



# CITY OF HOUSTON

**Sylvester Turner**

Mayor



HOUSTON AIRPORT SYSTEM

George Bush Intercontinental ~ William P. Hobby ~ Ellington Airport

Mario C. Diaz  
Director of Aviation

July 7, 2023

**SUBJECT: Letter of Clarification No. 3**

**REFERENCE:** Request for Competitive Sealed Proposal (CSP) Rehabilitation of Taxiways SA & SB at George Bush Intercontinental Airport; Solicitation No. HJA-TXSASB-2023-022; Project No. 646A

**To:** All Prospective Respondents:

This Letter of Clarification is issued for the following reasons:

- I. **Replace Document 00410 with Revised Document 00410 – Bid Form.**
- II. **Replace Document 01110 with Revised Document 01110 – Summary of Work.**
- III. **Replace Drawings General Section G01.02, G01.04 and Civil Section C04.01 with Revised Drawings General Section G01.02, G01.04, and Civil Section C04.01.**
- IV. **Replace Drawings Electrical Section from ‘E01.02 through E03.12’ and E04.02 with Revised Drawings Electrical Section from ‘E01.02 through E03.12’ and E04.02.**
- V. **Additional Drawing General Section ‘G04.00 through G04.06’ and C04.15 – “Additive Alternate 1”- Miscellaneous Repair of Taxiways.**
- VI. **Replace Specification Numbers P-101 “Preparation and Removal of Existing Pavements” and P-501 “Cement Concrete Pavement” with Revised Specification Numbers P-101 “Preparation and Removal of Existing Pavements” and P-501 “Cement Concrete Pavement”.**

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

If further clarification is needed regarding this solicitation, please contact Jorge Ardines, Sr. Procurement Specialist, via email at [jorge.ardines@houstontx.gov](mailto:jorge.ardines@houstontx.gov).

DS  
DE

DocuSigned by:

*Cathy Vander Plaats*

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DS  
CVP

Cathy Vander Plaats  
Aviation Procurement Officer  
Houston Airport System

CVP/ja

Rehabilitation of Taxiways SA & SB at IAH  
Solicitation No. HJA-TXSASB-2023-022  
Project No. 646A

cc: Alfredo Oracion  
Dallas Evans  
Solicitation File

Attachments:

- 1) Revised Document 00410
- 2) Revised Document 01110
- 3) Drawing No. G01.02 – Revised
- 4) Drawing No. G01.04 – Revised
- 5) Drawing No. C04.01 – Revised
- 6) Drawing No. E01.02 – Revised
- 7) Drawings No. E02.01 through E02.12 – Revised
- 8) Drawings No. E03.01 through E03.12 – Revised
- 9) Drawing No. E04.02 – Revised
- 10) Drawings No. G04.00 through G04.06 and C04.15 – “Additive Alternate 1” - Miscellaneous Repair of Taxiways
- 11) Specification P-101 Preparation and Removal of Existing Pavements
- 12) Specification P-501 Cement Concrete Pavement



Rehabilitation of Taxiways SA & SB  
PN 0646A

**BID FORM  
PART A**

Document 00410A

BID FORM – PART A

To: **Houston Airport System  
Supply Chain Management  
18600 Lee Road  
Humble, Texas 77338**

Project: Rehabilitation of Taxiways SA & SB

Project No.: PN 0646A

Bidder: \_\_\_\_\_

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

## 1.0 OFFER

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

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

**2.0 CONTRACT TIME**

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



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**BID FORM  
PART B**

13	SS-310-5.1	Temporary Airfield Lighting	LS	1		
14	SS-310-5.2	Mobile Photometric Testing	LS	1		
15	C-100-14.1	Contractor Quality Control Program (CQCP)	LS	1		
16	C-102-5.1a	Filter Dam Type II	LF	60		
17	C-102-5.1b	Reinforced Silt Fence	LF	24,112		
18	C-105-6.1	Mobilization	LS	1		
19	P-101-5.1	Asphalt Milling (1" and Variable Depth)	SY	66,760		
20	P-101-5.2	Asphalt Milling (2" and Variable Depth)	SY	204,600		
21	P-101-5.3	Asphalt Milling (5" and Variable Depth)	SY	45,370		
22	P-101-5.4	Full-Depth Asphalt Shoulder Removal	SY	4,920		
23	P-101-5.5	Concrete Pavement Removal (12"-15" Depth)	SY	550		
24	P-101-5.6	Remove and Dispose 24" CMP	LF	625		
25	P-101-5.7	Concrete Slope Paving Removal and Disposal	SY	9,679		
26	P-101-5.8	Concrete Headwall Removal	EA	10		
27	P-101-5.9	Asphalt Crack Repair	LF	140,000		
28	P-152-4.1	Unclassified Excavation	CY	388,350		
29	P-209-5.1	6" Crushed Aggregate Base Course	SY	13,450		
30	P-209-5.2	15" Crushed Aggregate Base Course	SY	81,360		
31	P-209-5.3	Aggregate Base Course (Slope Stabilization)	CY	1,343		
32	P-209-5.4	Separation Geotextile (Slope Stabilization)	SY	150,000		
33	P-209-5.5	Geogrid (Slope Stabilization)	SY	150,000		
34	P-304-8.1	6" Cement-Treated Base Course	SY	12,620		
35	P-307-7.1	6" Cement Treated Permeable Base	CY	350		
36	P-401-8.1	Bituminous Surface Course	TON	40,230		
37	P-403-8.1	Bituminous Base Course	TON	40,750		

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**BID FORM  
PART B**

38	P-501-8.1	10" Portland Cement Concrete Pavement	SY	410		
39	P-501-8.2	12"-15" Portland Cement Concrete Pavement	SY	550		
40	P-501-8.3	15" Portland Cement Concrete Pavement	SY	12,240		
41	P-501-8.4	Concrete Pavement Partial Depth Repair	SF	2,000		
42	P-501-8.5	Concrete Pavement Crack Repair	LF	3,000		
43	P-610-6.1	Concrete Slope Paving	SY	15,649		
44	P-610-6.2	Modify Curb Opening	EA	1		
45	P-610-6.3	Concrete Pilot Channel	SY	12,065		
46	P-610-6.4	Interceptor Structure	SY	304		
47	P-620-5.1a	Taxiway Pavement Marking with Reflective Beads (Yellow)	SF	87,900		
48	P-620-5.1b	Taxiway Pavement Marking with Reflective Beads (Black)	SF	113,400		
49	P-620-5.1c	Thermoplastic Surface Painted Runway Direction Signs	EA	18		
50	P-620-5.1d	Thermoplastic Surface Painted Apron Control Marking Signs	EA	2		
51	P-620-5.1e	Surface Preparation	SF	201,300		
52	P-620-5.1f	Temporary Taxiway Pavement Markings (Yellow)	SF	14,200		
53	P-620-5.1g	Temporary Taxiway Pavement Markings (Black)	SF	24,400		
54	P-620-5.1h	Temporary Taxiway Pavement Markings Removal	SF	4,700		
55	P-620-5.1i	Removal of Existing Pavement Marking	SF	1,500		
56	D-701-5.1	Install 6'x5' RCB (Class V) Open Cut, Complete in Place	LF	63		
57	D-701-5.2	Install 7'x5' RCB (Class V) Open Cut, Complete in Place	LF	65		
58	D-701-5.3	Install 8'x4' RCB (Class V) Open Cut, Complete in Place	LF	151		

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**BID FORM  
PART B**

59	D-701-5.4	Install 10'x7' RCB (Class V) Open Cut, Complete in Place	LF	28		
60	D-701-5.5	Install 24" CMP Open Cut, Complete in Place	LF	2,170		
61	D-752-5.1	Install Wingwall, Complete in Place	CY	729		
62	T-901-5.1	Hydroseeding	AC	61.0		
63	T-904-5.1	Sodding	SY	63,930		
64	L-108-5.1	No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Trench, Duct Bank or Conduit	LF	177,400		
65	L-108-5.2	No. 6 AWG, Solid, Bare Copper Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit, Including Connections/Terminations	LF	3,000		
66	L-110-5.1	Flowable Fill Encased Electrical Conduit, 1W-2"C	LF	1,900		
67	L-110-5.2	Non-Encased Electrical Conduit, 1W-2"C	LF	150		
68	L-110-5.3	Concrete Encased Electrical Conduit, 1W-2"C	LF	1,150		
69	L-110-5.4	Concrete Encased Electrical Conduit, 1W-2"C with Saw Kerf Pavement Repair	LF	450		
70	L-110-5.5	Non-Encased Electrical Duct Bank, 16W-2"C	LF	225		
71	L-110-5.6	Non-Encased Electrical Duct Bank, 2W-2"C	LF	280		
72	L-110-5.7	Flowable Fill Encased Electrical Duct Bank, 2W-2"C	LF	650		
73	L-115-5.1	Existing Electrical Junction Structure/Manhole Adjusted to New Grade	EA	51		
74	L-115-5.2	4'x4'x4' Aircraft-Rated Handhole, Installed	EA	4		
75	L-115-5.3	L-868 Blank Cover with Spacers, Installed	EA	5		
76	L-125-5.1	L-852C/D(L) Taxiway Centerline Light, Installed on Adjusted Light Base	EA	754		

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**BID FORM  
PART B**

77	L-125-5.2	L-852C/D(L) Taxiway Centerline Light, Installed on Existing Light Base	EA	442		
78	L-125-5.3	L-861T(L) Base Mounted Taxiway Edge Light, Installed on Adjusted Light Base	EA	407		
79	L-125-5.4	L-861T(L) Base Mounted Taxiway Edge Light, Installed on Existing Light Base	EA	88		
80	L-125-5.5	L-858(L) Base Mounted Guidance Sign, Installed	EA	28		
81	L-125-5.6	L-852C/D(L) Taxiway Centerline Light, Installed on New Light Base	EA	10		
82	L-125-5.7	L-852G(L) In-Pavement Runway Guard Light, Installed	EA	62		
83	L-125-5.8	L-861T(L) Base Mounted Taxiway Edge Light, Installed on New Base in Existing Pavement	EA	18		
84	L-125-5.9	L-861T(L) Base Mounted Taxiway Edge Light, Installed on New Base in New Pavement	EA	23		
85	L-125-5.10	L-852C/D(L) Taxiway Centerline Light, Installed on New Base in Existing Pavement	EA	18		
86	L-125-5.11	Update Sign Legend	EA	1		
87	02378-4.1	Riprap Gradation No. 1, including Topsoil	TON	242		
<b>TOTAL BASE UNIT PRICES</b>						\$ _____

**C. EXTRA UNIT PRICE TABLE: N/A**

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**D. CASH ALLOWANCE TABLE:**

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

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

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**E. ALTERNATES TABLE:**

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
1	P-101-5.2	Asphalt Milling (2" and Variable Depth)	SY	565		
2	P-101-5.10	Concrete Pavement Removal (14"-20" Depth)	SY	445		
3	P-401-8.1	Bituminous Surface Course	TON	145		
4	P-501-8.4	Concrete Pavement Partial Depth Repair	SF	500		
5	P-501-8.5	Concrete Pavement Crack Repair	LF	500		
6	P-501-8.6	Concrete Pavement Crack Repair (Epoxy Injection)	LF	400		
7	P-501-8.7	14"-20" Portland Cement Concrete Pavement	SY	445		
8	P-501-8.8	Concrete Joint Seal Repair	LF	5,000		
9	P-620-5.1a	Taxiway Pavement Marking with Reflective Beads (Yellow)	SF	2,000		
10	P-620-5.1b	Taxiway Pavement Marking with Reflective Beads (Black)	SF	2,000		
11	P-620-5.1f	Temporary Taxiway Pavement Markings (Yellow)	SF	2,115		
12	P-620-5.1g	Temporary Taxiway Pavement Markings (Black)	SF	2,115		
13	P-620-5.1h	Temporary Taxiway Pavement Markings Removal	SF	4,230		
<b>TOTAL BASE UNIT PRICES</b>						\$ _____

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**F. 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.

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**SECTION 01110  
SUMMARY OF WORK**

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 THE PROJECT

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

1.03 GENERAL DESCRIPTION OF THE WORK

- A. Construct the Work under a single general construction contract as follows:

**Base Bid**

Rehabilitation of Taxiways SA & SB

- Asphalt pavement rehabilitation of Taxiways SA, SB, SC, SF, SG, SH, SJ, and SK.
- Asphalt shoulder widening and reconstruction along above-mentioned taxiways.
- Partial depth repairs, and full depth replacement of damaged concrete pavement.
- Concrete pavement widening at the high-speed Taxiways SH and SJ.
- Associated grading, drainage, pavement markings and electrical infrastructure (including replacing aging cables).
- Other work identified in the Plans, Specifications, and Contract Documents.
- Replacement of #8, 5kV cables for taxiways SA, SB, and connectors lighting circuits.

**Additive Alternate 1**

- Miscellaneous asphalt and concrete repairs across the airfield as directed by HAS. Tentative areas have been identified in the Plans but are at the discretion of HAS.
- This work shall be performed simultaneously with base bid work phase in coordination with airport operations. No additional time will be granted for this work.

B. Construct the Work in multiple stages following Section 01326 - Construction Sequencing.

C. Notice to Proceed

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

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

1. Cut and patch existing construction designated or required to remain and to receive new construction, following *the construction plans*.

E. Contract limit lines are shown diagrammatically on Drawings.

#### 1.04 CITY OCCUPANCY

The City will occupy the site and remain in operation during the entire period of construction for the conduct of normal operations.

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

B. Schedule Work to fit these requirements.

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

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

#### 1.07 EXTRA COPIES OF CONTRACT DOCUMENTS

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

1.08 PERMITS, FEES AND NOTICES

Refer to Document 00700 Paragraph 3.14. Reimburse City for City's payment of fines levied against City or its employees because of Contractor's failure to obtain proper permits, pay proper fees, and make proper notifications. Reimbursement will be by Change Order, reducing the Contract Price as based upon the dollar amount of fines imposed.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

**REVISED 07-06-2023**

Rehabilitation of Taxiways SA & SB  
PN 0646A

**SUMMARY OF WORK**

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01110-4  
09-03-2019



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G01.03	INDEX OF SHEETS II
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G01.05	PROJECT SITE PLAN
G01.06	SURVEY CONTROL PLAN
G02.01	GENERAL CONTRACT, SAFETY, & SECURITY NOTES I
G02.02	GENERAL CONTRACT, SAFETY, & SECURITY NOTES II
G02.03	GENERAL CONTRACT, SAFETY, & SECURITY DETAILS I
G02.04	GENERAL CONTRACT, SAFETY, & SECURITY DETAILS II
G02.05	OVERALL PHASING PLAN
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G02.07	PHASING PLAN – PHASE 2
G02.08	PHASING PLAN – PHASE 3
G02.09	PHASING PLAN – PHASE 4 OVERVIEW
G02.10	PHASING PLAN – PHASE 4
G02.11	PHASING PLAN – PHASE 4 (CONT'D)
G02.12	PHASING PLAN – PHASE 5
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G02.14	PHASING PLAN – PHASE 7
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G03.02	TEMPORARY MARKING, SIGNAGE AND LIGHTING PLAN – PHASES 2 & 3
G03.03	TEMPORARY MARKING, SIGNAGE AND LIGHTING PLAN – PHASE 3
G03.04	TEMPORARY MARKING, SIGNAGE AND LIGHTING PLAN – PHASE 4
G03.05	TEMPORARY MARKING, SIGNAGE AND LIGHTING PLAN – PHASE 5
G03.06	TEMPORARY MARKING, SIGNAGE AND LIGHTING PLAN – PHASE 5 (CONT'D)
G03.07	TEMPORARY MARKING, SIGNAGE AND LIGHTING PLAN – PHASE 6
G03.08	TEMPORARY MARKING, SIGNAGE AND LIGHTING PLAN – PHASE 6 (CONT'D)
G03.09	TEMPORARY MARKING, SIGNAGE AND LIGHTING PLAN – PHASE 7
G03.10	TEMPORARY MARKING, SIGNAGE AND LIGHTING PLAN – PHASE 7 (CONT'D)
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G04.01	ADDITIVE ALTERNATE 1 PHASING PLAN – PAVEMENT REHAB 1
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G04.03	ADDITIVE ALTERNATE 1 PHASING PLAN – PAVEMENT REHAB 3
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C07.13	GRADING & DRAINAGE POINT TABLES I
C07.14	GRADING & DRAINAGE POINT TABLES II

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SHEET NUMBER	SHEET TITLE
C07.15	DRAINAGE PROFILES I
C07.16	DRAINAGE PROFILES II
C07.17	DRAINAGE PROFILES III
C07.18	DRAINAGE PROFILES IV
C07.19	DRAINAGE PROFILES V
C07.20	DRAINAGE PROFILES VI
C07.21	DRAINAGE PROFILES VII
C07.22	DRAINAGE PROFILES VIII
C07.23	DRAINAGE PROFILES IX
C07.24	DRAINAGE PROFILES X
C07.25	DRAINAGE DETAILS I
C07.26	DRAINAGE DETAILS II
C07.27	DRAINAGE DETAILS III
C07.28	DRAINAGE DETAILS IV
C07.29	DRAINAGE DETAILS V
C07.30	DRAINAGE DETAILS VI
C07.31	DRAINAGE DETAILS VII
C07.32	SINKHOLE PLAN I
C07.33	SINKHOLE PLAN II
C07.34	SINKHOLE PLAN III
C07.35	SINKHOLE PLAN IV
C07.36	SINKHOLE PLAN V
C07.37	SINKHOLE PLAN VI
C07.38	SINKHOLE PLAN VII
C07.39	SINKHOLE PLAN VIII
C07.40	SINKHOLE DETAILS I
C07.41	SINKHOLE DETAILS II
C07.42	BACKSLOPE SWALE PLAN I
C07.43	BACKSLOPE SWALE PLAN II
C07.44	BACKSLOPE SWALE PLAN III
C07.45	BACKSLOPE SWALE PLAN IV
C07.46	BACKSLOPE SWALE PLAN V
C07.47	BACKSLOPE SWALE PLAN VI
C07.48	BACKSLOPE SWALE PLAN VII
C07.49	BACKSLOPE SWALE PLAN VIII
C07.50	BACKSLOPE SWALE DETAILS I
C07.51	BACKSLOPE SWALE DETAILS II
C08.01	TELECOMMUNICATIONS PLAN I
C08.02	TELECOMMUNICATIONS PLAN II
C08.03	TELECOMMUNICATIONS PLAN III
C08.04	TELECOMMUNICATIONS PLAN IV
C08.05	TELECOMMUNICATIONS PLAN V
C08.06	TELECOMMUNICATIONS PLAN VI
C08.07	TELECOMMUNICATIONS PLAN VII
C08.08	TELECOMMUNICATIONS PLAN VIII
C08.09	TELECOMMUNICATIONS PLAN IX
C08.10	TELECOMMUNICATIONS PLAN X
C08.11	TELECOMMUNICATIONS PLAN XI
C08.12	TELECOMMUNICATIONS PLAN XII



REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADD. 1	07/06/23 JEF

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

PROJECT MGR:	JEF
DESIGNER:	KKR
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	1" = 1"
DATE:	07/06/2023



APPROVED BY: JEF

DIRECTOR  
HOUSTON AIRPORT SYSTEM

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

**G01.02**

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**BASE BID**

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
	01210	Cash Allowances	LS	1
1	01555-1.04A	Traffic Control and Regulation, Excluding Flagmen	LS	1
2	01555-1.04B	Flagmen	LS	1
3	SS-130-4.1	Trench and Excavation Safety Systems	LF	85
4	SS-300-5.1	Lockout/Tagout and Constant Current Regulator Calibration Procedures	LS	1
5	SS-301-5.1	Existing Base Mounted Edge Light, Removed	EA	88
6	SS-301-5.2	Existing In-Pavement Centerline Light, Removed	EA	456
7	SS-301-5.3	Existing Base Mounted Guidance Sign, Removed	EA	28
8	SS-301-5.4	Existing Base Mounted Edge Light, Removed, Base Top Section, Removed	EA	407
9	SS-301-5.5	Existing In-Pavement Centerline Light, Removed, Base Top Section, Removed	EA	754
10	SS-301-5.6	Existing L-852G Runway Guard Light, Relocated on New Base	EA	5
11	SS-301-5.7	Abandoned Sign Foundation, Demolished	EA	2
12	SS-305-5.1	Directional Boring, 16-Way 2" C Polyethylene Conduits	LF	1,350
13	SS-310-5.1	Temporary Airfield Lighting	LS	1
14	SS-310-5.2	Mobile Photometric Testing	LS	1
15	C-100-14.1	Contractor Quality Control Program (CQCP)	LS	1
16	C-102-5.1a	Filter Dam Type II	LF	60
17	C-102-5.1b	Reinforced Silt Fence	LF	24,112
18	C-105-6.1	Mobilization	LS	1
19	P-101-5.1	Asphalt Milling (1" and Variable Depth)	SY	66,760
20	P-101-5.2	Asphalt Milling (2" and Variable Depth)	SY	204,600
21	P-101-5.3	Asphalt Milling (5" and Variable Depth)	SY	45,370
22	P-101-5.4	Full-Depth Asphalt Shoulder Removal	SY	4,920
23	P-101-5.5	Concrete Pavement Removal (12"-15" Depth)	SY	550
24	P-101-5.6	Remove and Dispose 24" CMP	LF	625
25	P-101-5.7	Concrete Slope Paving Removal and Disposal	SY	9,679
26	P-101-5.8	Concrete Headwall Removal	EA	10
27	P-101-5.9	Asphalt Crack Repair	LF	140,000
28	P-152-4.1	Unclassified Excavation	CY	388,350
29	P-209-5.1	6" Crushed Aggregate Base Course	SY	13,450
30	P-209-5.2	15" Crushed Aggregate Base Course	SY	81,360
31	P-209-5.3	Aggregate Base Course (Slope Stabilization)	CY	1,343
32	P-209-5.4	Separation Geotextile (Slope Stabilization)	SY	150,000
33	P-209-5.5	Geogrid (Slope Stabilization)	SY	150,000
34	P-304-8.1	6" Cement-Treated Base Course	SY	12,620
35	P-307-7.1	6" Cement Treated Permeable Base	CY	350
36	P-401-8.1	Bituminous Surface Course	TON	40,230
37	P-403-8.1	Bituminous Base Course	TON	40,750
38	P-501-8.1	10" Portland Cement Concrete Pavement	SY	410
39	P-501-8.2	12"-15" Portland Cement Concrete Pavement	SY	550
40	P-501-8.3	15" Portland Cement Concrete Pavement	SY	12,240

**BASE BID (CONT'D)**

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
41	P-501-8.4	Concrete Pavement Partial Depth Repair	SF	2,000
42	P-501-8.5	Concrete Pavement Crack Repair	LF	3,000
43	P-610-6.1	Concrete Slope Paving	SY	15,649
44	P-610-6.2	Modify Curb Opening	EA	1
45	P-610-6.3	Concrete Pilot Channel	SY	12,065
46	P-610-6.4	Interceptor Structure	SY	304
47	P-620-5.1a	Taxiway Pavement Marking with Reflective Beads (Yellow)	SF	87,900
48	P-620-5.1b	Taxiway Pavement Marking with Reflective Beads (Black)	SF	113,400
49	P-620-5.1c	Thermoplastic Surface Painted Runway Direction Signs	EA	18
50	P-620-5.1d	Thermoplastic Surface Painted Apron Control Marking Signs	EA	2
51	P-620-5.1e	Surface Preparation	SF	201,300
52	P-620-5.1f	Temporary Taxiway Pavement Markings (Yellow)	SF	14,200
53	P-620-5.1g	Temporary Taxiway Pavement Markings (Black)	SF	24,400
54	P-620-5.1h	Temporary Taxiway Pavement Markings Removal	SF	4,700
55	P-620-5.1i	Removal of Existing Pavement Marking	SF	1,500
56	D-701-5.1	Install 6'x5' RCB (Class V) Open Cut, Complete in Place	LF	63
57	D-701-5.2	Install 7'x5' RCB (Class V) Open Cut, Complete in Place	LF	65
58	D-701-5.3	Install 8'x4' RCB (Class V) Open Cut, Complete in Place	LF	151
59	D-701-5.4	Install 10'x7' RCB (Class V) Open Cut, Complete in Place	LF	28
60	D-701-5.5	Install 24" CMP Open Cut, Complete in Place	LF	2,170
61	D-752-5.1	Install Wingwall, Complete in Place	CY	729
62	T-901-5.1	Hydroseeding	AC	61.0
63	T-904-5.1	Sodding	SY	63,930
64	L-108-5.1	No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Trench, Duct Bank or Conduit	LF	177,400
65	L-108-5.2	No. 6 AWG, Solid, Bare Copper Counterpoise Wire, Installed in Trench, Above the Duct Bank or Conduit, Including Connections/Terminations	LF	3,000
66	L-110-5.1	Flowable Fill Encased Electrical Conduit, 1W-2"C	LF	1,900
67	L-110-5.2	Non-Encased Electrical Conduit, 1W-2"C	LF	150
68	L-110-5.3	Concrete Encased Electrical Conduit, 1W-2"C	LF	1,150
69	L-110-5.4	Concrete Encased Electrical Conduit, 1W-2"C with Saw Kerf Pavement Repair	LF	450
70	L-110-5.5	Non-Encased Electrical Duct Bank, 16W-2"C	LF	225
71	L-110-5.6	Non-Encased Electrical Duct Bank, 2W-2"C	LF	280
72	L-110-5.7	Flowable Fill Encased Electrical Duct Bank, 2W-2"C	LF	650
73	L-115-5.1	Existing Electrical Junction Structure/Manhole Adjusted to New Grade	EA	51
74	L-115-5.2	4'x4' Aircraft-Rated Handhole, Installed	EA	4
75	L-115-5.3	L-868 Blank Cover with Spacers, Installed	EA	5

**BASE BID (CONT'D)**

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
76	L-125-5.1	L-852C/D(L) Taxiway Centerline Light, Installed on Adjusted Light Base	EA	754
77	L-125-5.2	L-852C/D(L) Taxiway Centerline Light, Installed on Existing Light Base	EA	442
78	L-125-5.3	L-861T(L) Base Mounted Taxiway Edge Light, Installed on Adjusted Light Base	EA	407
79	L-125-5.4	L-861T(L) Base Mounted Taxiway Edge Light, Installed on Existing Light Base	EA	88
80	L-125-5.5	L-858(L) Base Mounted Guidance Sign, Installed	EA	28
81	L-125-5.6	L-852C/D(L) Taxiway Centerline Light, Installed on New Light Base	EA	10
82	L-125-5.7	L-852G(L) In-Pavement Runway Guard Light, Installed	EA	62
83	L-125-5.8	L-861T(L) Base Mounted Taxiway Edge Light, Installed on New Base in Existing Pavement	EA	18
84	L-125-5.9	L-861T(L) Base Mounted Taxiway Edge Light, Installed on New Base in New Pavement	EA	23
85	L-125-5.10	L-852C/D(L) Taxiway Centerline Light, Installed on New Base in Existing Pavement	EA	18
86	L-125-5.11	Update Sign Legend	EA	1
87	02378-4.1	Riprap Gradation No. 1, including Topsoil	TON	242

**ADDITIVE ALTERNATE #1**

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
1	P-101-5.2	Asphalt Milling (2" and Variable Depth)	SY	565
2	P-101-5.10	Concrete Pavement Removal (14"-20" Depth)	SY	445
3	P-401-8.1	Bituminous Surface Course	TON	145
4	P-501-8.4	Concrete Pavement Partial Depth Repair	SF	500
5	P-501-8.5	Concrete Pavement Crack Repair	LF	500
6	P-501-8.6	Concrete Pavement Crack Repair (Epoxy Injection)	LF	400
7	P-501-8.7	14"-20" Portland Cement Concrete Pavement	SY	445
8	P-501-8.8	Concrete Joint Seal Repair	LF	5,000
9	P-620-5.1a	Taxiway Pavement Marking with Reflective Beads (Yellow)	SF	2,000
10	P-620-5.1b	Taxiway Pavement Marking with Reflective Beads (Black)	SF	2,000
11	P-620-5.1f	Temporary Taxiway Pavement Markings (Yellow)	SF	2,115
12	P-620-5.1g	Temporary Taxiway Pavement Markings (Black)	SF	2,115
13	P-620-5.1h	Temporary Taxiway Pavement Markings Removal	SF	4,230



NO.	DESCRIPTION	DATE BY
1	ADD. 1	07/06/23 JEF

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

PROJECT MGR:	JEF
DESIGNER:	KKR
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	1" = 1"
DATE:	07/06/2023



APPROVED BY: JEF

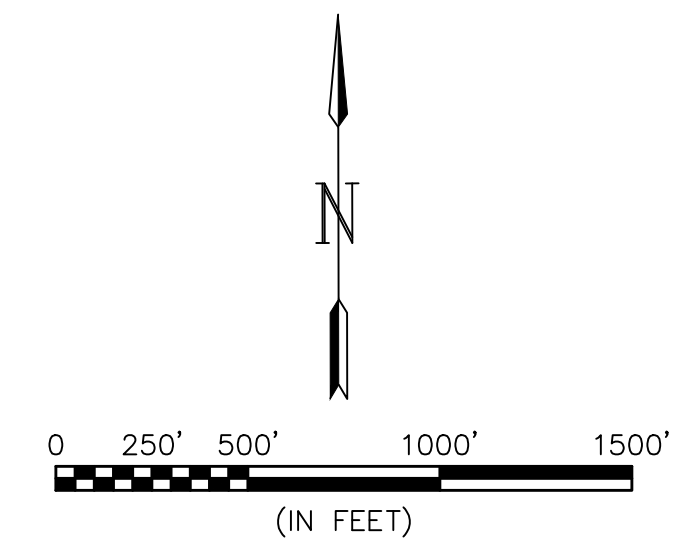
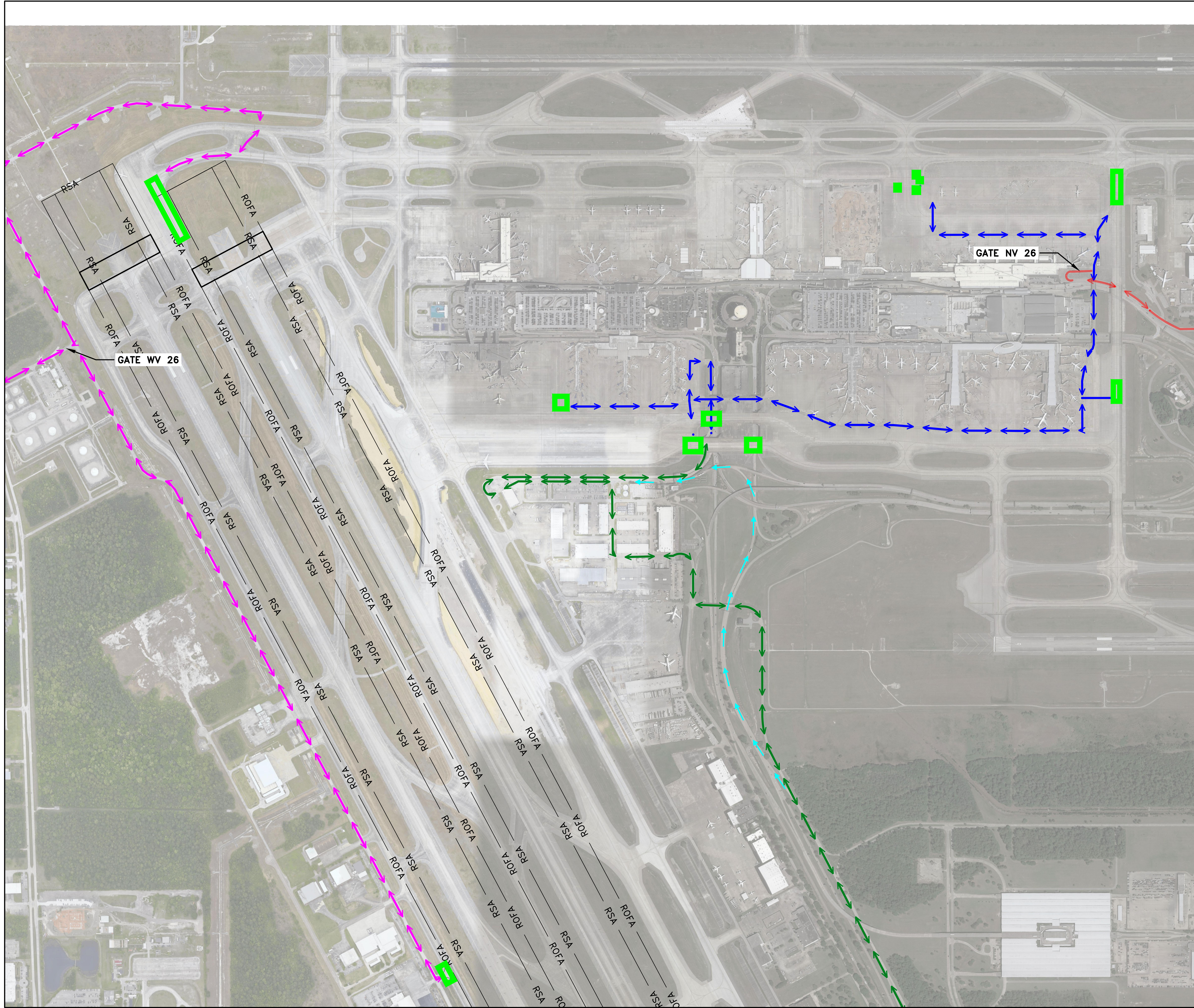
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A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	

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### LEGEND

	CONTRACTOR HAUL ROUTES
	RSA - RUNWAY SAFETY AREA
	ROFA - RUNWAY OBJECT FREE AREA
	TSA - TAXIWAY SAFETY AREA
	TOFA - TAXIWAY OBJECT FREE AREA
	LOW-PROFILE BARRICADE
	PHASING WORK AREA

- NOTES:**
1. WORK HOURS SHALL BE THE NIGHTTIME WORK HOURS OF 10:00PM TO 6:00AM OR AS DIRECTED BY THE AIRPORT. CONTRACTOR MAY PERFORM THIS WORK DURING ANY OF THE PHASES IDENTIFIED ON SHEET G02.05 WITH AIRPORT APPROVAL. NO ADDITIONAL CONTRACT TIME SHALL BE AWARDED FOR ADDITIVE ALTERNATE WORK.
  2. CONTRACTOR SHALL USE EXTREME CAUTION WHILE MOVING ON ACTIVE TAXIWAYS AND SHALL ONLY USE APPROVED HAUL ROUTES FOR TRANSPORTATION PURPOSES.
  3. REQUIREMENTS TO REOPEN: THE PHASING AREA WILL REOPEN AFTER EACH WORK PERIOD IN ORDER TO SERVICE AIR TRAFFIC THROUGH THE DAY. ALL BARRICADES MUST BE REMOVED; ALL FOD MUST BE REMOVED; ALL DROP OFFS EXCEEDING 3 INCHES AND ALL GRADES IN EXCESS OF 5% MUST BE CORRECTED WITHIN WORK AREA. EXISTING MARKINGS MUST BE REINSTALLED.
  4. CONTRACTOR SHALL PLAN FOR A 2 HOUR CLEAN UP AFTER EACH WORK PERIOD IN ORDER TO ACCOMMODATE INSPECTION FOM IAH AIRPORT OPERATIONS AND ENSURE COMPLIANCE WITH FAA STANDARDS FOR THE REOPENING OF TAXIWAYS BY 6:00AM.
  5. CONSTRUCTION LIMITS AREA APPROXIMATE AND WILL BE CONFIRMED WITH RPR AND/OR HAS PROJECT MANAGER PRIOR TO STARTING ANY WORK.
  6. CONTRACTOR SHALL PROTECT ALL EXISTING UTILITIES, HAND HOLES, AIRFIELD EQUIPMENT, DRAINAGE STRUCTURES, AND BUILDINGS NOT SHOWN FOR DEMOLITION. ANY DAMAGE AS A RESULT OF CONSTRUCTION ACTIVITIES SHALL BE REPAIRED BY THE CONTRACTOR AT NO COST TO THE OWNER.
  7. CONTRACTOR SHALL MAINTAIN VSR ACCESS THROUGH WORK AREA FOR DURATION OF WORK. IF WORK IS NEEDED WITHIN THE VSR, CONTRACTOR WILL PROVIDE TEMPORARY VSR THROUGH WORK AREA.

### KEYMAP



REVISIONS

NO.	DESCRIPTION	DATE BY
1	ADD. 1	07/06/23 JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
**ADDITIVE ALTERNATE 1 PHASING PLAN -  
 OVERALL HAUL ROUTES**

PROJECT MGR:	JEF
DESIGNER:	KKR
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	1" = 500'
DATE:	07/06/2023



APPROVED BY: JEF

DIRECTOR  
HOUSTON AIRPORT SYSTEM

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

**G04.00**



REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADD. 1	07/06/23 JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
**ADDITIVE ALTERNATE 1 PHASING PLAN -  
 PAVEMENT REHAB 1**

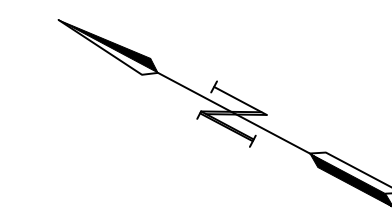
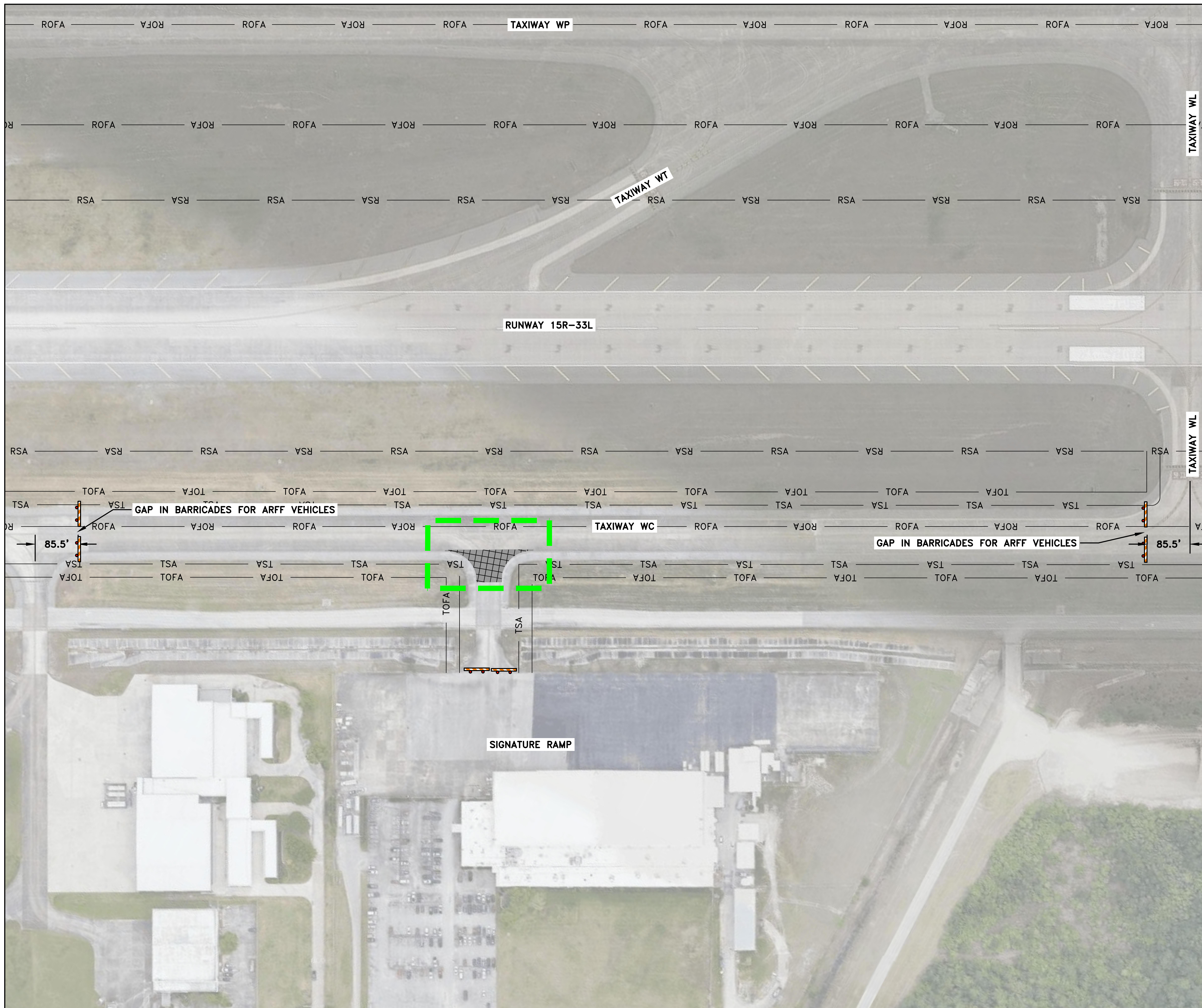
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DESIGNER:	KKR
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	1" = 100'
DATE:	07/06/2023



APPROVED BY: JEF

DIRECTOR  
HOUSTON AIRPORT SYSTEM

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



### LEGEND

	PROPOSED 2" ASPHALT MILL & OVERLAY
- RSA -	RUNWAY SAFETY AREA
- ROFA -	RUNWAY OBJECT FREE AREA
- TSA -	TAXIWAY SAFETY AREA
- TOFA -	TAXIWAY OBJECT FREE AREA
	LOW-PROFILE BARRICADE
	PHASING WORK AREA

- NOTES:**
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  - CONTRACTOR SHALL MAINTAIN A CLEAR ROUTE THROUGH WORK AREA FOR ARFF VEHICLE RESPONSE.

