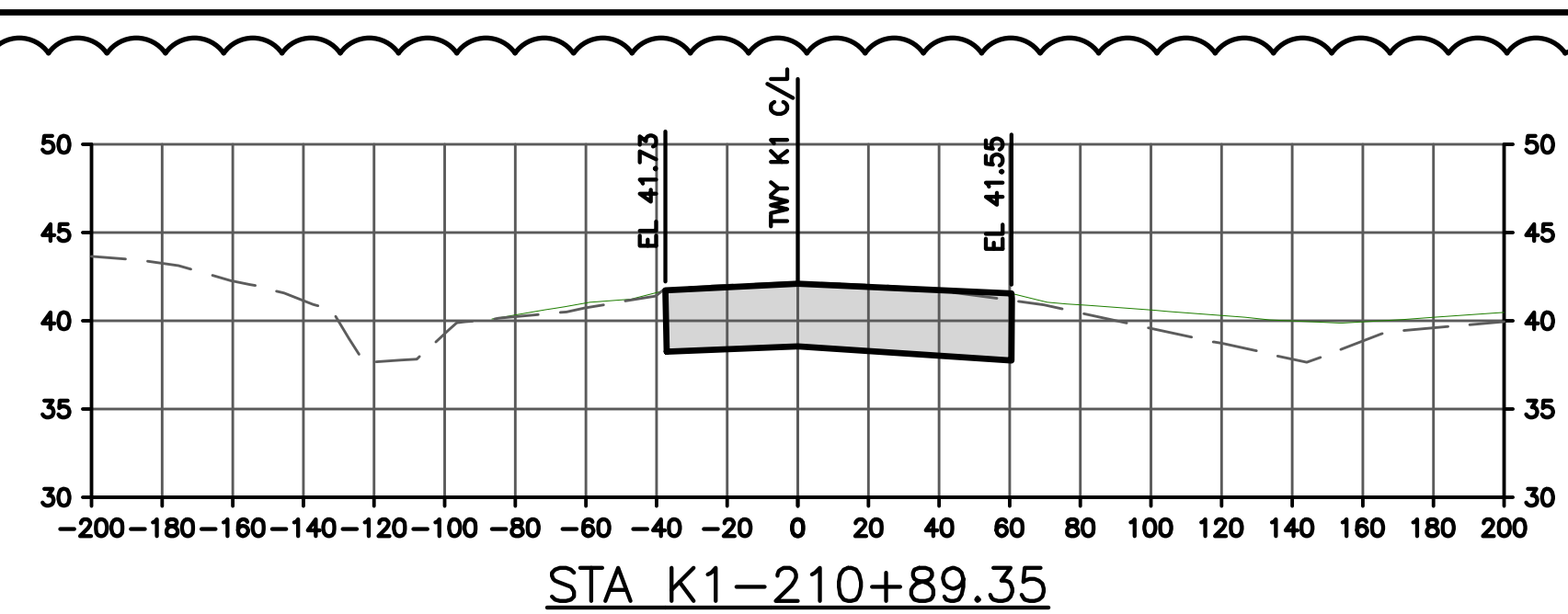
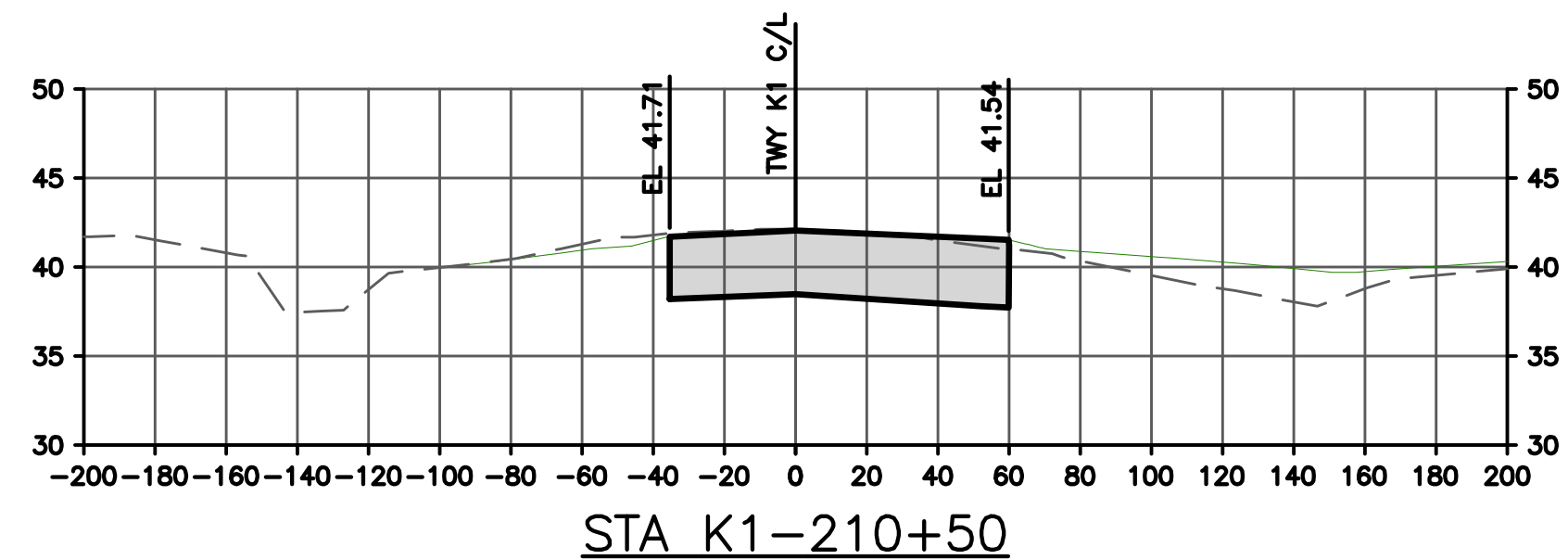
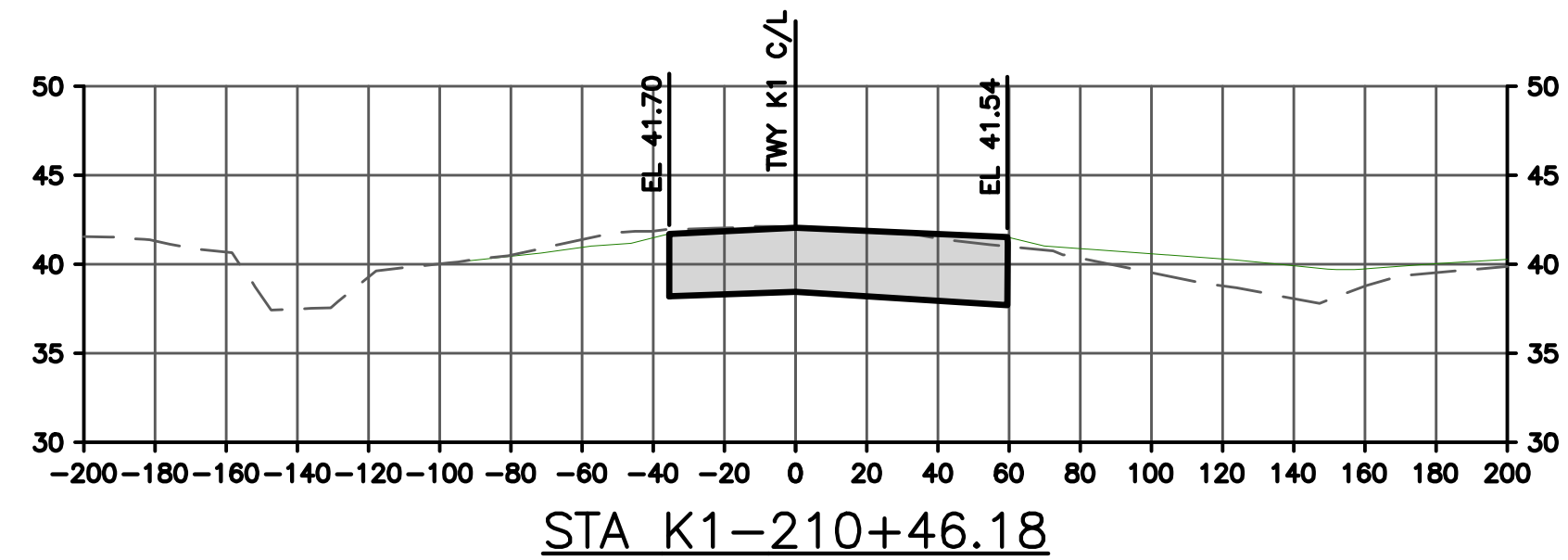
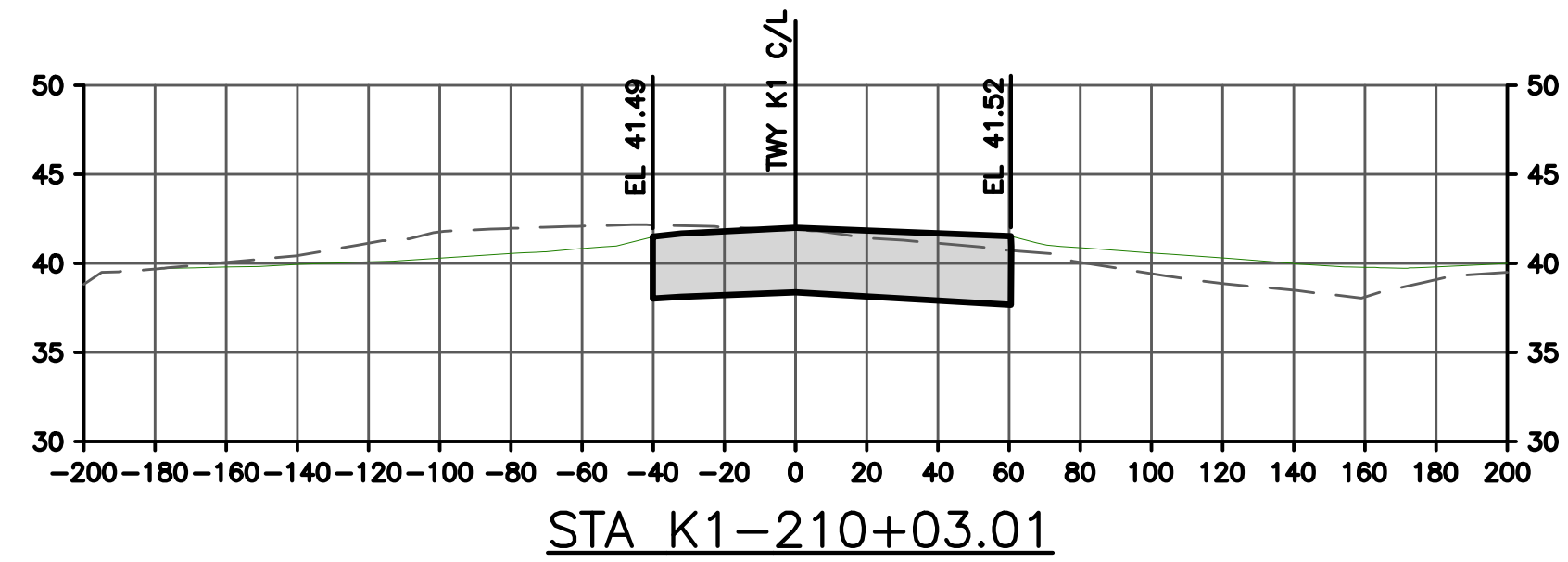
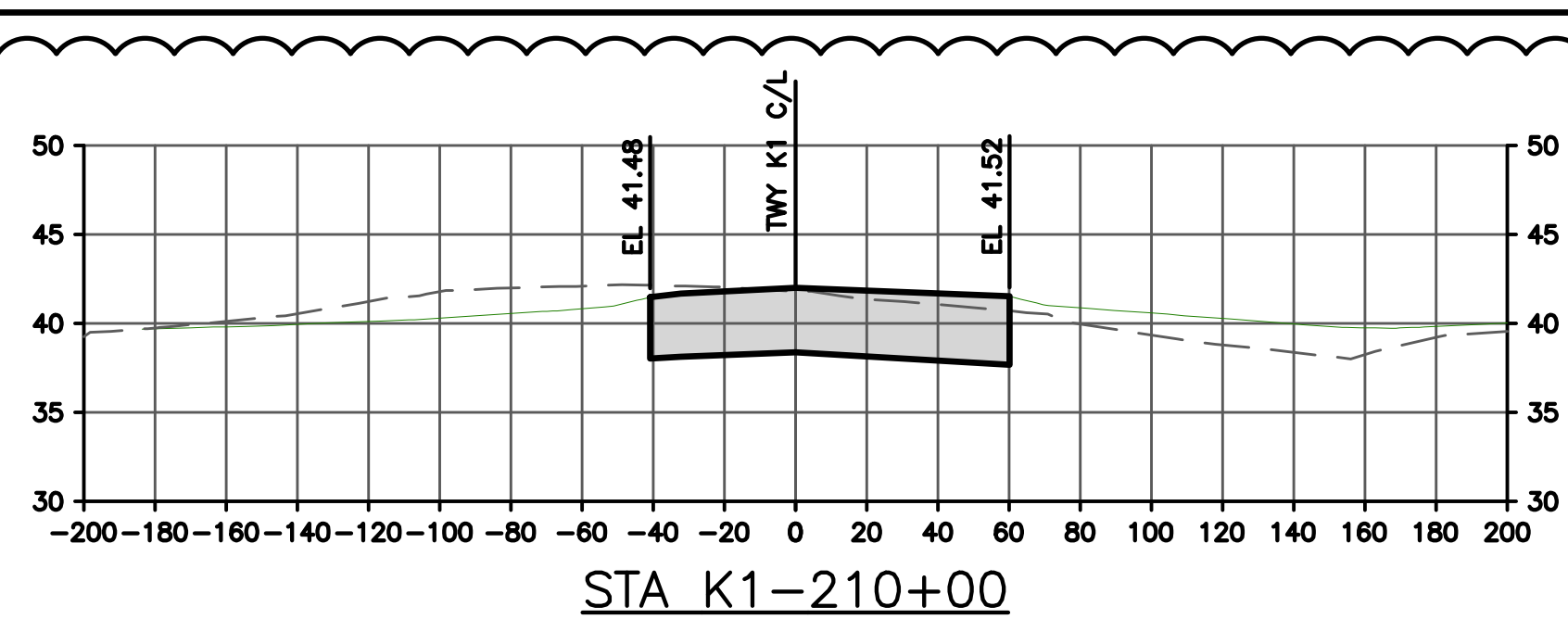
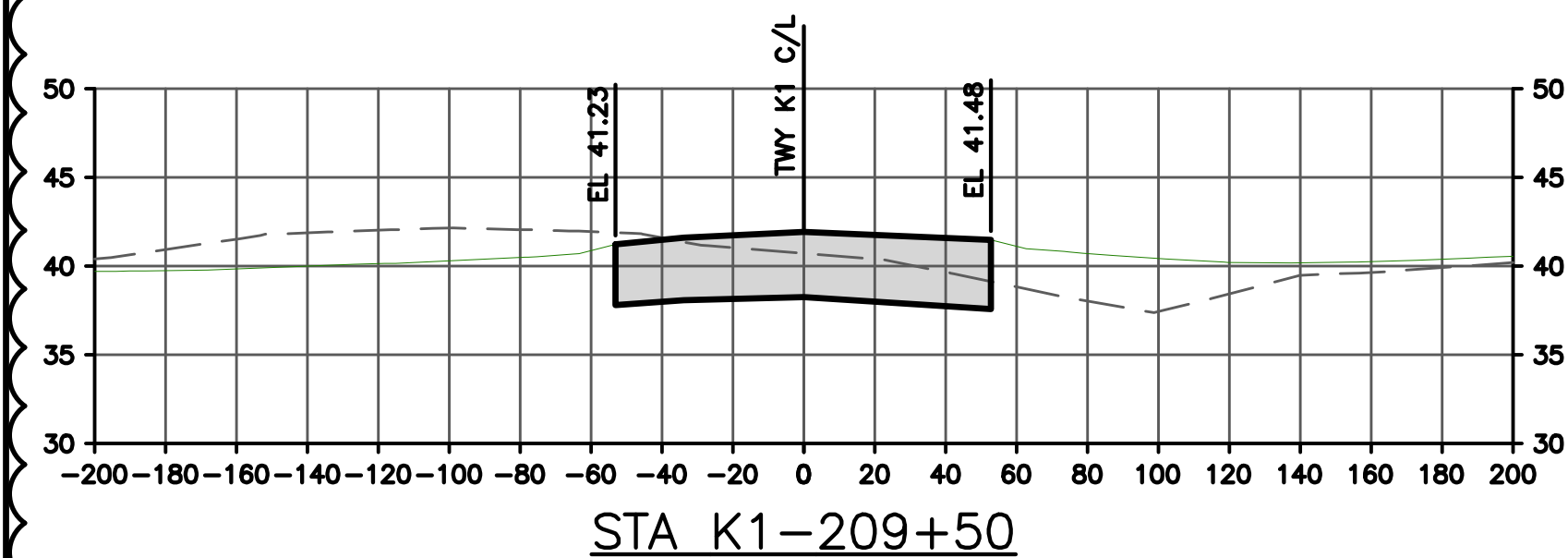