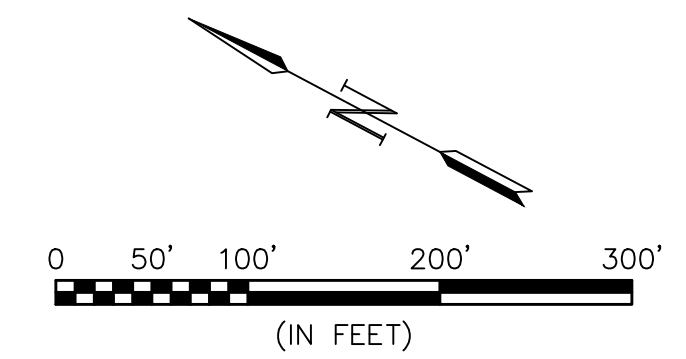
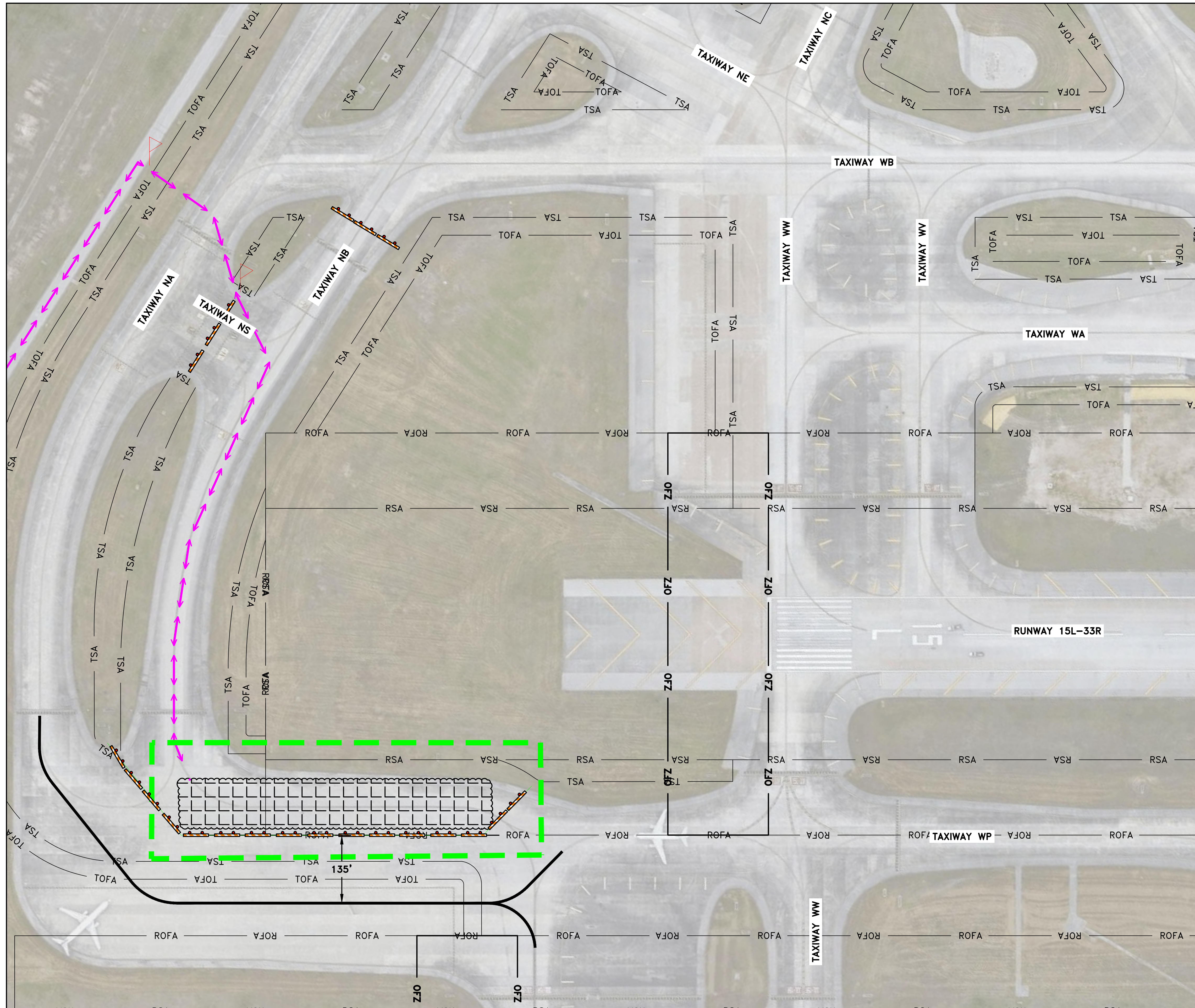
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### LEGEND

	PROPOSED CRACK, PATCH, AND PANEL REPAIR AREA
— RSA —	RUNWAY SAFETY AREA
— ROFA —	RUNWAY OBJECT FREE AREA
— TSA —	TAXIWAY SAFETY AREA
— TOFA —	TAXIWAY OBJECT FREE AREA
	LOW-PROFILE BARRICADE
	PHASING WORK AREA
	TEMPORARY TAXILANE CENTERLINE
	TEMPORARY TAXILANE OFA LIMIT
	FLAGGER

- NOTES:**
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### KEYMAP



REVISIONS

NO.	DESCRIPTION	DATE BY
1	ADD. 1	07/06/23 JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
**ADDITIVE ALTERNATE 1 PHASING PLAN -  
 PAVEMENT REHAB 2**

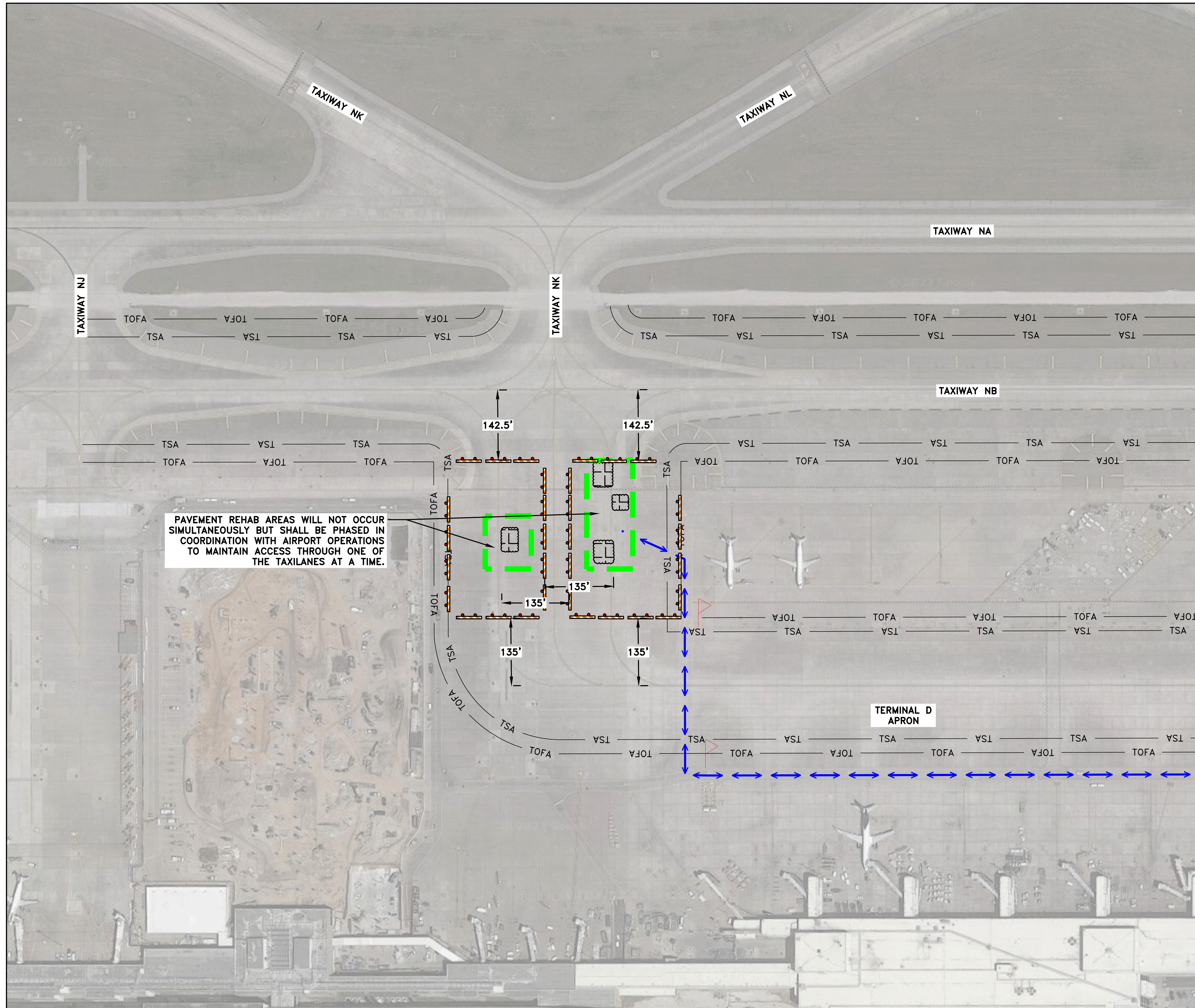
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DESIGNER:	KKR
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	1" = 100'
DATE:	07/06/2023

STATE OF TEXAS  
 JASON E. FRANK  
 87879  
 LICENSE  
 PROFESSIONAL ENGINEER  
 Digitally Signed 07/06/2023  
 APPROVED BY: JEF

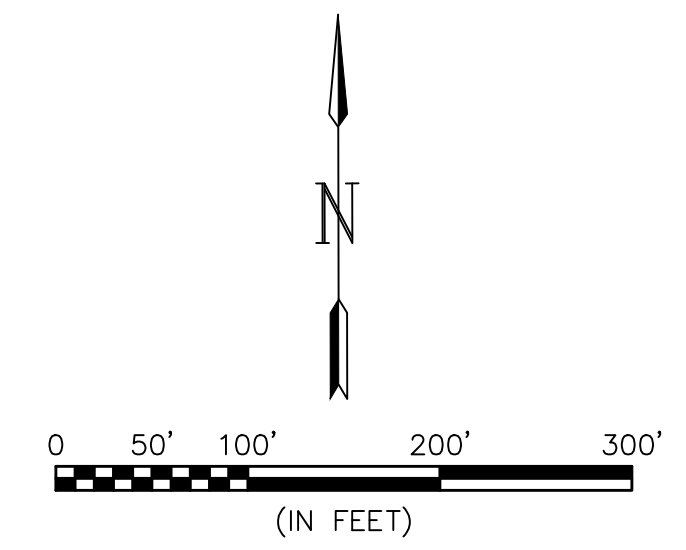
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A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	






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PAVEMENT REHAB AREAS WILL NOT OCCUR SIMULTANEOUSLY BUT SHALL BE PHASED IN COORDINATION WITH AIRPORT OPERATIONS TO MAINTAIN ACCESS THROUGH ONE OF THE TAXILANES AT A TIME.



### LEGEND

	PROPOSED CRACK, PATCH, AND PANEL REPAIR AREA
— RSA —	RUNWAY SAFETY AREA
— ROFA —	RUNWAY OBJECT FREE AREA
— TSA —	TAXIWAY SAFETY AREA
— TOFA —	TAXIWAY OBJECT FREE AREA
	LOW-PROFILE BARRICADE
	PHASING WORK AREA

- NOTES:**
- WORK HOURS SHALL BE THE NIGHTTIME WORK HOURS OF 10:00PM TO 6:00AM OR AS DIRECTED BY THE AIRPORT. CONTRACTOR MAY PERFORM THIS WORK DURING ANY OF THE PHASES IDENTIFIED ON SHEET G02.05 WITH AIRPORT APPROVAL. NO ADDITIONAL CONTRACT TIME SHALL BE AWARDED FOR ADDITIVE ALTERNATE WORK.
  - CONTRACTOR SHALL USE EXTREME CAUTION WHILE MOVING ON ACTIVE TAXIWAYS AND SHALL ONLY USE APPROVED HAUL ROUTES FOR TRANSPORTATION PURPOSES.
  - REQUIREMENTS TO REOPEN: THE PHASING AREA WILL REOPEN AFTER EACH WORK PERIOD IN ORDER TO SERVICE AIR TRAFFIC THROUGH THE DAY. ALL BARRICADES MUST BE REMOVED; ALL FOD MUST BE REMOVED; ALL DROP OFFS EXCEEDING 3 INCHES AND ALL GRADES IN EXCESS OF 5% MUST BE CORRECTED WITHIN WORK AREA. EXISTING MARKINGS MUST BE REINSTALLED.
  - CONTRACTOR SHALL PLAN FOR A 2 HOUR CLEAN UP AFTER EACH WORK PERIOD IN ORDER TO ACCOMMODATE INSPECTION FROM IAH AIRPORT OPERATIONS AND ENSURE COMPLIANCE WITH FAA STANDARDS FOR THE REOPENING OF TAXIWAYS BY 6:00AM.
  - CONSTRUCTION LIMITS AREA APPROXIMATE AND WILL BE CONFIRMED WITH RPR AND/OR HAS PROJECT MANAGER PRIOR TO STARTING ANY WORK.
  - CONTRACTOR SHALL PROTECT ALL EXISTING UTILITIES, HAND HOLES, AIRFIELD EQUIPMENT, DRAINAGE STRUCTURES, AND BUILDINGS NOT SHOWN FOR DEMOLITION. ANY DAMAGE AS A RESULT OF CONSTRUCTION ACTIVITIES SHALL BE REPAIRED BY THE CONTRACTOR AT NO COST TO THE OWNER.
  - CONTRACTOR SHALL MAINTAIN A CLEAR ROUTE THROUGH WORK AREA FOR ARFF VEHICLE RESPONSE.

### KEYMAP




REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADD. 1	07/06/23 JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
**ADDITIVE ALTERNATE 1 PHASING PLAN -  
 PAVEMENT REHAB 3**

PROJECT MGR:	JEF
DESIGNER:	KKR
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	1" = 100'
DATE:	07/06/2023

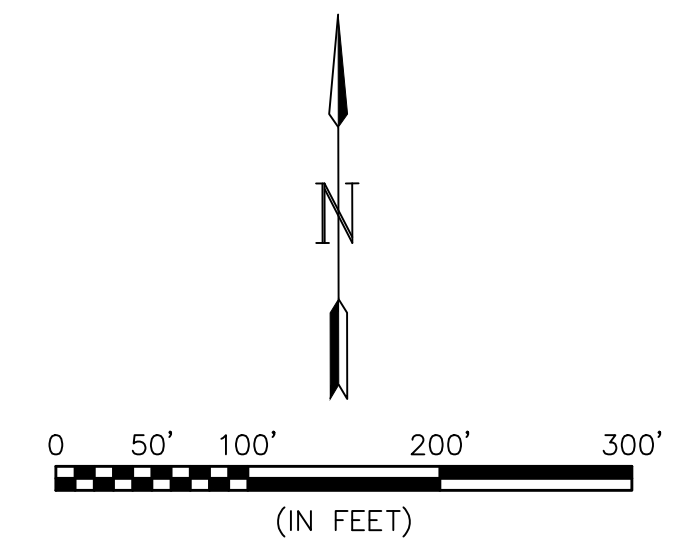
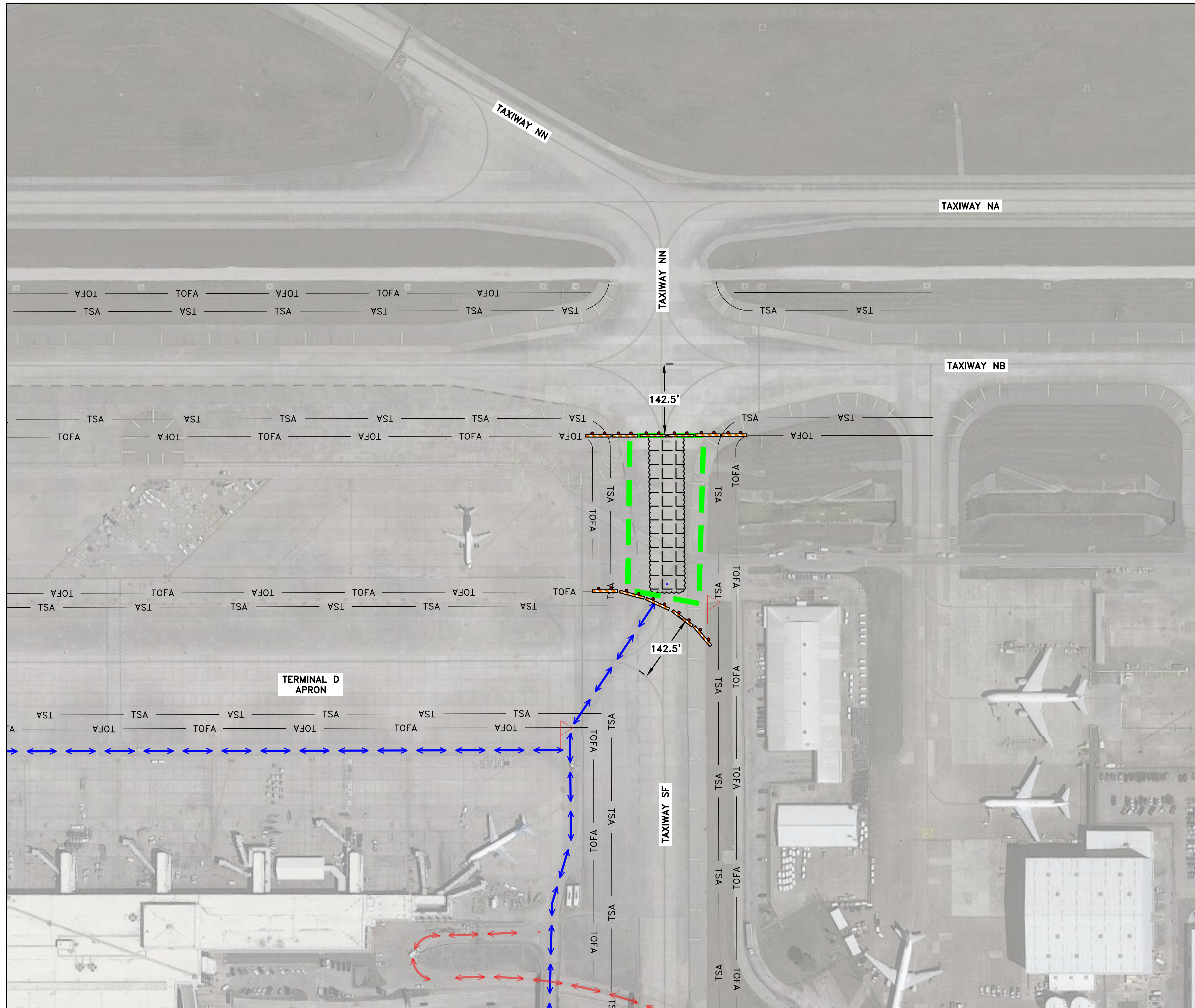


APPROVED BY: JEF

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



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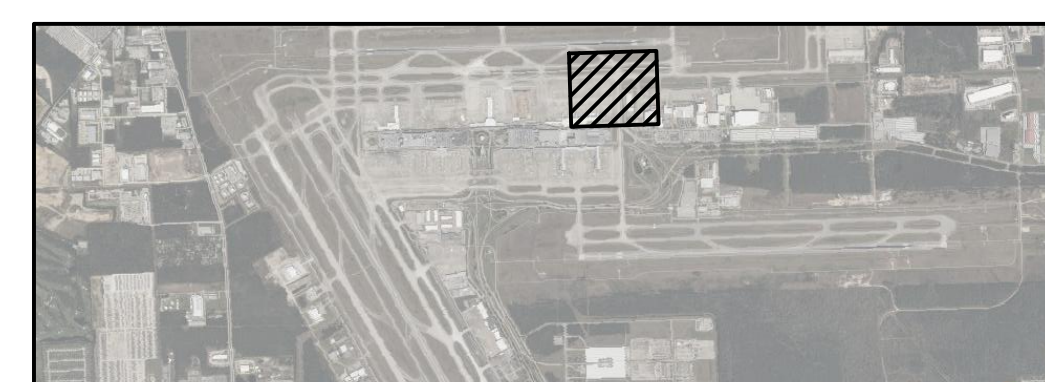
### LEGEND

	PROPOSED CRACK, PATCH, AND PANEL REPAIR AREA
— RSA —	RUNWAY SAFETY AREA
— ROFA —	RUNWAY OBJECT FREE AREA
— TSA —	TAXIWAY SAFETY AREA
— TOFA —	TAXIWAY OBJECT FREE AREA
	LOW-PROFILE BARRICADE
	PHASING WORK AREA

**NOTES:**

1. WORK HOURS SHALL BE THE NIGHTTIME WORK HOURS OF 10:00PM TO 6:00AM OR AS DIRECTED BY THE AIRPORT. CONTRACTOR MAY PERFORM THIS WORK DURING ANY OF THE PHASES IDENTIFIED ON SHEET G02.05 WITH AIRPORT APPROVAL. NO ADDITIONAL CONTRACT TIME SHALL BE AWARDED FOR ADDITIVE ALTERNATE WORK.
2. CONTRACTOR SHALL USE EXTREME CAUTION WHILE MOVING ON ACTIVE TAXIWAYS AND SHALL ONLY USE APPROVED HAUL ROUTES FOR TRANSPORTATION PURPOSES.
3. REQUIREMENTS TO REOPEN: THE PHASING AREA WILL REOPEN AFTER EACH WORK PERIOD IN ORDER TO SERVICE AIR TRAFFIC THROUGH THE DAY. ALL BARRICADES MUST BE REMOVED; ALL FOD MUST BE REMOVED; ALL DROP OFFS EXCEEDING 3 INCHES AND ALL GRADES IN EXCESS OF 5% MUST BE CORRECTED WITHIN WORK AREA. EXISTING MARKINGS MUST BE REINSTALLED.
4. CONTRACTOR SHALL PLAN FOR A 2 HOUR CLEAN UP AFTER EACH WORK PERIOD IN ORDER TO ACCOMMODATE INSPECTION FROM IAH AIRPORT OPERATIONS AND ENSURE COMPLIANCE WITH FAA STANDARDS FOR THE REOPENING OF TAXIWAYS BY 6:00AM.
5. CONSTRUCTION LIMITS AREA APPROXIMATE AND WILL BE CONFIRMED WITH RPR AND/OR HAS PROJECT MANAGER PRIOR TO STARTING ANY WORK.
6. CONTRACTOR SHALL PROTECT ALL EXISTING UTILITIES, HAND HOLES, AIRFIELD EQUIPMENT, DRAINAGE STRUCTURES, AND BUILDINGS NOT SHOWN FOR DEMOLITION. ANY DAMAGE AS A RESULT OF CONSTRUCTION ACTIVITIES SHALL BE REPAIRED BY THE CONTRACTOR AT NO COST TO THE OWNER.
7. CONTRACTOR SHALL MAINTAIN A CLEAR ROUTE THROUGH WORK AREA FOR ARFF VEHICLE RESPONSE.

**KEYMAP**



REVISIONS		
NO.	DESCRIPTION	DATE BY
1 ADD. 1	07/06/23	JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
**ADDITIVE ALTERNATE 1 PHASING PLAN -  
 PAVEMENT REHAB 4**

PROJECT MGR:	JEF
DESIGNER:	KKR
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	1" = 100'
DATE:	07/06/2023



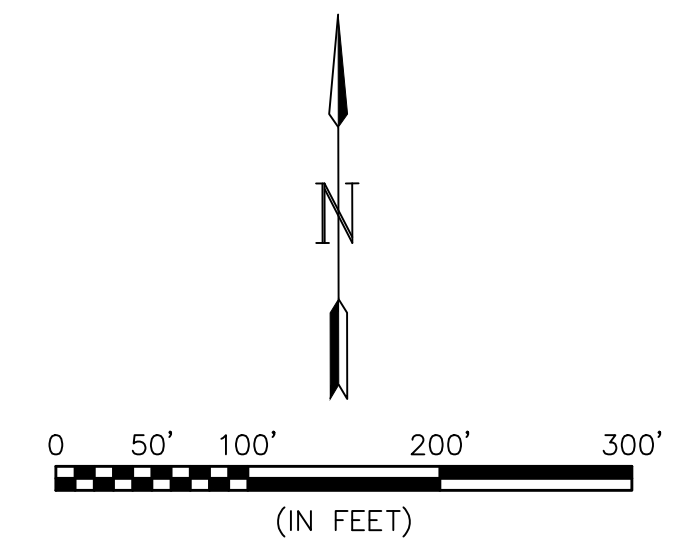
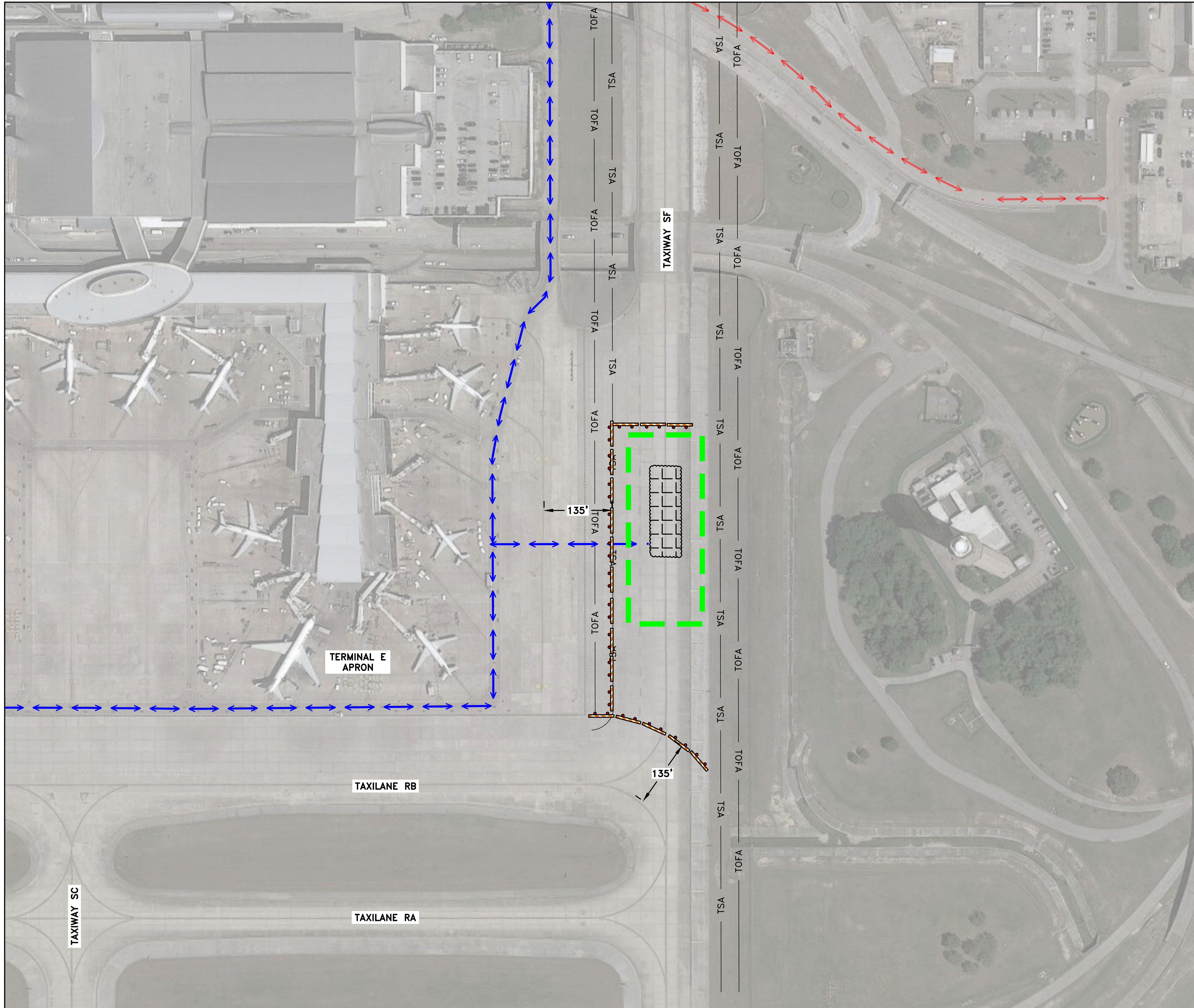
APPROVED BY: JEF

DIRECTOR  
HOUSTON AIRPORT SYSTEM

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



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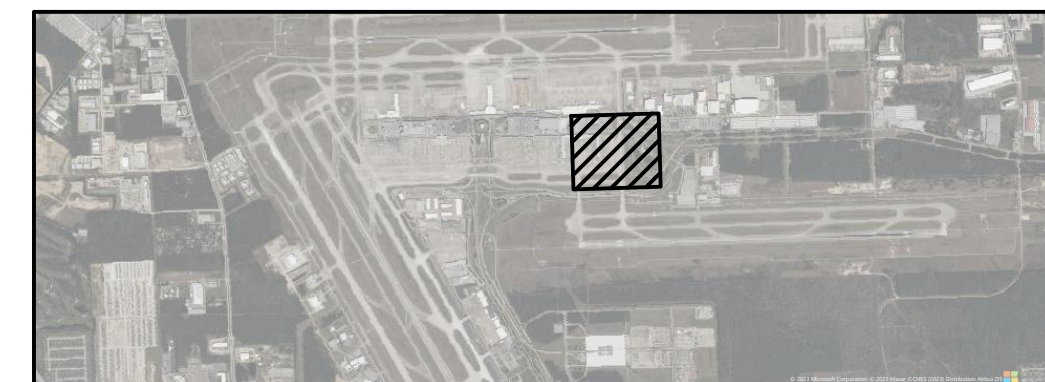


LEGEND	
	PROPOSED CRACK, PATCH, AND PANEL REPAIR AREA
— RSA —	RUNWAY SAFETY AREA
— ROFA —	RUNWAY OBJECT FREE AREA
— TSA —	TAXIWAY SAFETY AREA
— TOFA —	TAXIWAY OBJECT FREE AREA
	LOW-PROFILE BARRICADE
	PHASING WORK AREA

**NOTES:**

1. WORK HOURS SHALL BE THE NIGHTTIME WORK HOURS OF 10:00PM TO 6:00AM OR AS DIRECTED BY THE AIRPORT. CONTRACTOR MAY PERFORM THIS WORK DURING ANY OF THE PHASES IDENTIFIED ON SHEET G02.05 WITH AIRPORT APPROVAL. NO ADDITIONAL CONTRACT TIME SHALL BE AWARDED FOR ADDITIVE ALTERNATE WORK.
2. CONTRACTOR SHALL USE EXTREME CAUTION WHILE MOVING ON ACTIVE TAXIWAYS AND SHALL ONLY USE APPROVED HAUL ROUTES FOR TRANSPORTATION PURPOSES.
3. REQUIREMENTS TO REOPEN: THE PHASING AREA WILL REOPEN AFTER EACH WORK PERIOD IN ORDER TO SERVICE AIR TRAFFIC THROUGH THE DAY. ALL BARRICADES MUST BE REMOVED; ALL FOD MUST BE REMOVED; ALL DROP OFFS EXCEEDING 3 INCHES AND ALL GRADES IN EXCESS OF 5% MUST BE CORRECTED WITHIN WORK AREA. EXISTING MARKINGS MUST BE REINSTALLED.
4. CONTRACTOR SHALL PLAN FOR A 2 HOUR CLEAN UP AFTER EACH WORK PERIOD IN ORDER TO ACCOMMODATE INSPECTION FROM IAH AIRPORT OPERATIONS AND ENSURE COMPLIANCE WITH FAA STANDARDS FOR THE REOPENING OF TAXIWAYS BY 6:00AM.
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6. CONTRACTOR SHALL PROTECT ALL EXISTING UTILITIES, HAND HOLES, AIRFIELD EQUIPMENT, DRAINAGE STRUCTURES, AND BUILDINGS NOT SHOWN FOR DEMOLITION. ANY DAMAGE AS A RESULT OF CONSTRUCTION ACTIVITIES SHALL BE REPAIRED BY THE CONTRACTOR AT NO COST TO THE OWNER.
7. CONTRACTOR SHALL MAINTAIN A CLEAR ROUTE THROUGH WORK AREA FOR ARFF VEHICLE RESPONSE.

**KEYMAP**



REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADD. 1	07/06/23 JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
**ADDITIVE ALTERNATE 1 PHASING PLAN -  
 PAVEMENT REHAB 5**

PROJECT MGR:	JEF
DESIGNER:	KKR
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	1" = 100'
DATE:	07/06/2023



APPROVED BY: JEF

DIRECTOR  
HOUSTON AIRPORT SYSTEM

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

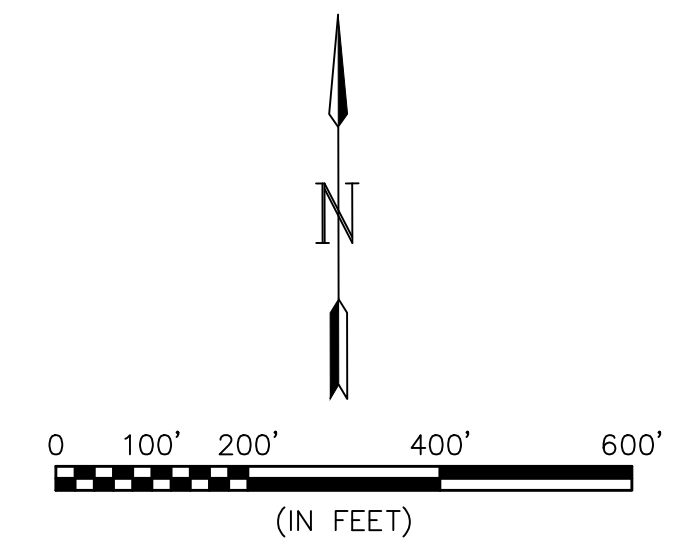


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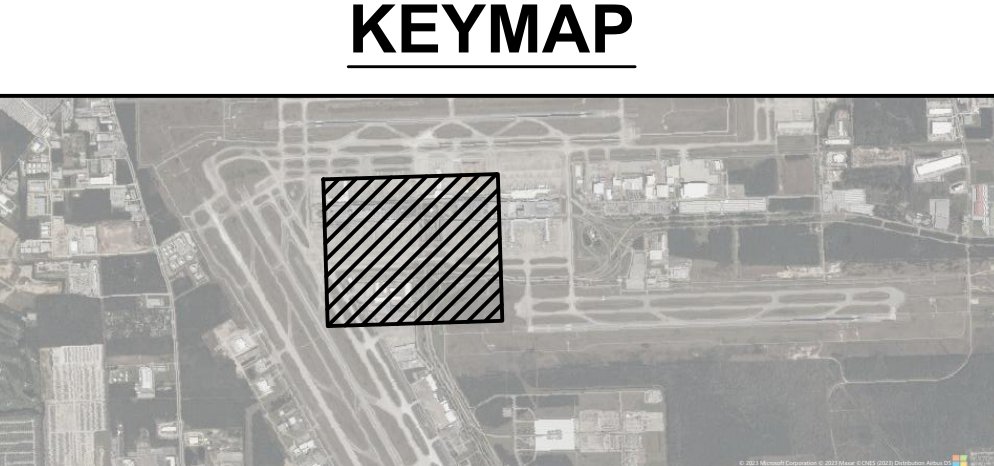
CONTRACTOR SHALL COORDINATE GATE CLOSURES WITH AIRPORT OPERATIONS BASED ON REPAIR EXTENTS.

PAVEMENT REHAB AREAS WILL NOT OCCUR SIMULTANEOUSLY BUT SHALL BE PHASSED IN COORDINATION WITH AIRPORT OPERATIONS TO MAINTAIN ACCESS THROUGH ONE OF THE BRIDGES AT A TIME.



LEGEND	
	PROPOSED CRACK, PATCH, AND PANEL REPAIR AREA
—RSA—	RUNWAY SAFETY AREA
—ROFA—	RUNWAY OBJECT FREE AREA
—TSA—	TAXIWAY SAFETY AREA
—TOFA—	TAXIWAY OBJECT FREE AREA
	LOW-PROFILE BARRICADE
	PHASING WORK AREA
	GATE CLOSURE

- NOTES:**
1. WORK HOURS SHALL BE THE NIGHTTIME WORK HOURS OF 10:00PM TO 6:00AM OR AS DIRECTED BY THE AIRPORT. CONTRACTOR MAY PERFORM THIS WORK DURING ANY OF THE PHASES IDENTIFIED ON SHEET G02.05 WITH AIRPORT APPROVAL. NO ADDITIONAL CONTRACT TIME SHALL BE AWARDED FOR ADDITIVE ALTERNATE WORK.
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  7. CONTRACTOR SHALL MAINTAIN VSR ACCESS THROUGH WORK AREA FOR DURATION OF WORK. IF WORK IS NEEDED WITHIN THE VSR, CONTRACTOR WILL PROVIDE TEMPORARY VSR THROUGH WORK AREA.



REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADD. 1	07/06/23 JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
**ADDITIVE ALTERNATE 1 PHASING PLAN -  
 PAVEMENT REHAB 6**

PROJECT MGR:	JEF
DESIGNER:	KKR
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	1" = 200'
DATE:	07/06/2023



APPROVED BY: JEF

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





TBPE Registration No. F-5713



1700 West Loop South  
Suite 1500  
Houston, TX 77027  
(713) 622-0227  
TBPE Registration No. F-845

REVISIONS

NO.	DESCRIPTION	DATE BY
1	ADD. 1	07/07/23 JEF

HORIZONTAL GEOMETRY PLAN I

PROJECT MGR: JF  
 DESIGNER: PAB  
 DRAWN BY: PAB  
 CHECK BY: JF  
 SCALE: 1" = 50'  
 DATE: 07/06/2023



APPROVED BY: JEF

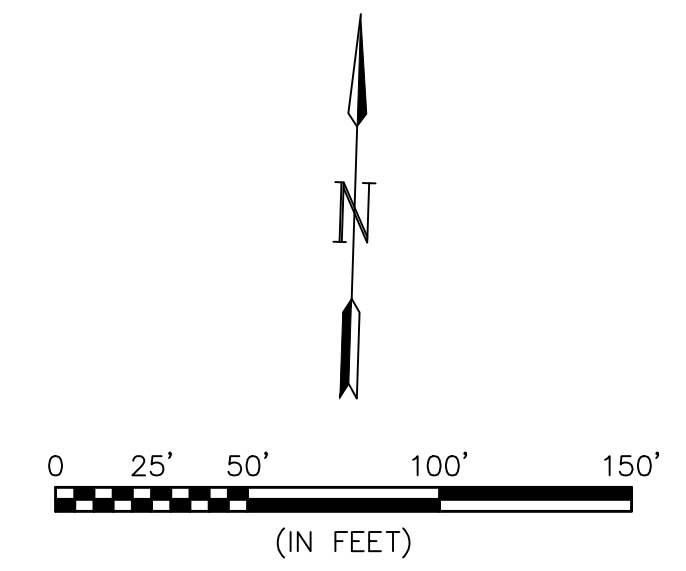
DIRECTOR HOUSTON AIRPORT SYSTEM

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

C04.01

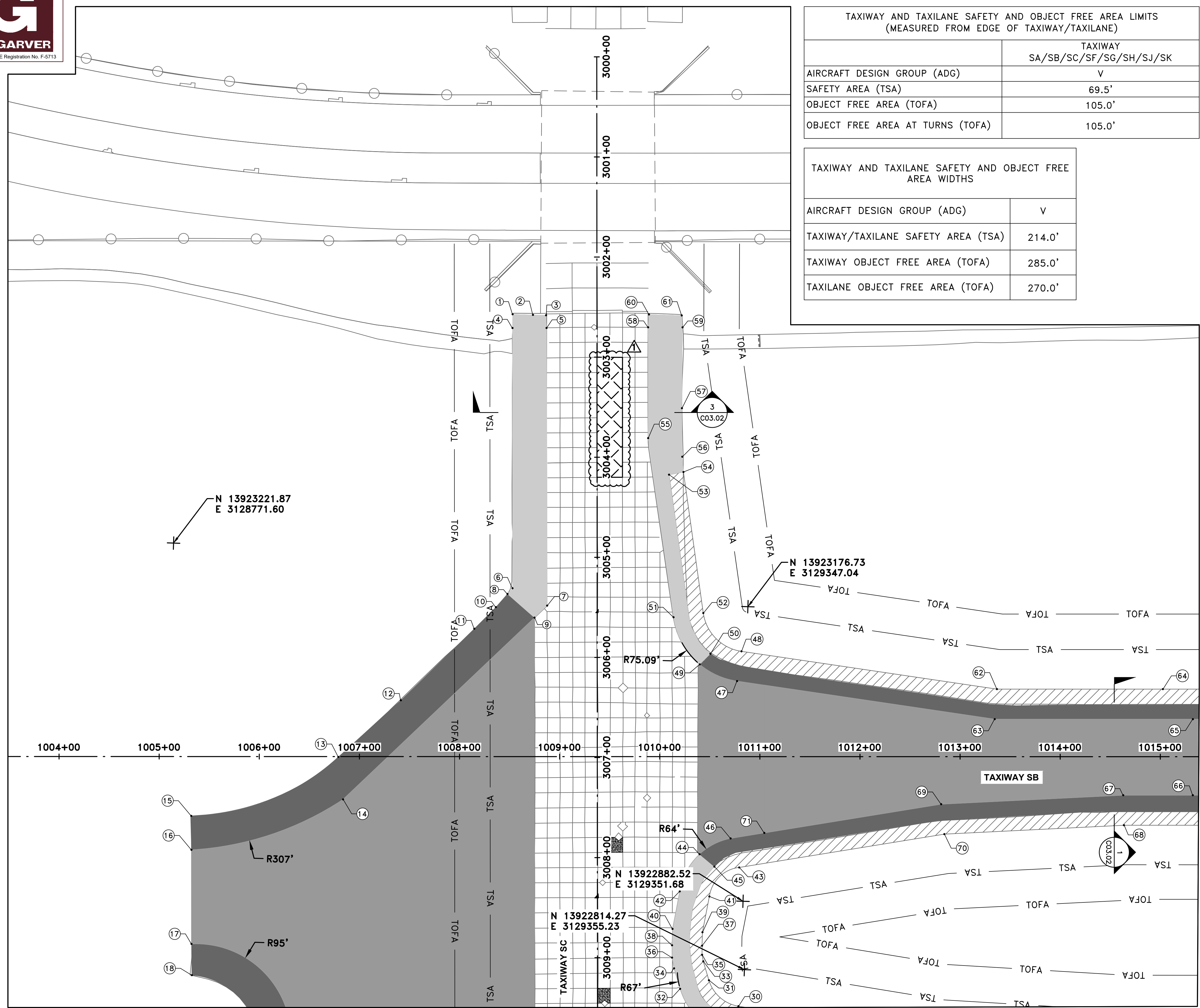
TAXIWAY AND TAXILANE SAFETY AND OBJECT FREE AREA LIMITS (MEASURED FROM EDGE OF TAXIWAY/TAXILANE)	
	TAXIWAY SA/SB/SC/SF/SG/SH/SJ/SK
AIRCRAFT DESIGN GROUP (ADG)	V
SAFETY AREA (TSA)	69.5'
OBJECT FREE AREA (TOFA)	105.0'
OBJECT FREE AREA AT TURNS (TOFA)	105.0'

TAXIWAY AND TAXILANE SAFETY AND OBJECT FREE AREA WIDTHS	
AIRCRAFT DESIGN GROUP (ADG)	V
TAXIWAY/TAXILANE SAFETY AREA (TSA)	214.0'
TAXIWAY OBJECT FREE AREA (TOFA)	285.0'
TAXILANE OBJECT FREE AREA (TOFA)	270.0'



NOTES:

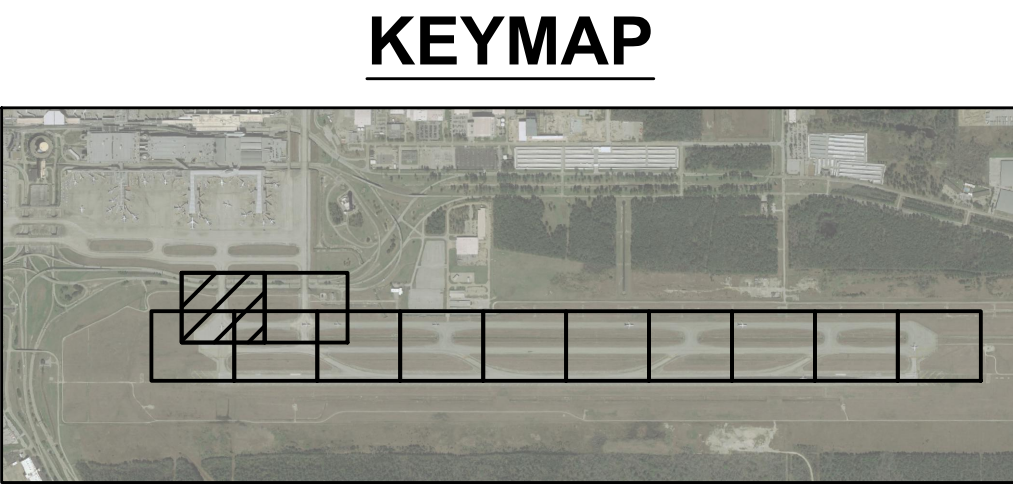
- REFER TO SHEET G01.05 FOR HORIZONTAL AND VERTICAL CONTROL INFORMATION.
- REFER TO SHEET G01.05 FOR DIMENSIONS OF TAXIWAY SAFETY AND OBJECT FREE AREAS
- MISCELLANEOUS PAVEMENT REPAIR LOCATIONS ARE APPROXIMATE. THE RPR SHALL APPROVE THE ACTUAL REPAIR LOCATIONS PRIOR TO THE WORK.



MATCHLINE SHEET C04.02

**LEGEND**

- PROPOSED CRACK, PATCH, AND PANEL REPAIR AREA (SEE NOTE 3)
- PROPOSED TAXIWAY MILL (2") & OVERLAY (3")
- PROPOSED SHOULDER MILL (1") & OVERLAY (2")
- PROPOSED SHOULDER MILL (2") & OVERLAY (2")
- PROPOSED TAXIWAY MILL (5") & OVERLAY (6")
- PROPOSED FULL DEPTH ASPHALT SHOULDER WIDENING
- PROPOSED FULL DEPTH CONCRETE SECTION
- PROPOSED FULL DEPTH CONCRETE PANEL REPAIR
- CORNER BREAK, JOINT SPALL, AND CORNER SPALL REPAIRS RESPECTIVELY (SEE NOTE 3)
- TSA TAXIWAY SAFETY AREA
- TOFA TAXIWAY OBJECT FREE AREA
- RSA RUNWAY SAFETY AREA



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PLOT DATE: 3/10/2022 11:08:43 AM



NO.	DESCRIPTION	DATE	BY
1	ADD. 1	07/06/23	JEF

GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
**ADDITIVE ALTERNATE 1 - SIGNATURE RAMP  
 PAVEMENT REHAB PLAN**

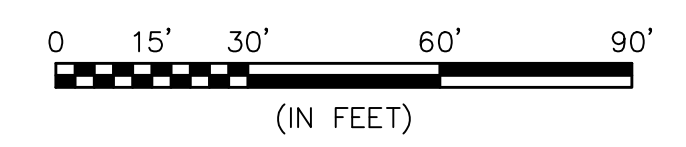
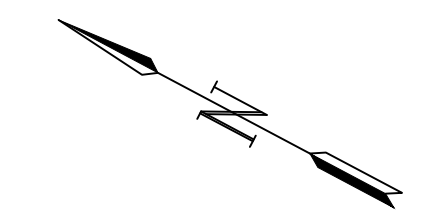
PROJECT MGR:	JEF
DESIGNER:	KKR
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	1" = 30'
DATE:	07/06/2023



APPROVED BY: JEF

DIRECTOR  
HOUSTON AIRPORT SYSTEM

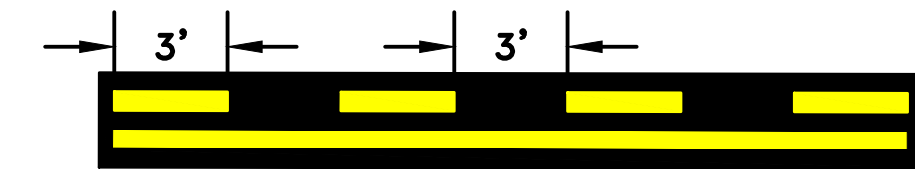
PROJECT NO.	0646A
A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	



LEGEND	
	PROPOSED 2" ASPHALT MILL & OVERLAY
— RSA —	RUNWAY SAFETY AREA
— ROFA —	RUNWAY OBJECT FREE AREA
— TSA —	TAXIWAY SAFETY AREA
— TOFA —	TAXIWAY OBJECT FREE AREA

**NOTES:**

1. CONSTRUCTION LIMITS AREA APPROXIMATE AND WILL BE CONFIRMED WITH RPR AND/OR HAS PROJECT MANAGER PRIOR TO STARTING ANY WORK.
2. CONTRACTOR SHALL PROTECT ALL EXISTING UTILITIES, HAND HOLES, AIRFIELD EQUIPMENT, DRAINAGE STRUCTURES, AND BUILDINGS NOT SHOWN FOR DEMOLITION. ANY DAMAGE AS A RESULT OF CONSTRUCTION ACTIVITIES SHALL BE REPAIRED BY THE CONTRACTOR AT NO COST TO THE OWNER.
3. WHERE PROPOSED NEW PAVEMENT ABUTS EXISTING PAVEMENT, PROVIDE AN INITIAL CLEAN SAWCUT EDGE 6 INCHES FROM THE PROPOSED EDGE OF NEW PAVEMENT. WHEN PREPARING FOR PLACING PAVEMENT, SAWCUT NEW CLEAN EDGE AT THE PROPOSED EDGE OF PAVEMENT.
4. SEE G04.01 FOR CSPP DETAILS.

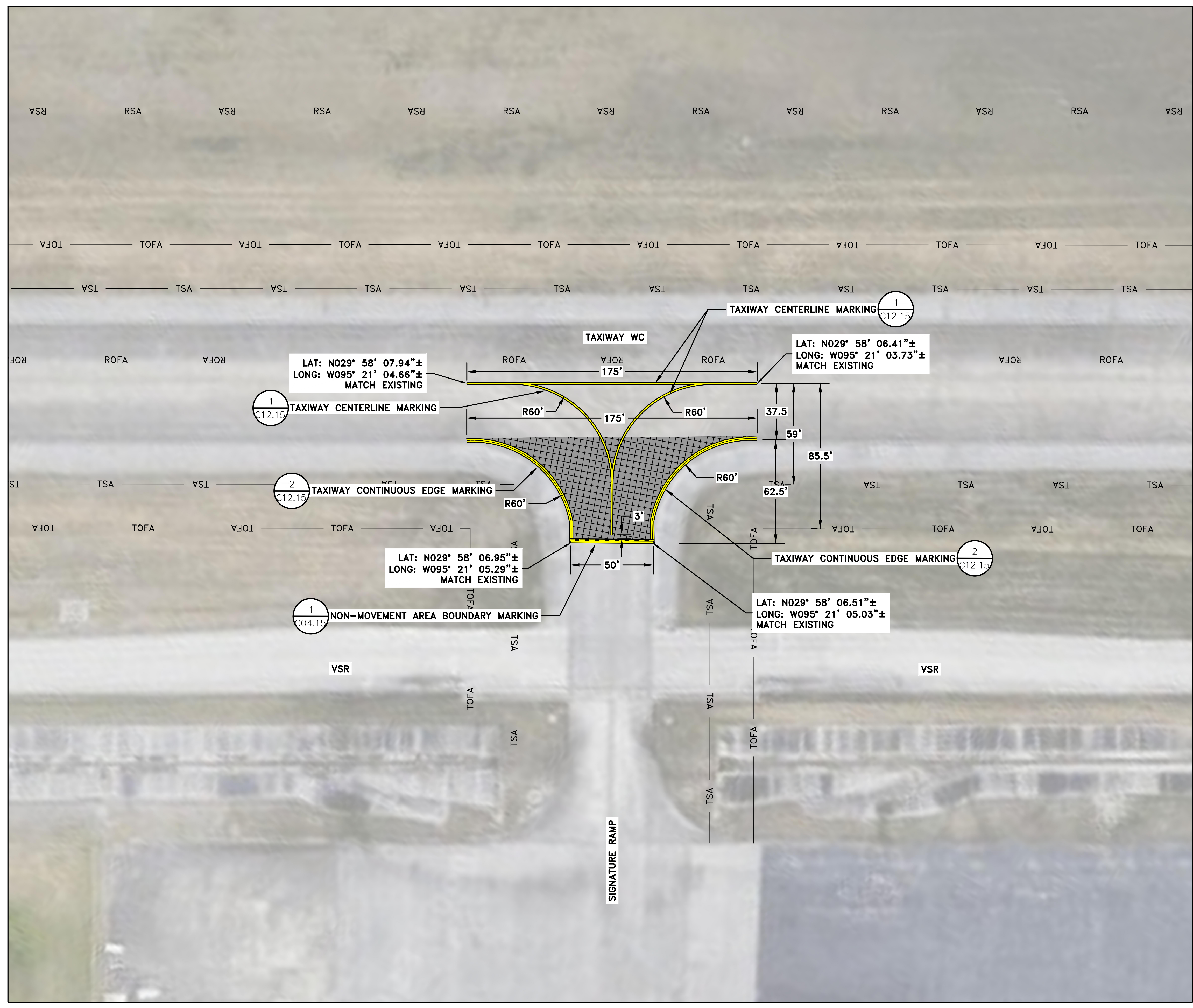


**NOTES:**

1. YELLOW AND BLACK LINES ARE 6" WIDE.
2. YELLOW LINES ARE SEPARATED BY 6" SPACE.

NON-MOVEMENT AREA BOUNDARY  
 THIS REF SCALE: NONE

**KEYMAP**





REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	7/05/23

**ELECTRICAL KEYED NOTES**

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	NONE
DATE:	04/28/2023



Digitally Signed 07/05/2023  
 APPROVED BY: JEF

DIRECTOR  
 HOUSTON AIRPORT SYSTEM

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

**DEMOLITION KEYED NOTES:**

- 101 REMOVE EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
- 102 REMOVE EXISTING BASE MOUNTED TAXIWAY CENTERLINE LIGHT AND DRAIN IF WATER IS PRESENT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
- 103 REMOVE EXISTING BASE MOUNTED CLEARANCE BAR LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP. OF 3 LIGHTS PER LOCATION)
- 104 REMOVE EXISTING BASE MOUNTED GUIDANCE SIGN. DEMOLISH FOUNDATION. (TYP.)
- 105 REMOVE ELECTRICAL HANDHOLE.
- 106 REMOVE EXISTING BASE MOUNTED LIGHT. BASE TO REMAIN.
- 107 EXISTING EDGE OR CENTERLINE LIGHT TO REMAIN. (TYP.)
- 108 EXISTING AIRFIELD GUIDANCE SIGN TO REMAIN. (TYP.)
- 109 EXISTING AIRFIELD CONDUIT OR DUCT AND CABLE TO REMAIN. (TYP.)
- 110 EXISTING ELECTRICAL HANDHOLE, MANHOLE, OR PULL BOX TO REMAIN. (TYP.)
- 111 EXISTING FAA-OWNED RUNWAY STATUS LIGHTS (RWSL) TO REMAIN.
- 112 DEMOLISH ABANDONED SIGN FOUNDATION.
- 113 REMOVE EXISTING CONDUCTORS AND ABANDON ELECTRICAL DUCT BANK IN PLACE.
- 114 REMOVE COVER OF EXISTING BASE MOUNTED JUNCTION STRUCTURE AND DRAIN IF WATER IS PRESENT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
- 115 REMOVE CONDUCTORS FROM EXISTING CONDUIT. CONDUIT TO REMAIN. (TYP.)



**INSTALLATION KEYED NOTES:**

- 201 INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON EXISTING LIGHT BASE. (TYP.)
- 202 INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON EXISTING LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
- 203 INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON EXISTING LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
- 204 INSTALL NEW L-858(L) BASE MOUNTED GUIDANCE SIGN. (TYP.)
- 205 INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON ADJUSTED LIGHT BASE. (TYP.)
- 206 INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON ADJUSTED LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN NEW PAVEMENT.)
- 207 INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON ADJUSTED LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN NEW PAVEMENT.)
- 208 ADJUST EXISTING JUNCTION STRUCTURE TO FINAL GRADE. MAKE ALL NECESSARY CABLE TERMINATIONS.
- 209 INSTALL NEW L-852C(L) ON NEW L-868 LIGHT BASE IN FULL DEPTH RECONSTRUCTION AREA.
- 210 INSTALL NEW L-852D(L) ON NEW L-868 LIGHT BASE IN FULL DEPTH RECONSTRUCTION AREA.
- 211 REINSTALL EXISTING L-852G ON NEW L-868 LIGHT BASE.
- 212 EXTEND 2" PVC CONDUIT FROM EXISTING SHOULDER TO NEW SIGN LOCATION. INSTALL TWO #8 AWG L-824C CABLES TO NEW SIGN TRANSFORMER AND SPLICE INTO EXISTING CIRCUIT AT THE NEXT JUNCTION LOCATION.
- 213 INSTALL NEW L-861T(L) TAXIWAY EDGE LIGHT ON NEW BASE IN EXISTING ASPHALT PAVEMENT. (TYP.)
- 214 INSTALL NEW L-861T(L) TAXIWAY EDGE LIGHT ON NEW BASE IN NEW PAVEMENT. (TYP.)
- 215 INSTALL NEW L-852D(L) TAXIWAY CENTERLINE LIGHTING IN EXISTING PAVEMENT WITH MILL AND OVERLAY. (TYP.)
- 216 INSTALL NEW L-852D(L) TAXIWAY CENTERLINE LIGHT IN NEW CONCRETE PAVEMENT. (TYP.)
- 217 INSTALL NEW L-852D(L) TAXIWAY CENTERLINE LIGHT IN EXISTING CONCRETE PAVEMENT. (TYP.)

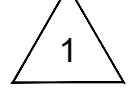
- 218 CONSTRUCT 1-WAY 2" C CONCRETE ENCASED CONDUIT IN EXISTING PAVEMENT VIA SAW KERF.
- 219 CONSTRUCT 1-WAY 2" C CONCRETE ENCASED CONDUIT IN NEW PAVEMENT.
- 220 INSTALL NEW L-852G(L) RUNWAY GUARD LIGHT INSTALLED IN NEW PAVEMENT. (TYP.)
- 221 CONSTRUCT NEW 16-WAY 2" DIRECTIONALLY BORED DUCT BANK WITH CONDUCTORS AS NOTED.
- 222 INSTALL NEW 4'x4'x4' AIRCRAFT-RATED HANDHOLE. (TYP.)
- 223 CONSTRUCT NEW 16-WAY 2" NON-ENCASED DUCT BANK.
- 224 CONSTRUCT NEW 2-WAY 2" C NON-ENCASED DUCT BANK.
- 225 CONSTRUCT NEW 2-WAY 2" C FLOWABLE FILL ENCASED DUCT BANK.
- 226 INSTALL NEW L-868 BLANK COVER AND SPACER RINGS TO BE FLUSH TO PAVEMENT. (TYP.)
- 227 UPDATE SIGN LEGEND. REFER TO SIGN INDEX.
- 228 MAINTAIN EXISTING JUNCTION CAN FROM EXISTING SIGN BASE.

229 INSTALL NEW #8 AWG L-824C CABLE WITH EXISTING CONDUIT. (NUMBER OF CONDUCTORS INDICATED BY HASH MARKS)



**GENERAL NOTES:**

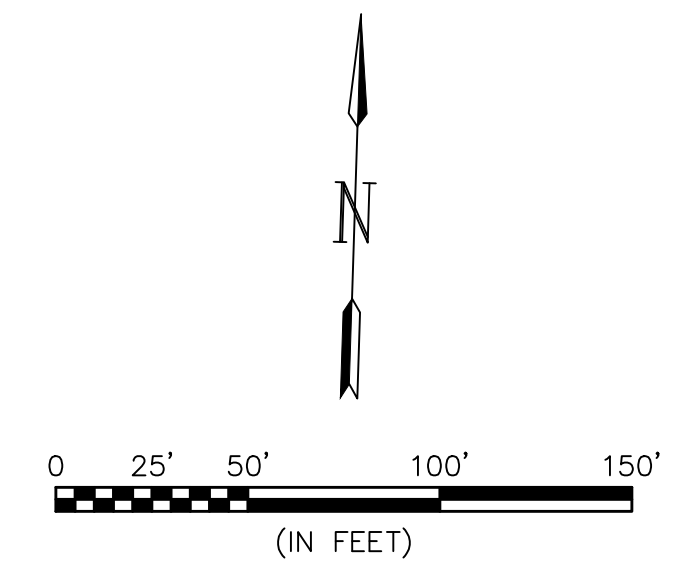
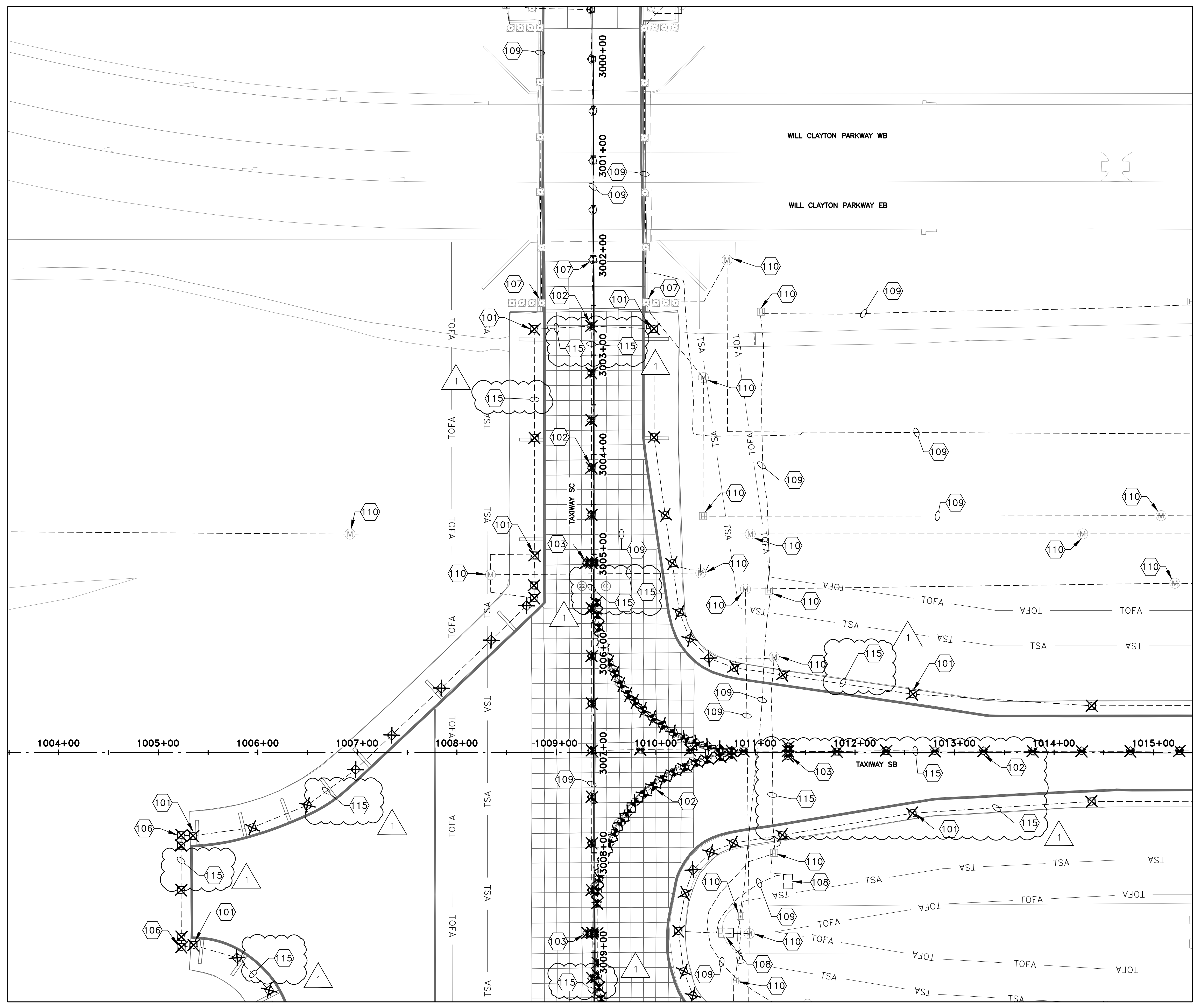
- 1. ALL ELECTRICIANS WORKING IN THE AIRFIELD SHALL HAVE A VALID ELECTRICAL LICENSE REGISTERED IN THE STATE OF TEXAS TDLR OFFICE. NO ELECTRICIANS SHALL BE WORKING IN THE AIRFIELD WITHOUT ANY TYPE OF LICENSE(S).
- 2. THE MASTER ELECTRICIAN SHALL BE RESPONSIBLE AND SUPERVISE THEIR LICENSE PERSONNEL UNDER HIS/HER SUPERVISION, FOR THEIR SAFETY AND WORK PERFORMED IN THE AIRFIELD.
- 3. THE ELECTRICAL CONTRACTOR SHALL PROVIDE COPIES OF THEIR ELECTRICAL LICENSES AND VALID DRIVER LICENSES, TO BE SUBMITTED AND ATTACHED TO THE BID DOCUMENTS.
- 4. ALL ELECTRICIANS THAT WORK ON THE CONDUCTOR SPLICING, EXOTHERMIC CONNECTIONS AND TORQUE SHALL HAVE AT LEAST (3) YEARS WORK EXPERIENCE UNLESS CAN PROVIDE SOME TYPE OF CERTIFICATION.
- 5. THE MASTER ELECTRICIAN SHALL BE AVAILABLE AND CONSTANTLY VISIT AND SUPERVISE THE PROJECT.
- 6. ON PAYMENT OF MATERIALS - THE ELECTRICAL CONTRACTOR SHALL PROVIDE AN EXHIBITS SHOWING THE LENGTH AND MATERIAL DESCRIPTION USED IN EACH PHASE.
- 7. ALL EXISTING AND NEW BASE CANS SHALL BE CLEAN INSIDE FREE OF DIRT AND WATER BEFORE INSTALLING THE LED FIXTURES AND ISOLATION TRANSFORMERS. DO NOT INSTALL TRANSFORMERS UNTIL THE LED FIXTURES ARE READY TO BE INSTALLED AND PLACED. APPLY AN APPROVED COMPOUND ON BOLT THREADS AND TORQUE ACCORDINGLY PER MANUFACTURER RECOMMENDATIONS.
- 8. ALL GROUND BARE CONDUCTOR CONNECTIONS SHALL BE EXOTHERMIC CADWELD ONLY. ONLY A SINGLE GROUND CONDUCTOR ALLOWED ON A SINGLE GROUND LUG. WRAPPED AROUND A 23M TAPE THOROUGHLY THE GROUND LUG BEFORE CONCRETE PLACEMENT.
- 9. ALL CONDUCTOR(S), GROUND CONDUCTOR CONNECTIONS AND LED FIXTURES SHALL BE TORQUE PER MANUFACTURER REQUIREMENTS. LED FIXTURES (CENTER AND EDGE LIGHTS) BOLTS ARE TO BE TORQUED, WITNESSED BY HAS INSPECTOR, RECORDED, DOCUMENTED, SIGNED AND DATED BY THE MASTER ELECTRICIAN SUBMITTED TO HAS ELECTRICAL INSPECTOR AND O&M MANUALS.
- 10. CONSTRUCTION NOTES: ALL CONDUITS SHALL BE RUN STRAIGHT, LEVEL AND UNIFORMITY THROUGHOUT INSTALLATION FROM POINT A TO POINT B.
- 11. CONSTRUCTION NOTES: ALL LIGHTING INSTALL IN THIS PROJECT SHALL BE LED FIXTURES AND MATCH THE TRANSFORMER PER MANUFACTURER RECOMMENDATIONS.
- 12. THE CONTRACTOR SHALL TRACE EXISTING CABLING SERVING THE TAXIWAY EDGE, TAXIWAY CENTERLINE, AND SIGN CIRCUITS. THESE CIRCUITS SHALL BE REPLACED IN KIND AND CONFIGURATION WHERE THEY ARE FOUND IN THE TAXIWAY FULL-STRENGTH AND SHOULDER PAVEMENT.
- 13. ALL CABLE REMOVAL COSTS SHALL BE SUBSIDIARY TO THE #8 AWG L-824C PAY ITEM.



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**DEMOLITION KEYED NOTES:**

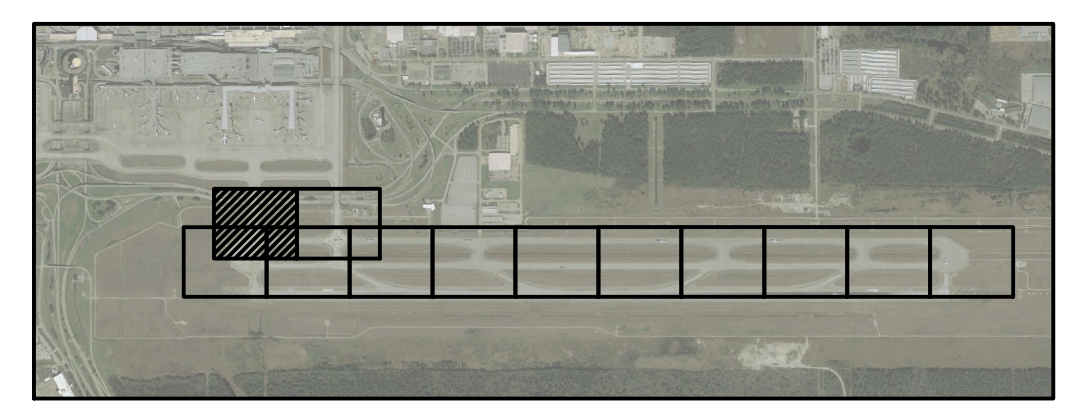
- 101 REMOVE EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
- 102 REMOVE EXISTING BASE MOUNTED TAXIWAY CENTERLINE LIGHT AND DRAIN IF WATER IS PRESENT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
- 103 REMOVE EXISTING BASE MOUNTED CLEARANCE BAR LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP. OF 3 LIGHTS PER LOCATION)
- 106 REMOVE EXISTING BASE MOUNTED LIGHT. BASE TO REMAIN.
- 107 EXISTING TAXIWAY EDGE OR CENTERLINE LIGHT TO REMAIN. (TYP.)
- 108 EXISTING AIRFIELD GUIDANCE SIGN TO REMAIN. (TYP.)
- 109 EXISTING AIRFIELD CONDUIT OR DUCT AND CABLE TO REMAIN. (TYP.)
- 110 EXISTING ELECTRICAL HANDHOLE, MANHOLE, OR PULL BOX TO REMAIN. (TYP.)
- 115 REMOVE CONDUCTORS FROM EXISTING CONDUIT. CONDUIT TO REMAIN. (TYP.)

MATCHLINE SHEET E02.02

**NOTES:**

1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND DEMOLITION NOTES.
2. SEE SHEET E01.02 FOR DEMOLITION KEYED NOTES.
3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.

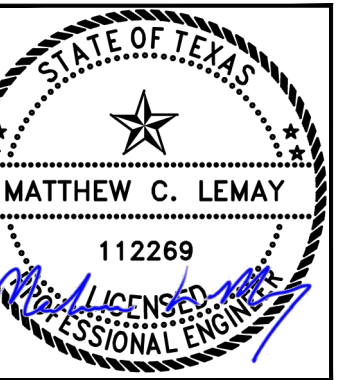
**KEYMAP**



REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

**ELECTRICAL DEMOLITION PLAN I**

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023



APPROVED BY: JEF

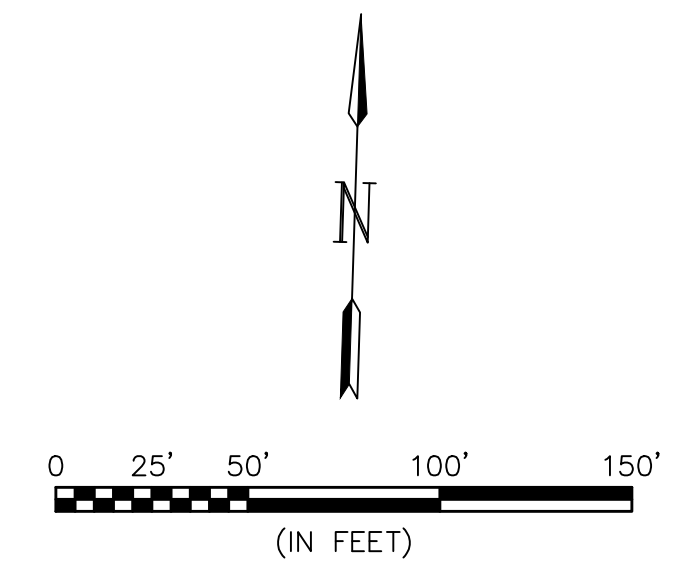
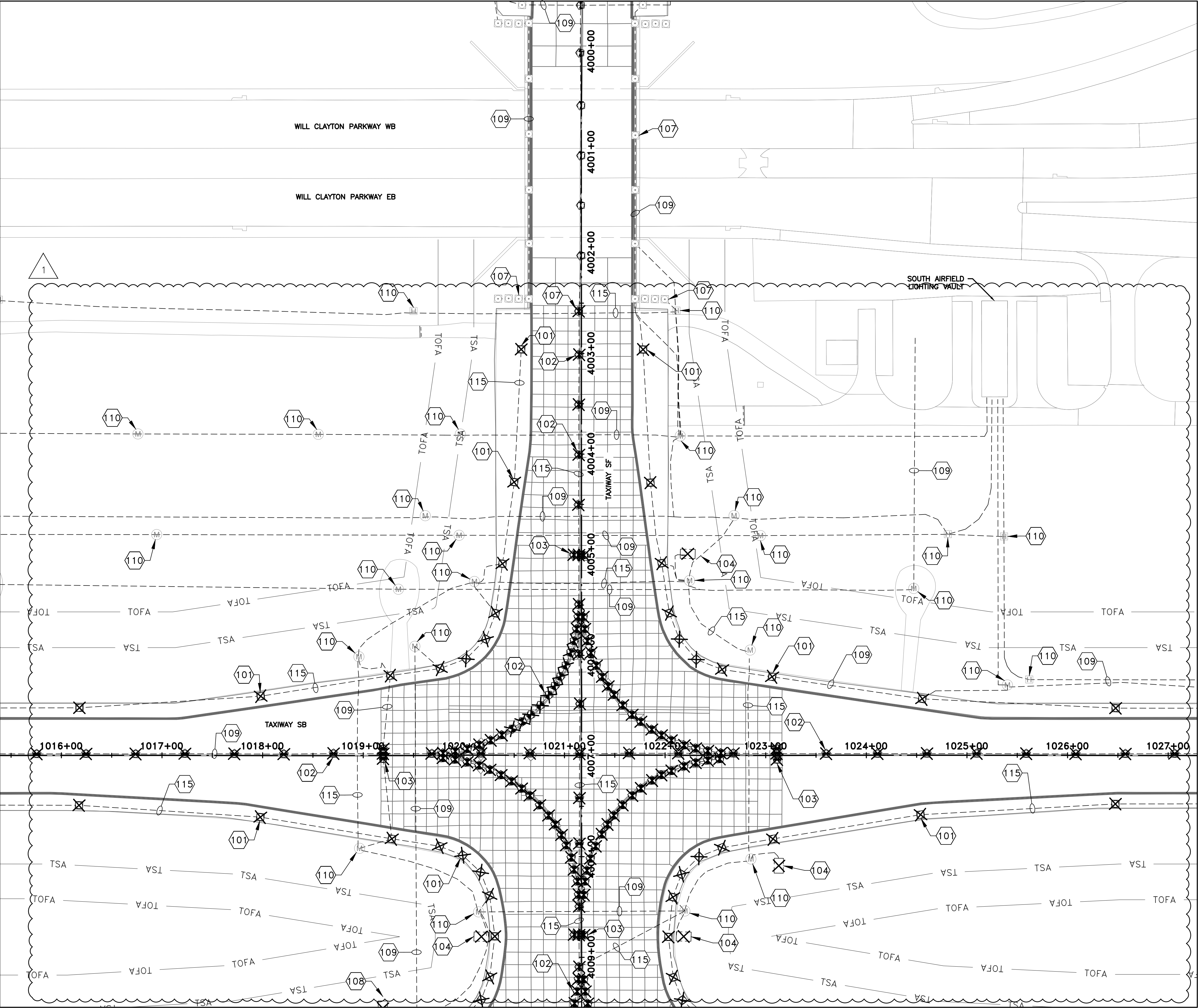
DIRECTOR  
HOUSTON AIRPORT SYSTEM

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



HAS FILE: C:\Users\MCLemay\Conver\AH - TXYS SA SB REHAB - Aviation - 106462\14 - Electrical\Sheet\Files\ELECTRICAL DEMOLITION PLAN II.dwg  
 PLOT DATE: 11/8/2019 3:32:47 PM

MATCHLINE SHEET E02.01



**DEMOLITION KEYED NOTES:**

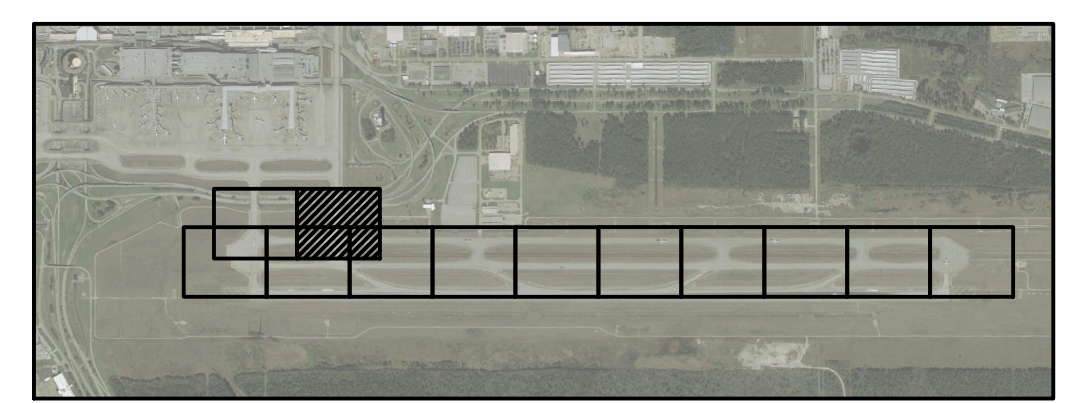
- 101 REMOVE EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
- 102 REMOVE EXISTING BASE MOUNTED TAXIWAY CENTERLINE LIGHT AND DRAIN IF WATER IS PRESENT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
- 103 REMOVE EXISTING BASE MOUNTED CLEARANCE BAR LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP. OF 3 LIGHTS PER LOCATION)
- 104 REMOVE EXISTING BASE MOUNTED GUIDANCE SIGN. DEMOLISH FOUNDATION. (TYP.)
- 107 EXISTING TAXIWAY EDGE OR CENTERLINE LIGHT TO REMAIN. (TYP.)
- 108 EXISTING AIRFIELD GUIDANCE SIGN TO REMAIN. (TYP.)
- 109 EXISTING AIRFIELD CONDUIT OR DUCT AND CABLE TO REMAIN. (TYP.)
- 110 EXISTING ELECTRICAL HANDHOLE, MANHOLE, OR PULL BOX TO REMAIN. (TYP.)
- 115 REMOVE CONDUCTORS FROM EXISTING CONDUIT. CONDUIT TO REMAIN. (TYP.)