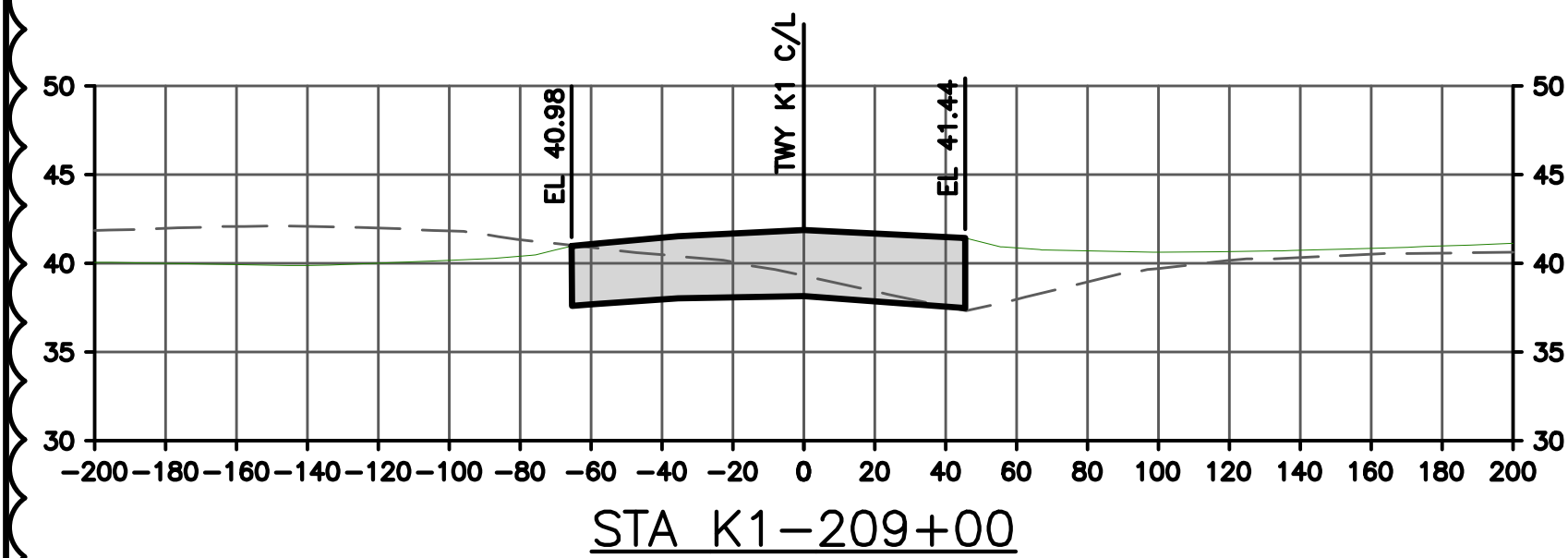
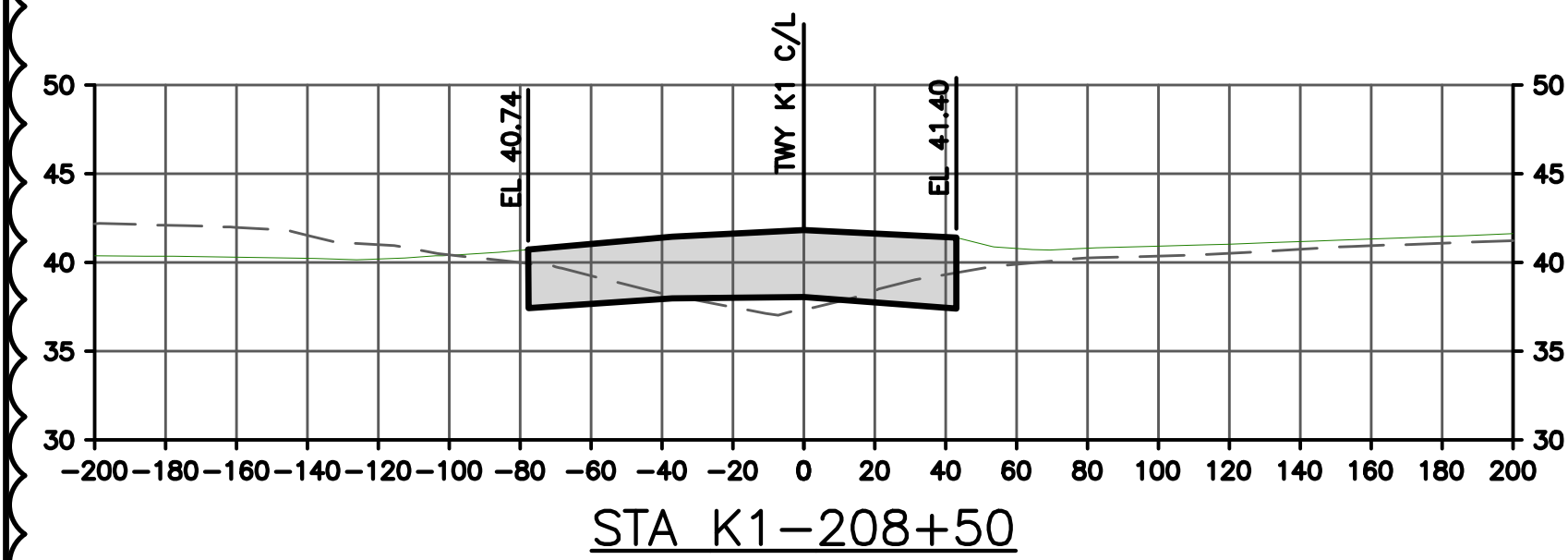
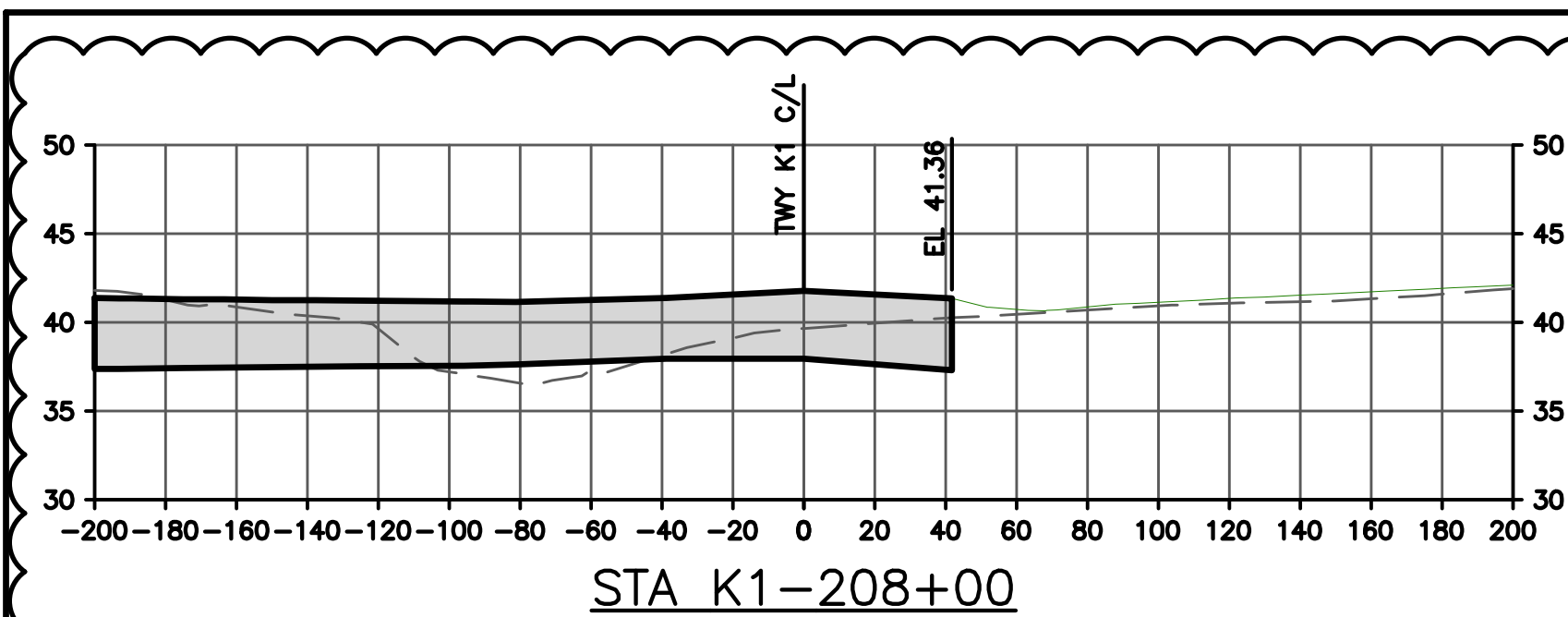
APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**DIRECTOR  
HOUSTON AIRPORT SYSTEM**



SUBJECT NO: 770  
 P. NO: 3-48-0110-044  
 S. NO: N/A  
 SET NO:

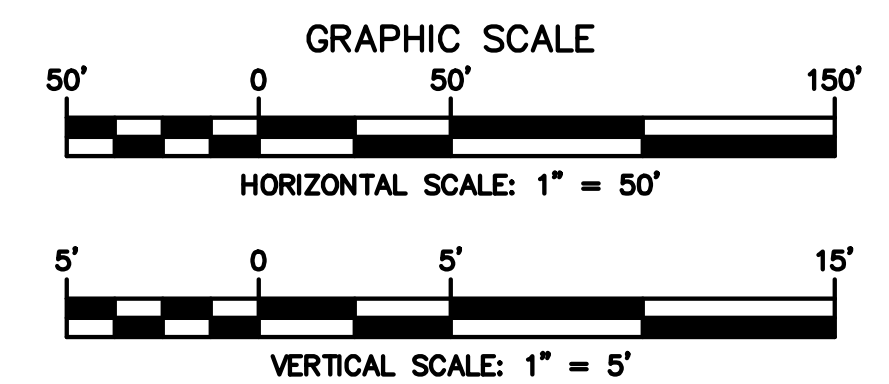
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LEGEND:

 PROPOSED GRADE  
 EXISTING GRADE  
 PROPOSED PAVEMENT SECTION OUTLINE

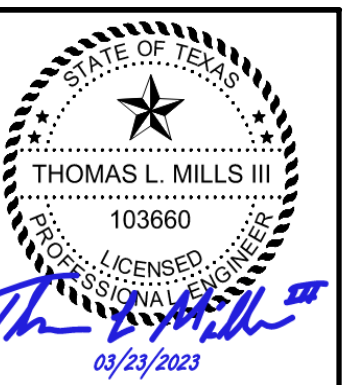


REVISIONS		
DESCRIPTION	DATE	BY
ISSUED FOR BID	02/24/2023	SC
ADDENDUM	03/23/2023	SC

FAA NON-STANDARD TAXIWAYS PROJECT

CROSS SECTIONS - TAXIWAY K1

PROJECT MGR:	S. CHILDERS
DESIGNER:	B. BARTLETT
OWNED BY:	S. WAZIRI
CHECKED BY:	R. EHTESHAM
FILE:	AS SHOWN
DATE:	03/23/2023

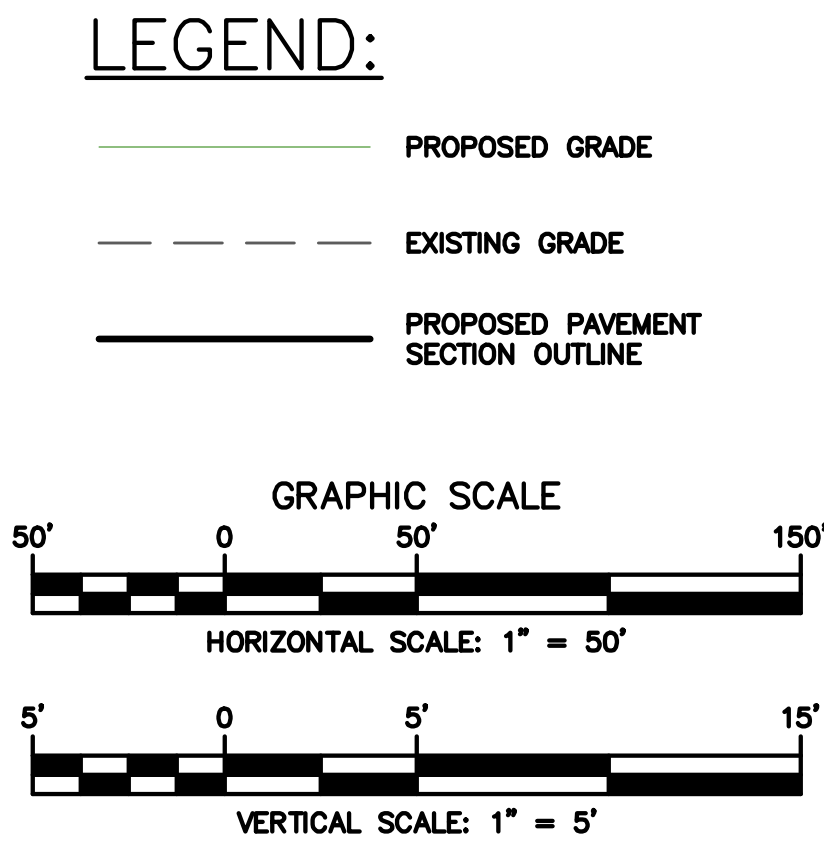


APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**DIRECTOR**  
**HOUSTON AIRPORT SYSTEM**

SUBJECT NO: 770  
 P. NO: 3-48-0110-044  
 S. NO: N/A  
 SET NO:





## HOUSTON AIRPORT SYSTEM

HOUSTON TEXAS

# Jacobs

JACOBS ENGINEERING GROUP INC  
5995 ROGERDALE ROAD  
HOUSTON, TEXAS 77072  
+1-832-351-6000  
WWW.JACOBS.COM  
TEXAS P.E. FIRM F-2966

VERIFY SCALE  
BAR IS ONE INCH ON  
ORIGINAL DRAWING.

REVISIONS			
NO.	DESCRIPTION	DATE	BY
0	ISSUED FOR BID	02/24/2023	SC
1	ADDENDUM	03/23/2023	SC

FAA NON-STANDARD TAXIWAYS PROJECT

# CROSS SECTIONS – TAXIWAY K1

PROJECT MGR:	S. CHILDERS
DESIGNER:	B. BARTLETT
DRAWN BY:	S. WAZIRIRI
CHECKED BY:	R. EHTESHAM
SCALE:	AS SHOWN
DATE:	03/23/2023