1

**NOTES:**

1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND DEMOLITION NOTES.
2. SEE SHEET E01.02 FOR DEMOLITION KEYED NOTES.
3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.

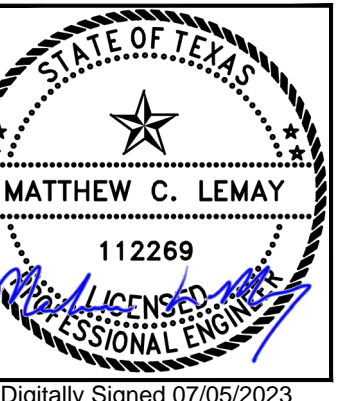
**KEYMAP**



REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

**ELECTRICAL DEMOLITION PLAN II**

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023

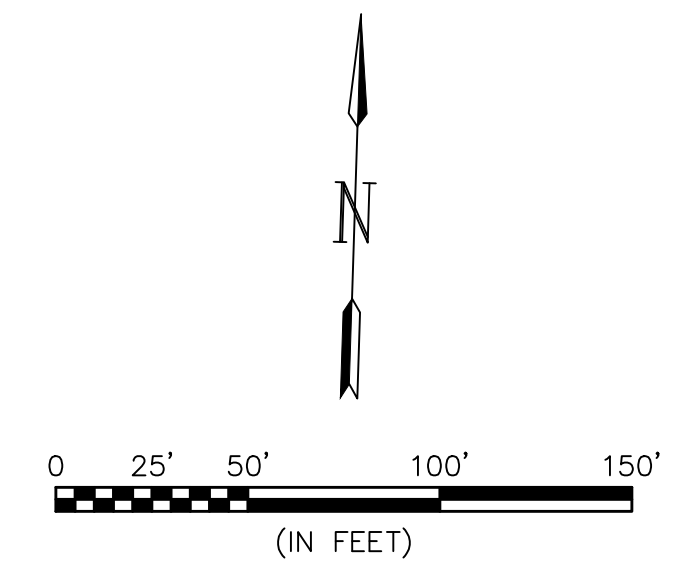
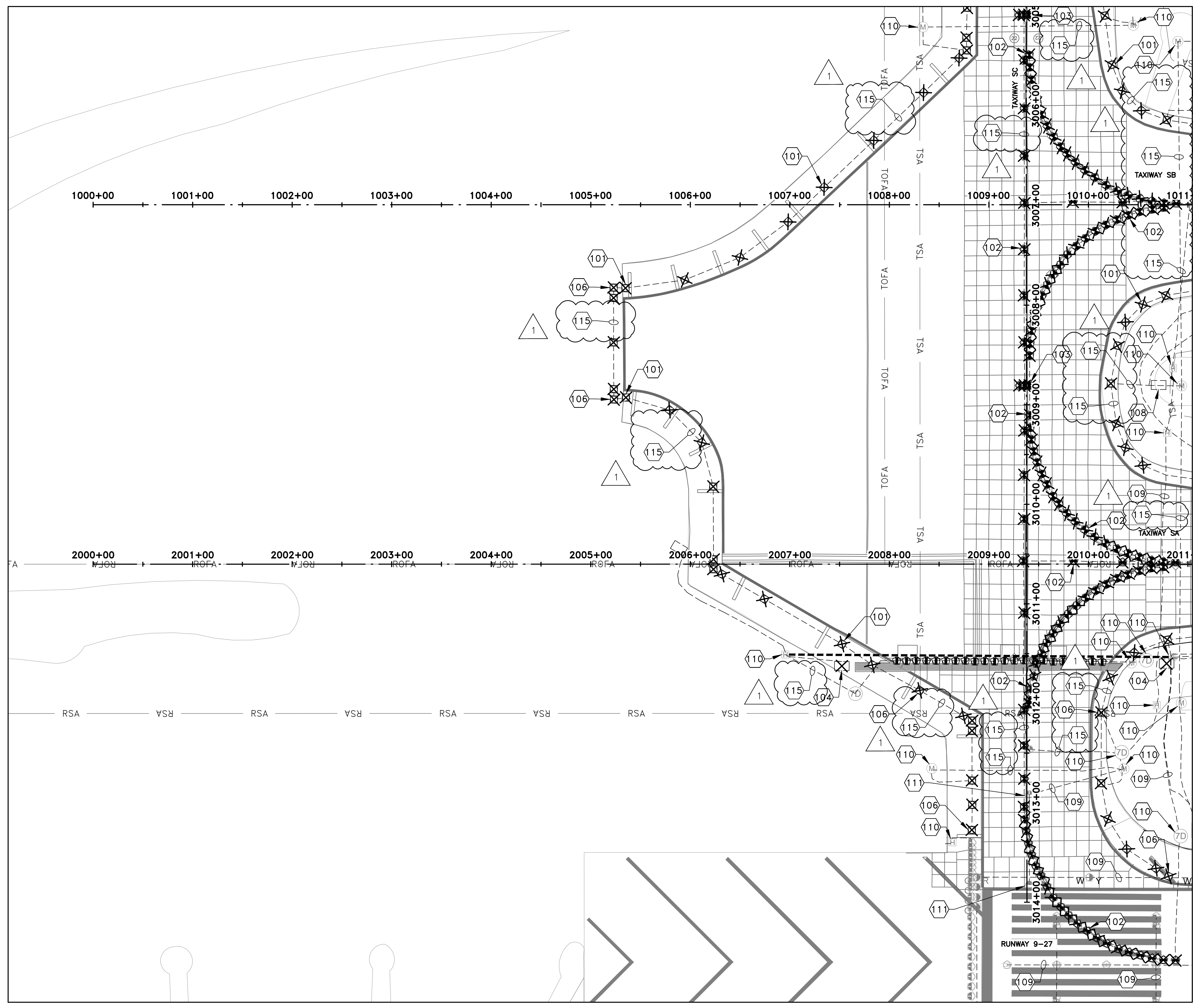


APPROVED BY: JEF  
 DIRECTOR  
 HOUSTON AIRPORT SYSTEM

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



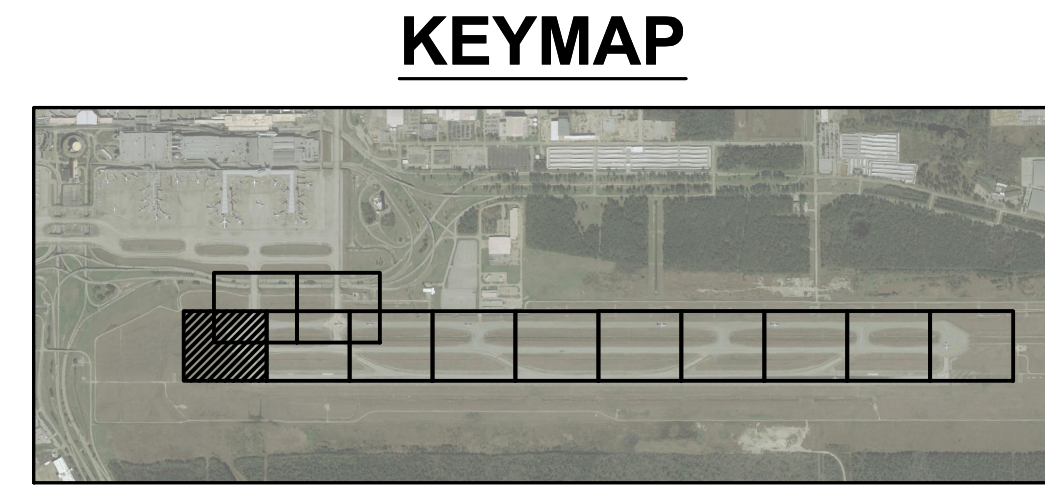
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 PLOT DATE: 11/8/2019 3:32:47 PM



- DEMOLITION KEYED NOTES:**
- 101 REMOVE AND STORE EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 102 REMOVE AND STORE EXISTING BASE MOUNTED TAXIWAY CENTERLINE LIGHT AND DRAIN IF WATER IS PRESENT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 103 REMOVE AND STORE EXISTING BASE MOUNTED CLEARANCE BAR LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP. OF 3 LIGHTS PER LOCATION)
  - 104 REMOVE EXISTING BASE MOUNTED GUIDANCE SIGN. DEMOLISH FOUNDATION. (TYP.)
  - 106 REMOVE AND STORE EXISTING BASE MOUNTED LIGHT. BASE TO REMAIN.
  - 108 EXISTING AIRFIELD GUIDANCE SIGN TO REMAIN. (TYP.)
  - 109 EXISTING AIRFIELD CONDUIT OR DUCT AND CABLE TO REMAIN. (TYP.)
  - 110 EXISTING ELECTRICAL HANDHOLE, MANHOLE, OR PULL BOX TO REMAIN. (TYP.)
  - 111 EXISTING FAA-OWNED RUNWAY STATUS LIGHTS (RWSL) TO REMAIN.
  - 115 REMOVE CONDUCTORS FROM EXISTING CONDUIT. CONDUIT TO REMAIN. (TYP.)

MATCHLINE SHEET E02.04

- NOTES:**
1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND DEMOLITION NOTES.
  2. SEE SHEET E01.02 FOR DEMOLITION KEYED NOTES.
  3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.



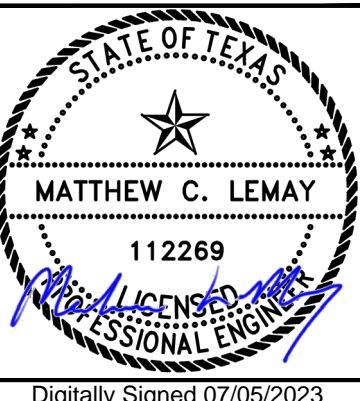
**REVISIONS**

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

**ELECTRICAL DEMOLITION PLAN III**

GEORGE BUSH INTERCONTINENTAL AIRPORT  
REHABILITATION OF TAXIWAYS SA & SB

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023

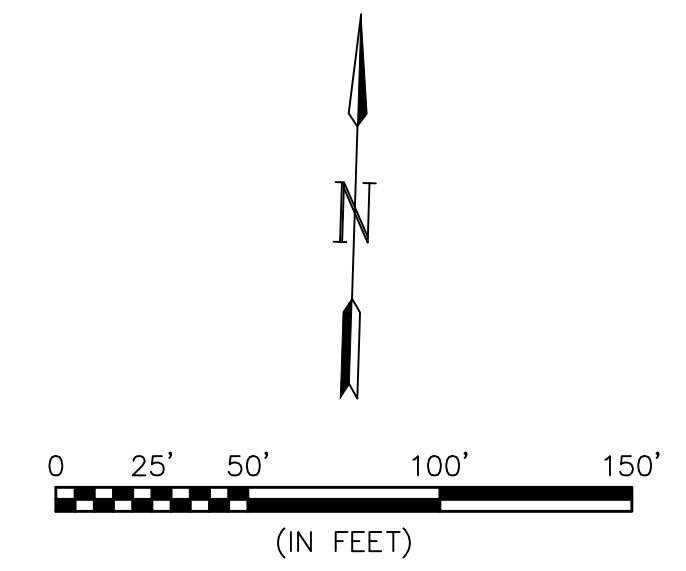
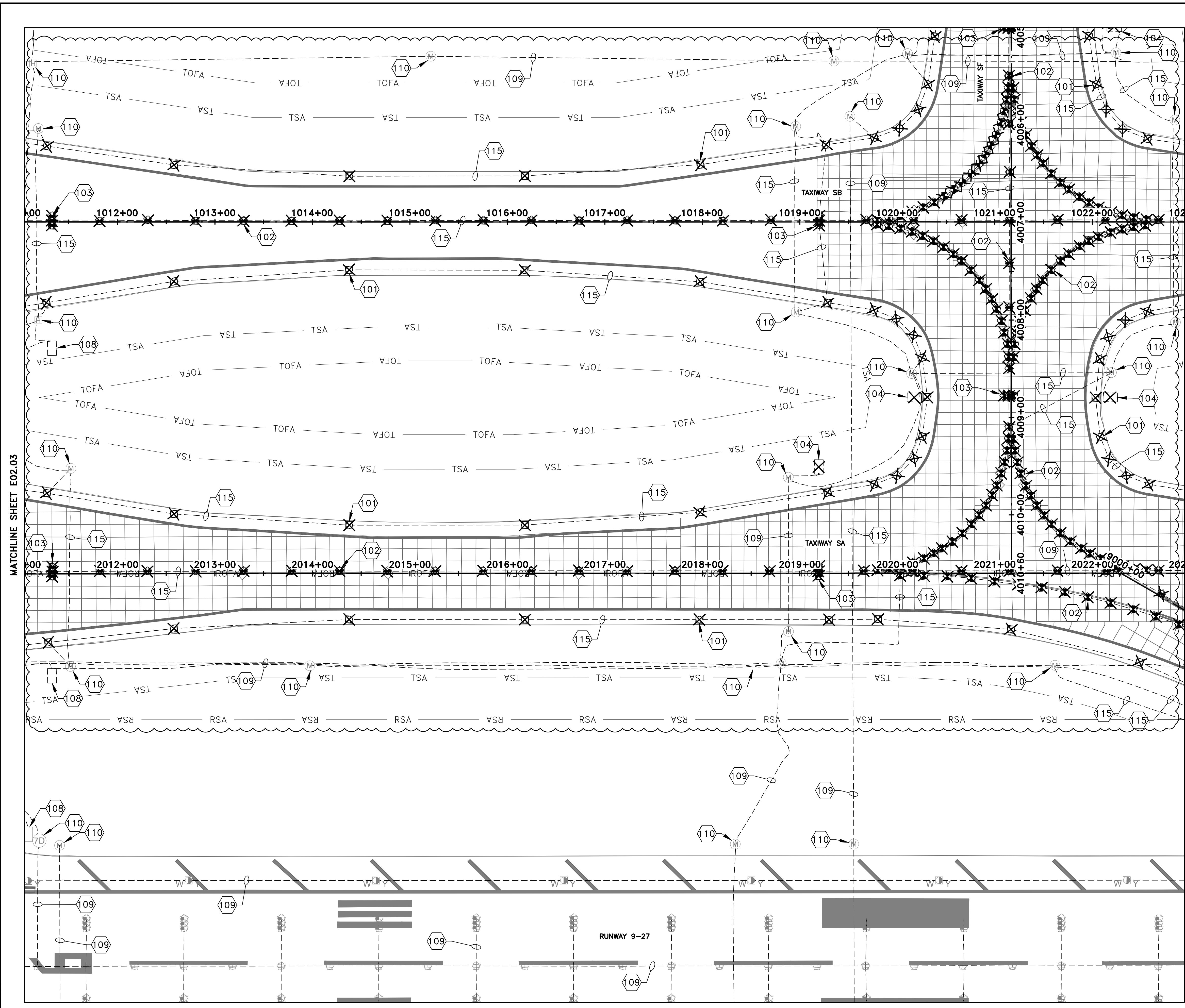


APPROVED BY: JEF  
 DIRECTOR  
 HOUSTON AIRPORT SYSTEM

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



HAS FILE: C:\Users\MCLemay\Conver\AH - TXYS SA SB REHAB - 106462\14 - Electrical\Sheet Files\10646E02.04.dwg  
 PLOT DATE: 11/8/2019 3:32:47 PM



- DEMOLITION KEYED NOTES:**
- 101 REMOVE EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 102 REMOVE EXISTING BASE MOUNTED TAXIWAY CENTERLINE LIGHT AND DRAIN IF WATER IS PRESENT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 103 REMOVE EXISTING BASE MOUNTED CLEARANCE BAR LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP. OF 3 LIGHTS PER LOCATION)
  - 104 REMOVE EXISTING BASE MOUNTED GUIDANCE SIGN. DEMOLISH FOUNDATION. (TYP.)
  - 108 EXISTING AIRFIELD GUIDANCE SIGN TO REMAIN. (TYP.)
  - 109 EXISTING AIRFIELD CONDUIT OR DUCT AND CABLE TO REMAIN. (TYP.)
  - 110 EXISTING ELECTRICAL HANDHOLE, MANHOLE, OR PULL BOX TO REMAIN. (TYP.)
  - 115 REMOVE CONDUCTORS FROM EXISTING CONDUIT. CONDUIT TO REMAIN. (TYP.)

MATCHLINE SHEET E02.05

MATCHLINE SHEET E02.03

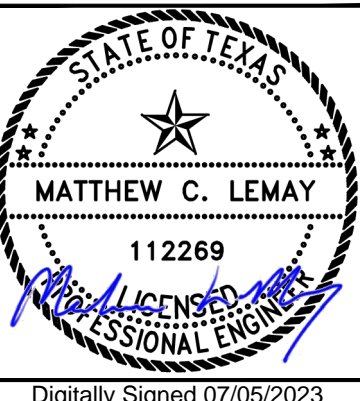


**REVISIONS**

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

**GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
 ELECTRICAL DEMOLITION PLAN IV**

**PROJECT MGR:** JEF  
**DESIGNER:** RH  
**DRAWN BY:** RH  
**CHECK BY:** MCL  
**SCALE:** 1"=50'  
**DATE:** 04/28/2023

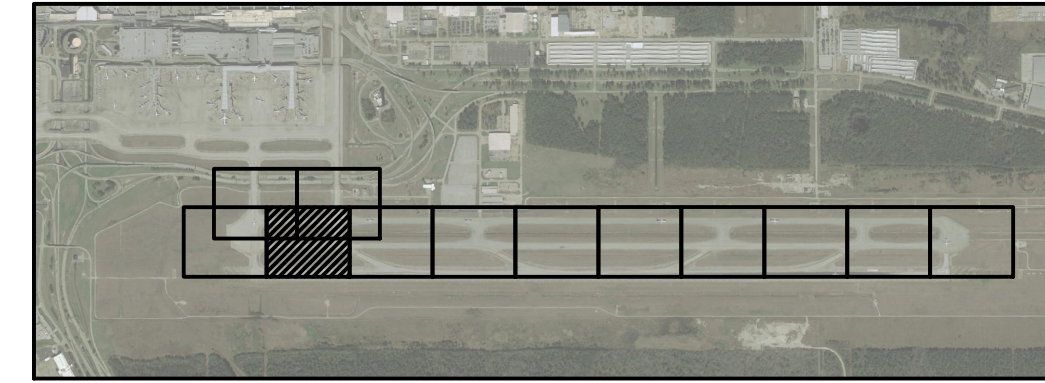


**APPROVED BY:** JEF  
 DIRECTOR  
 HOUSTON AIRPORT SYSTEM

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

- NOTES:**
- SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND DEMOLITION NOTES.
  - SEE SHEET E01.02 FOR DEMOLITION KEYED NOTES.
  - EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.

**KEYMAP**

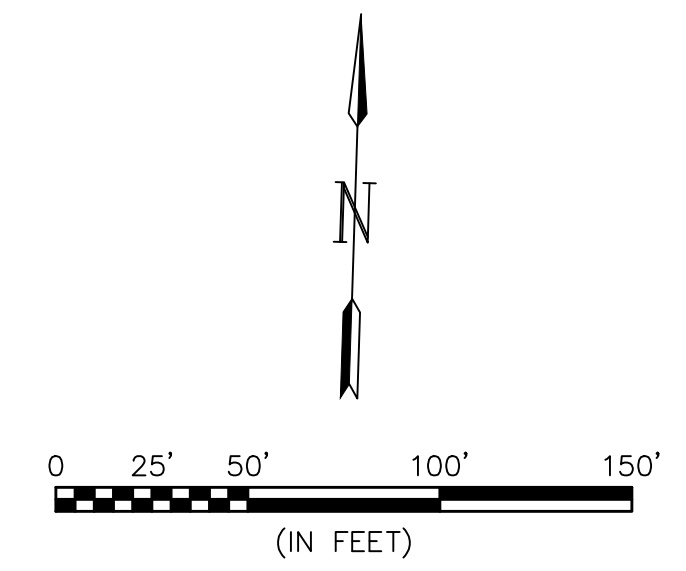
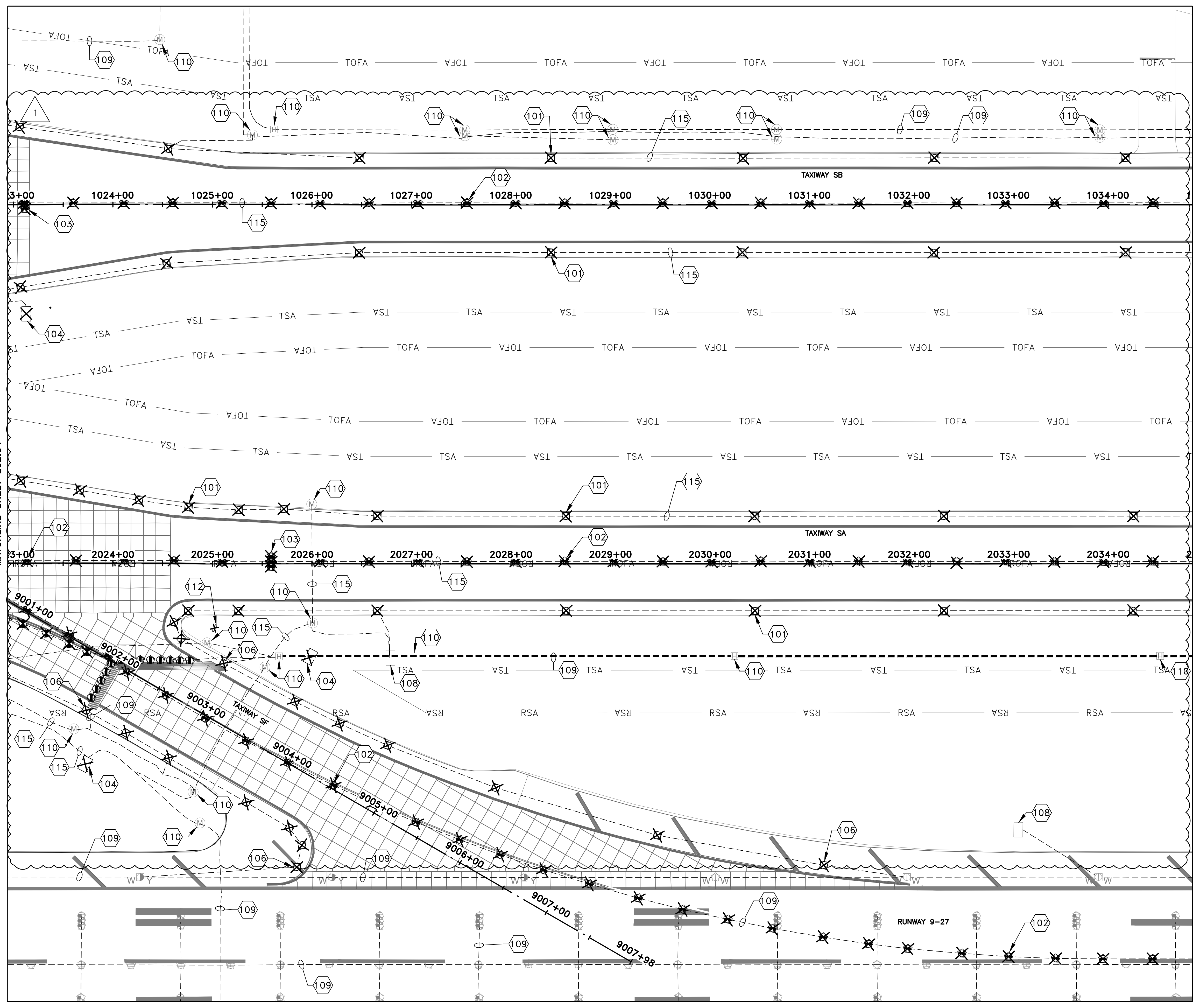




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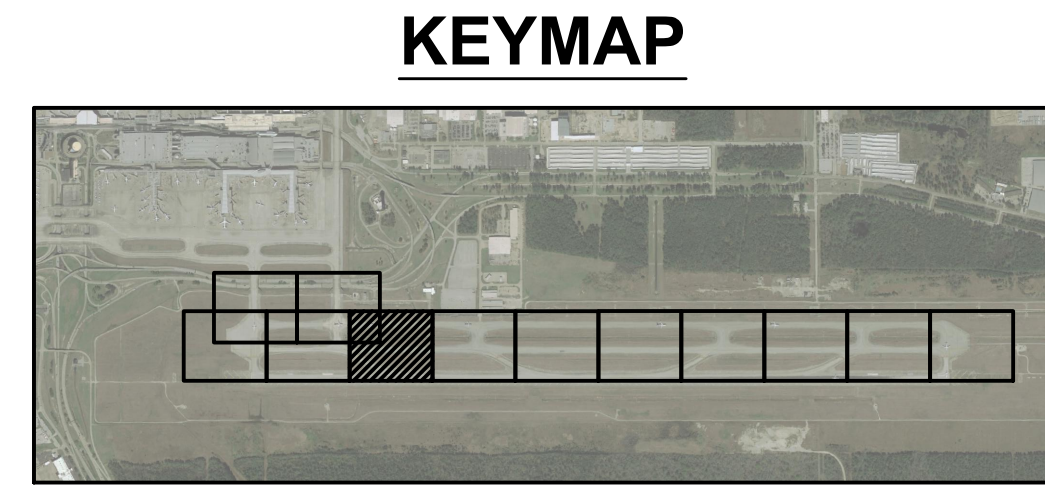
MATCHLINE SHEET E02.04

MATCHLINE SHEET E02.06



- DEMOLITION KEYED NOTES:**
- 101 REMOVE EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 102 REMOVE EXISTING BASE MOUNTED TAXIWAY CENTERLINE LIGHT AND DRAIN IF WATER IS PRESENT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 103 REMOVE EXISTING BASE MOUNTED CLEARANCE BAR LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP. OF 3 LIGHTS PER LOCATION)
  - 104 REMOVE EXISTING BASE MOUNTED GUIDANCE SIGN. DEMOLISH FOUNDATION. (TYP.)
  - 106 REMOVE EXISTING BASE MOUNTED LIGHT. BASE TO REMAIN.
  - 108 EXISTING AIRFIELD GUIDANCE SIGN TO REMAIN. (TYP.)
  - 109 EXISTING AIRFIELD CONDUIT OR DUCT AND CABLE TO REMAIN. (TYP.)
  - 110 EXISTING ELECTRICAL HANDHOLE, MANHOLE, OR PULL BOX TO REMAIN. (TYP.)
  - 112 DEMOLISH ABANDONED SIGN FOUNDATION.
  - 115 REMOVE CONDUCTORS FROM EXISTING CONDUIT. CONDUIT TO REMAIN. (TYP.)

- NOTES:**
1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND DEMOLITION NOTES.
  2. SEE SHEET E01.02 FOR DEMOLITION KEYED NOTES.
  3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.

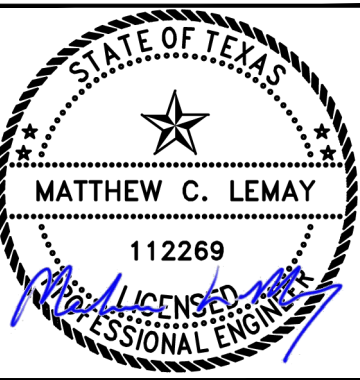


**REVISIONS**

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
**ELECTRICAL DEMOLITION PLAN V**

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023

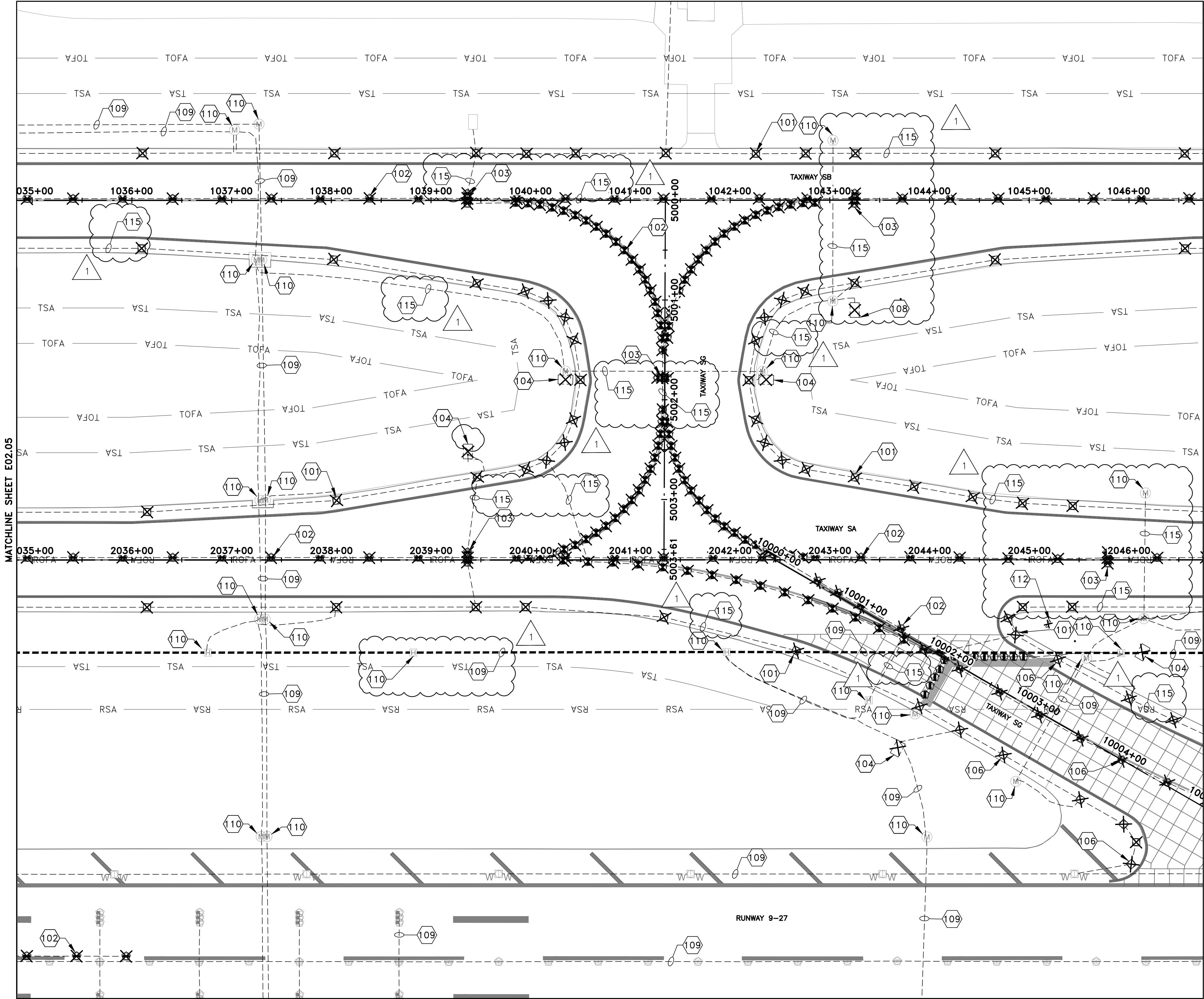


APPROVED BY: JEF  
 DIRECTOR  
 HOUSTON AIRPORT SYSTEM

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

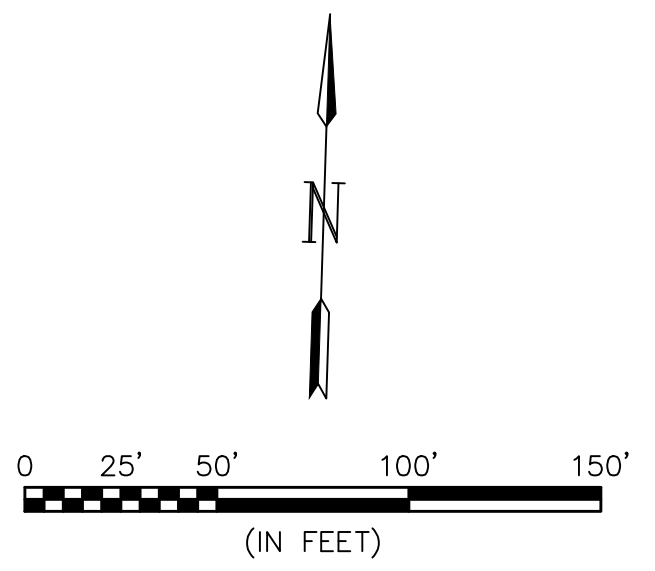


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MATCHLINE SHEET E02.05

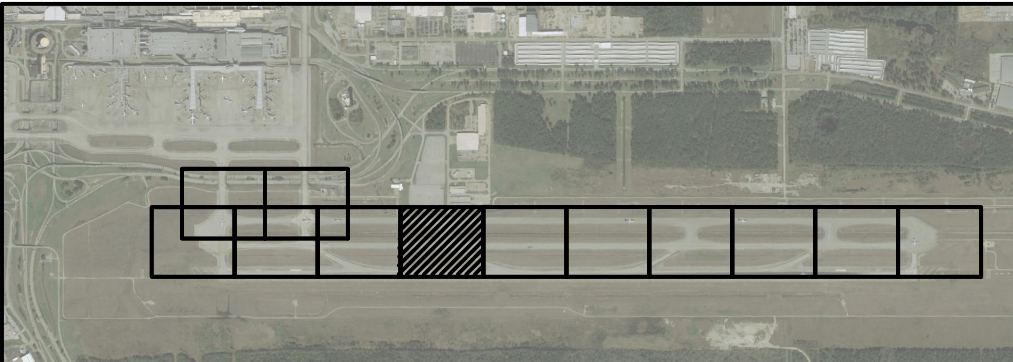
MATCHLINE SHEET E02.07



- DEMOLITION KEYED NOTES:**
- (101) REMOVE EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - (102) REMOVE EXISTING BASE MOUNTED TAXIWAY CENTERLINE LIGHT AND DRAIN IF WATER IS PRESENT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - (103) REMOVE EXISTING BASE MOUNTED CLEARANCE BAR LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP. OF 3 LIGHTS PER LOCATION)
  - (104) REMOVE EXISTING BASE MOUNTED GUIDANCE SIGN. DEMOLISH FOUNDATION. (TYP.)
  - (106) REMOVE EXISTING BASE MOUNTED LIGHT. BASE TO REMAIN.
  - (108) EXISTING AIRFIELD GUIDANCE SIGN TO REMAIN. (TYP.)
  - (109) EXISTING AIRFIELD CONDUIT OR DUCT AND CABLE TO REMAIN. (TYP.)
  - (110) EXISTING ELECTRICAL HANDHOLE, MANHOLE, OR PULL BOX TO REMAIN. (TYP.)
  - (112) DEMOLISH ABANDONED SIGN FOUNDATION.
  - (115) REMOVE CONDUCTORS FROM EXISTING CONDUIT. CONDUIT TO REMAIN. (TYP.)

- NOTES:**
1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND DEMOLITION NOTES.
  2. SEE SHEET E01.02 FOR DEMOLITION KEYED NOTES.
  3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.

**KEYMAP**



**REVISIONS**

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

**ELECTRICAL DEMOLITION PLAN VI**

**PROJECT MGR:** JEF  
**DESIGNER:** RH  
**DRAWN BY:** RH  
**CHECK BY:** MCL  
**SCALE:** 1"=50'  
**DATE:** 04/28/2023



APPROVED BY: JEF

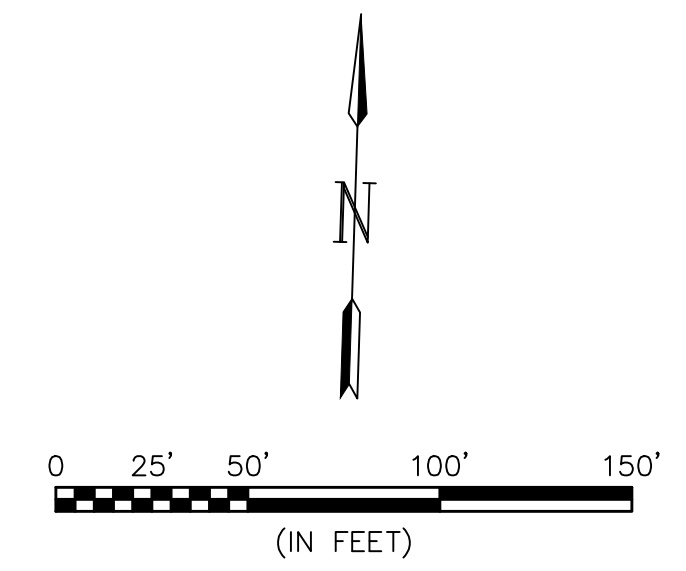
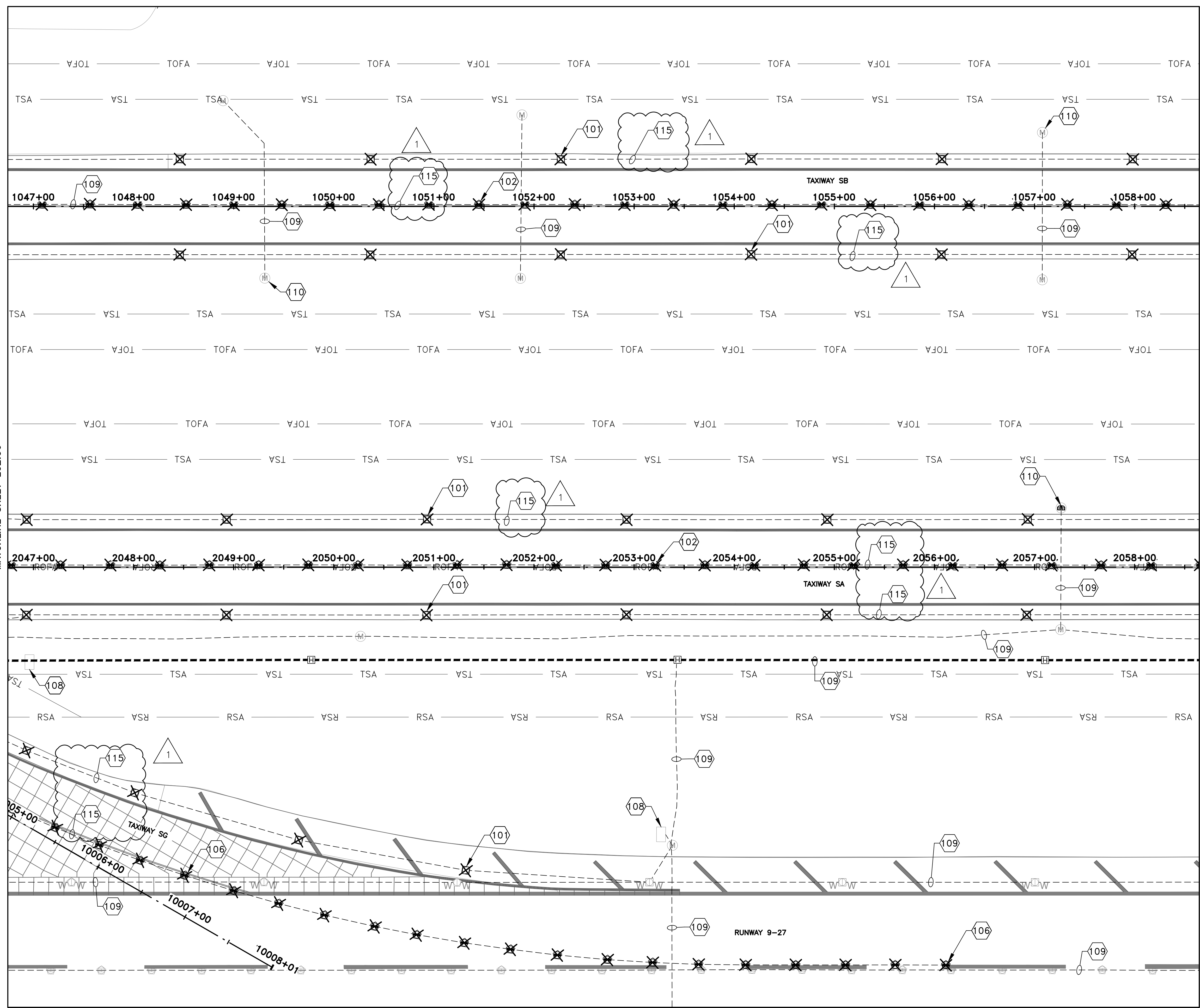
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**A.I.P. NO.** XXXX  
**C.I.P. NO.** A-0515  
**H.A.S. NO.** 20C0646A  
**SHEET NO.**



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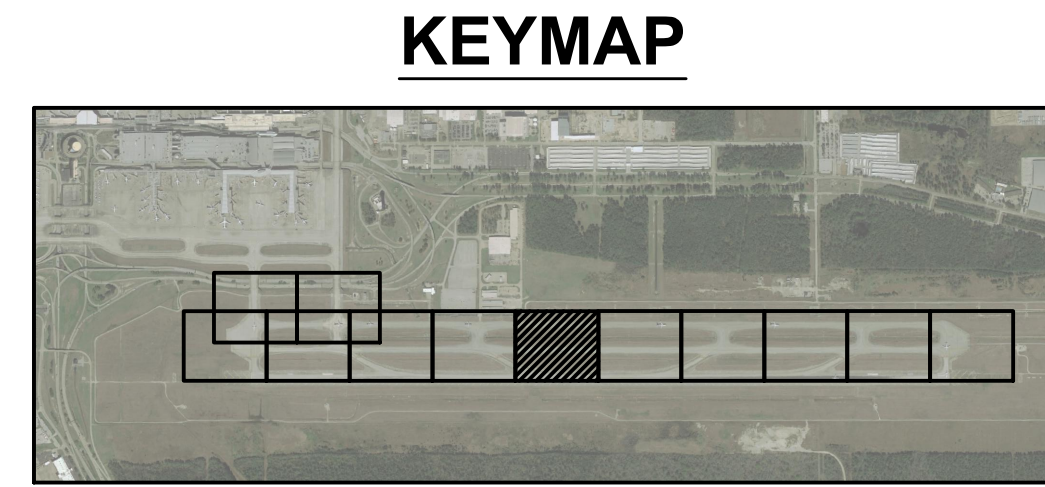
MATCHLINE SHEET E02.06

MATCHLINE SHEET E02.08



- DEMOLITION KEYED NOTES:**
- 101 REMOVE EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 102 REMOVE EXISTING BASE MOUNTED TAXIWAY CENTERLINE LIGHT AND DRAIN IF WATER IS PRESENT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 106 REMOVE EXISTING BASE MOUNTED LIGHT. BASE TO REMAIN.
  - 108 EXISTING AIRFIELD GUIDANCE SIGN TO REMAIN. (TYP.)
  - 109 EXISTING AIRFIELD CONDUIT OR DUCT AND CABLE TO REMAIN. (TYP.)
  - 110 EXISTING ELECTRICAL HANDHOLE, MANHOLE, OR PULL BOX TO REMAIN. (TYP.)
  - 115 REMOVE CONDUCTORS FROM EXISTING CONDUIT. CONDUIT TO REMAIN. (TYP.)