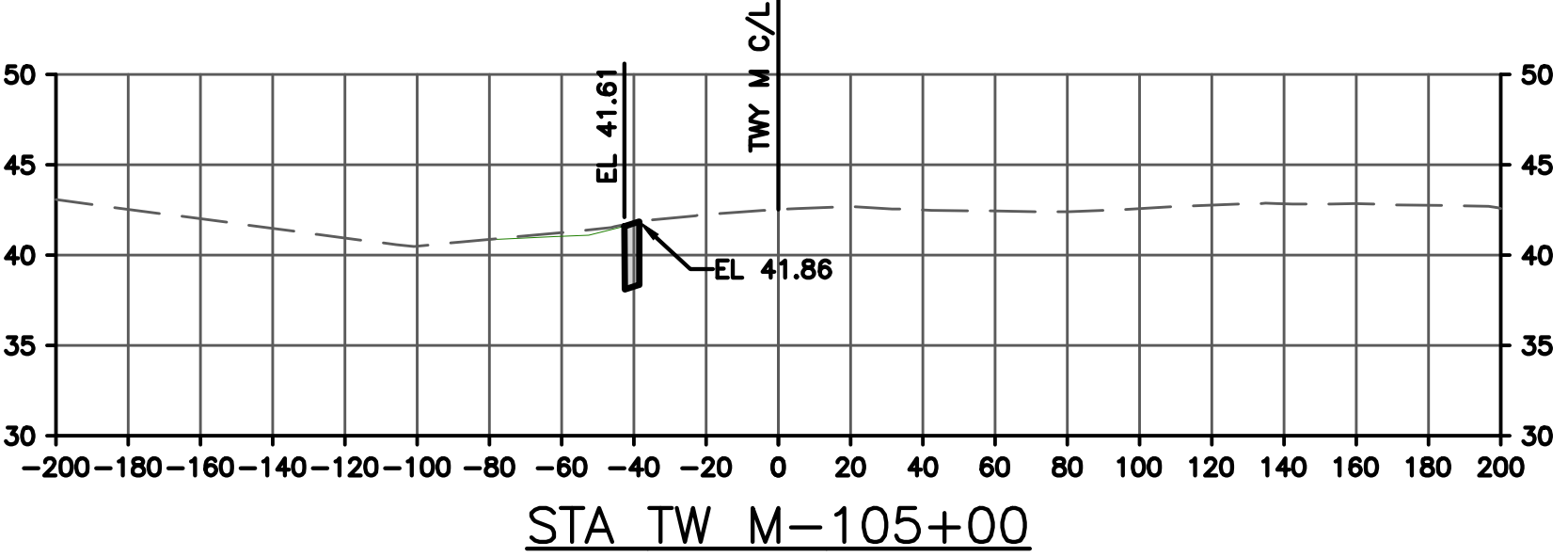
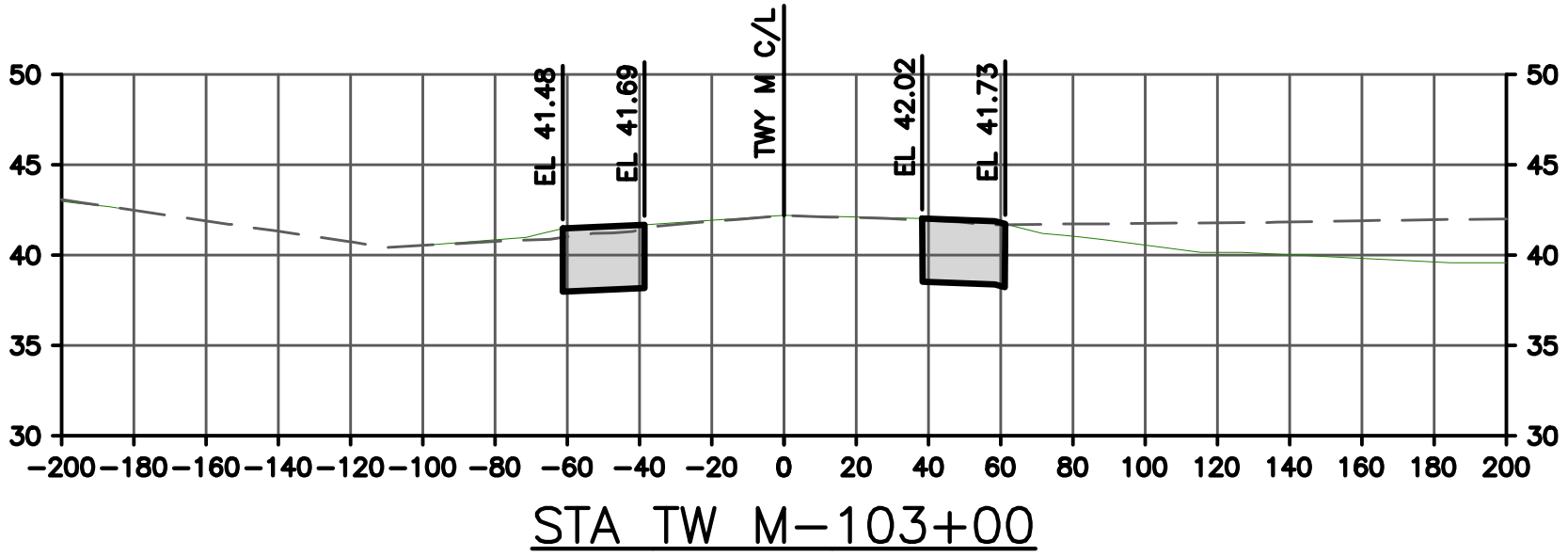
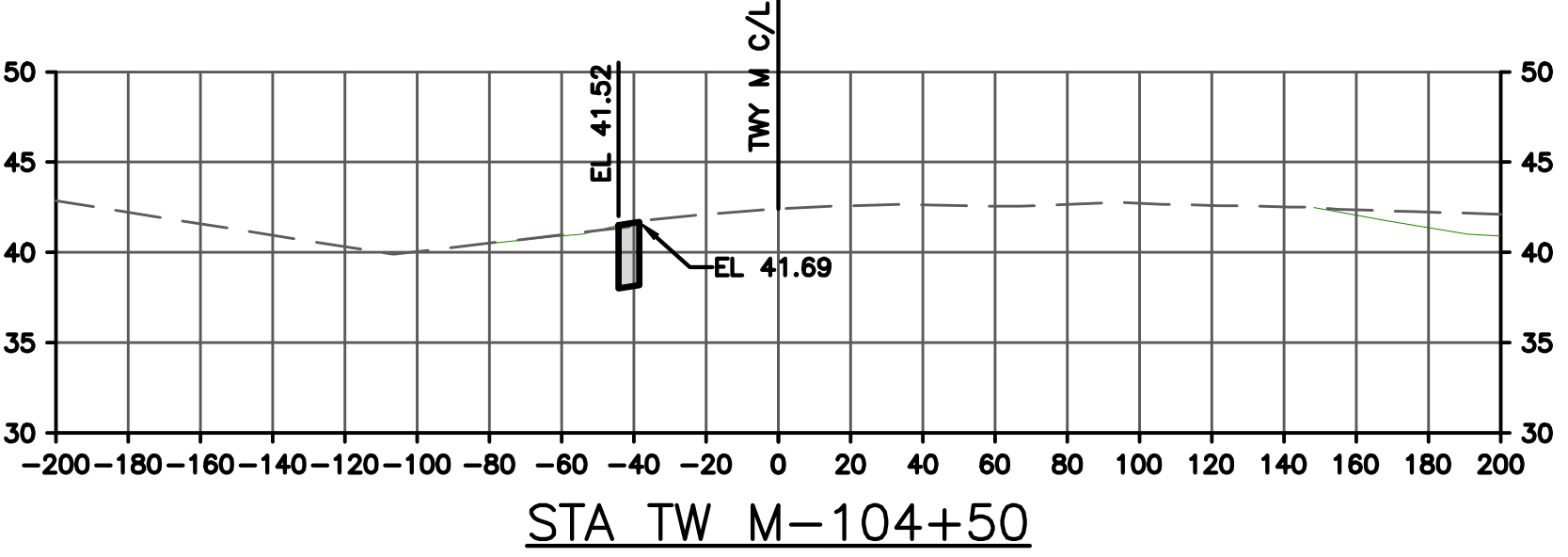
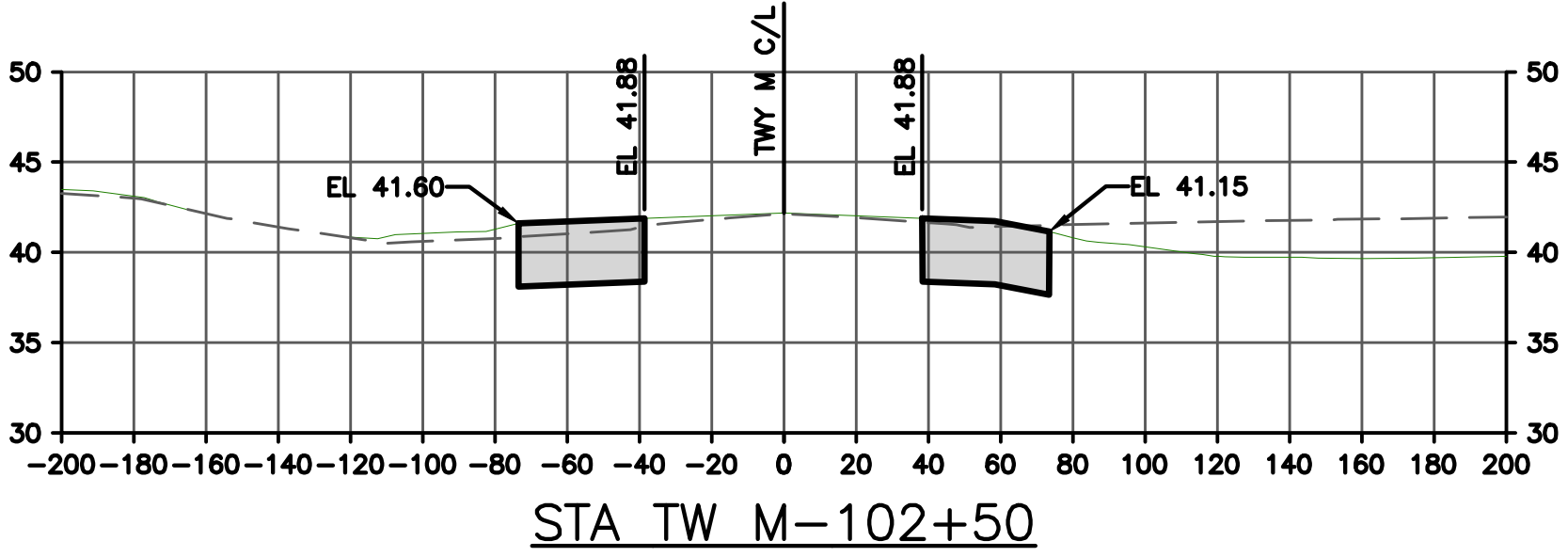
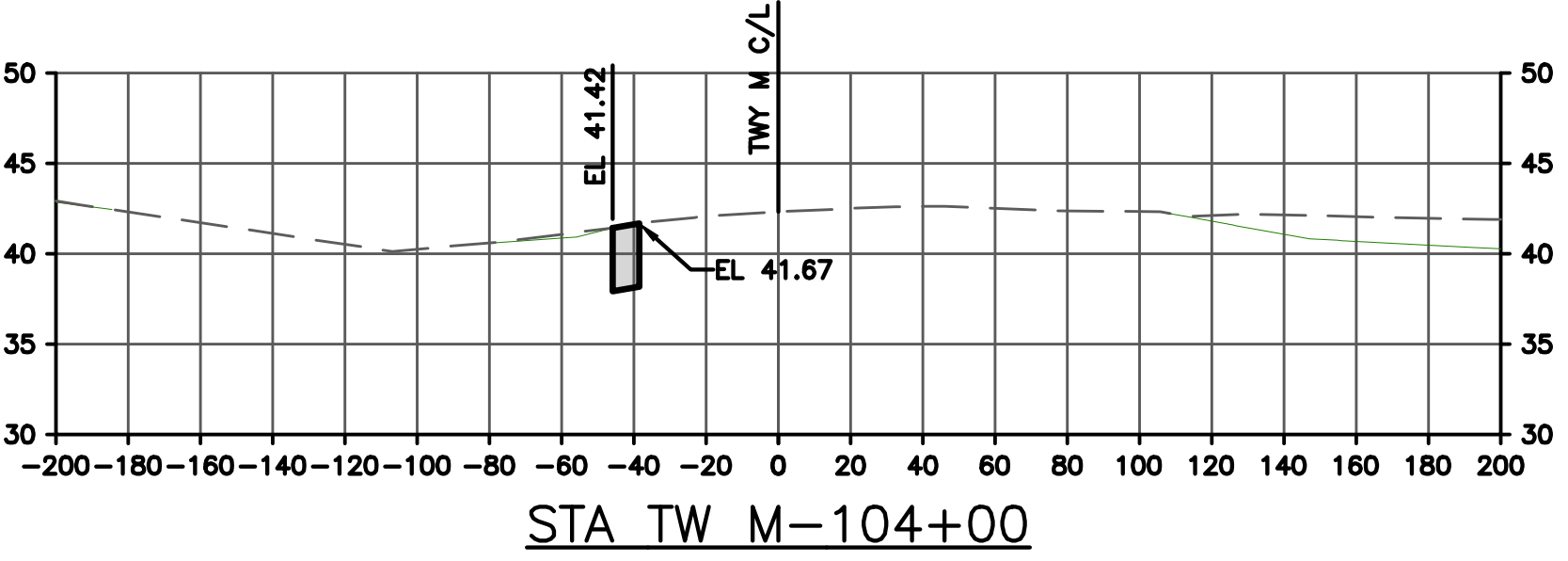
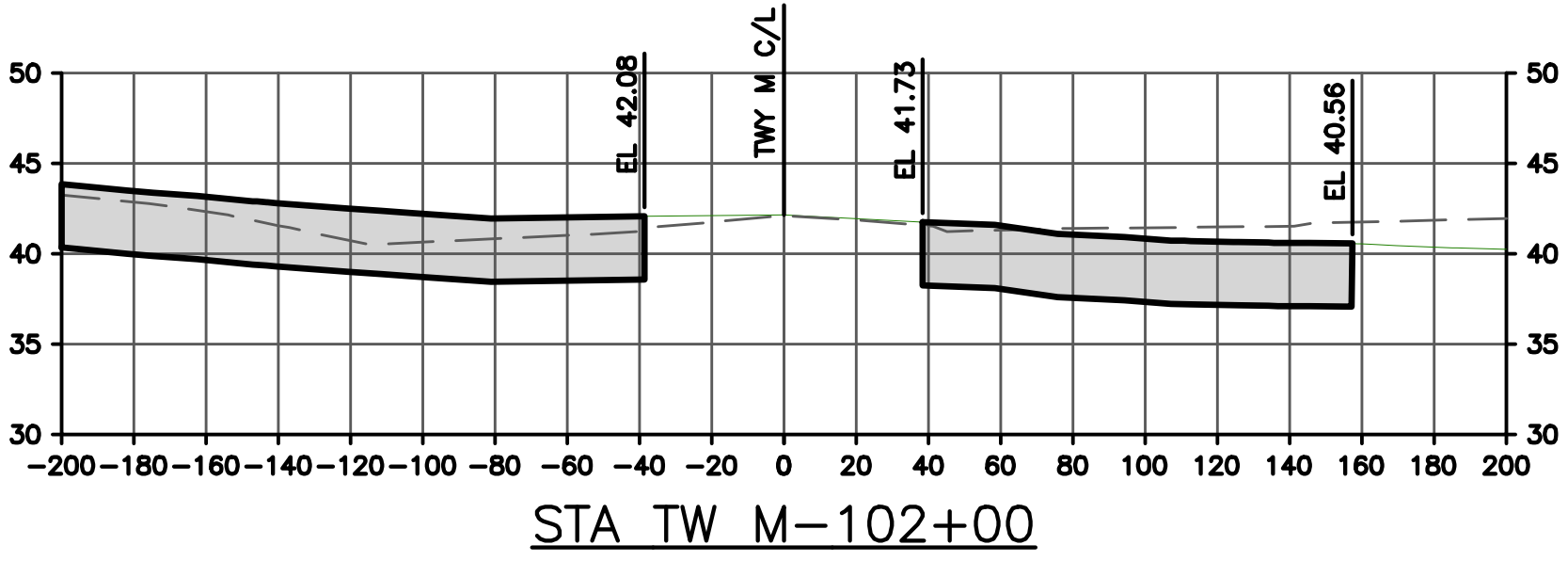
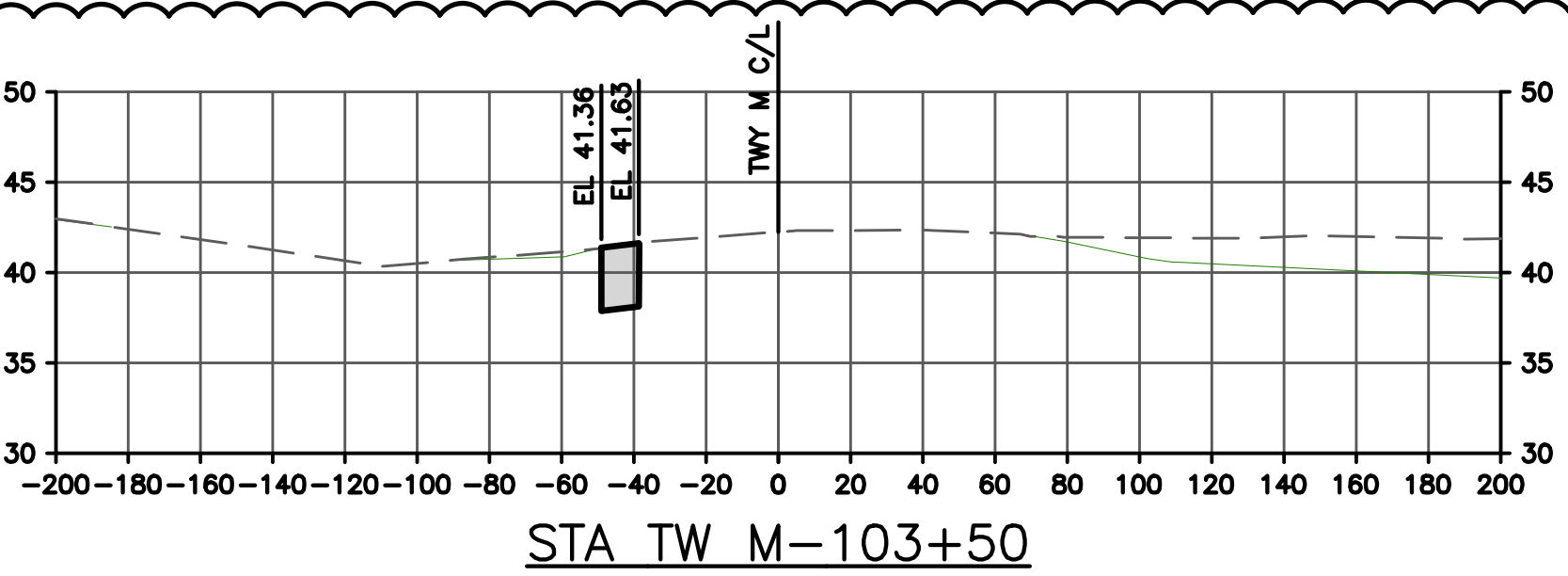
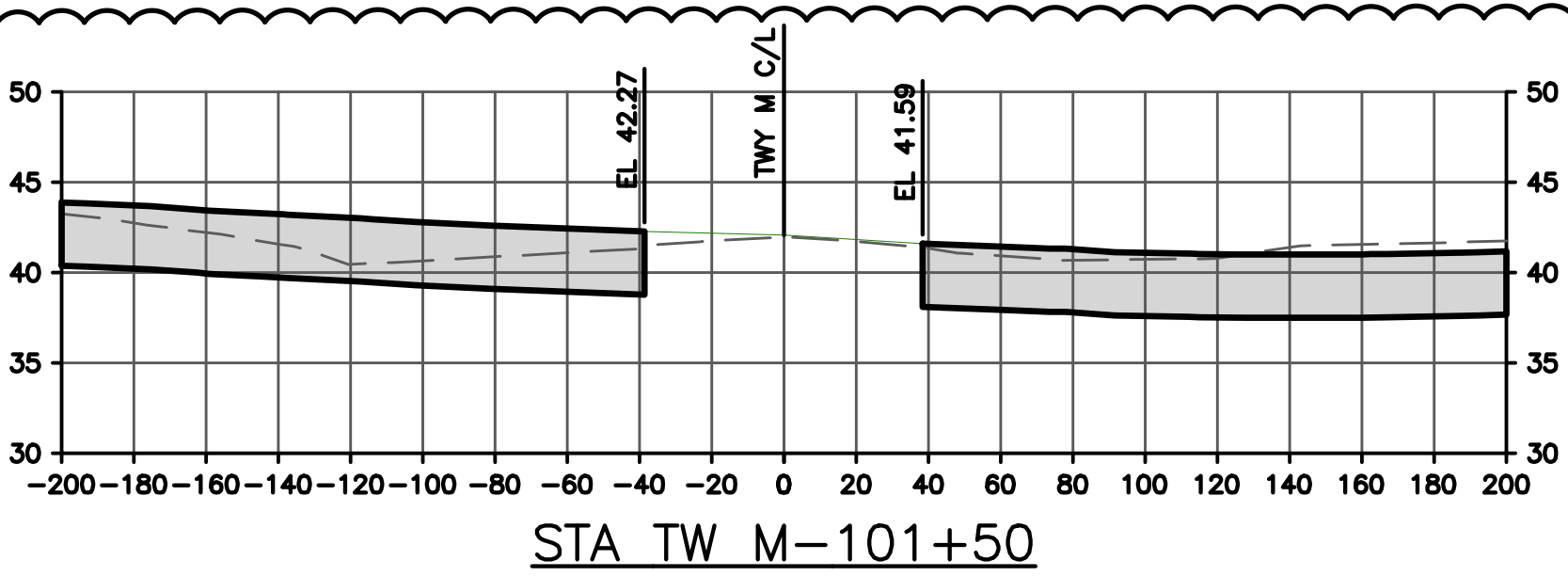
APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**DIRECTOR  
HOUSTON AIRPORT SYSTEM**

PROJECT NO:  
770  
C.I.P. NO:  
3-48-0110-044  
H.A.S. NO:  
N/A  
SHEET NO:

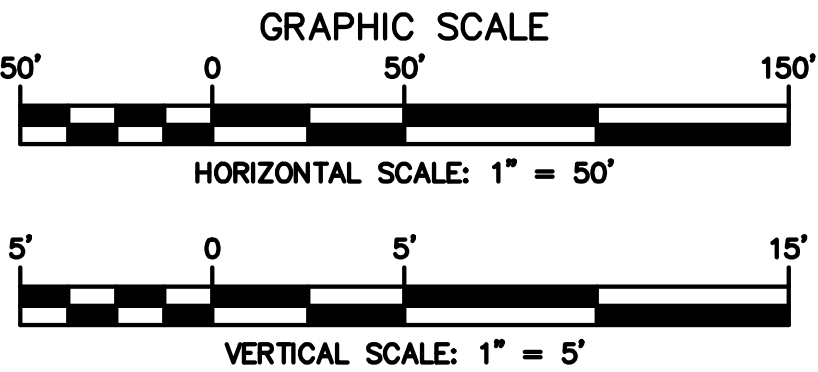
XS343  
of





LEGEND:

- PROPOSED GRADE
- EXISTING GRADE
- PROPOSED PAVEMENT SECTION OUTLINE



HOUSTON AIRPORT SYSTEM  
WILLIAM P. HOBBY AIRPORT  
HOUSTON TEXAS

**Jacobs**  
JACOBS ENGINEERING GROUP INC.  
5995 ROGERDALE ROAD  
HOUSTON, TEXAS 77072  
+1-832-351-6000  
WWW.JACOBS.COM  
TEXAS P.E. FIRM F-2966

VERIFY SCALE  
BAR IS ONE INCH ON  
ORIGINAL DRAWING.  
0 1"

REVISIONS			
NO.	DESCRIPTION	DATE	BY
0	ISSUED FOR BID	02/24/2023	SC
1	ADDENDUM	03/23/2023	SC

FAA NON-STANDARD TAXIWAYS PROJECT

CROSS SECTIONS – TAXIWAY M

PROJECT MGR:	S. CHILDERS
DESIGNER:	B. BARTLETT
DRAWN BY:	S. WAZIRI
CHECKED BY:	R. EHTESHAM
SCALE:	AS SHOWN
DATE:	03/23/2023

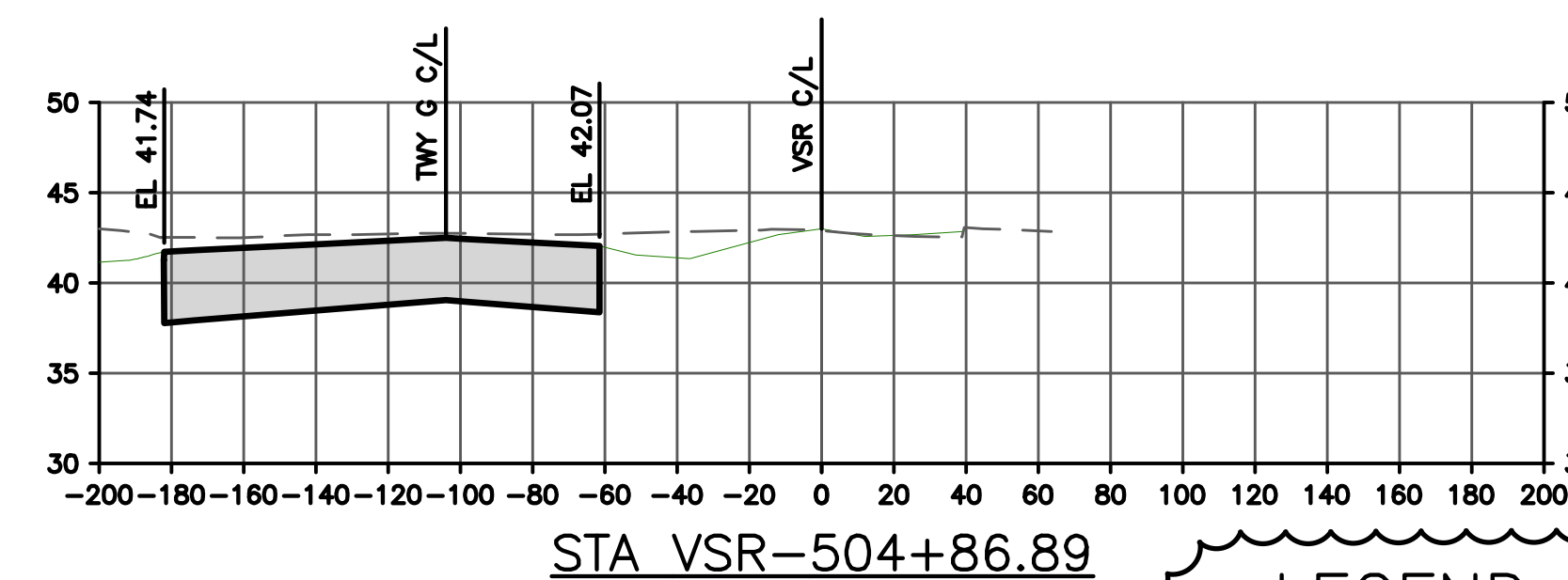
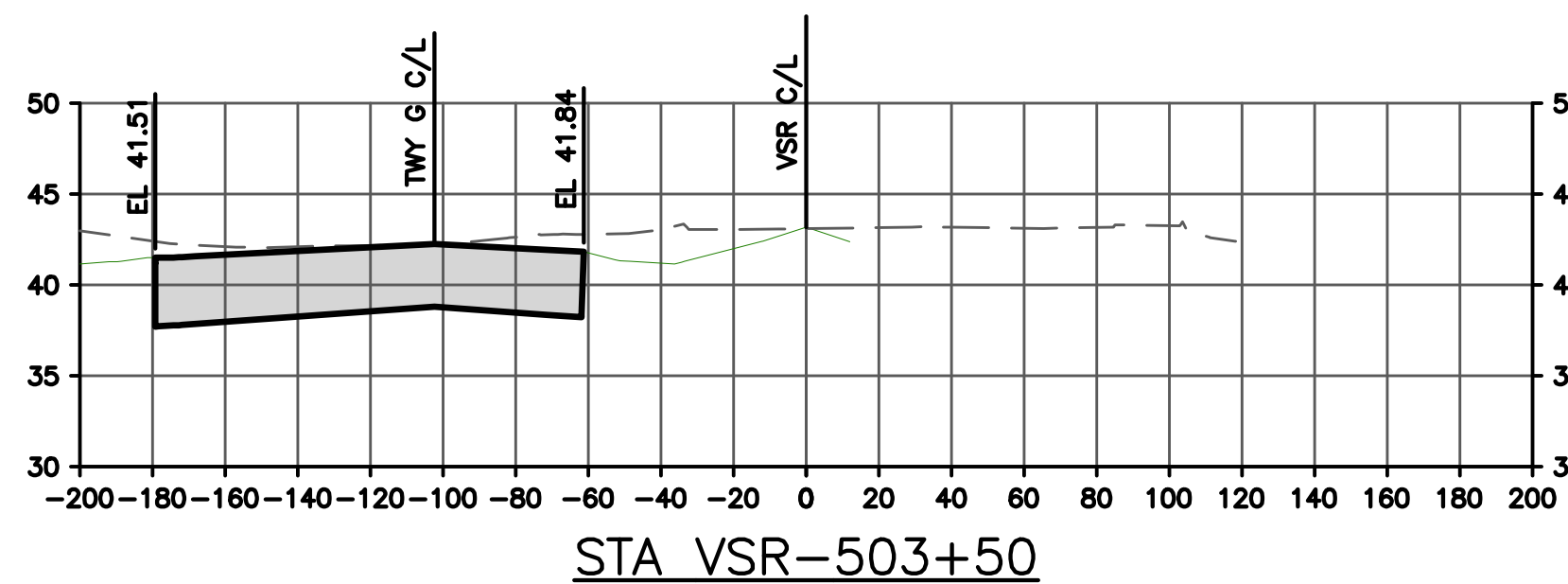
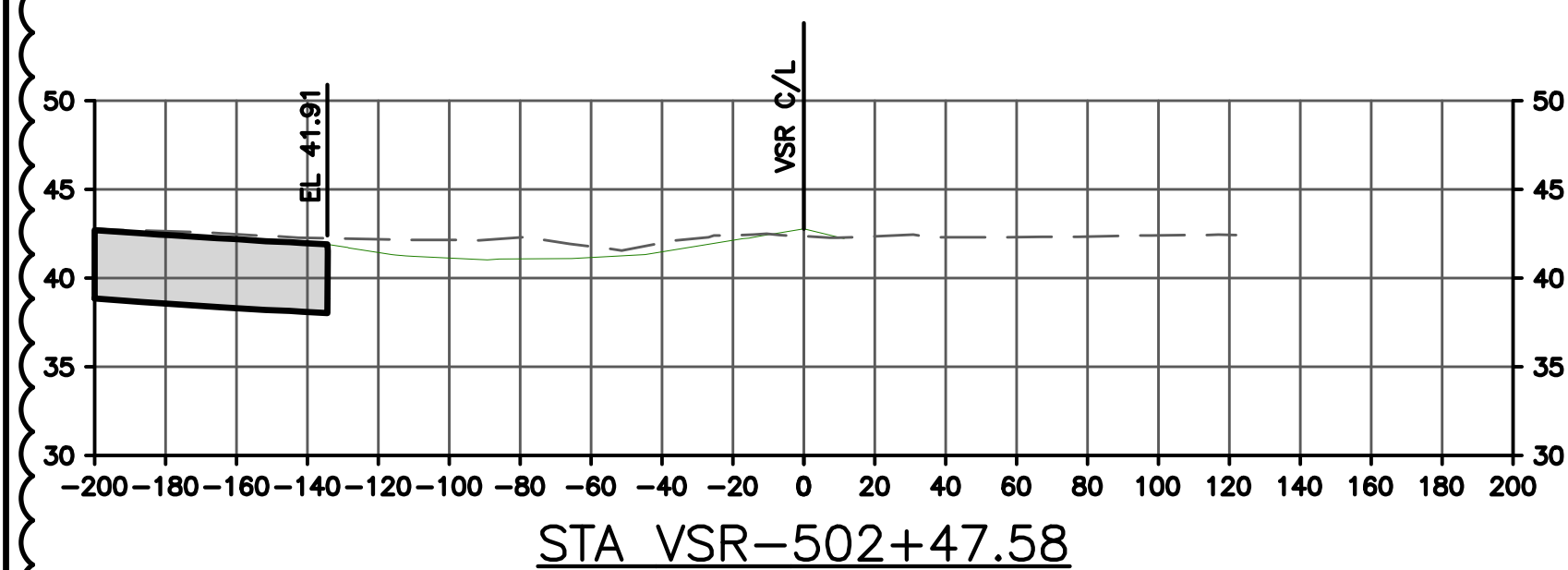
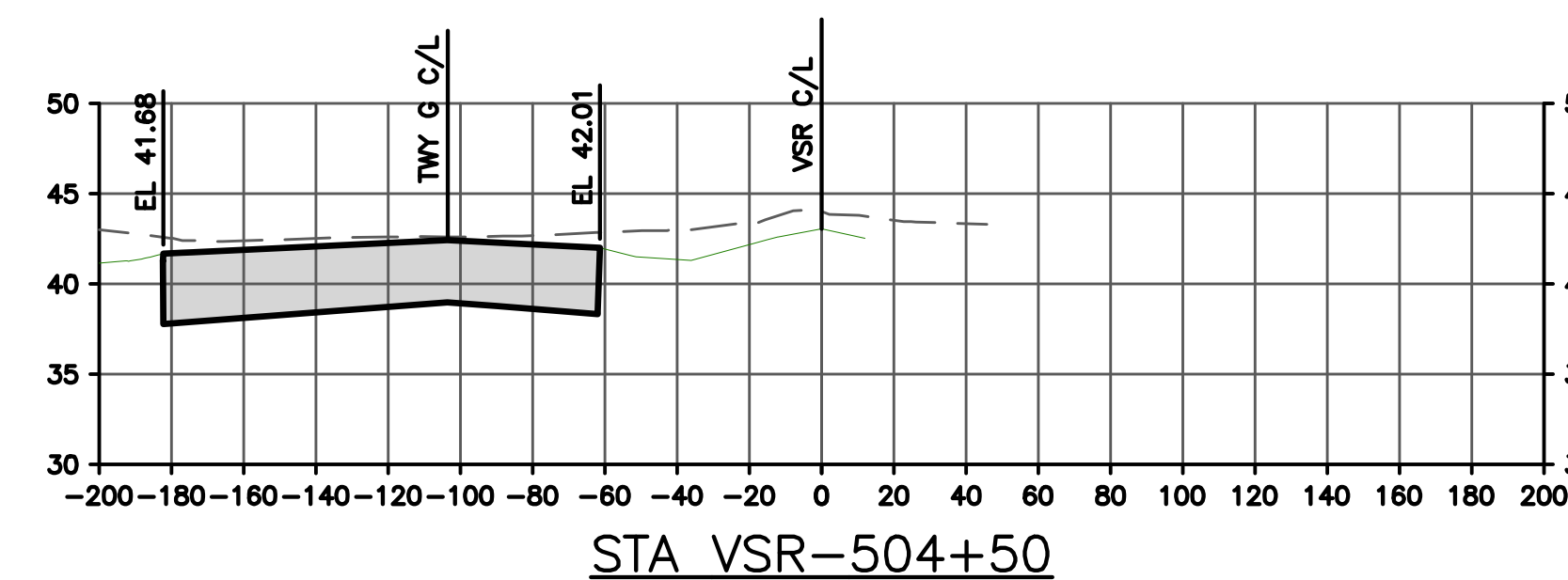
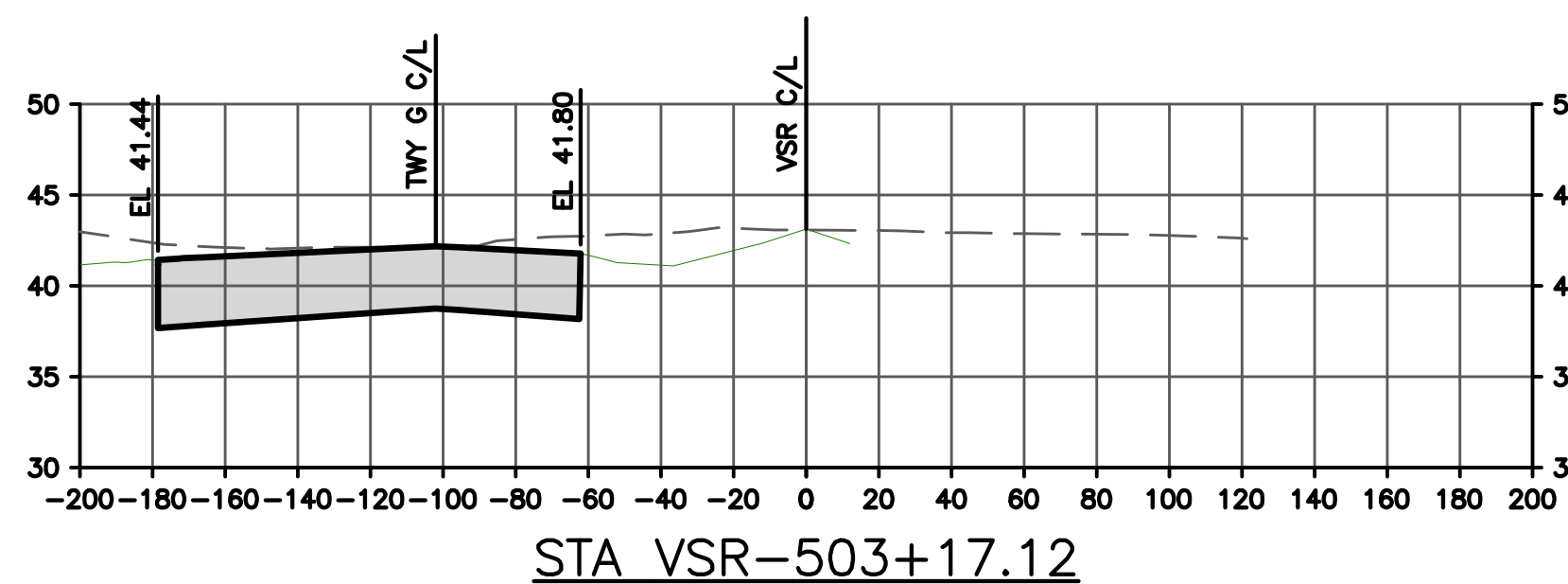
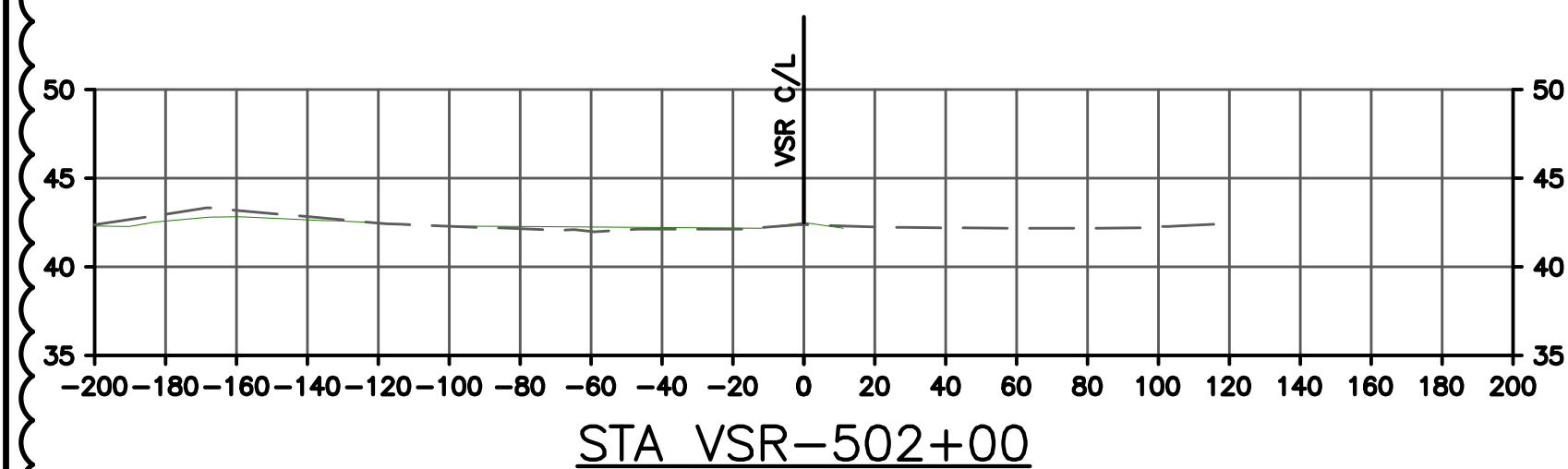
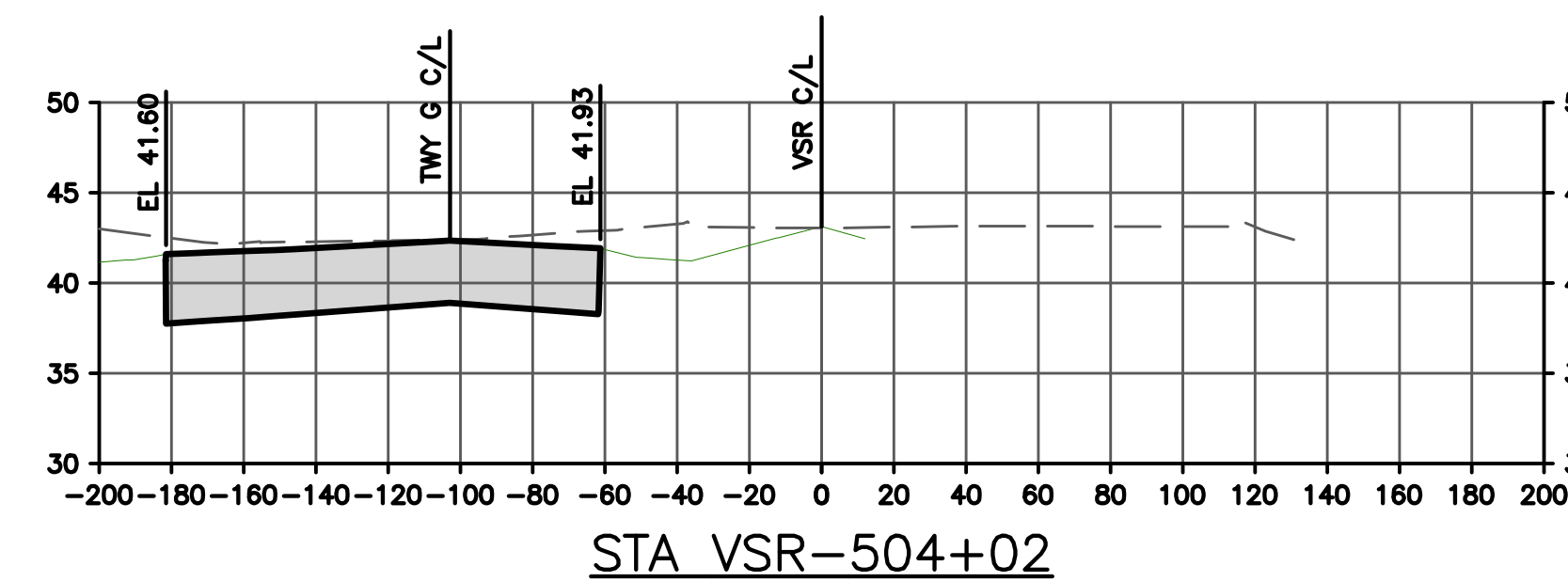
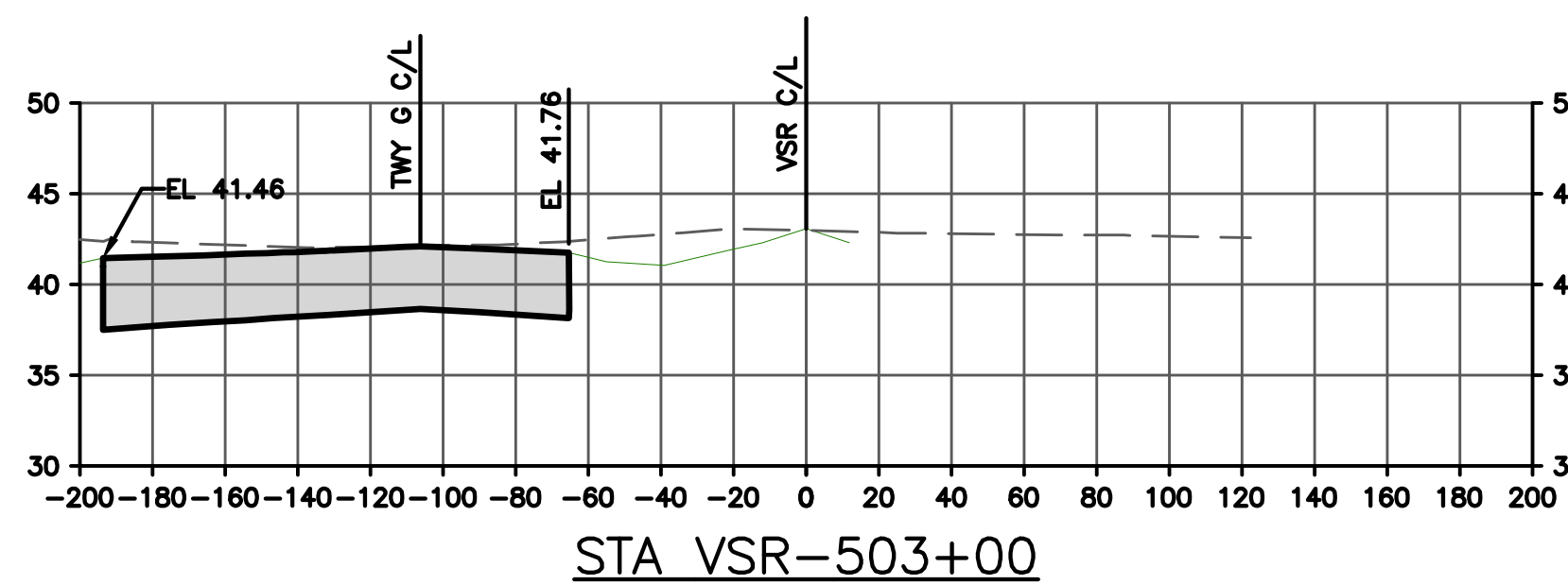
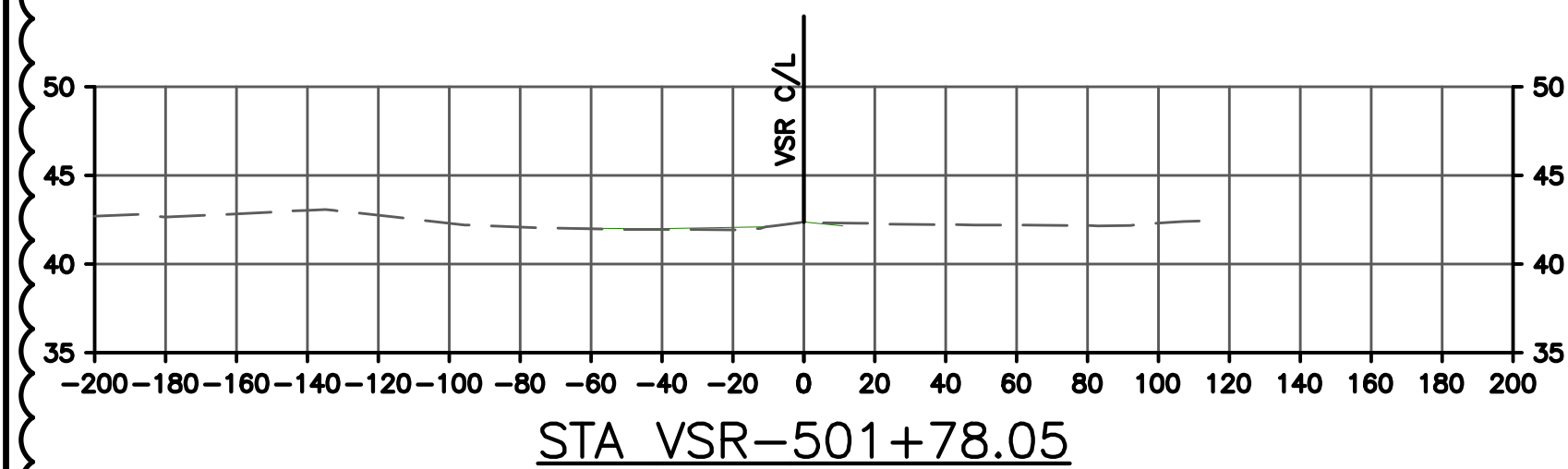
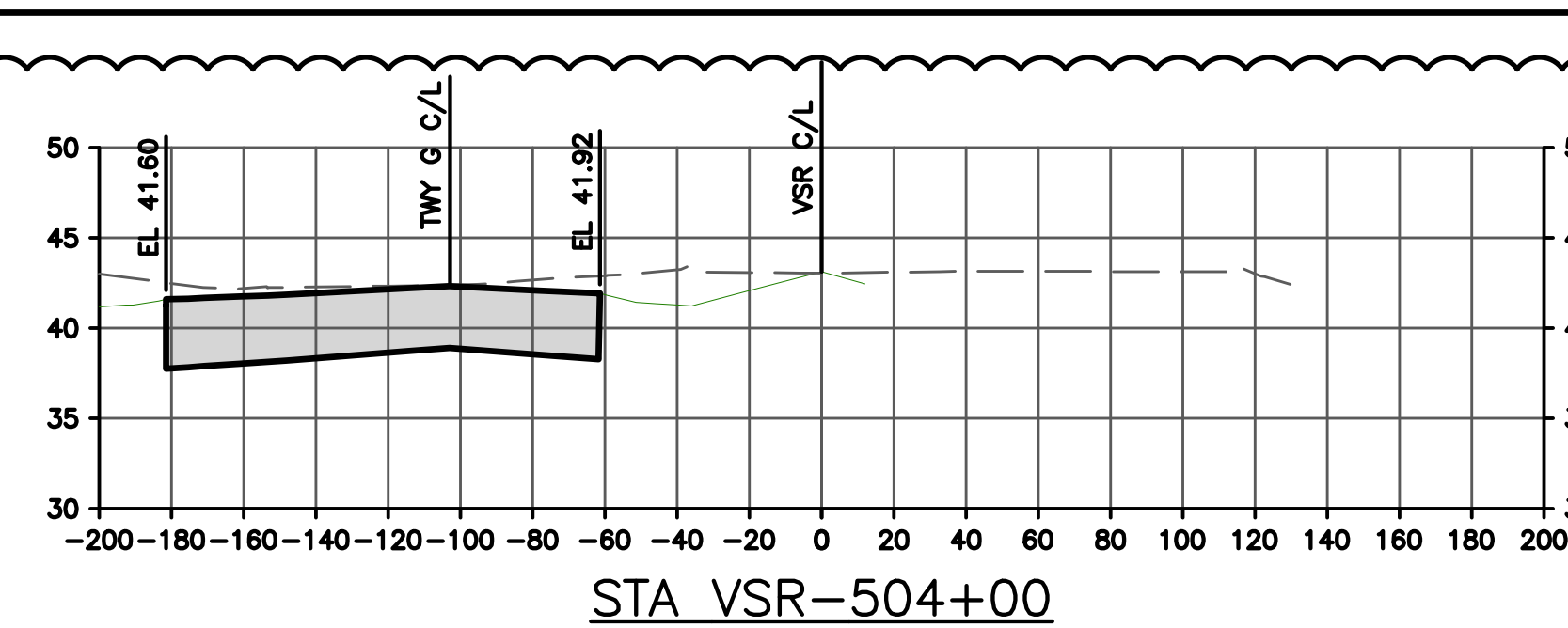
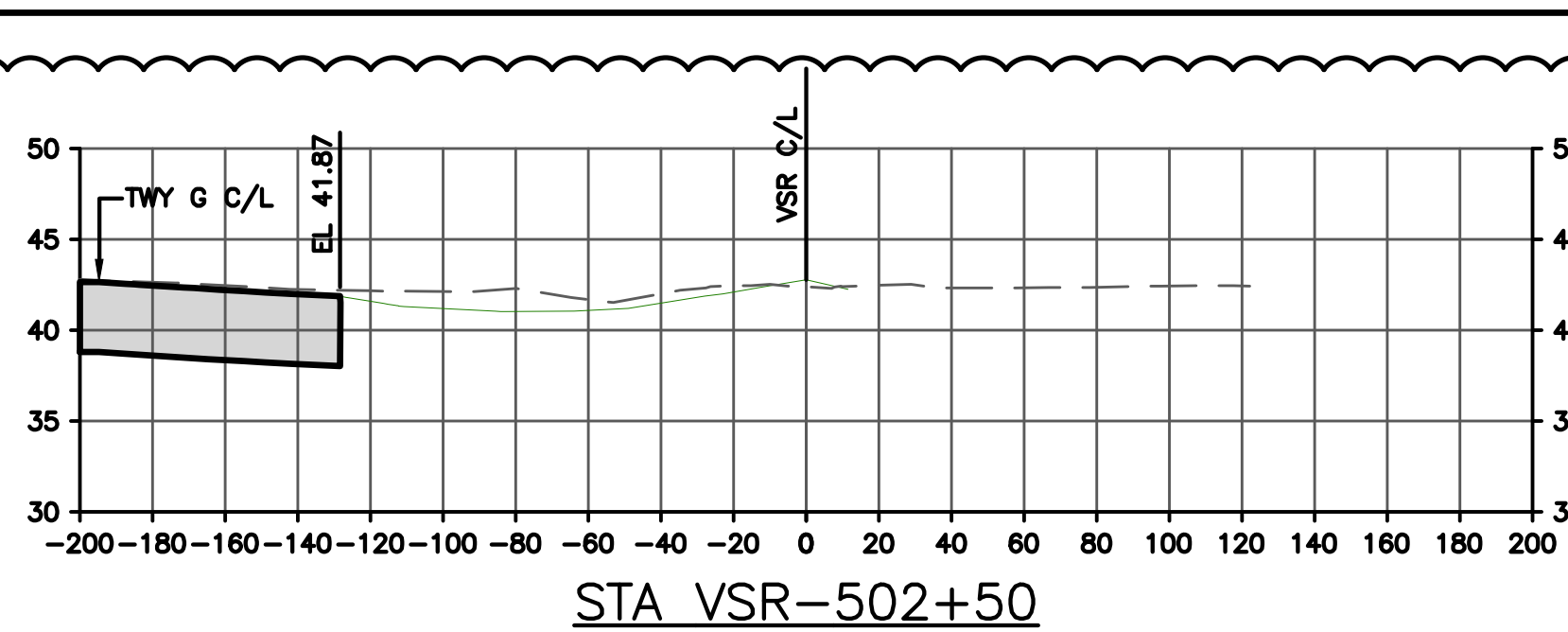
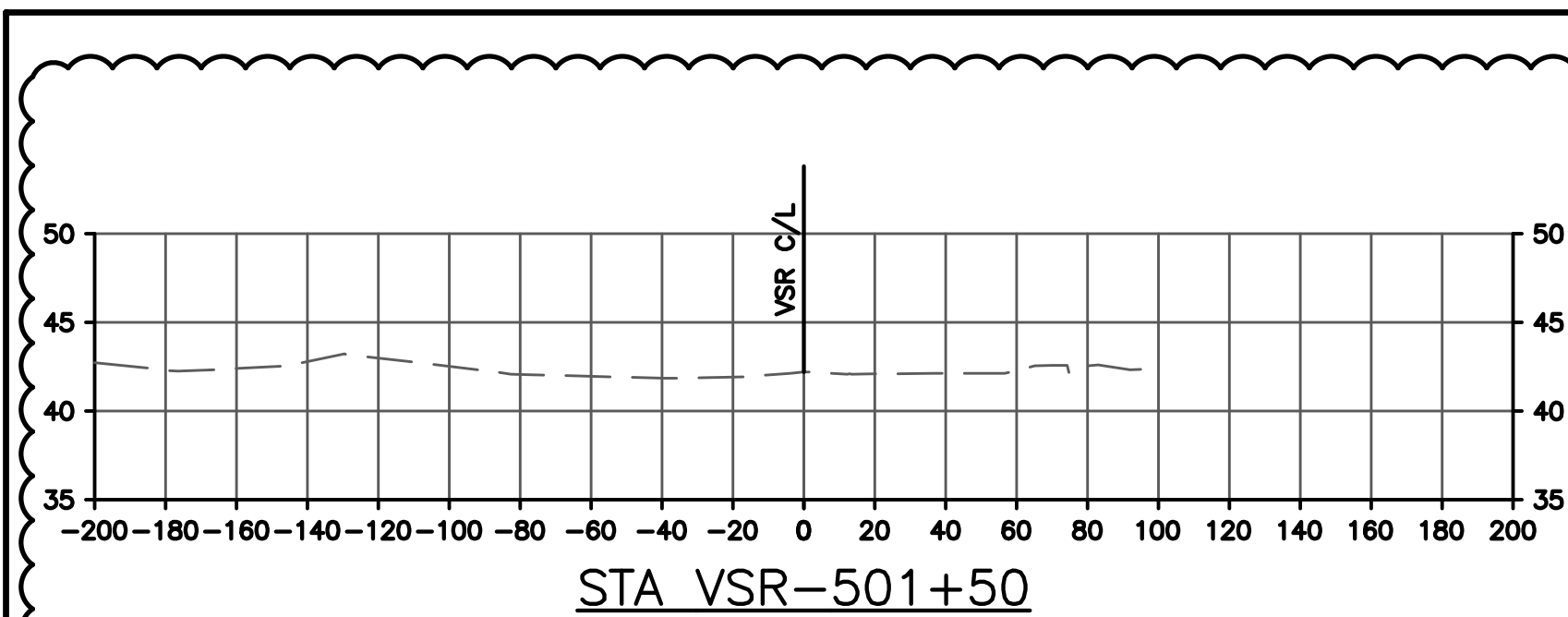