- NOTES:**
1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND DEMOLITION NOTES.
  2. SEE SHEET E01.02 FOR DEMOLITION KEYED NOTES.
  3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.

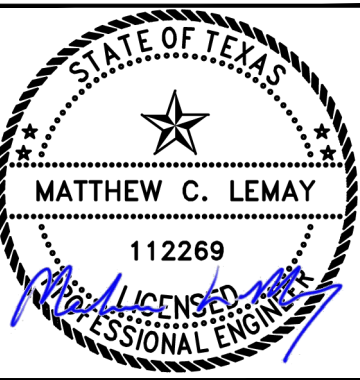


**REVISIONS**

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
**ELECTRICAL DEMOLITION PLAN VII**

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023



APPROVED BY: JEF

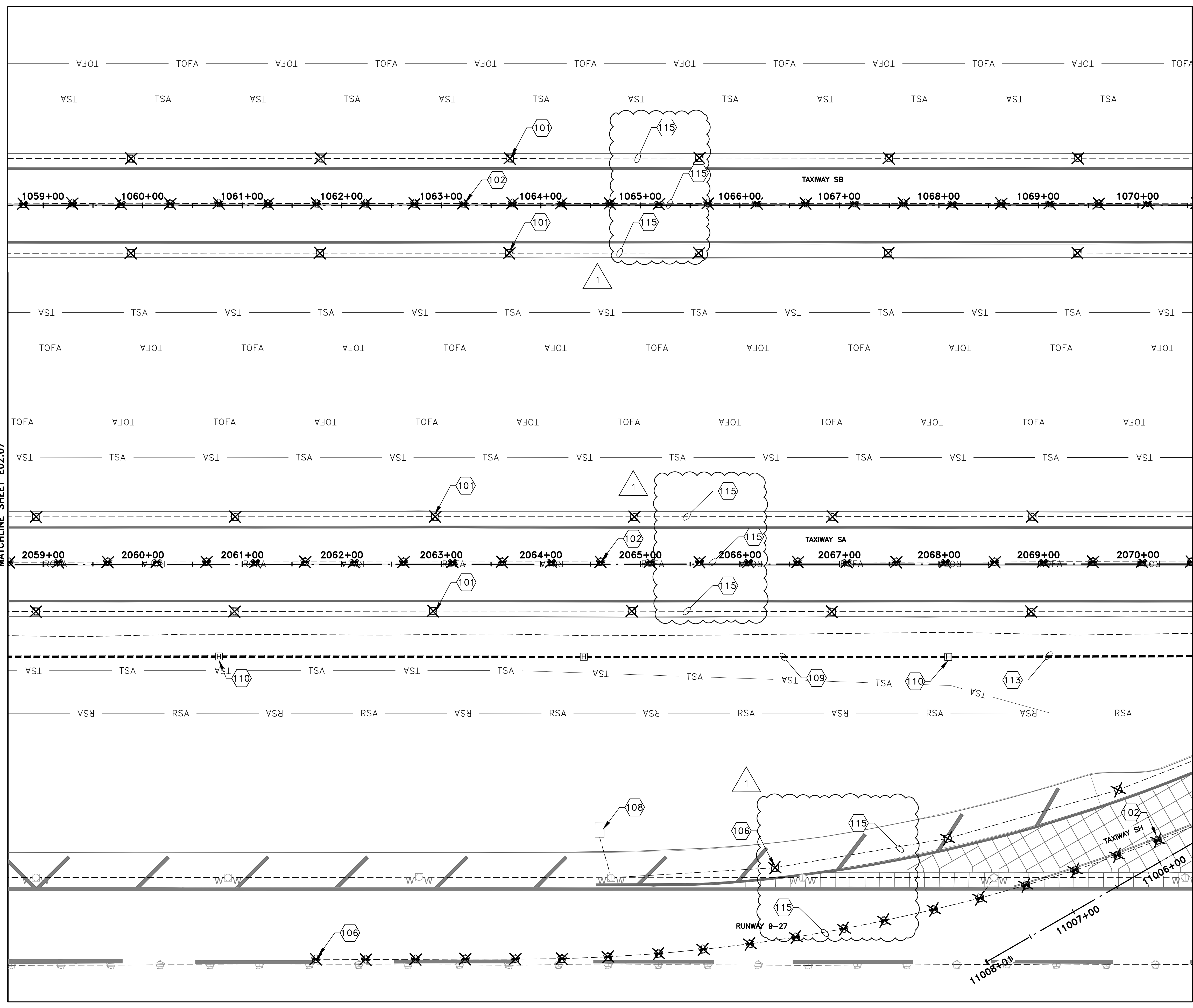
DIRECTOR  
HOUSTON AIRPORT SYSTEM

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

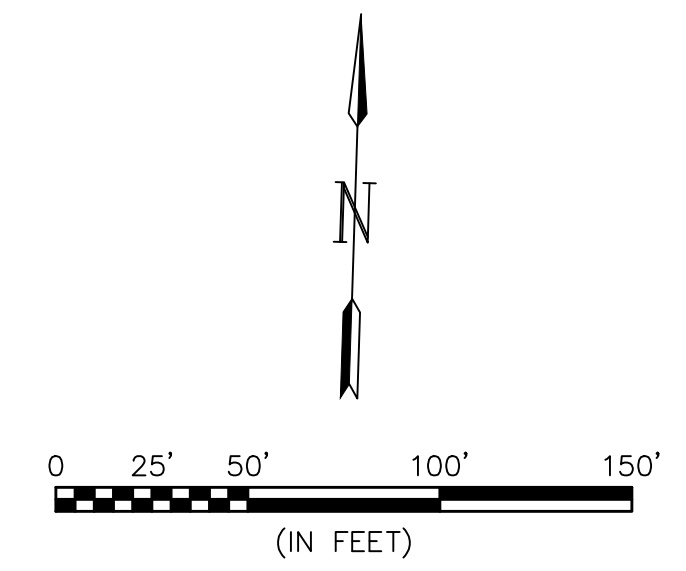


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 PLOT DATE: 11/8/2019 3:32:47 PM

MATCHLINE SHEET E02.07



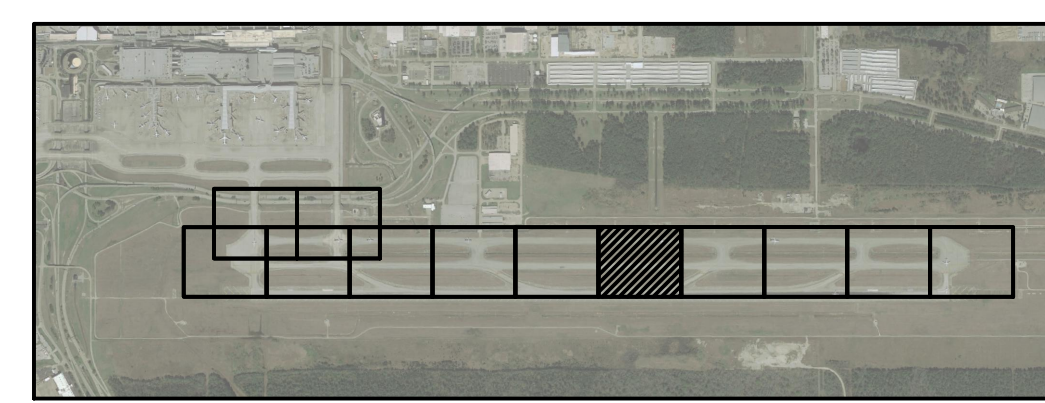
MATCHLINE SHEET E02.08



- DEMOLITION KEYED NOTES:**
- 101 REMOVE EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 102 REMOVE EXISTING BASE MOUNTED TAXIWAY CENTERLINE LIGHT AND DRAIN IF WATER IS PRESENT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 106 REMOVE EXISTING BASE MOUNTED LIGHT. BASE TO REMAIN.
  - 108 EXISTING AIRFIELD GUIDANCE SIGN TO REMAIN. (TYP.)
  - 109 EXISTING AIRFIELD CONDUIT OR DUCT AND CABLE TO REMAIN. (TYP.)
  - 110 EXISTING ELECTRICAL HANDHOLE, MANHOLE, OR PULL BOX TO REMAIN. (TYP.)
  - 113 REMOVE EXISTING CONDUCTORS AND ABANDON ELECTRICAL DUCT BANK IN PLACE.
  - 115 REMOVE CONDUCTORS FROM EXISTING CONDUIT. CONDUIT TO REMAIN. (TYP.)

- NOTES:**
1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND DEMOLITION NOTES.
  2. SEE SHEET E01.02 FOR DEMOLITION KEYED NOTES.
  3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.

**KEYMAP**



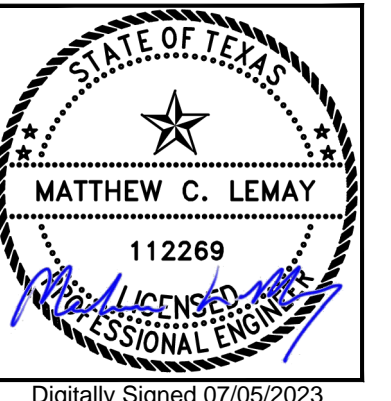
**REVISIONS**

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

**ELECTRICAL DEMOLITION PLAN VIII**

GEORGE BUSH INTERCONTINENTAL AIRPORT  
REHABILITATION OF TAXIWAYS SA & SB

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023

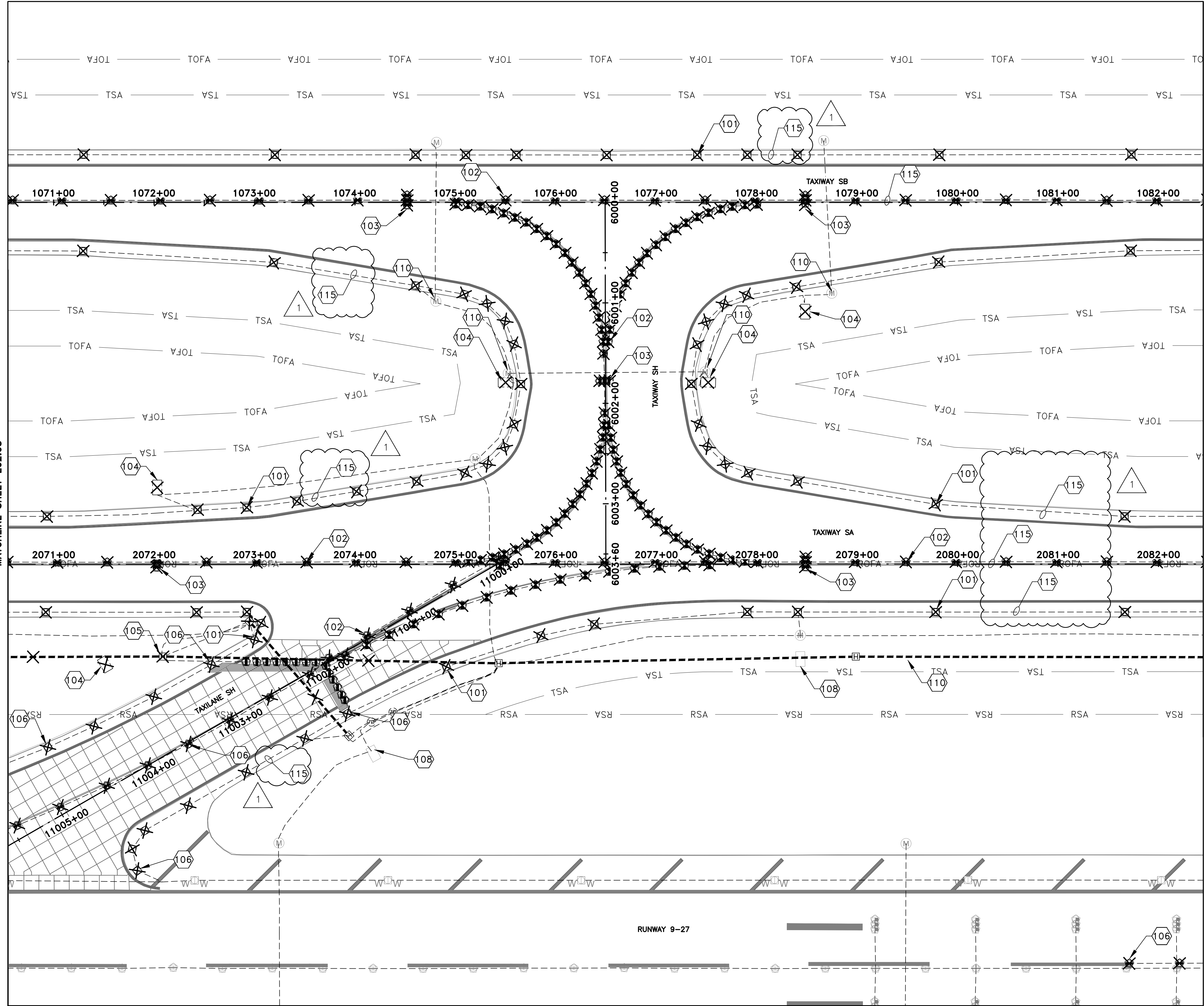


APPROVED BY: JEF

PROJECT NO.	0646A
A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	E02.08

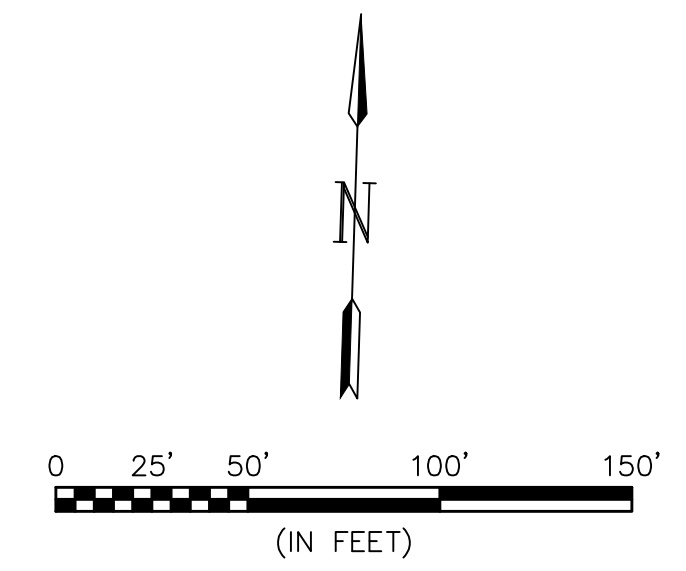


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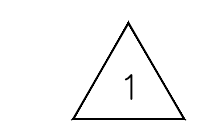


MATCHLINE SHEET E02.08

MATCHLINE SHEET E02.10

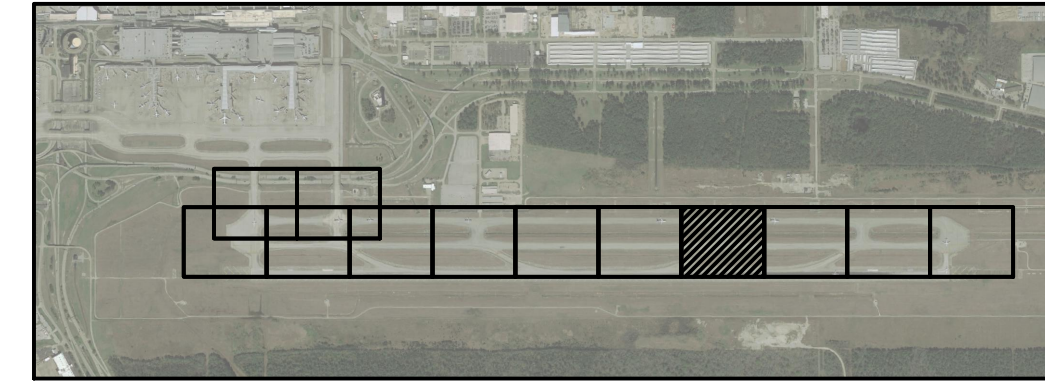


- DEMOLITION KEYED NOTES:**
- 101 REMOVE EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 102 REMOVE EXISTING BASE MOUNTED TAXIWAY CENTERLINE LIGHT AND DRAIN IF WATER IS PRESENT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 103 REMOVE EXISTING BASE MOUNTED CLEARANCE BAR LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP. OF 3 LIGHTS PER LOCATION)
  - 104 REMOVE EXISTING BASE MOUNTED GUIDANCE SIGN. DEMOLISH FOUNDATION. (TYP.)
  - 105 REMOVE ELECTRICAL HANDHOLE.
  - 106 REMOVE AND STORE EXISTING BASE MOUNTED LIGHT. BASE TO REMAIN.
  - 108 EXISTING AIRFIELD GUIDANCE SIGN TO REMAIN. (TYP.)
  - 109 EXISTING AIRFIELD CONDUIT OR DUCT AND CABLE TO REMAIN. (TYP.)
  - 110 EXISTING ELECTRICAL HANDHOLE, MANHOLE, OR PULL BOX TO REMAIN. (TYP.)
  - 113 REMOVE EXISTING CONDUCTORS AND ABANDON ELECTRICAL DUCT BANK IN PLACE.
  - 115 REMOVE CONDUCTORS FROM EXISTING CONDUIT. CONDUIT TO REMAIN. (TYP.)



- NOTES:**
1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND DEMOLITION NOTES.
  2. SEE SHEET E01.02 FOR DEMOLITION KEYED NOTES.
  3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.

**KEYMAP**



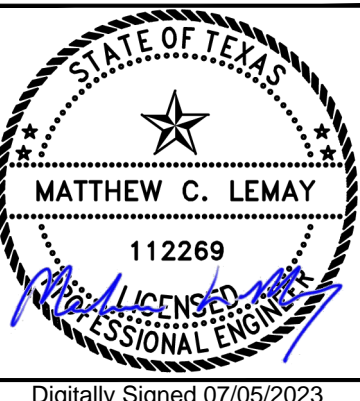
**REVISIONS**

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

**ELECTRICAL DEMOLITION PLAN IX**

GEORGE BUSH INTERCONTINENTAL AIRPORT  
REHABILITATION OF TAXIWAYS SA & SB

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023



APPROVED BY: JEF  
 DIRECTOR  
 HOUSTON AIRPORT SYSTEM

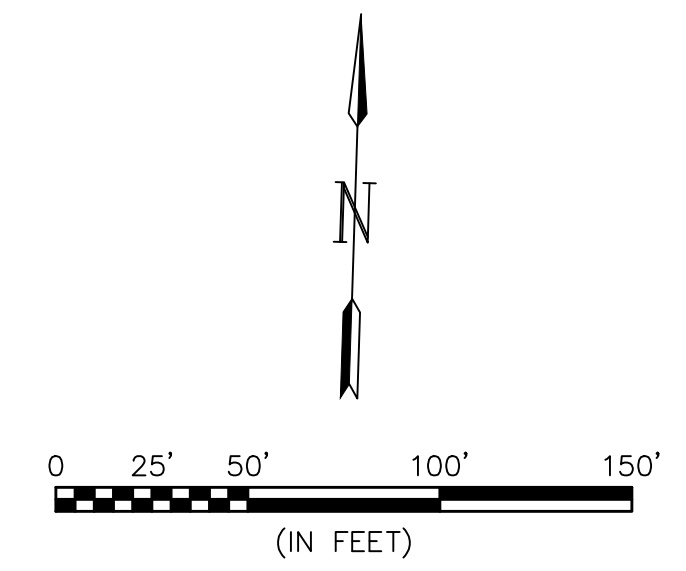
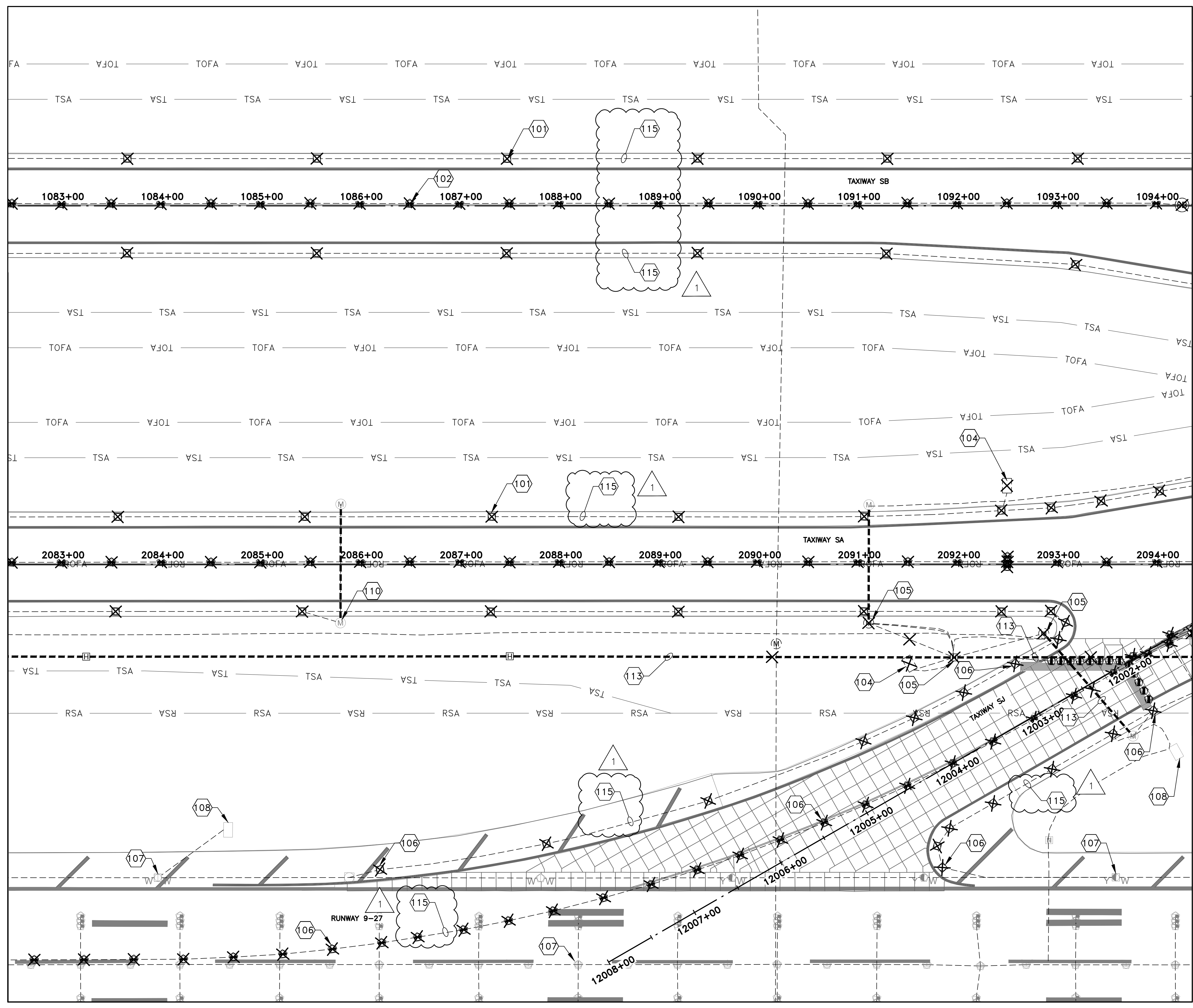
PROJECT NO.	0646A
A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	



HAS FILE: C:\Users\MCLemay\Conver\AH - TXYS SA SB REHAB - Aviation - 106462\14 - Electrical\Sheet\Files\10646E02.10.dwg  
 PLOT DATE: 11/8/2019 3:32:47 PM

MATCHLINE SHEET E02.09

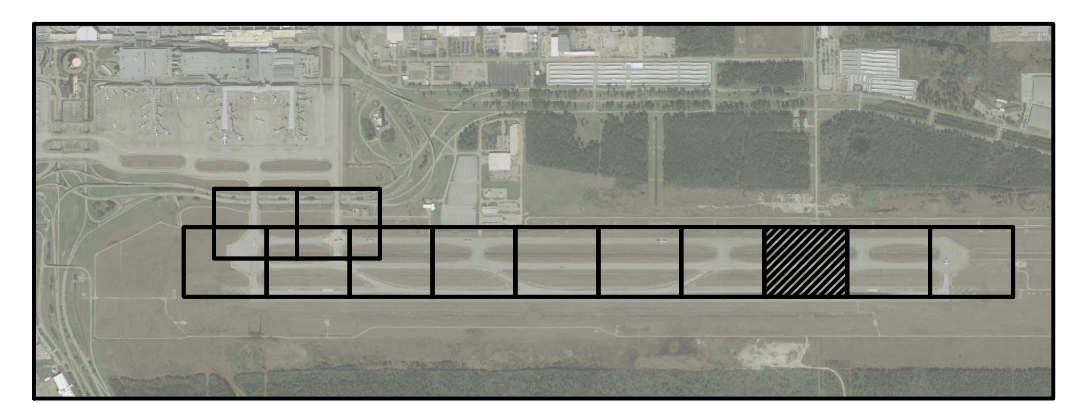
MATCHLINE SHEET E02.11



- DEMOLITION KEYED NOTES:**
- 101 REMOVE EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 102 REMOVE EXISTING BASE MOUNTED TAXIWAY CENTERLINE LIGHT AND DRAIN IF WATER IS PRESENT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 104 REMOVE EXISTING BASE MOUNTED GUIDANCE SIGN. DEMOLISH FOUNDATION. (TYP.)
  - 105 REMOVE ELECTRICAL HANDHOLE.
  - 106 REMOVE EXISTING BASE MOUNTED LIGHT. BASE TO REMAIN.
  - 107 EXISTING EDGE OR CENTERLINE LIGHT TO REMAIN. (TYP.)
  - 108 EXISTING AIRFIELD GUIDANCE SIGN TO REMAIN. (TYP.)
  - 109 EXISTING AIRFIELD CONDUIT OR DUCT AND CABLE TO REMAIN. (TYP.)
  - 110 EXISTING ELECTRICAL HANDHOLE, MANHOLE, OR PULL BOX TO REMAIN. (TYP.)
  - 113 REMOVE EXISTING CONDUCTORS AND ABANDON ELECTRICAL DUCT BANK IN PLACE.
  - 115 REMOVE CONDUCTORS FROM EXISTING CONDUIT. CONDUIT TO REMAIN. (TYP.)

- NOTES:**
1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND DEMOLITION NOTES.
  2. SEE SHEET E01.02 FOR DEMOLITION KEYED NOTES.
  3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.

**KEYMAP**

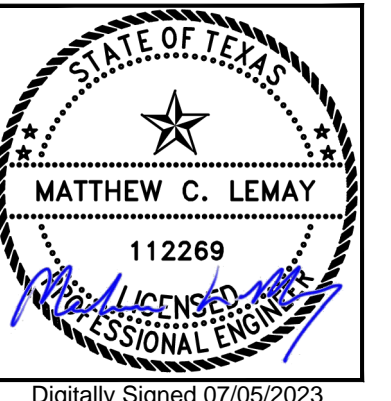


**REVISIONS**

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

**ELECTRICAL DEMOLITION PLAN X**

PROJECT MGR: JEF  
 DESIGNER: RH  
 DRAWN BY: RH  
 CHECK BY: MCL  
 SCALE: 1"=50'  
 DATE: 04/28/2023

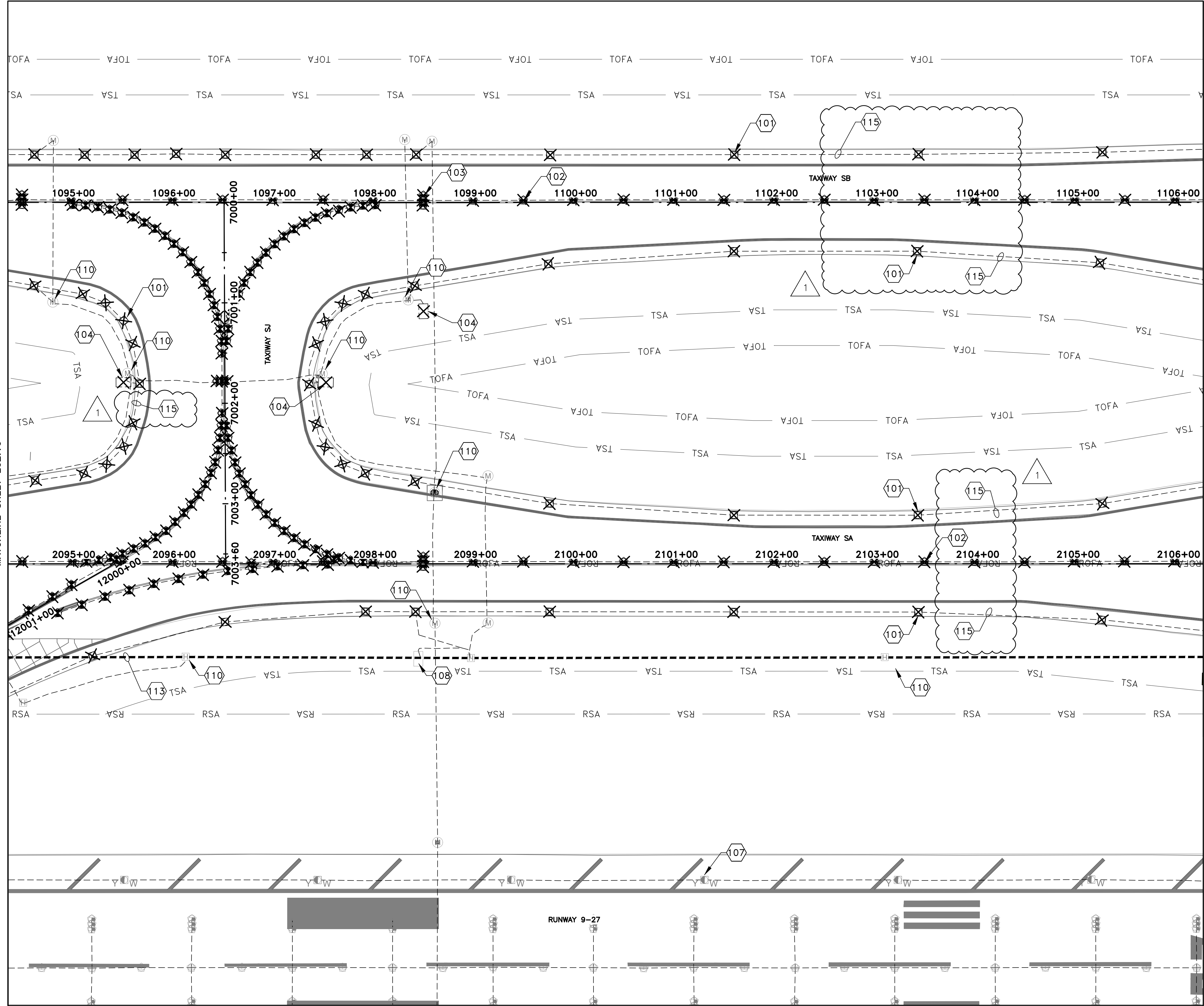


APPROVED BY: JEF  
 DIRECTOR  
 HOUSTON AIRPORT SYSTEM

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

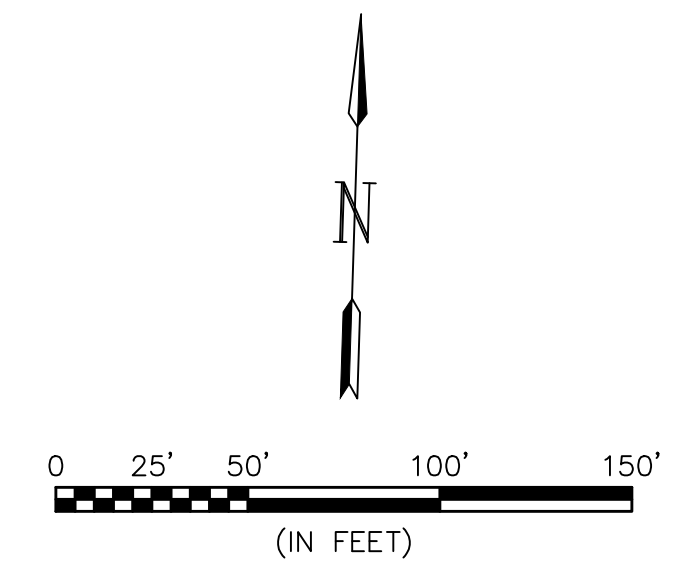


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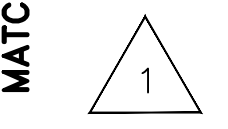
MATCHLINE SHEET E02.10

MATCHLINE SHEET E02.12



**DEMOLITION KEYED NOTES:**

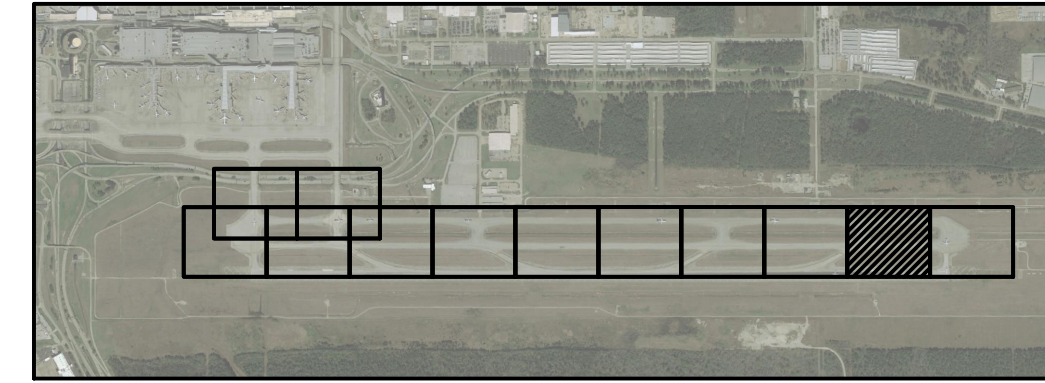
- 101 REMOVE EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
- 102 REMOVE EXISTING BASE MOUNTED TAXIWAY CENTERLINE LIGHT AND DRAIN IF WATER IS PRESENT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
- 103 REMOVE EXISTING BASE MOUNTED CLEARANCE BAR LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP. OF 3 LIGHTS PER LOCATION)
- 104 REMOVE EXISTING BASE MOUNTED GUIDANCE SIGN. DEMOLISH FOUNDATION. (TYP.)
- 107 EXISTING EDGE OR CENTERLINE LIGHT TO REMAIN. (TYP.)
- 108 EXISTING AIRFIELD GUIDANCE SIGN TO REMAIN. (TYP.)
- 109 EXISTING AIRFIELD CONDUIT OR DUCT AND CABLE TO REMAIN. (TYP.)
- 110 EXISTING ELECTRICAL HANDHOLE, MANHOLE, OR PULL BOX TO REMAIN. (TYP.)
- 115 REMOVE CONDUCTORS FROM EXISTING CONDUIT. CONDUIT TO REMAIN. (TYP.)



**NOTES:**

1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND DEMOLITION NOTES.
2. SEE SHEET E01.02 FOR DEMOLITION KEYED NOTES.
3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.