APPROVED BY:	DATE:
DIRECTOR	
HOUSTON AIRPORT SYSTEM	

PROJECT NO:	770
C.I.P. NO:	3-48-0110-044
H.A.S. NO:	N/A
SHEET NO:	

**XS351**  
of





LEGEND:

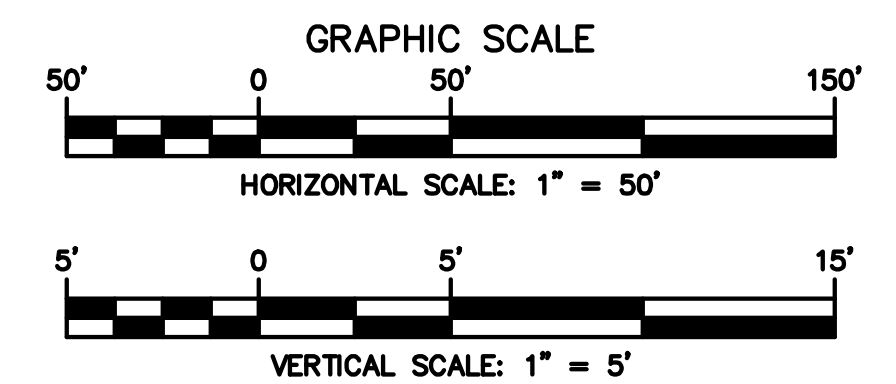
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**PROPOSED GRADE**

— — — — EXISTING GRADE

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**PROPOSED PAVEMENT  
SECTION OUTLINE**

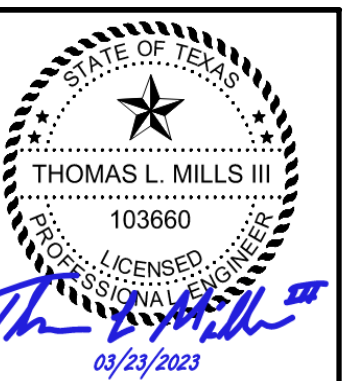


REVISIONS		
DESCRIPTION	DATE	BY
ISSUED FOR BID	02/24/2023	SC
ADDENDUM	03/23/2023	SC

FAA NON-STANDARD TAXIWAYS PROJECT

## CROSS SECTIONS – VSR

PROJECT MGR:	S. CHILDERS
DESIGNER:	B. BARTLETT
OWNED BY:	S. WAZIRI
CHECKED BY:	R. EHTESHAM
FILE:	AS SHOWN
DATE:	03/23/2023



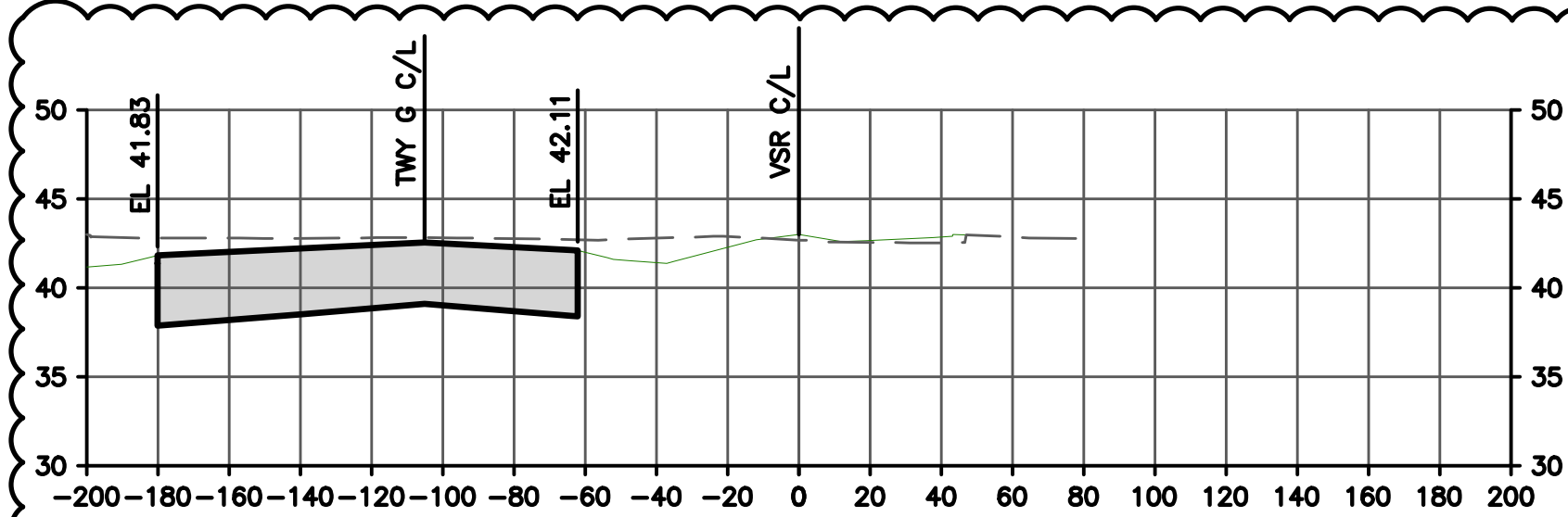
**APPROVED BY:** \_\_\_\_\_ **DATE:** \_\_\_\_\_