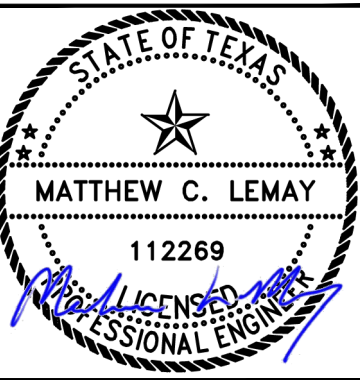
**KEYMAP**



REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
**ELECTRICAL DEMOLITION PLAN XI**

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023

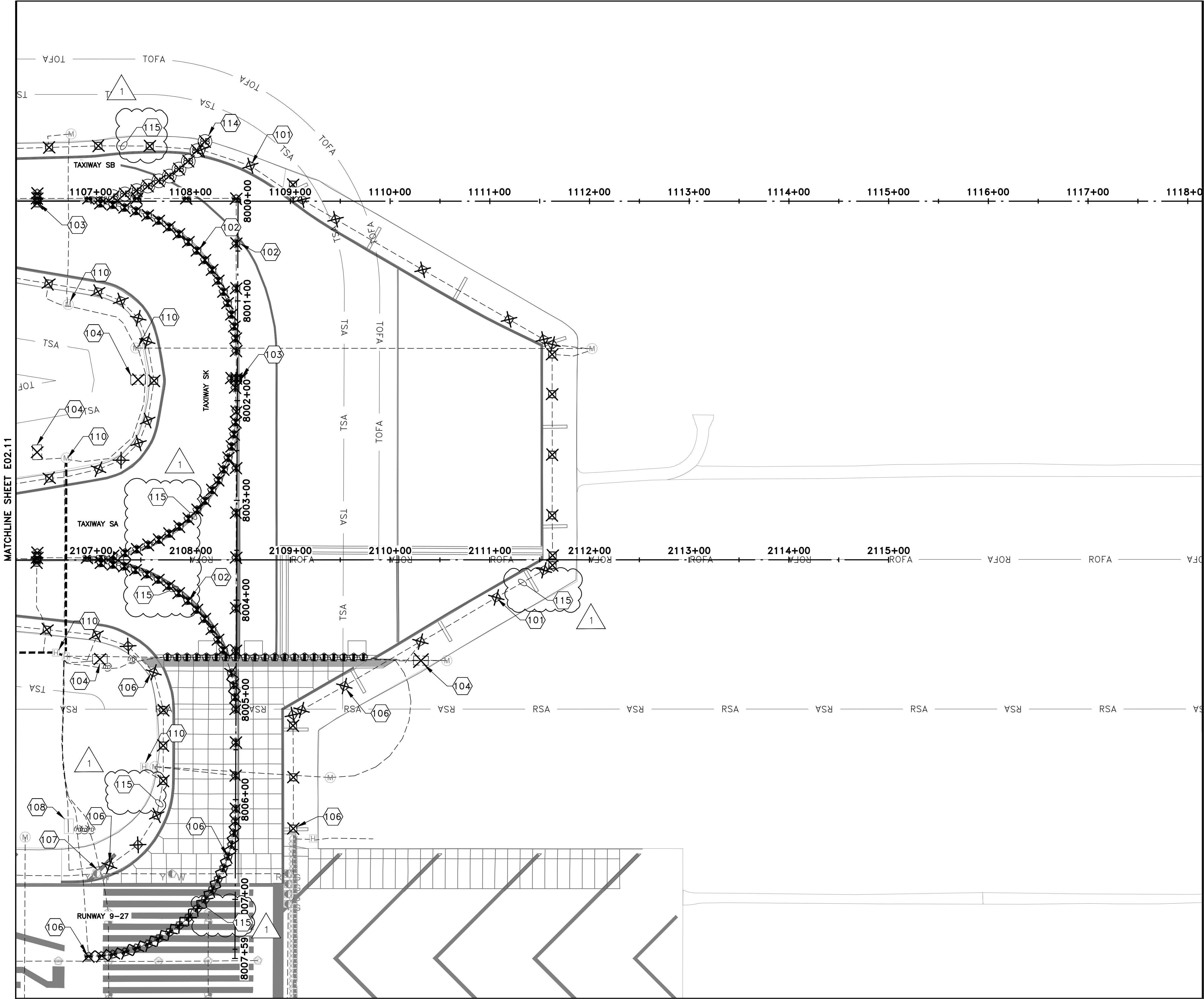


APPROVED BY: JEF  
 DIRECTOR  
 HOUSTON AIRPORT SYSTEM

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

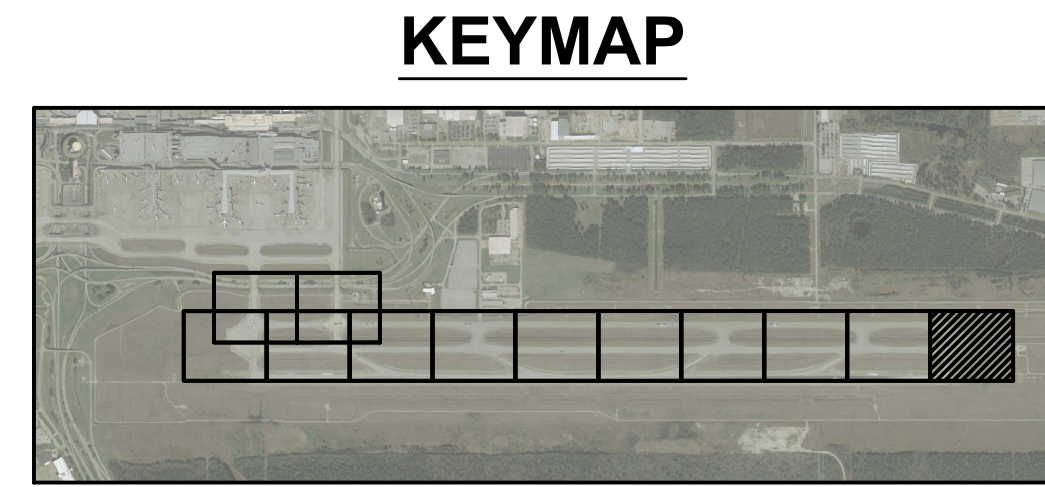


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 PLOT DATE: 11/8/2019 3:32:47 PM



- DEMOLITION KEYED NOTES:**
- 101 REMOVE EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 102 REMOVE EXISTING BASE MOUNTED TAXIWAY CENTERLINE LIGHT AND DRAIN IF WATER IS PRESENT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 103 REMOVE EXISTING BASE MOUNTED CLEARANCE BAR LIGHT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP. OF 3 LIGHTS PER LOCATION)
  - 104 REMOVE EXISTING BASE MOUNTED GUIDANCE SIGN. DEMOLISH FOUNDATION. (TYP.)
  - 106 REMOVE EXISTING BASE MOUNTED LIGHT. BASE TO REMAIN.
  - 107 EXISTING EDGE OR CENTERLINE LIGHT TO REMAIN. (TYP.)
  - 108 EXISTING AIRFIELD GUIDANCE SIGN TO REMAIN. (TYP.)
  - 109 EXISTING AIRFIELD CONDUIT OR DUCT AND CABLE TO REMAIN. (TYP.)
  - 110 EXISTING ELECTRICAL HANDHOLE, MANHOLE, OR PULL BOX TO REMAIN. (TYP.)
  - 114 REMOVE COVER OF EXISTING BASE MOUNTED JUNCTION STRUCTURE AND DRAIN IF WATER IS PRESENT. BASE TO REMAIN DURING MILL AND OVERLAY CONSTRUCTION. (TYP.)
  - 115 REMOVE CONDUCTORS FROM EXISTING CONDUIT. CONDUIT TO REMAIN. (TYP.)

- NOTES:**
1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND DEMOLITION NOTES.
  2. SEE SHEET E01.02 FOR DEMOLITION KEYED NOTES.
  3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.

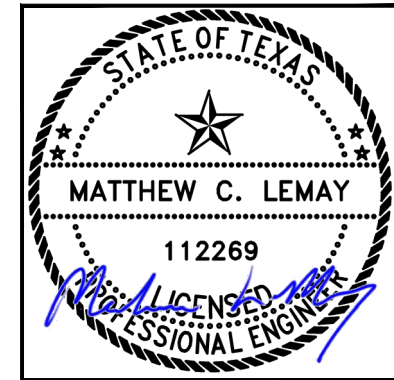


**REVISIONS**

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
**ELECTRICAL DEMOLITION PLAN XII**

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023

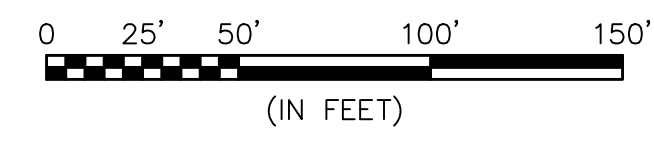
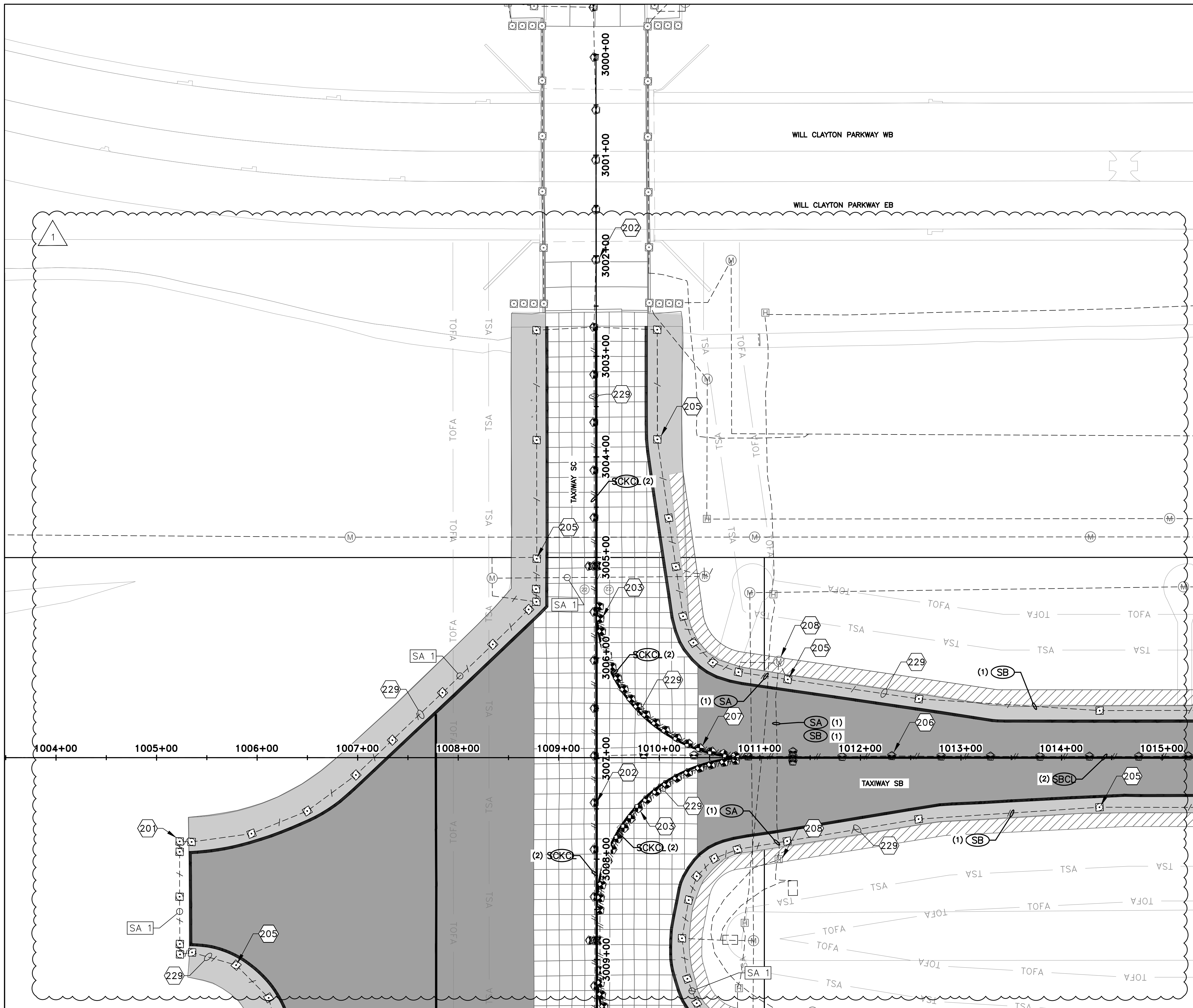


APPROVED BY: JEF  
 DIRECTOR  
 HOUSTON AIRPORT SYSTEM

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



HAS FILE: C:\Users\MCLemay\Conver\VAH - TXYS SA SB REHAB - Aviation - 106462\14 - Electrical\Sheet Files\ELECTRICAL INSTALLATION PLAN I.dwg  
 PLOT DATE: 11/8/2019 3:32:47 PM



**INSTALLATION KEYED NOTES:**

- 201 INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON EXISTING LIGHT BASE. (TYP.)
- 202 INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON EXISTING LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
- 203 INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON EXISTING LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
- 205 INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON ADJUSTED LIGHT BASE. (TYP.)
- 206 INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON ADJUSTED LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN NEW PAVEMENT.)
- 207 INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON ADJUSTED LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN NEW PAVEMENT.)
- 208 ADJUST EXISTING JUNCTION STRUCTURE TO FINAL GRADE. MAKE ALL NECESSARY CABLE TERMINATIONS.
- 229 INSTALL NEW #8 AWG L-824C CABLE WITH EXISTING CONDUIT. (NUMBER OF CONDUCTORS INDICATED BY HASH MARKS)

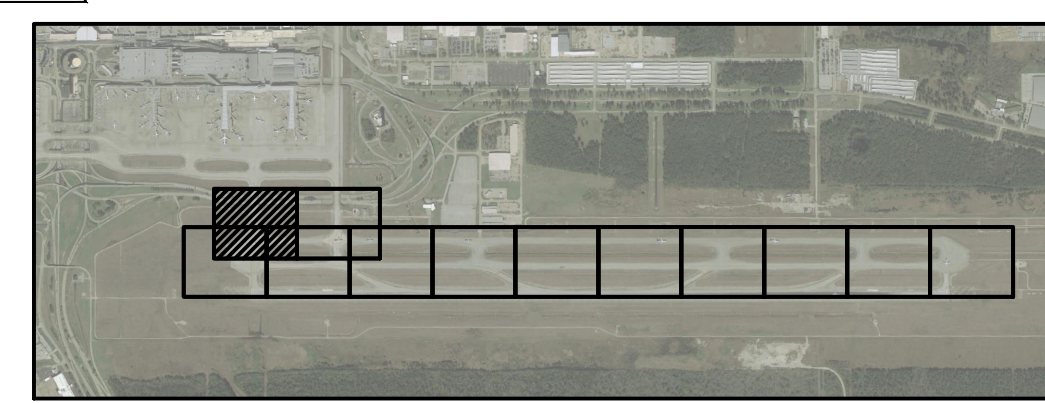
MATCHLINE SHEET E03.02



**NOTES:**

1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND INSTALLATION NOTES.
2. SEE SHEET E01.02 FOR INSTALLATION KEYED NOTES.
3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.
4. THE CONTRACTOR SHALL MATCH EXISTING COLORED ELECTRICAL TAPE CIRCUIT IDENTIFICATION SCHEME AT EACH ACCESSIBLE LOCATION AND SHALL ALSO INSTALL CABLE TAGS AT EACH ACCESSIBLE LOCATION ON EACH CIRCUIT.

**KEYMAP**



REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

**ELECTRICAL INSTALLATION PLAN I**

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023



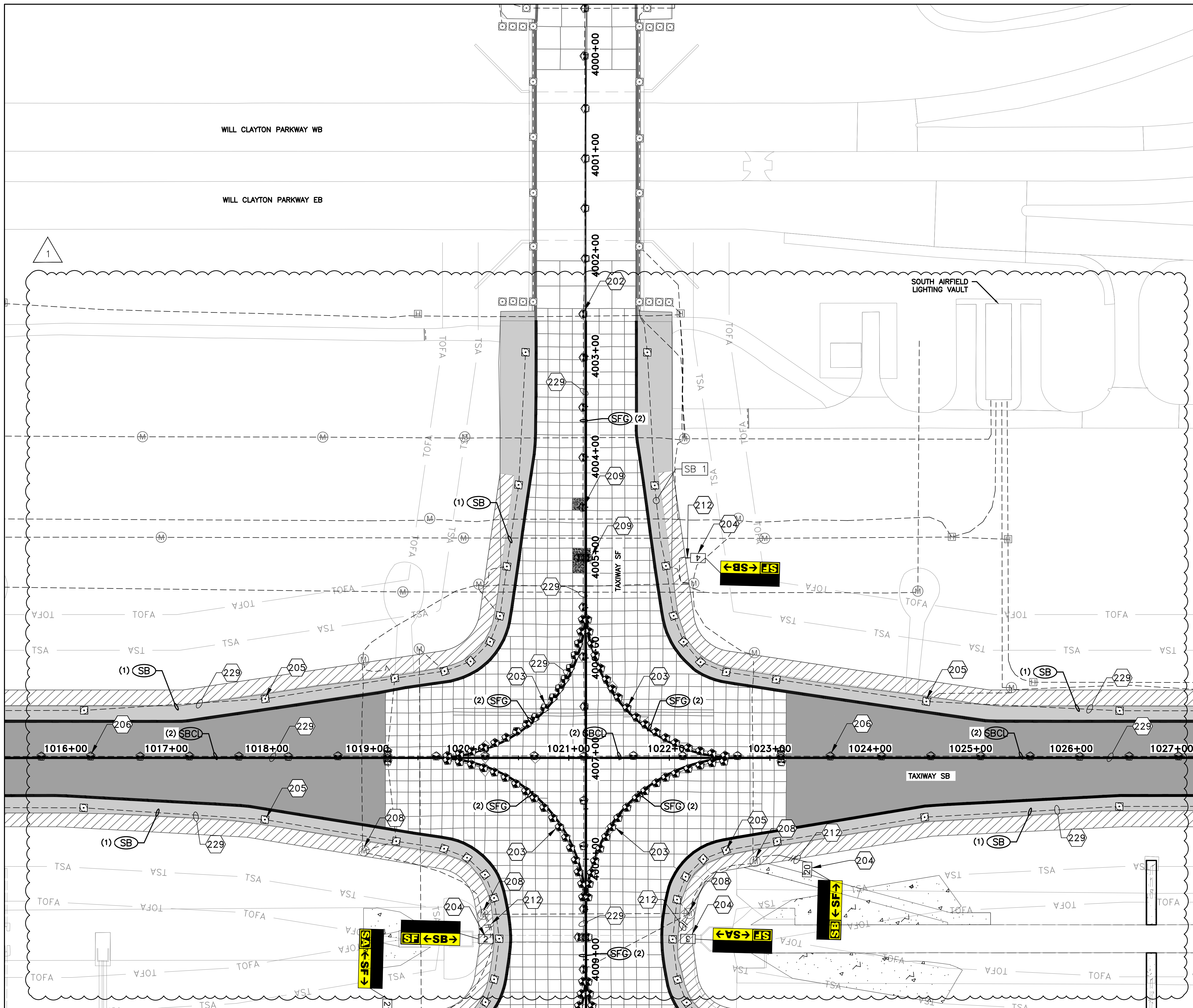
APPROVED BY: JEF  
 DIRECTOR  
 HOUSTON AIRPORT SYSTEM

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



HAS FILE: C:\Users\MCLemay\Conver\AH - TXYS SA SB REHAB - Aviation - 106462\14 - Electrical\Sheet\ELECTRICAL INSTALLATION PLAN II.dwg  
 PLOT DATE: 11/8/2019 3:32:47 PM

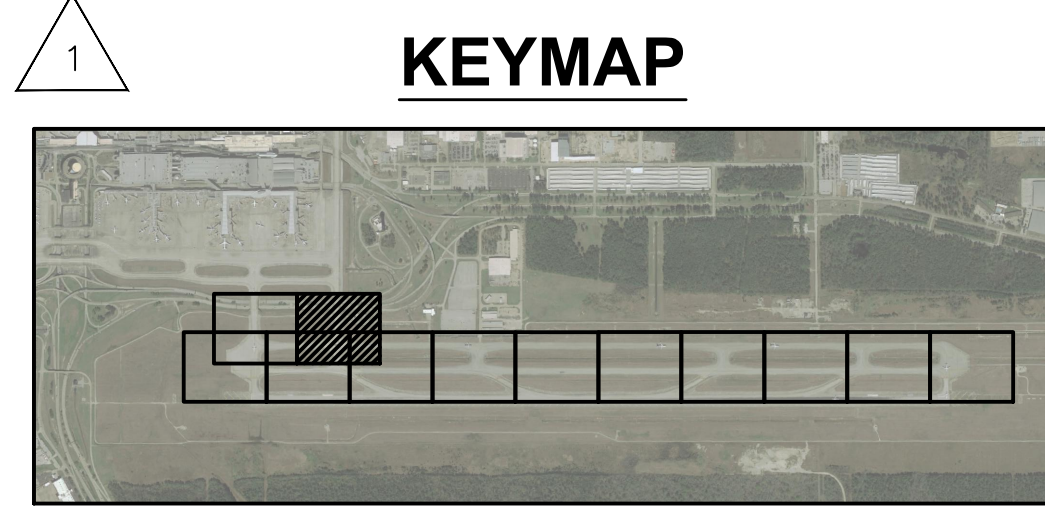
MATCHLINE SHEET E03.01



**INSTALLATION KEYED NOTES:**

- 202 INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON EXISTING LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
- 203 INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON EXISTING LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
- 204 INSTALL NEW L-858(L) BASE MOUNTED GUIDANCE SIGN. (TYP.)
- 205 INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON ADJUSTED LIGHT BASE. (TYP.)
- 206 INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON ADJUSTED LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN NEW PAVEMENT.)
- 208 ADJUST EXISTING PULL BOX TO FINAL GRADE. MAKE ALL NECESSARY CABLE TERMINATIONS.
- 209 INSTALL NEW L-852C(L) ON NEW L-868 LIGHT BASE IN FULL DEPTH RECONSTRUCTION AREA.
- 212 EXTEND 2" PVC CONDUIT FROM EXISTING SHOULDER TO NEW SIGN LOCATION. INSTALL TWO #8 AWG L-824C CABLES TO NEW SIGN TRANSFORMER AND SPLICE INTO EXISTING CIRCUIT AT THE NEXT JUNCTION LOCATION.
- 229 INSTALL NEW #8 AWG L-824C CABLE WITH EXISTING CONDUIT. (NUMBER OF CONDUCTORS INDICATED BY HASH MARKS)

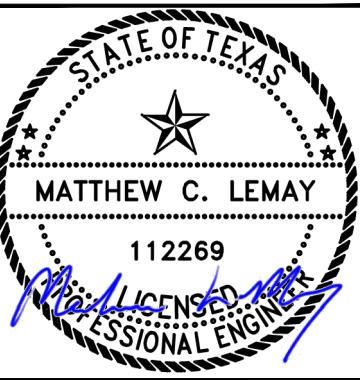
- NOTES:**
1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND INSTALLATION NOTES.
  2. SEE SHEET E01.02 FOR INSTALLATION KEYED NOTES.
  3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.
  4. THE CONTRACTOR SHALL MATCH EXISTING COLORED ELECTRICAL TAPE CIRCUIT IDENTIFICATION SCHEME AT EACH ACCESSIBLE LOCATION AND SHALL ALSO INSTALL CABLE TAGS AT EACH ACCESSIBLE LOCATION ON EACH CIRCUIT.



REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

**GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
 ELECTRICAL INSTALLATION PLAN II**

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023

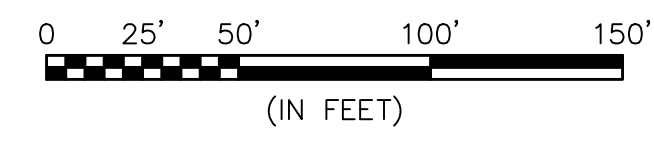
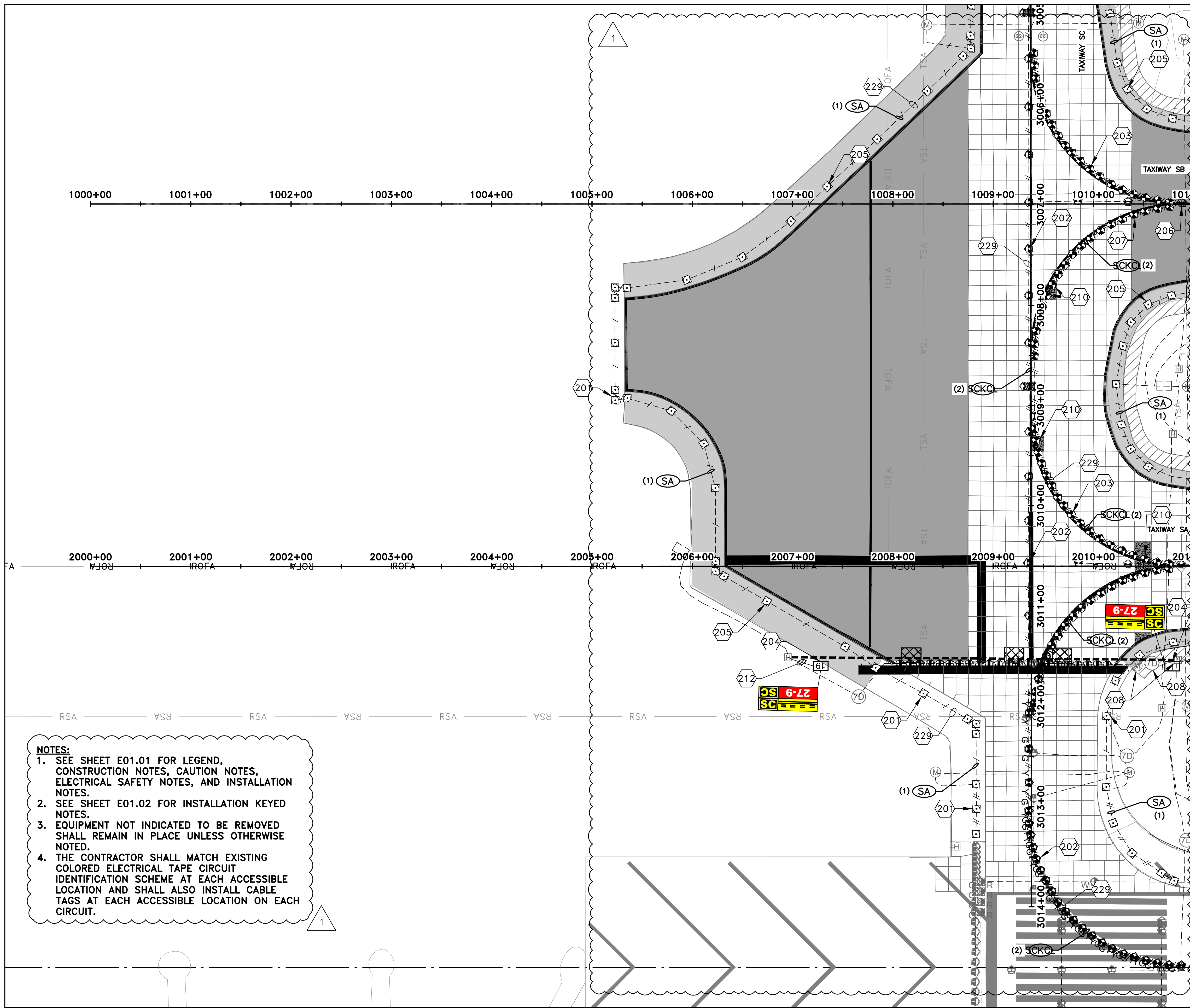


Digitally Signed 07/05/2023  
 APPROVED BY: JEF

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



HAS FILE: C:\Users\MCLemay\OneDrive\Work\Projects\TXYS SA SB REHAB - Aviation - 106462\14 - Electrical\Sheet Files\ELECTRICAL INSTALLATION PLAN III.dwg  
 PLOT DATE: 11/09/2019 3:32:47 PM



**INSTALLATION KEYED NOTES:**

- 201 INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON EXISTING LIGHT BASE. (TYP.)
- 202 INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON EXISTING LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
- 203 INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON EXISTING LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
- 204 INSTALL NEW L-858(L) BASE MOUNTED GUIDANCE SIGN. (TYP.)
- 205 INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON ADJUSTED LIGHT BASE. (TYP.)
- 206 INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON ADJUSTED LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN NEW PAVEMENT.)
- 207 INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON ADJUSTED LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN NEW PAVEMENT.)
- 208 ADJUST EXISTING JUNCTION STRUCTURE TO FINAL GRADE. MAKE ALL NECESSARY CABLE TERMINATIONS.
- 210 INSTALL NEW L-852D(L) ON NEW L-868 LIGHT BASE IN FULL DEPTH RECONSTRUCTION AREA.
- 212 EXTEND 2" PVC CONDUIT FROM EXISTING SHOULDER TO NEW SIGN LOCATION. INSTALL TWO #8 AWG L-824C CABLES TO NEW SIGN TRANSFORMER AND SPLICE INTO EXISTING CIRCUIT AT THE NEXT JUNCTION LOCATION.
- 229 INSTALL NEW #8 AWG L-824C CABLE WITH EXISTING CONDUIT. (NUMBER OF CONDUCTORS INDICATED BY HASH MARKS)

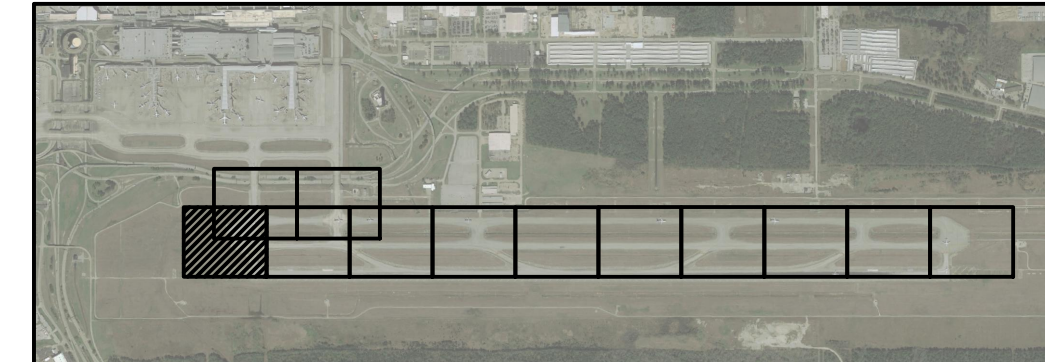
MATCHLINE SHEET E03.04

**NOTES:**

1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND INSTALLATION NOTES.
2. SEE SHEET E01.02 FOR INSTALLATION KEYED NOTES.
3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.
4. THE CONTRACTOR SHALL MATCH EXISTING COLORED ELECTRICAL TAPE CIRCUIT IDENTIFICATION SCHEME AT EACH ACCESSIBLE LOCATION AND SHALL ALSO INSTALL CABLE TAGS AT EACH ACCESSIBLE LOCATION ON EACH CIRCUIT.

1

**KEYMAP**



REVISIONS

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

**ELECTRICAL INSTALLATION PLAN III**

PROJECT MGR: JEF  
 DESIGNER: RH  
 DRAWN BY: RH  
 CHECK BY: MCL  
 SCALE: 1"=50'  
 DATE: 04/28/2023

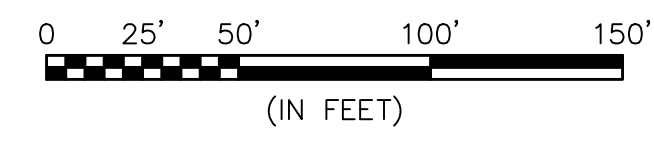
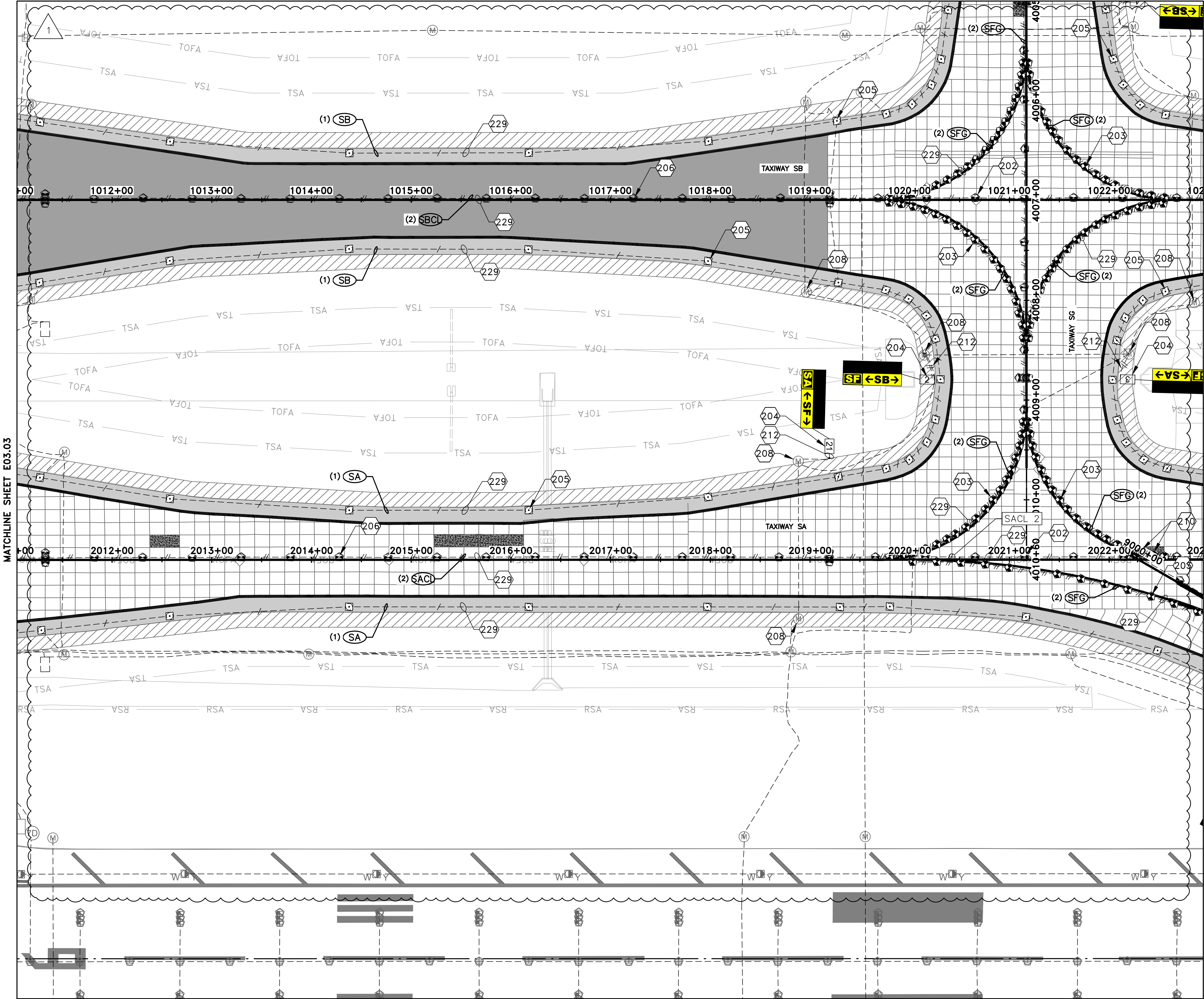


APPROVED BY: JEF

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



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 PLOT DATE: 11/8/2019 3:32:47 PM



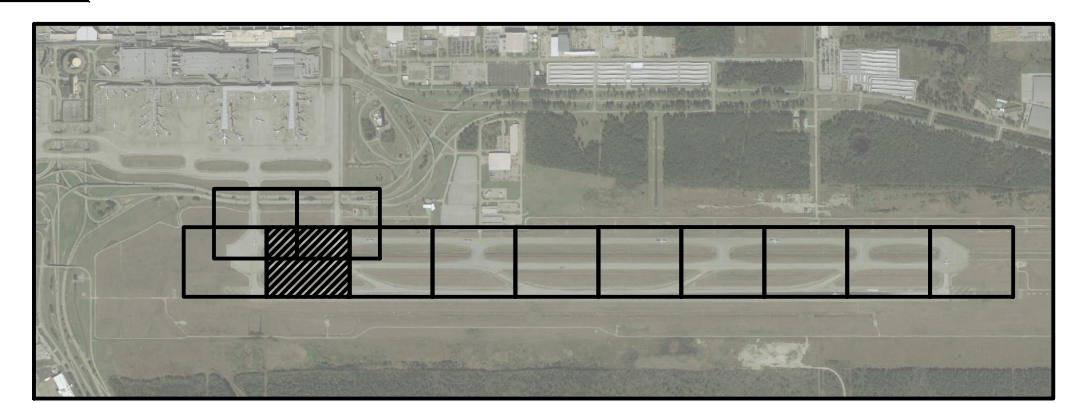
**INSTALLATION KEYED NOTES:**

- 202 INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON EXISTING TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
- 203 INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON EXISTING LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
- 204 INSTALL NEW L-858(L) BASE MOUNTED GUIDANCE SIGN. (TYP.)
- 205 INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON ADJUSTED LIGHT BASE. (TYP.)
- 206 INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON ADJUSTED LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN NEW PAVEMENT.)
- 208 ADJUST EXISTING PULL BOX TO FINAL GRADE. MAKE ALL NECESSARY CABLE TERMINATIONS.
- 210 INSTALL NEW L-852D(L) ON NEW L-868 LIGHT BASE IN FULL DEPTH RECONSTRUCTION AREA.
- 212 EXTEND 2" PVC CONDUIT FROM EXISTING SHOULDER TO NEW SIGN LOCATION. INSTALL TWO #8 AWG L-824C CABLES TO NEW SIGN TRANSFORMER AND SPLICE INTO EXISTING CIRCUIT AT THE NEXT JUNCTION LOCATION.
- 229 INSTALL NEW #8 AWG L-824C CABLE WITH EXISTING CONDUIT. (NUMBER OF CONDUCTORS INDICATED BY HASH MARKS)

**NOTES:**

1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND INSTALLATION NOTES.
2. SEE SHEET E01.02 FOR INSTALLATION KEYED NOTES.
3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.
4. THE CONTRACTOR SHALL MATCH EXISTING COLORED ELECTRICAL TAPE CIRCUIT IDENTIFICATION SCHEME AT EACH ACCESSIBLE LOCATION AND SHALL ALSO INSTALL CABLE TAGS AT EACH ACCESSIBLE LOCATION ON EACH CIRCUIT.

**KEYMAP**



**REVISIONS**

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

**ELECTRICAL INSTALLATION PLAN IV**

PROJECT MGR: JEF  
 DESIGNER: RH  
 DRAWN BY: RH  
 CHECK BY: MCL  
 SCALE: 1"=50'  
 DATE: 04/28/2023



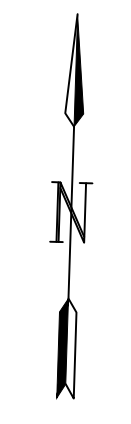
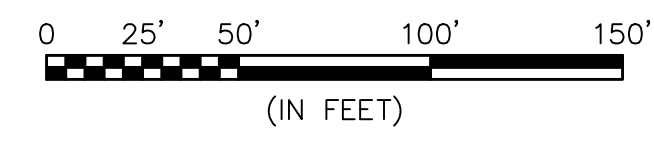
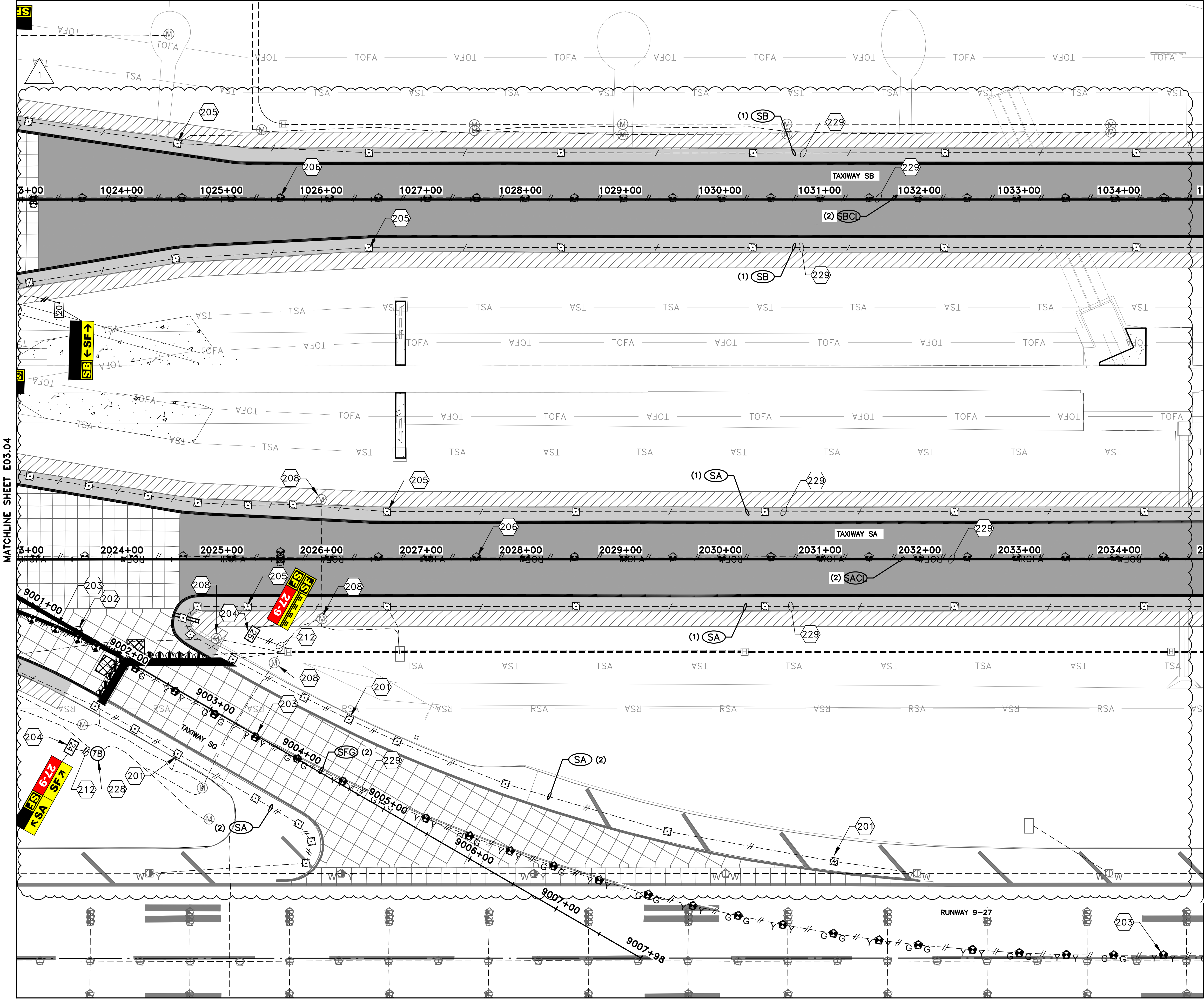
APPROVED BY: JEF  
 DIRECTOR  
 HOUSTON AIRPORT SYSTEM

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

**E03.04**



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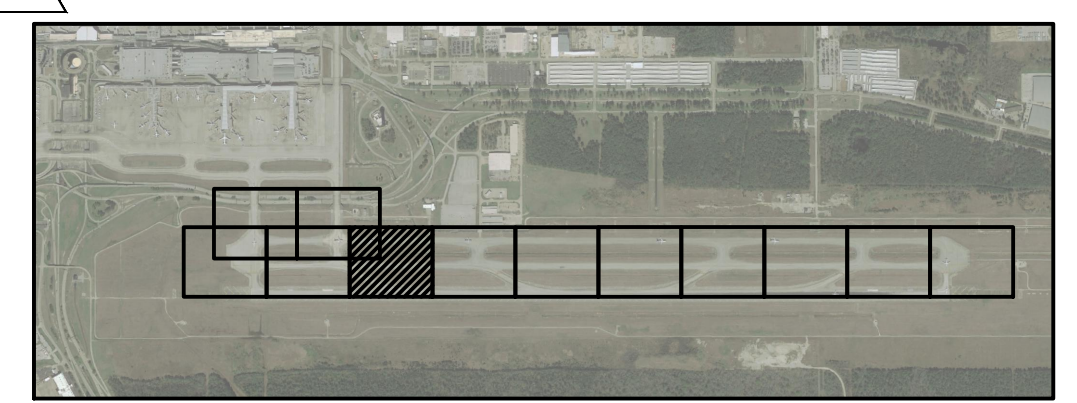
**INSTALLATION KEYED NOTES:**

- 201 INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON EXISTING LIGHT BASE. (TYP.)
- 202 INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON EXISTING LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
- 203 INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON EXISTING LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
- 204 INSTALL NEW L-858(L) BASE MOUNTED GUIDANCE SIGN. (TYP.)
- 205 INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON ADJUSTED LIGHT BASE. (TYP.)
- 206 INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON ADJUSTED LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN NEW PAVEMENT.)
- 208 ADJUST EXISTING JUNCTION STRUCTURE TO FINAL GRADE. MAKE ALL NECESSARY CABLE TERMINATIONS.
- 212 EXTEND 2" PVC CONDUIT FROM EXISTING SHOULDER TO NEW SIGN LOCATION. INSTALL TWO #8 AWG L-824C CABLES TO NEW SIGN TRANSFORMER AND SPLICE INTO EXISTING CIRCUIT AT THE NEXT JUNCTION LOCATION.
- 228 MAINTAIN EXISTING JUNCTION CAN FROM EXISTING SIGN BASE.
- 229 INSTALL NEW #8 AWG L-824C CABLE WITH EXISTING CONDUIT. (NUMBER OF CONDUCTORS INDICATED BY HASH MARKS)

**NOTES:**

1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND INSTALLATION NOTES.
2. SEE SHEET E01.02 FOR INSTALLATION KEYED NOTES.
3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.
4. THE CONTRACTOR SHALL MATCH EXISTING COLORED ELECTRICAL TAPE CIRCUIT IDENTIFICATION SCHEME AT EACH ACCESSIBLE LOCATION AND SHALL ALSO INSTALL CABLE TAGS AT EACH ACCESSIBLE LOCATION ON EACH CIRCUIT.

**KEYMAP**



**REVISIONS**

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

**ELECTRICAL INSTALLATION PLAN V**

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023

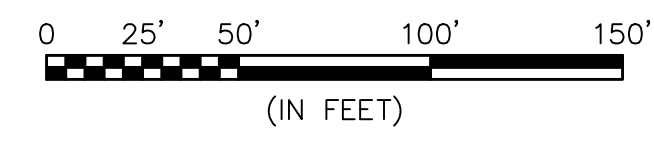
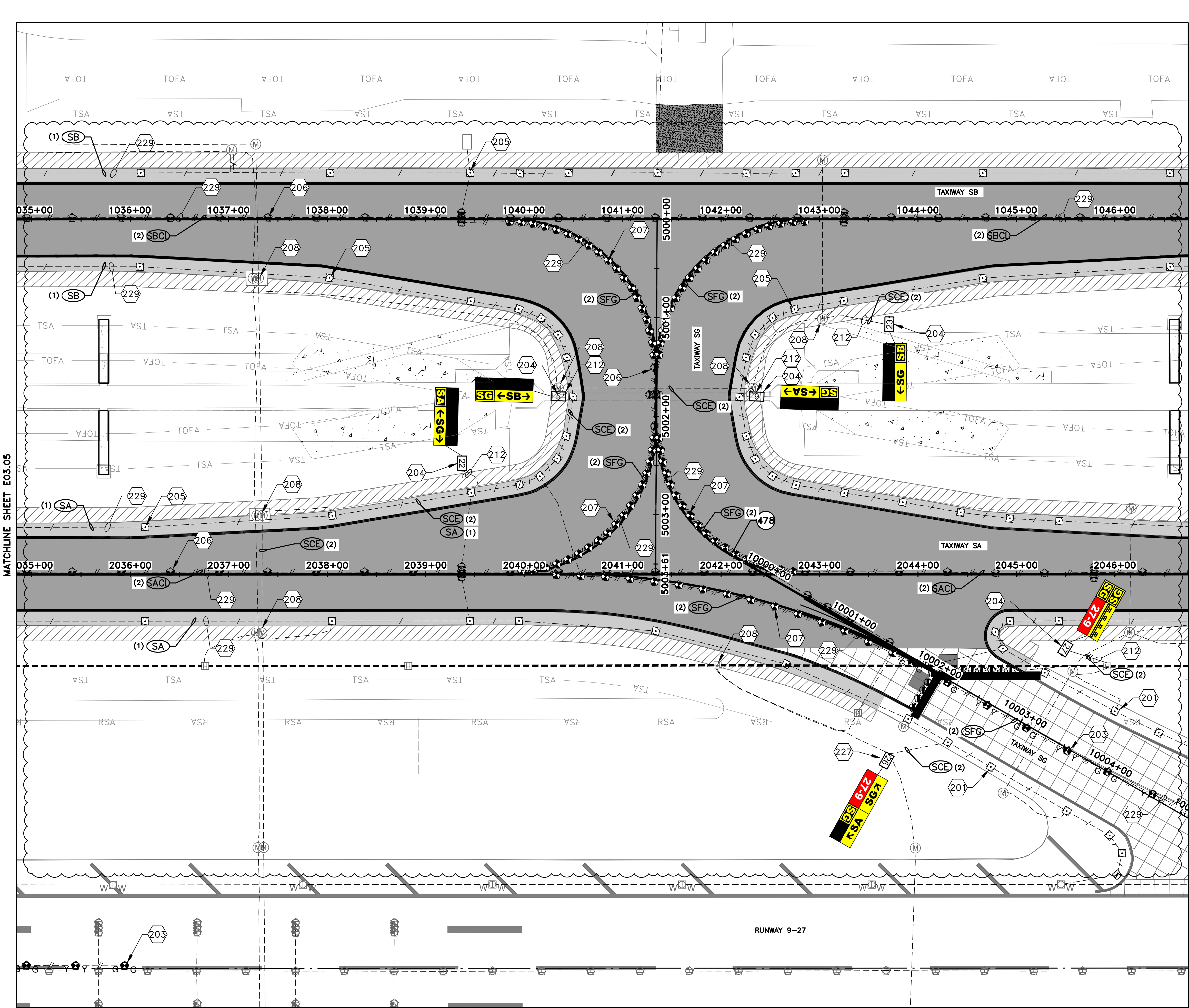


APPROVED BY: JEF  
 DIRECTOR  
 HOUSTON AIRPORT SYSTEM

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



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**INSTALLATION KEYED NOTES:**

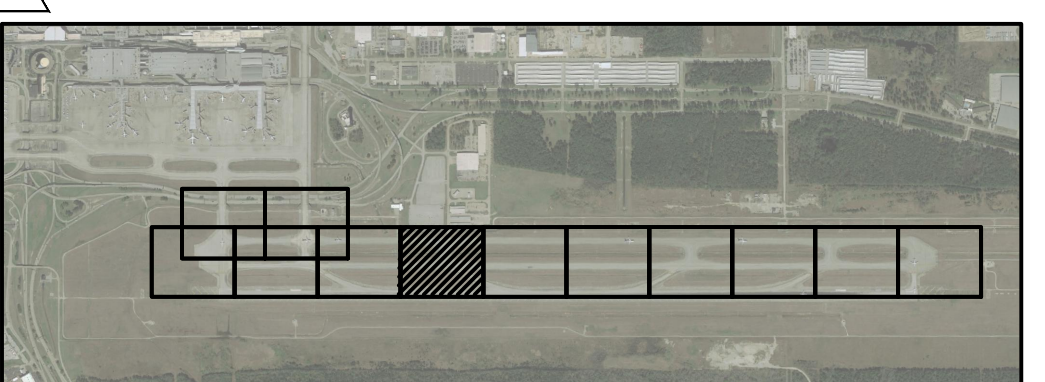
- (201) INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON EXISTING LIGHT BASE. (TYP.)
- (203) INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON EXISTING LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
- (204) INSTALL NEW L-858(L) BASE MOUNTED GUIDANCE SIGN. (TYP.)
- (205) INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON ADJUSTED LIGHT BASE. (TYP.)
- (206) INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON ADJUSTED LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN NEW PAVEMENT.)
- (207) INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON ADJUSTED LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN NEW PAVEMENT.)
- (208) ADJUST EXISTING PULL BOX TO FINAL GRADE. MAKE ALL NECESSARY CABLE TERMINATIONS.
- (212) EXTEND 2" PVC CONDUIT FROM EXISTING SHOULDER TO NEW SIGN LOCATION. INSTALL TWO #8 AWG L-824C CABLES TO NEW SIGN TRANSFORMER AND SPLICE INTO EXISTING CIRCUIT AT THE NEXT JUNCTION LOCATION.
- (227) UPDATE SIGN LEGEND. REFER TO NEW SIGN INDEX.
- (229) INSTALL NEW #8 AWG L-824C CABLE WITH EXISTING CONDUIT. (NUMBER OF CONDUCTORS INDICATED BY HASH MARKS)

MATCHLINE SHEET E03.07

MATCHLINE SHEET E03.05

- NOTES:**
1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND INSTALLATION NOTES.
  2. SEE SHEET E01.02 FOR INSTALLATION KEYED NOTES.
  3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.
  4. THE CONTRACTOR SHALL MATCH EXISTING COLORED ELECTRICAL TAPE CIRCUIT IDENTIFICATION SCHEME AT EACH ACCESSIBLE LOCATION AND SHALL ALSO INSTALL CABLE TAGS AT EACH ACCESSIBLE LOCATION ON EACH CIRCUIT.

**KEYMAP**



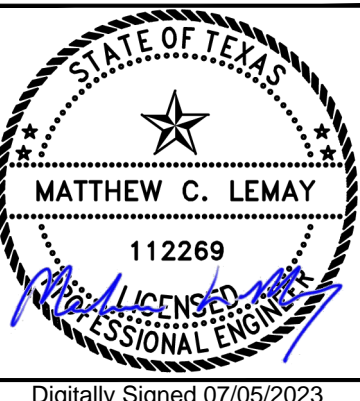
**REVISIONS**

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

**ELECTRICAL INSTALLATION PLAN VI**

GEORGE BUSH INTERCONTINENTAL AIRPORT  
REHABILITATION OF TAXIWAYS SA & SB

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023



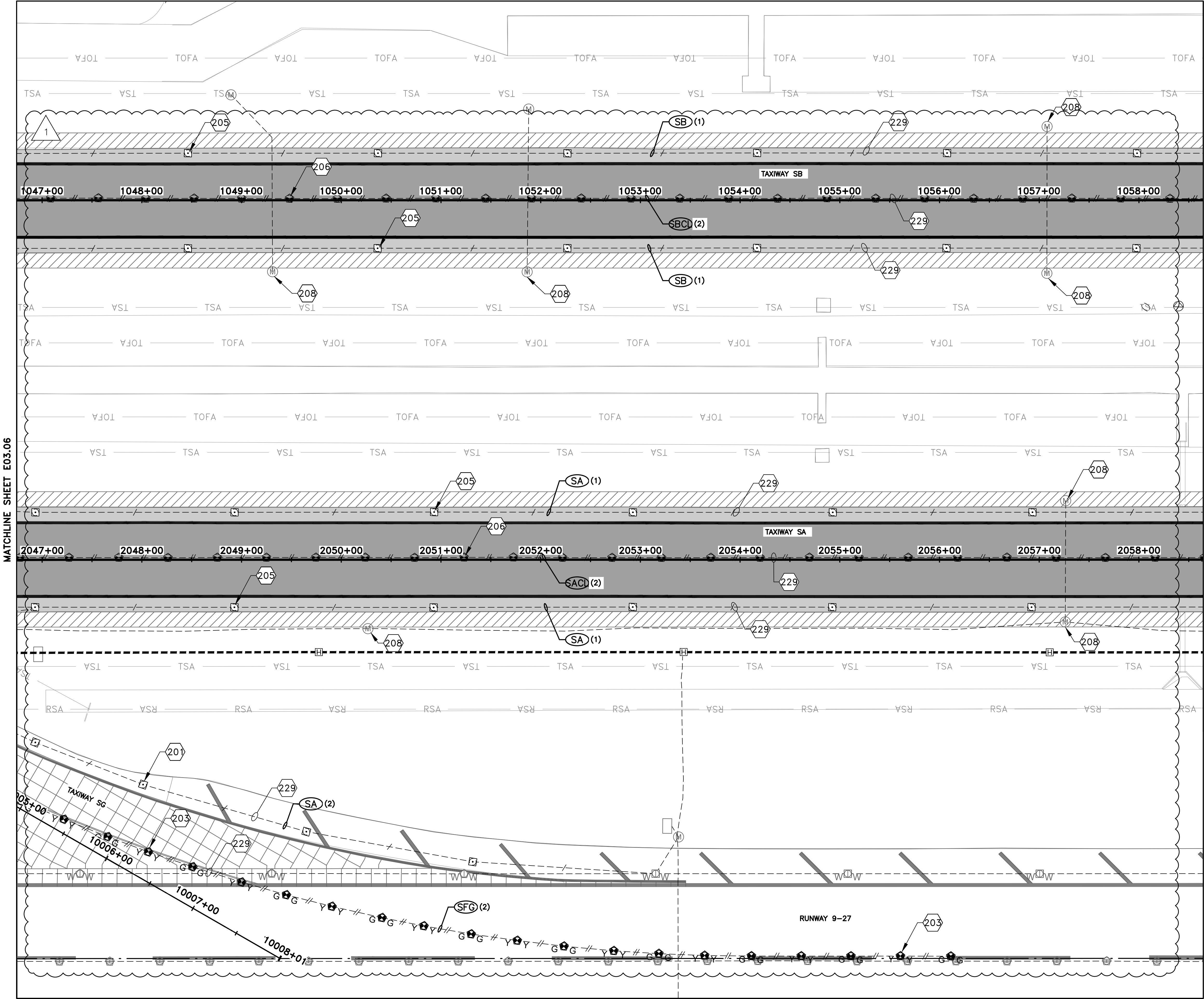
APPROVED BY: JEF

DIRECTOR  
HOUSTON AIRPORT SYSTEM

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

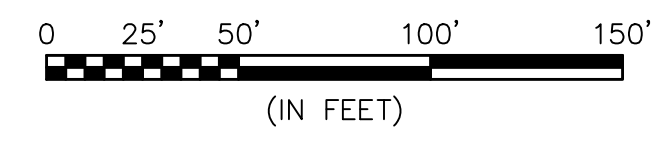


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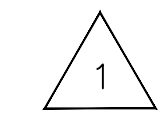
MATCHLINE SHEET E03.06

MATCHLINE SHEET E03.08



INSTALLATION KEYED NOTES:

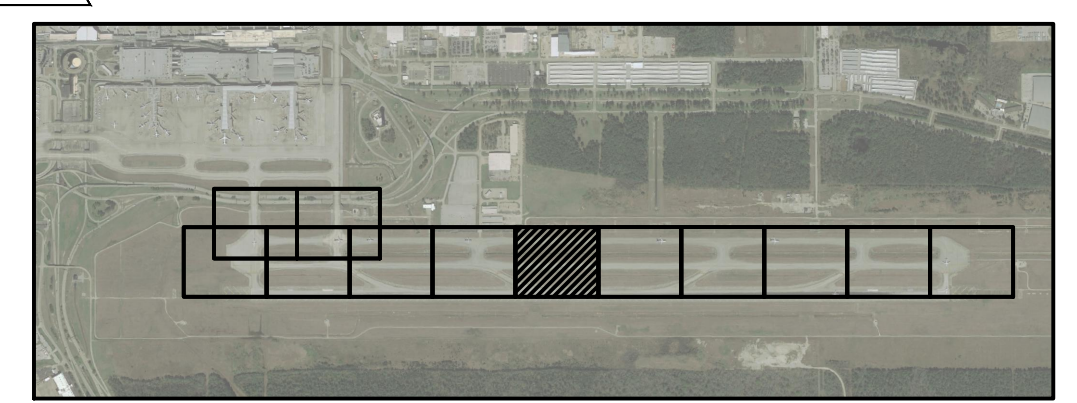
- 201 INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON EXISTING LIGHT BASE. (TYP.)
- 203 INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON EXISTING LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
- 205 INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON ADJUSTED LIGHT BASE. (TYP.)
- 206 INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON ADJUSTED LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN NEW PAVEMENT.)
- 208 ADJUST EXISTING PULL BOX TO FINAL GRADE. MAKE ALL NECESSARY CABLE TERMINATIONS.
- 229 INSTALL NEW #8 AWG L-824C CABLE WITH EXISTING CONDUIT. (NUMBER OF CONDUCTORS INDICATED BY HASH MARKS)



NOTES:

1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND INSTALLATION NOTES.
2. SEE SHEET E01.02 FOR INSTALLATION KEYED NOTES.
3. EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.
4. THE CONTRACTOR SHALL MATCH EXISTING COLORED ELECTRICAL TAPE CIRCUIT IDENTIFICATION SCHEME AT EACH ACCESSIBLE LOCATION AND SHALL ALSO INSTALL CABLE TAGS AT EACH ACCESSIBLE LOCATION ON EACH CIRCUIT.

KEYMAP



NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
**ELECTRICAL INSTALLATION PLAN VII**

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023



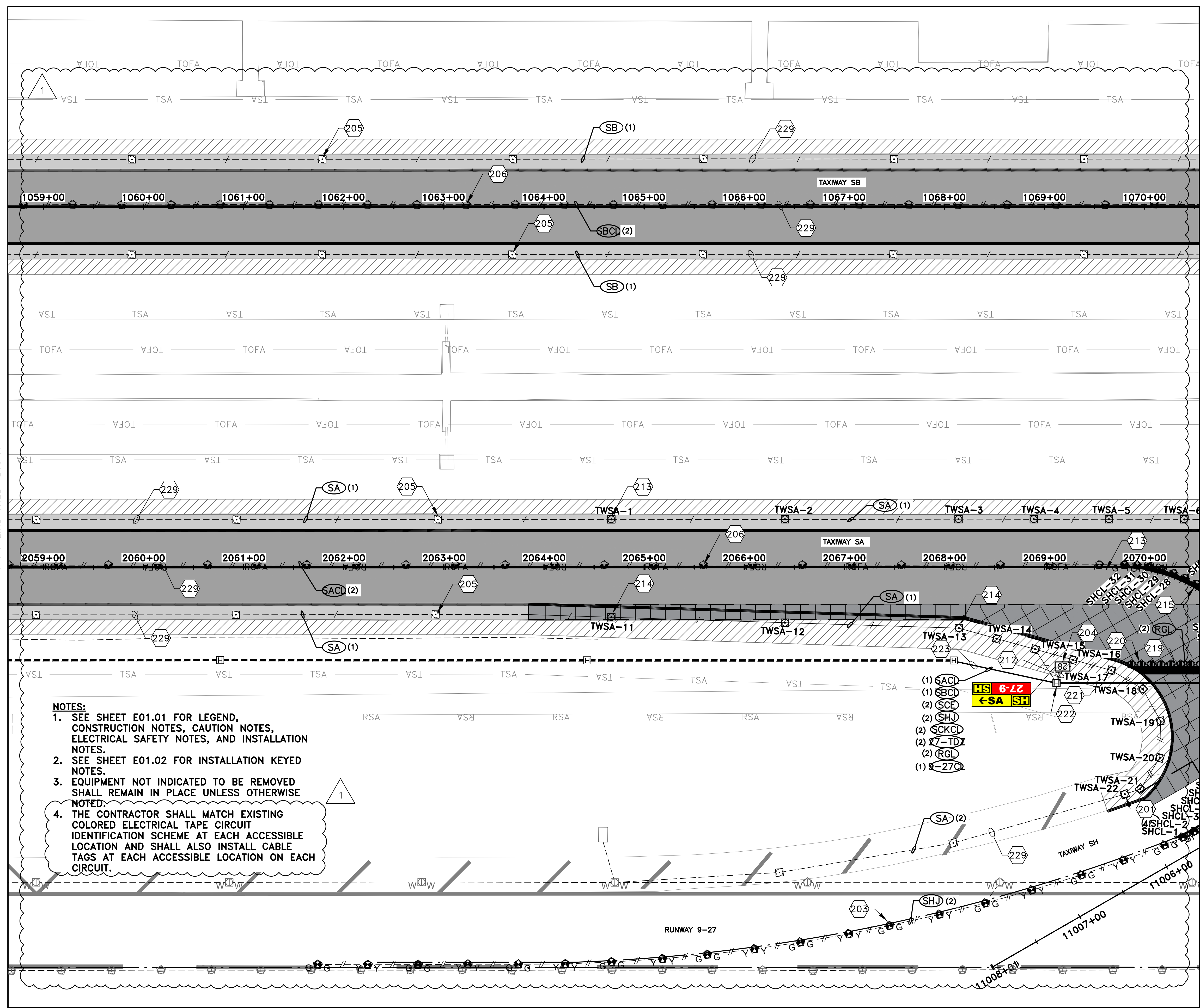
APPROVED BY: JEF  
 DIRECTOR  
 HOUSTON AIRPORT SYSTEM

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



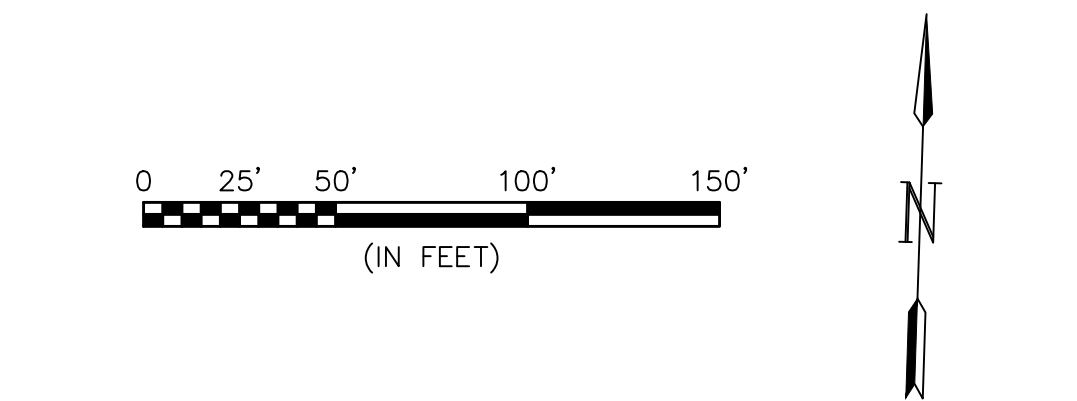
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MATCHLINE SHEET E03.07



- NOTES:**
- SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND INSTALLATION NOTES.
  - SEE SHEET E01.02 FOR INSTALLATION KEYED NOTES.
  - EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.
  - THE CONTRACTOR SHALL MATCH EXISTING COLORED ELECTRICAL TAPE CIRCUIT IDENTIFICATION SCHEME AT EACH ACCESSIBLE LOCATION AND SHALL ALSO INSTALL CABLE TAGS AT EACH ACCESSIBLE LOCATION ON EACH CIRCUIT.

- INSTALLATION KEYED NOTES:**
- INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON EXISTING LIGHT BASE. (TYP.)
  - INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON EXISTING LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
  - INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON ADJUSTED LIGHT BASE. (TYP.)
  - INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON ADJUSTED LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN NEW PAVEMENT.)
  - EXTEND 2" PVC CONDUIT FROM EXISTING SHOULDER TO NEW SIGN LOCATION. INSTALL TWO #8 AWG L-824C CABLES TO NEW SIGN TRANSFORMER AND SPLICE INTO EXISTING CIRCUIT AT THE NEXT JUNCTION LOCATION.
  - INSTALL NEW L-861T(L) TAXIWAY EDGE LIGHT ON NEW BASE IN EXISTING ASPHALT PAVEMENT. (TYP.)
  - INSTALL NEW L-861T(L) TAXIWAY EDGE LIGHT ON NEW BASE IN NEW PAVEMENT. (TYP.)
  - INSTALL NEW L-852D(L) TAXIWAY CENTERLINE LIGHTING IN EXISTING PAVEMENT WITH MILL AND OVERLAY. (TYP.)
  - CONSTRUCT 1-WAY 2" C CONCRETE ENCASED CONDUIT.
  - INSTALL NEW L-852G(L) RUNWAY GUARD LIGHT. (TYP.)
  - CONSTRUCT NEW 16-WAY 2" DIRECTIONALLY BORED DUCT BANK WITH CONDUCTORS AS NOTED.
  - INSTALL NEW 4'x4'x4' AIRCRAFT-RATED HANDHOLE.
  - CONSTRUCT NEW 16-WAY 2" NON-ENCASED DUCT BANK.
  - INSTALL NEW #8 AWG L-824C CABLE WITH EXISTING CONDUIT. (NUMBER OF CONDUCTORS INDICATED BY HASH MARKS)

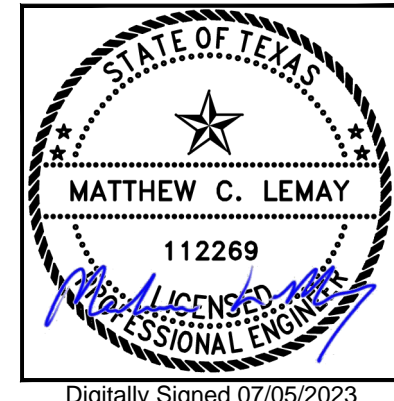


**REVISIONS**

NO.	DESCRIPTION	DATE BY
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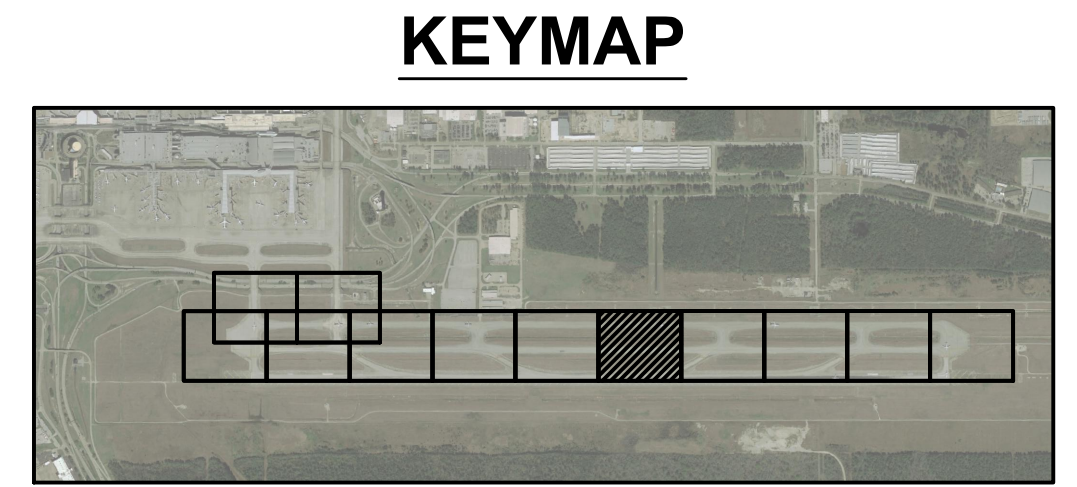
**GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
 ELECTRICAL INSTALLATION PLAN VIII**

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023



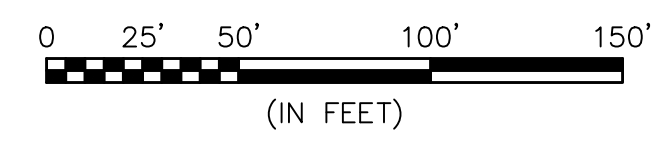
APPROVED BY: JEF  
 DIRECTOR HOUSTON AIRPORT SYSTEM

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





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 PLOT DATE: 11/8/2019 3:32:47 PM



REVISIONS

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
**ELECTRICAL INSTALLATION PLAN IX**

PROJECT MGR: JEF  
 DESIGNER: RH  
 DRAWN BY: RH  
 CHECK BY: MCL  
 SCALE: 1"=50'  
 DATE: 04/28/2023



APPROVED BY: JEF

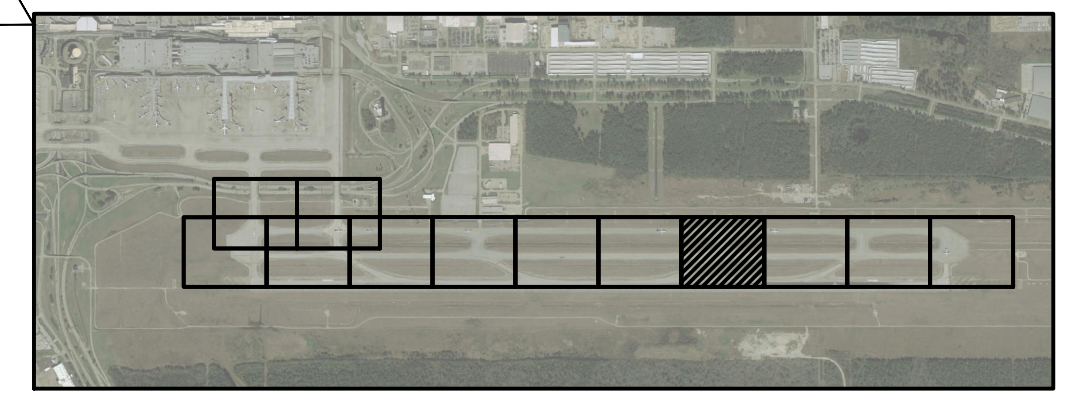
PROJECT NO. 0646A  
 A.I.P. NO. XXXX  
 C.I.P. NO. A-0515  
 H.A.S. NO. 20C0646A  
 SHEET NO.

**E03.09**

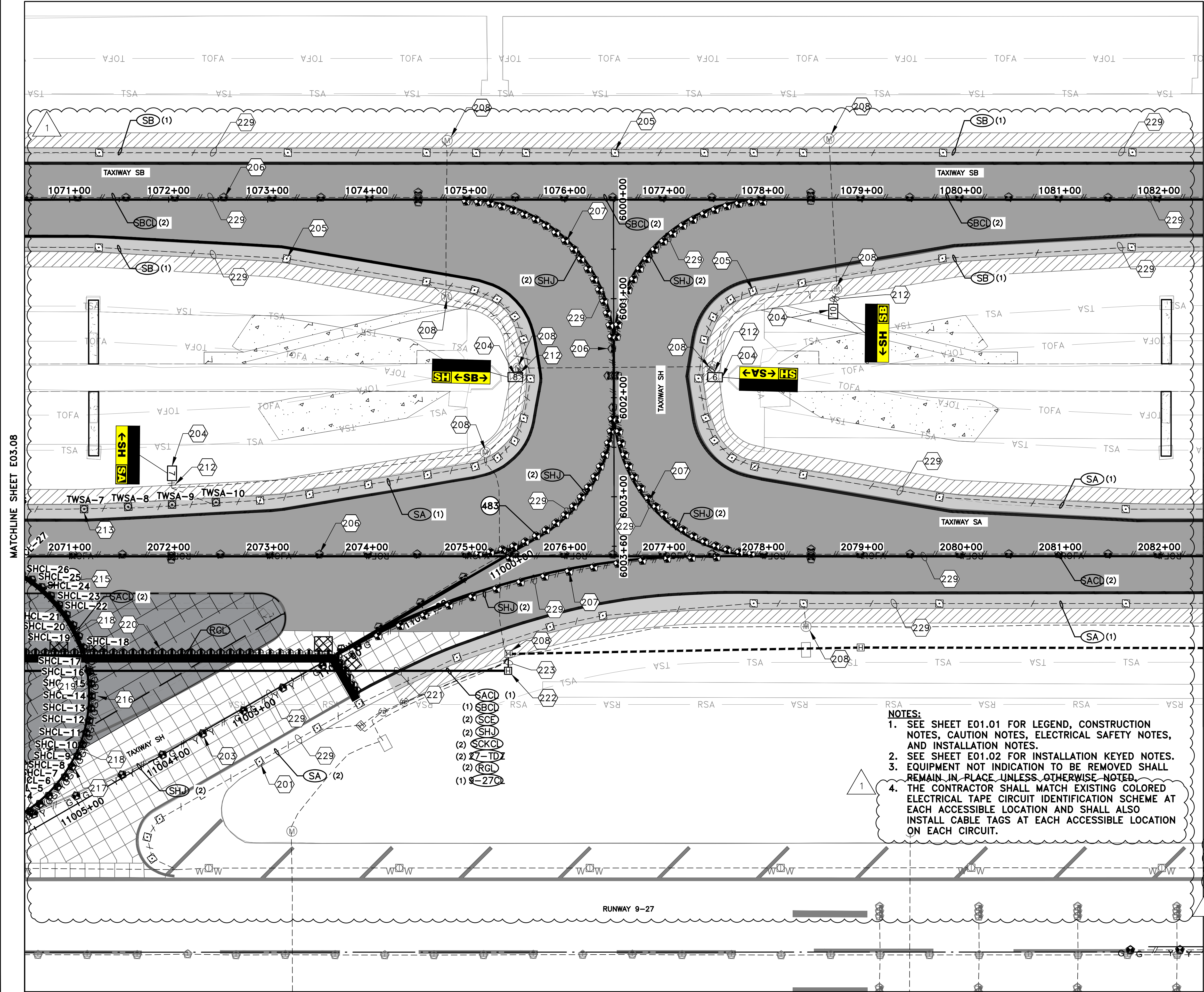
INSTALLATION KEYED NOTES:

- 201 INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON EXISTING LIGHT BASE. (TYP.)
- 203 INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON EXISTING LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
- 204 INSTALL NEW L-858(L) BASE MOUNTED GUIDANCE SIGN. (TYP.)
- 205 INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON ADJUSTED LIGHT BASE. (TYP.)
- 206 INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON ADJUSTED LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN NEW PAVEMENT.)
- 207 INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON ADJUSTED LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN NEW PAVEMENT.)
- 208 ADJUST EXISTING PULL BOX TO FINAL GRADE. MAKE ALL NECESSARY CABLE TERMINATIONS.
- 212 EXTEND 2" PVC CONDUIT FROM EXISTING SHOULDER TO NEW SIGN LOCATION. INSTALL TWO #8 AWG L-824C CABLES TO NEW SIGN TRANSFORMER AND SPLICE INTO EXISTING CIRCUIT AT THE NEXT JUNCTION LOCATION.
- 213 INSTALL NEW L-861T TAXIWAY EDGE LIGHT ON NEW BASE IN EXISTING ASPHALT PAVEMENT. (TYP.)
- 215 INSTALL NEW L-852D(L) TAXIWAY CENTERLINE LIGHTING IN EXISTING PAVEMENT WITH MILL AND OVERLAY. (TYP.)
- 216 INSTALL NEW L-852D(L) TAXIWAY CENTERLINE LIGHT IN NEW CONCRETE PAVEMENT. (TYP.)
- 217 INSTALL NEW L-852D(L) TAXIWAY CENTERLINE LIGHT IN EXISTING CONCRETE PAVEMENT. (TYP.)
- 218 CONSTRUCT 1-WAY 2" C CONCRETE ENCASED CONDUIT IN EXISTING PAVEMENT VIA SAW KERF.
- 219 CONSTRUCT 1-WAY 2" C CONCRETE ENCASED CONDUIT IN NEW PAVEMENT.
- 220 INSTALL NEW L-852G(L) RUNWAY GUARD LIGHT INSTALLED IN NEW PAVEMENT. (TYP.)
- 221 CONSTRUCT NEW 16-WAY 2" DIRECTIONALLY BORED DUCT BANK WITH CONDUCTORS AS NOTED.
- 222 INSTALL NEW 4'x4'x4' AIRCRAFT-RATED HANDHOLE. (TYP.)
- 223 CONSTRUCT NEW 16-WAY 2" NON-ENCASED DUCT BANK.
- 229 INSTALL NEW #8 AWG L-824C CABLE WITH EXISTING CONDUIT. (NUMBER OF CONDUCTORS INDICATED BY HASH MARKS)

**KEYMAP**



- NOTES:**
1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND INSTALLATION NOTES.
  2. SEE SHEET E01.02 FOR INSTALLATION KEYED NOTES.
  3. EQUIPMENT NOT INDICATION TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.
  4. THE CONTRACTOR SHALL MATCH EXISTING COLORED ELECTRICAL TAPE CIRCUIT IDENTIFICATION SCHEME AT EACH ACCESSIBLE LOCATION AND SHALL ALSO INSTALL CABLE TAGS AT EACH ACCESSIBLE LOCATION ON EACH CIRCUIT.