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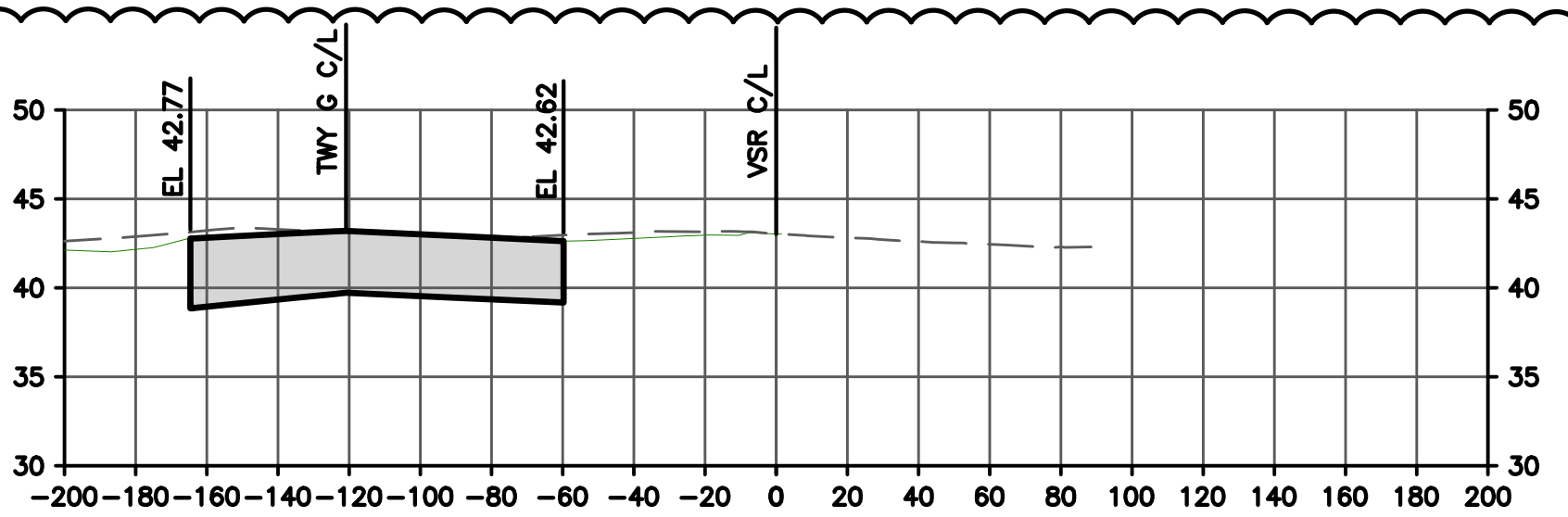
**DIRECTOR  
HOUSTON AIRPORT SYSTEM**

JECT NO: 770  
P. NO: 3-48-0110-044  
S. NO: N/A  
ET NO:

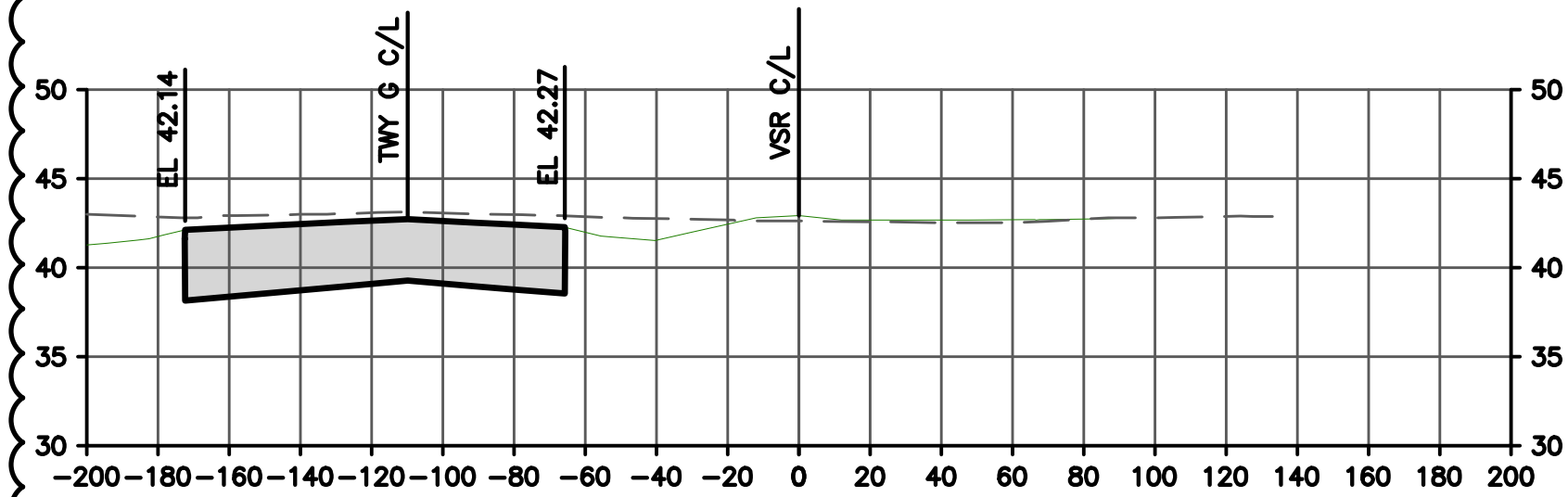




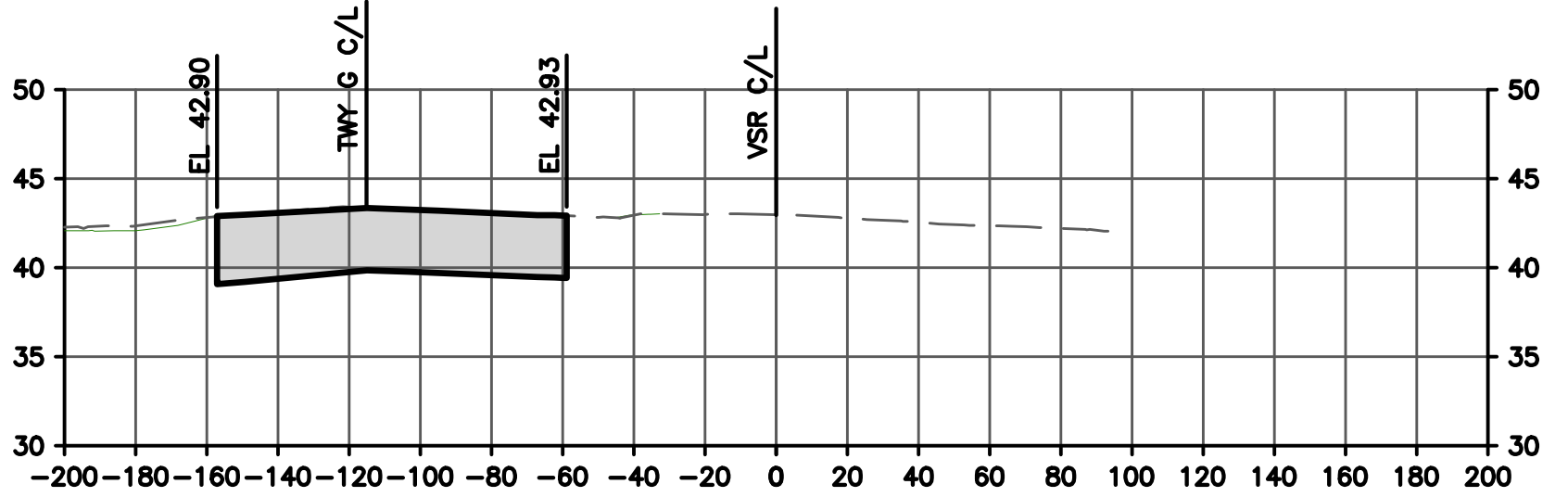
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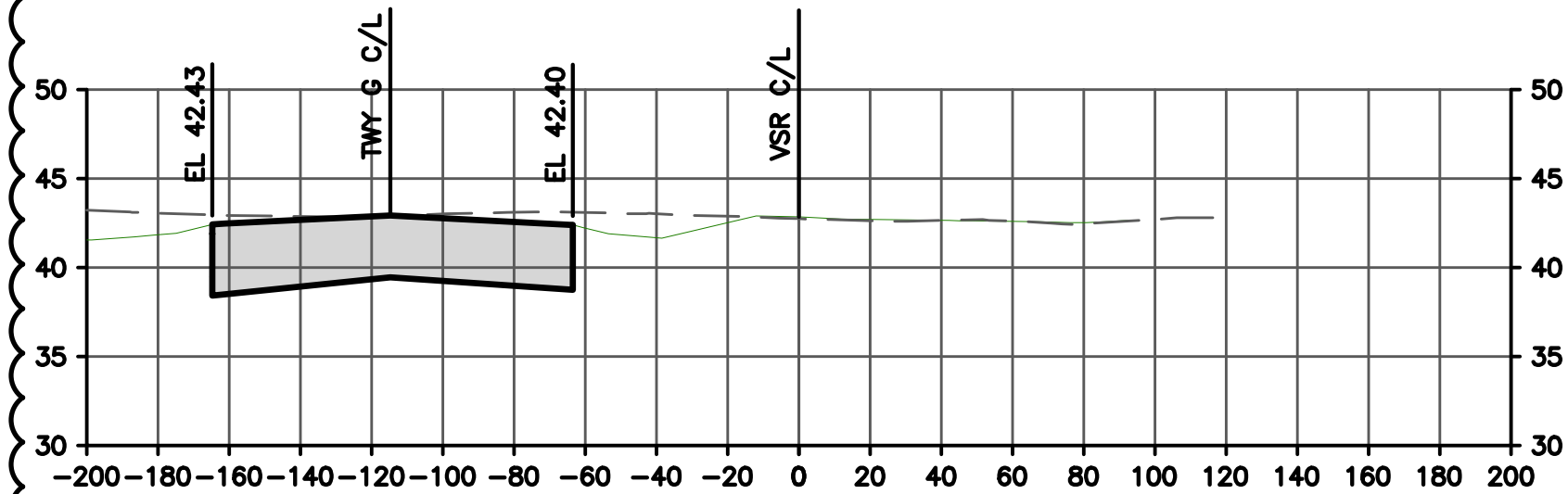
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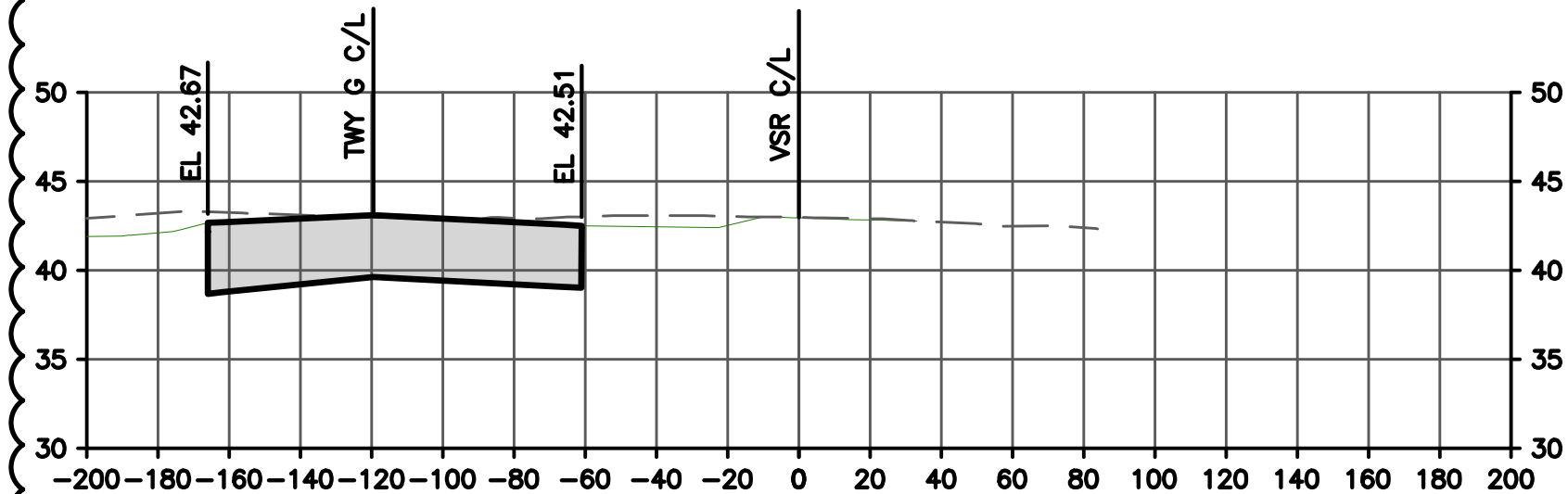
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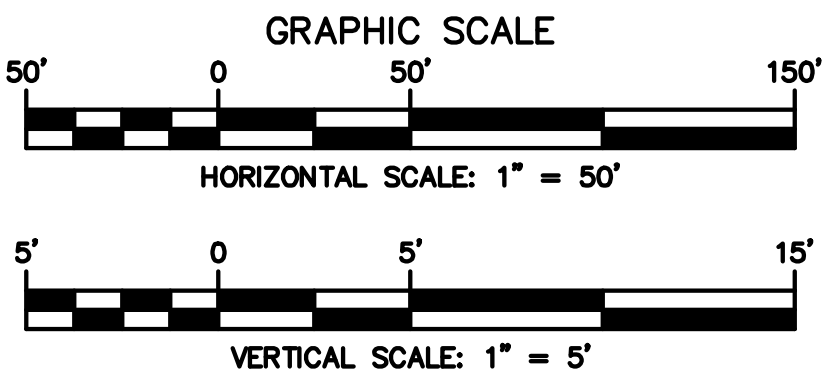


STA VSR-506+50

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LEGEND:

- PROPOSED GRADE
- EXISTING GRADE
- PROPOSED PAVEMENT SECTION OUTLINE



REVISIONS			
NO.	DESCRIPTION	DATE	BY
0	ISSUED FOR BID	02/24/2023	SC
1	ADDENDUM	03/23/2023	SC

FAA NON-STANDARD TAXIWAYS PROJECT  
CROSS SECTIONS – VSR

PROJECT MGR:	S. CHILDERS
DESIGNER:	B. BARTLETT
DRAWN BY:	S. WAZIRI
CHECKED BY:	R. EHTESHAM
SCALE:	AS SHOWN
DATE:	03/23/2023



APPROVED BY:	DATE:
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DIRECTOR  
HOUSTON AIRPORT SYSTEM

PROJECT NO:	770
C.I.P. NO:	3-48-0110-044
H.A.S. NO:	N/A
SHEET NO:	XS372