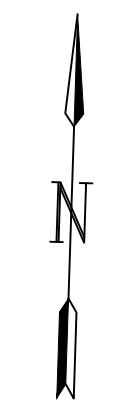
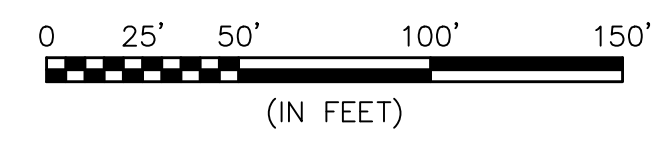
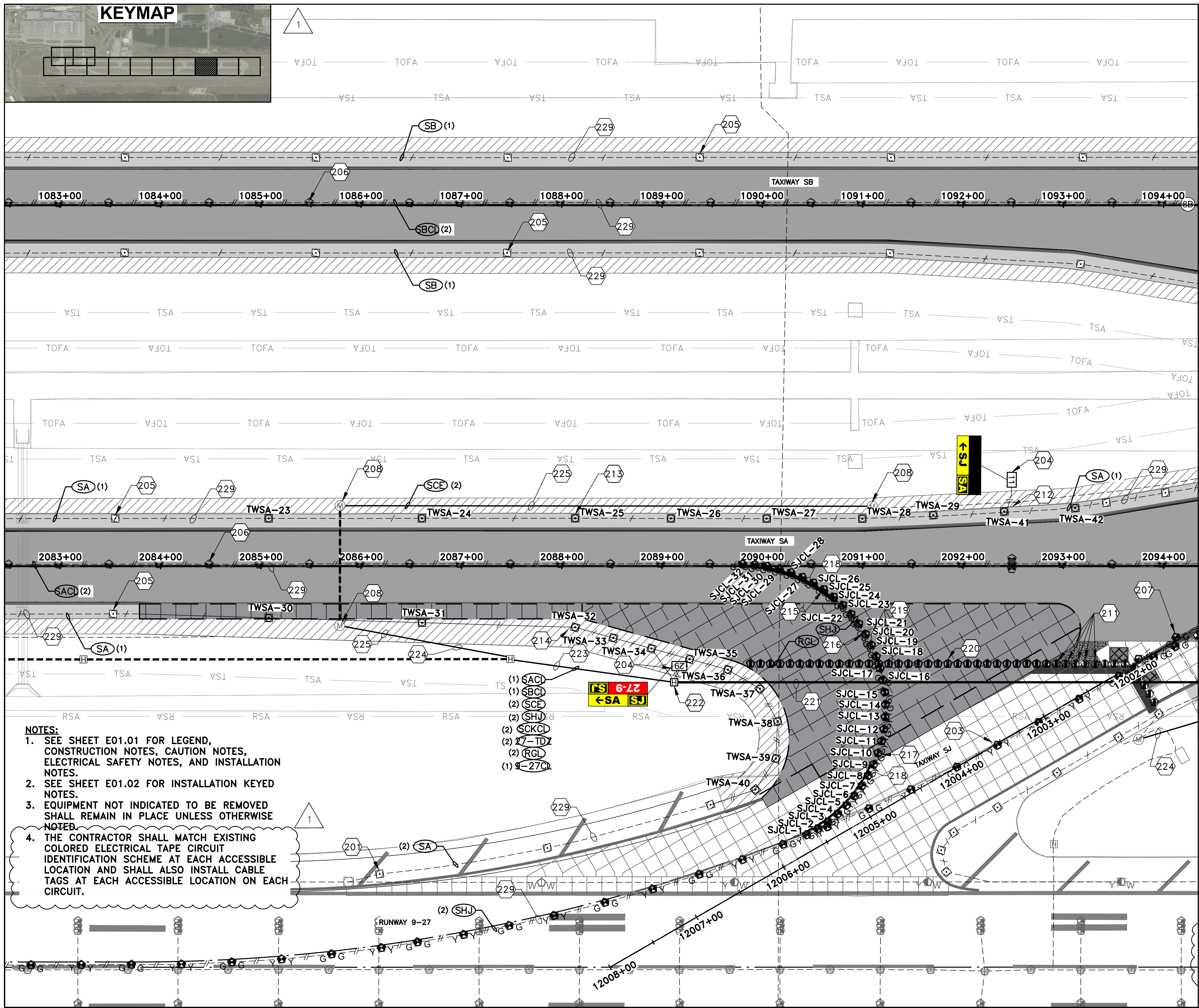
MATCHLINE SHEET E03.08

MATCHLINE SHEET E03.10

- (1) SAC
- (1) SBCL
- (2) SCE
- (2) SHJ
- (2) SCKC
- (2) 7-TD
- (2) RCL
- (1) 8-27C



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PLOT DATE: 11/8/2019 3:32:47 PM



INSTALLATION KEYED NOTES:

- (20) INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON EXISTING LIGHT BASE. (TYP.)
- (204) INSTALL NEW L-858(L) BASE MOUNTED GUIDANCE SIGN. (TYP.)
- (205) INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON ADJUSTED LIGHT BASE. (TYP.)
- (206) INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON ADJUSTED LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN NEW PAVEMENT.)
- (207) INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON ADJUSTED LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN NEW PAVEMENT.)
- (208) ADJUST EXISTING PULL BOX TO FINAL GRADE. MAKE ALL NECESSARY CABLE TERMINATIONS.
- (211) REINSTALL EXISTING L-852G ON NEW L-868 LIGHT BASE.
- (212) EXTEND 2" PVC CONDUIT FROM EXISTING SHOULDER TO NEW SIGN LOCATION. INSTALL 2/C #8 AWG L-824C CABLE TO NEW SIGN TRANSFORMER AND SPLICE INTO EXISTING CIRCUIT AT THE NEXT JUNCTION LOCATION.
- (213) INSTALL NEW L-861T TAXIWAY EDGE LIGHT ON NEW BASE IN EXISTING ASPHALT PAVEMENT. (TYP.)
- (214) INSTALL NEW L-861T TAXIWAY EDGE LIGHT ON NEW BASE IN NEW PAVEMENT. (TYP.)
- (215) INSTALL NEW L-852D(L) TAXIWAY CENTERLINE LIGHTING IN EXISTING PAVEMENT WITH MILL AND OVERLAY. (TYP.)
- (216) INSTALL NEW L-852D(L) TAXIWAY CENTERLINE LIGHT IN NEW CONCRETE PAVEMENT. (TYP.)
- (217) INSTALL NEW L-852D(L) TAXIWAY CENTERLINE LIGHT IN EXISTING CONCRETE PAVEMENT. (TYP.)
- (218) CONSTRUCT 1-WAY 2" CONCRETE ENCASED CONDUIT IN EXISTING PAVEMENT VIA SAW KERF.
- (219) CONSTRUCT 1-WAY 2" CONCRETE ENCASED CONDUIT IN NEW PAVEMENT.
- (220) INSTALL NEW L-852G(L) RUNWAY GUARD LIGHT INSTALLED IN NEW PAVEMENT. (TYP.)
- (221) CONSTRUCT NEW 16-WAY 2" DIRECTIONALLY BORED DUCT BANK WITH CONDUCTORS AS NOTED.
- (222) INSTALL NEW 4'x4' AIRCRAFT-RATED HANDHOLE. (TYP.)
- (223) CONSTRUCT NEW 16-WAY 2" NON-ENCASED DUCT BANK.
- (224) CONSTRUCT NEW 2-WAY 2" CONCRETE ENCASED DUCT BANK.
- (225) CONSTRUCT NEW 2-WAY 2" CONCRETE FLOWABLE FILL ENCASED DUCT BANK.
- (229) INSTALL NEW #8 AWG L-824C CABLE WITH EXISTING CONDUIT. (NUMBER OF CONDUCTORS INDICATED BY HASH MARKS)

- NOTES:**
- SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND INSTALLATION NOTES.
  - SEE SHEET E01.02 FOR INSTALLATION KEYED NOTES.
  - EQUIPMENT NOT INDICATED TO BE REMOVED SHALL REMAIN IN PLACE UNLESS OTHERWISE NOTED.
  - THE CONTRACTOR SHALL MATCH EXISTING COLORED ELECTRICAL TAPE CIRCUIT IDENTIFICATION SCHEME AT EACH ACCESSIBLE LOCATION AND SHALL ALSO INSTALL CABLE TAGS AT EACH ACCESSIBLE LOCATION ON EACH CIRCUIT.

- (1) SACL
- (1) SBCL
- (2) SCE
- (2) SHJ
- (2) SCKCL
- (2) 27-TD
- (2) RCL
- (1) 9-27C

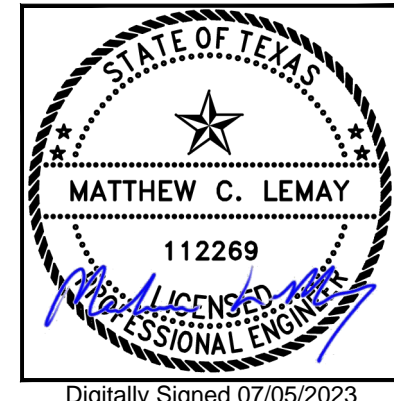


REVISIONS

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
**ELECTRICAL INSTALLATION PLAN X**

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023



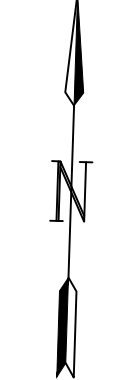
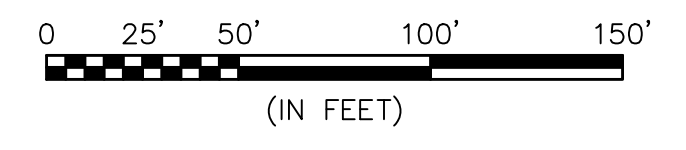
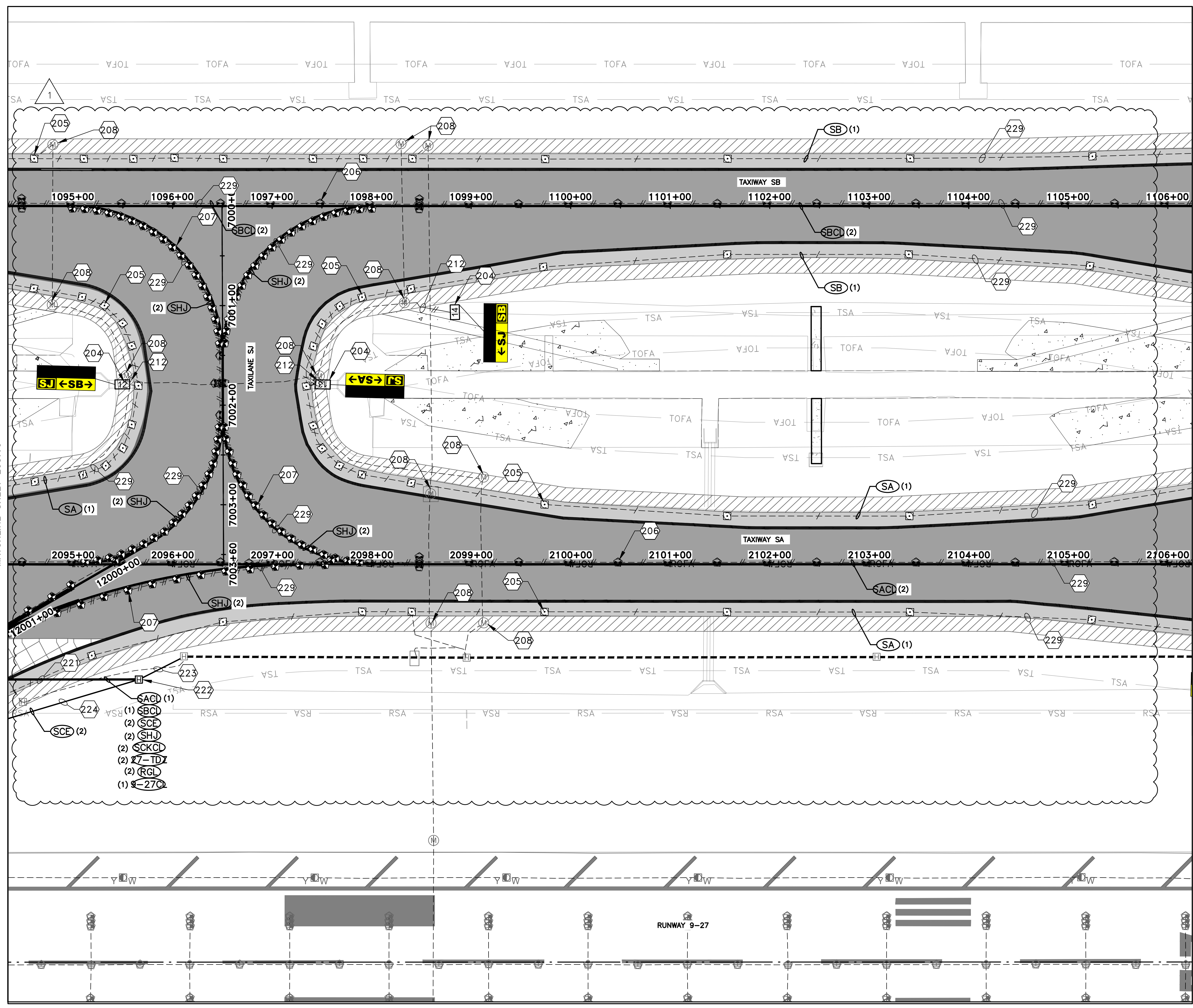
APPROVED BY: JEF

DIRECTOR  
HOUSTON AIRPORT SYSTEM

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



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 PLOT DATE: 11/8/2019 3:32:47 PM



- INSTALLATION KEYED NOTES:**
- 204 INSTALL NEW L-858(L) BASE MOUNTED GUIDANCE SIGN. (TYP.)
  - 205 INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON ADJUSTED LIGHT BASE. (TYP.)
  - 206 INSTALL NEW L-852C(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT ON ADJUSTED LIGHT BASE. (TYP. OF STRAIGHT TAXIWAY CENTERLINES IN NEW PAVEMENT.)
  - 207 INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON ADJUSTED LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN NEW PAVEMENT.)
  - 208 ADJUST EXISTING PULL BOX TO FINAL GRADE. MAKE ALL NECESSARY CABLE TERMINATIONS.
  - 212 EXTEND 2" PVC CONDUIT FROM EXISTING SHOULDER TO NEW SIGN LOCATION. INSTALL TWO #8 AWG L-824C CABLES TO NEW SIGN TRANSFORMER AND SPLICE INTO EXISTING CIRCUIT AT THE NEXT JUNCTION LOCATION.
  - 221 CONSTRUCT NEW 16-WAY 2" DIRECTIONALLY BORED DUCT BANK WITH CONDUCTORS AS NOTED.
  - 222 INSTALL NEW 4'x4' AIRCRAFT-RATED HANDHOLE. (TYP.)
  - 223 CONSTRUCT NEW 16-WAY 2" NON-ENCASED DUCT BANK.
  - 224 CONSTRUCT NEW 2-WAY 2" NON-ENCASED DUCT BANK.
  - 229 INSTALL NEW #8 AWG L-824C CABLE WITH EXISTING CONDUIT. (NUMBER OF CONDUCTORS INDICATED BY HASH MARKS)

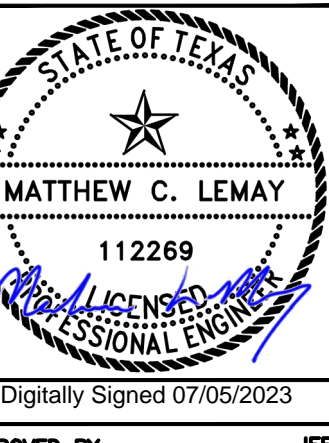
- NOTES:**
1. SEE SHEET E01.01 FOR LEGEND, CONSTRUCTION NOTES, CAUTION NOTES, ELECTRICAL SAFETY NOTES, AND INSTALLATION NOTES.
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**REVISIONS**

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

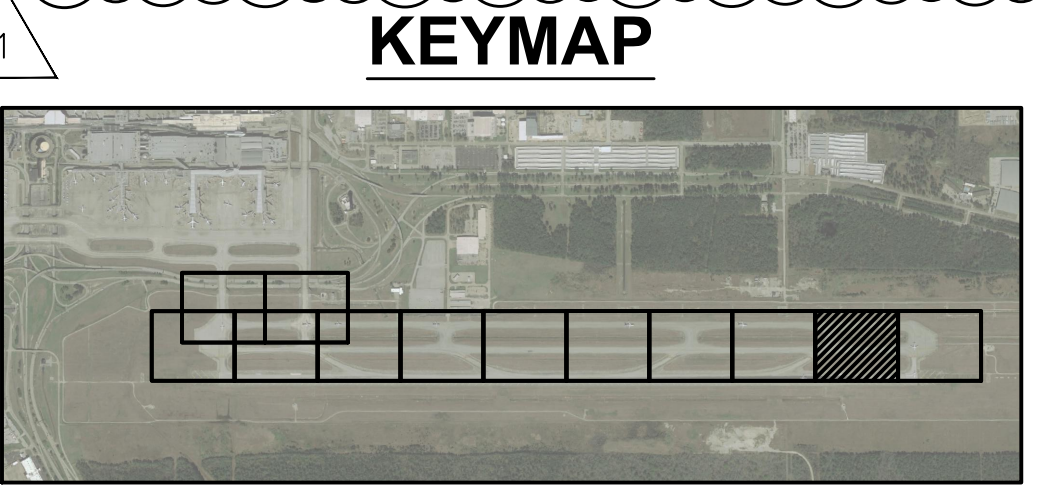
**GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
 ELECTRICAL INSTALLATION PLAN XI**

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023



APPROVED BY: JEF  
DIRECTOR  
HOUSTON AIRPORT SYSTEM

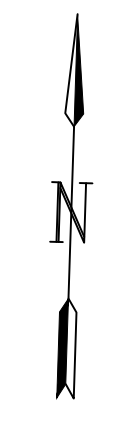
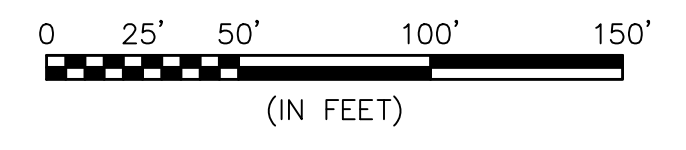
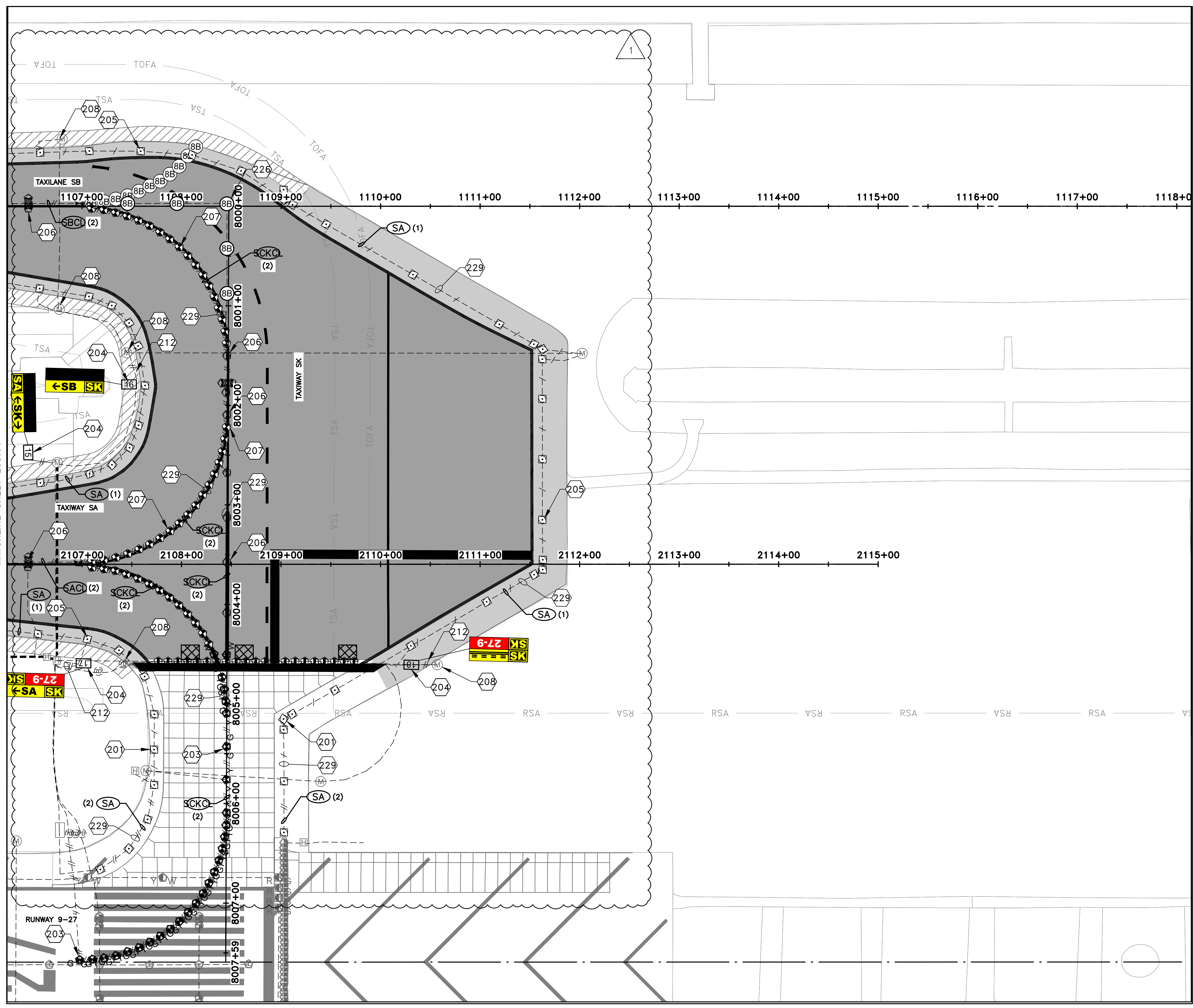
PROJECT NO.	0646A
A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	E03.11





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 PLOT DATE: 11/8/2019 3:32:47 PM

MATCHLINE SHEET E03.11



**INSTALLATION KEYED NOTES:**

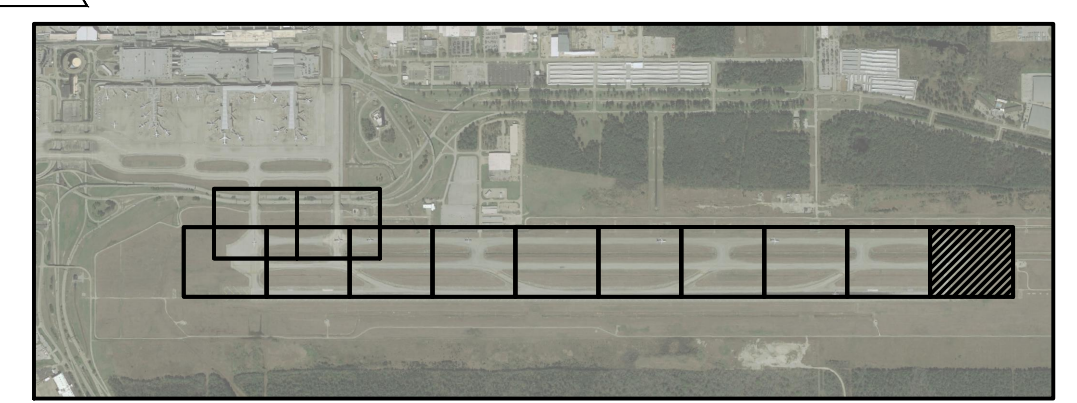
- 201 INSTALL NEW L-861T(L) BASE MOUNTED TAXIWAY EDGE LIGHT ON EXISTING LIGHT BASE. (TYP.)
- 203 INSTALL NEW L-852D(L) BASE MOUNTED TAXIWAY CENTERLINE LIGHT IN FULL STRENGTH PAVEMENT ON EXISTING LIGHT BASE. (TYP. OF CURVED TAXIWAY CENTERLINES IN EXISTING PAVEMENT.)
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- 208 ADJUST EXISTING PULL BOX TO FINAL GRADE. MAKE ALL NECESSARY CABLE TERMINATIONS.
- 212 EXTEND 2" PVC CONDUIT FROM EXISTING SHOULDER TO NEW SIGN LOCATION. INSTALL TWO #8 AWG L-824C CABLES TO NEW SIGN TRANSFORMER AND SPLICE INTO EXISTING CIRCUIT AT THE NEXT JUNCTION LOCATION.
- 226 INSTALL NEW L-868 BLANK COVER AND SPACER RINGS TO BE FLUSH TO PAVEMENT. (TYP.)
- 229 INSTALL NEW #8 AWG L-824C CABLE WITH EXISTING CONDUIT. (NUMBER OF CONDUCTORS INDICATED BY HASH MARKS)

1

**NOTES:**

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**KEYMAP**



REVISIONS

NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

**ELECTRICAL INSTALLATION PLAN XII**

GEORGE BUSH INTERCONTINENTAL AIRPORT  
REHABILITATION OF TAXIWAYS SA & SB

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	1"=50'
DATE:	04/28/2023



APPROVED BY: JEF  
 DIRECTOR  
 HOUSTON AIRPORT SYSTEM

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



REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	7/05/23

PROJECT MGR:	JEF
DESIGNER:	RH
DRAWN BY:	RH
CHECK BY:	MCL
SCALE:	NONE
DATE:	04/28/2023



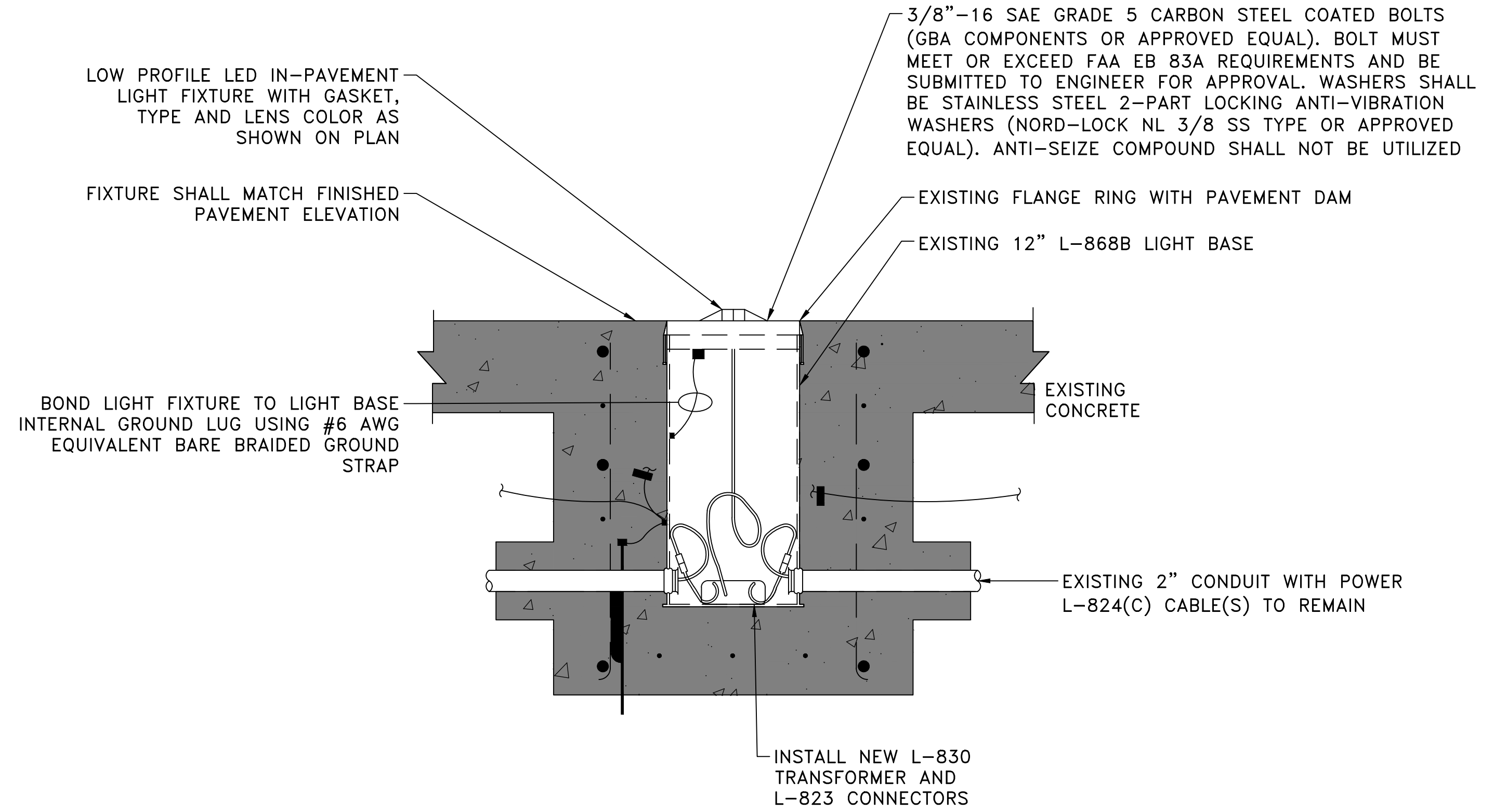
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 APPROVED BY: JEF

DIRECTOR  
 HOUSTON AIRPORT SYSTEM

PROJECT NO.	0646A
A.I.P. NO.	XXXX
C.I.P. NO.	A-0515
H.A.S. NO.	20C0646A
SHEET NO.	E04.02

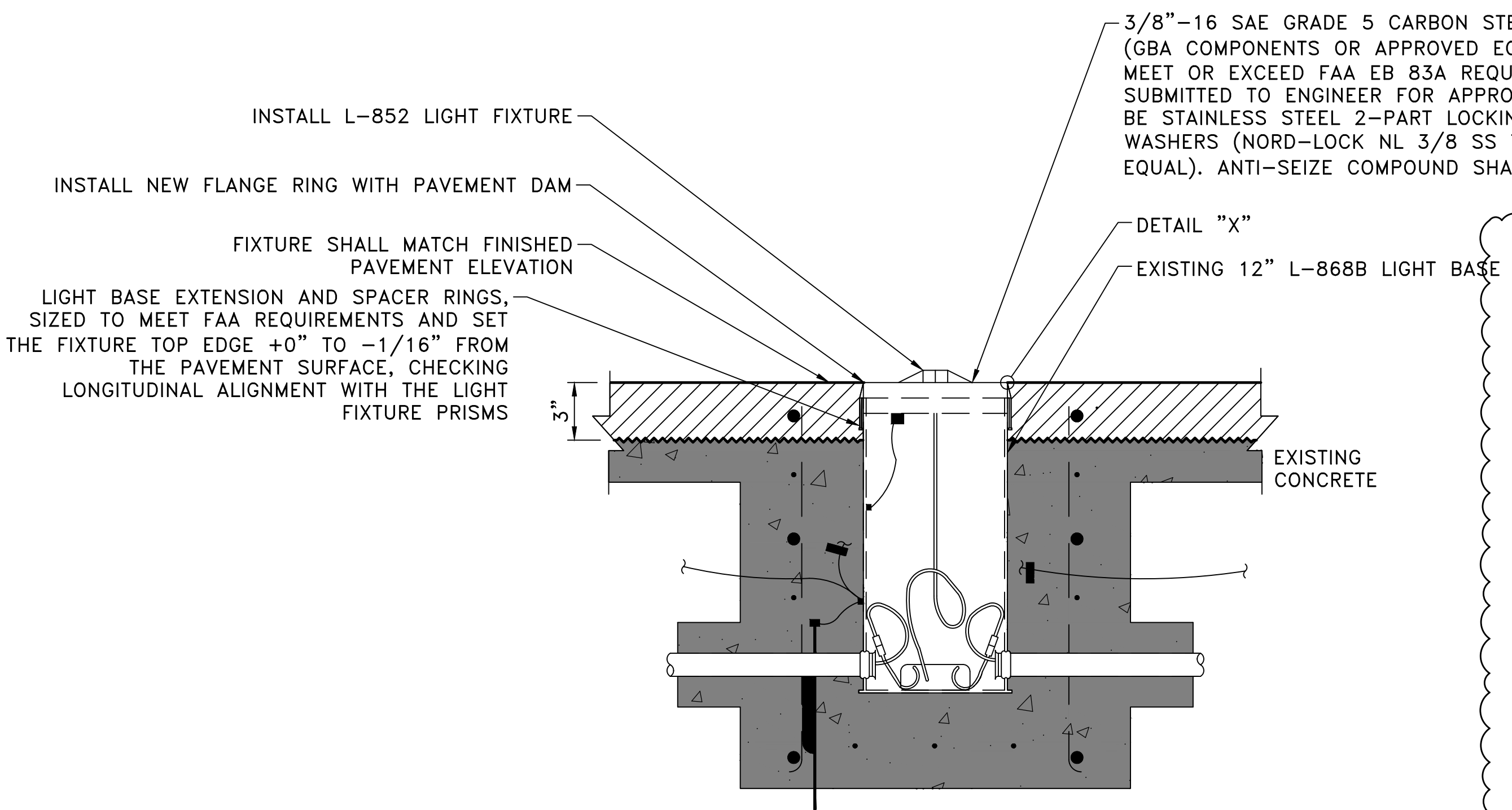
**IN-PAVEMENT NOTES:**

- INSTALL NEW L-823 CONNECTOR KITS WITH HEAT SHRINK AND CABLE TAGS AT ALL LIGHTS.
- INSTALL IN-PAVEMENT LIGHT FIXTURES WITH NEW APPURTENANCES IN ACCORDANCE WITH FAA GUIDELINES AND MANUFACTURER'S RECOMMENDATIONS FOR A COMPLETE INSTALLATION.
- SUBMIT FIXTURE AND ACCESSORIES INSTALLATION METHOD SHOP DRAWINGS WITH BOLT TORQUE CALCULATIONS FOR REVIEW AND APPROVAL PRIOR TO STARTING WORK. MINIMUM BOLT TORQUE MUST BE 333 IN-LB ± 10 IN-LBS. TWO WEEKS AFTER INSTALLATION, COORDINATE RUNWAY CLOSURE AND CHECK TORQUE ON ALL FIXTURES.
- DEMONSTRATE PROPER INSTALLATION LOCATION, ELEVATION, AND ORIENTATION PRIOR TO PAVING WORK.
- TAKE ALL MEASUREMENTS REQUIRED TO INSTALL NEW FIXTURES IN ACCORDANCE WITH FAA AC AND MANUFACTURER INSTALLATION REQUIREMENTS. ALL WORK MUST BE TO THE SATISFACTION OF THE ENGINEER.
- UTILIZE A DIGITAL ELECTRONIC TORQUE-ANGLE WRENCH THAT HAS VISUAL AND AUDIBLE WARNINGS SO THAT PRECISE TORQUE AND ROTATION ANGLE CAN BE ACHIEVED. TORQUE BOLTS IN A STAR PATTERN. PROVIDE WRENCH CALIBRATION CERTIFICATE TO ENGINEER PRIOR TO WORK.
- NEVER USE IMPACT WRENCHES / DRILLS WHEN REMOVING OR INSTALLING BOLTS.
- A BEVEL SPACER RING OR DIAL-A-BEVEL 2-PIECE SPACER RING MAY BE REQUIRED TO PROPERLY INSTALL FIXTURES ON LIGHT BASES.
- TO PRESERVE THE LIGHT BASE INTEGRITY AND PROPER BOLT TORQUE, A MAXIMUM OF (3) THREE RINGS MAY BE STACKED TOGETHER TO BRING LIGHT FIXTURES TO THE CORRECT ELEVATION. THIS MAXIMUM LIMIT INCLUDES FLANGE RINGS, SPACER RINGS, AND BEVEL RINGS.
- THE CONTRACTOR MUST BE RESPONSIBLE TO MEASURE AND DETERMINE THE REQUIRED THICKNESS OF EACH INDIVIDUAL SPACER RING REQUIRED TO PUT THE FIXTURE AT THE CORRECT ELEVATION, AZIMUTH, AND ROTATION PER FAA ADVISORY CIRCULARS.
- IF IN-PAVEMENT FIXTURE ASSEMBLY OR FAILED PHOTOMETRIC TEST INDICATE AN INCORRECT ELEVATION OR ORIENTATION, THE CONTRACTOR MUST EXPEDITIOUSLY OBTAIN THE CORRECT SPACER RINGS TO CORRECT THE PROBLEM IMMEDIATELY TO THE SATISFACTION OF THE ENGINEER, WHICH WILL INCLUDE A SECOND PHOTOMETRIC TEST. ALL SUCH WORK AND ADDITIONAL TESTING MUST BE PERFORMED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.



**SECTION VIEW**  
 SCALE: NONE

**1**  
 E04.02 **BASE MOUNTED IN-PAVEMENT LIGHT INSTALLATION - EXISTING BASE**  
 SCALE: NONE

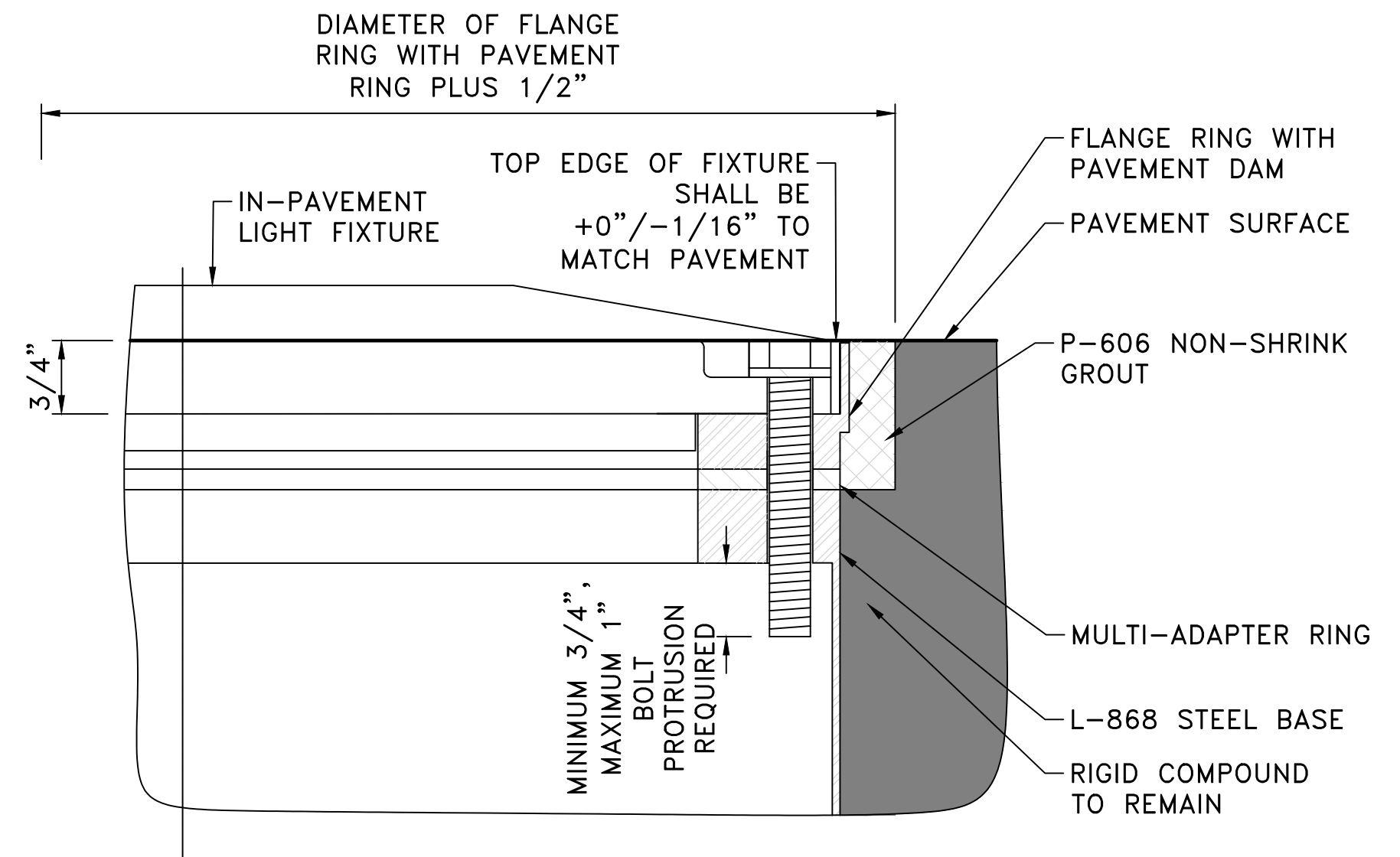


**SECTION VIEW**  
 SCALE: NONE

**2**  
 E04.02 **BASE MOUNTED IN-PAVEMENT LIGHT - PAVEMENT OVERLAY**  
 SCALE: NONE

**INSTALLATION NOTES:**

- REMOVE AND STORE LIGHT FIXTURE.
- REMOVE EXISTING FLANGE RING, ANY SPACER RINGS, AND CORE OUT TOP SECTION OF THE CAN AS ASPHALT IS MILLED DOWN. INSTALL BLANK COVER ON BOTTOM SECTION OF THE CAN.
- PRIOR TO THE ASPHALT OVERLAY, INSTALL NEW TOP SECTION OF CAN WITH MUD PLATE.
- AFTER ASPHALT OVERLAY, LOCATE CENTER OF CAN VIA MUD PLATE. CORE OUT TOP OF CAN WITH 14" CORE.
- INSTALLING NEW FLANGE RING AND APPROPRIATE SPACER RINGS TO MATCH TOP OF PAVEMENT ELEVATION.
- INSTALL SEALANT BETWEEN FLANGE RING AND CONCRETE.
- AFTER OVERLAY WORK HAS BEEN COMPLETED, REINSTALL EXISTING LIGHT FIXTURE WITH NEW BOLTS.



**DETAIL NOTES:**

- INITIALLY, INSTALL AND TIGHTEN DOWN ALL ITEMS FOR PROPER FIT AND ORIENTATION FOR FINAL INSPECTION AND CHECKING THAT THE ASSEMBLY IS WITHIN TOLERANCE. MARK ALL ITEMS CAREFULLY AND THEN DISASSEMBLE. THEN REASSEMBLE AND INSTALL NEW SEALANTS.

**3**  
 E04.02 **DETAIL 'X'**  
 SCALE: NONE

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 PLOT DATE: 3/10/2022 11:08:43 AM



REVISIONS		
NO.	DESCRIPTION	DATE BY
1	ADDENDUM NO. 1	07/05/23

GEORGE BUSH INTERCONTINENTAL AIRPORT  
 REHABILITATION OF TAXIWAYS SA & SB  
**ELECTRICAL DETAILS XII**

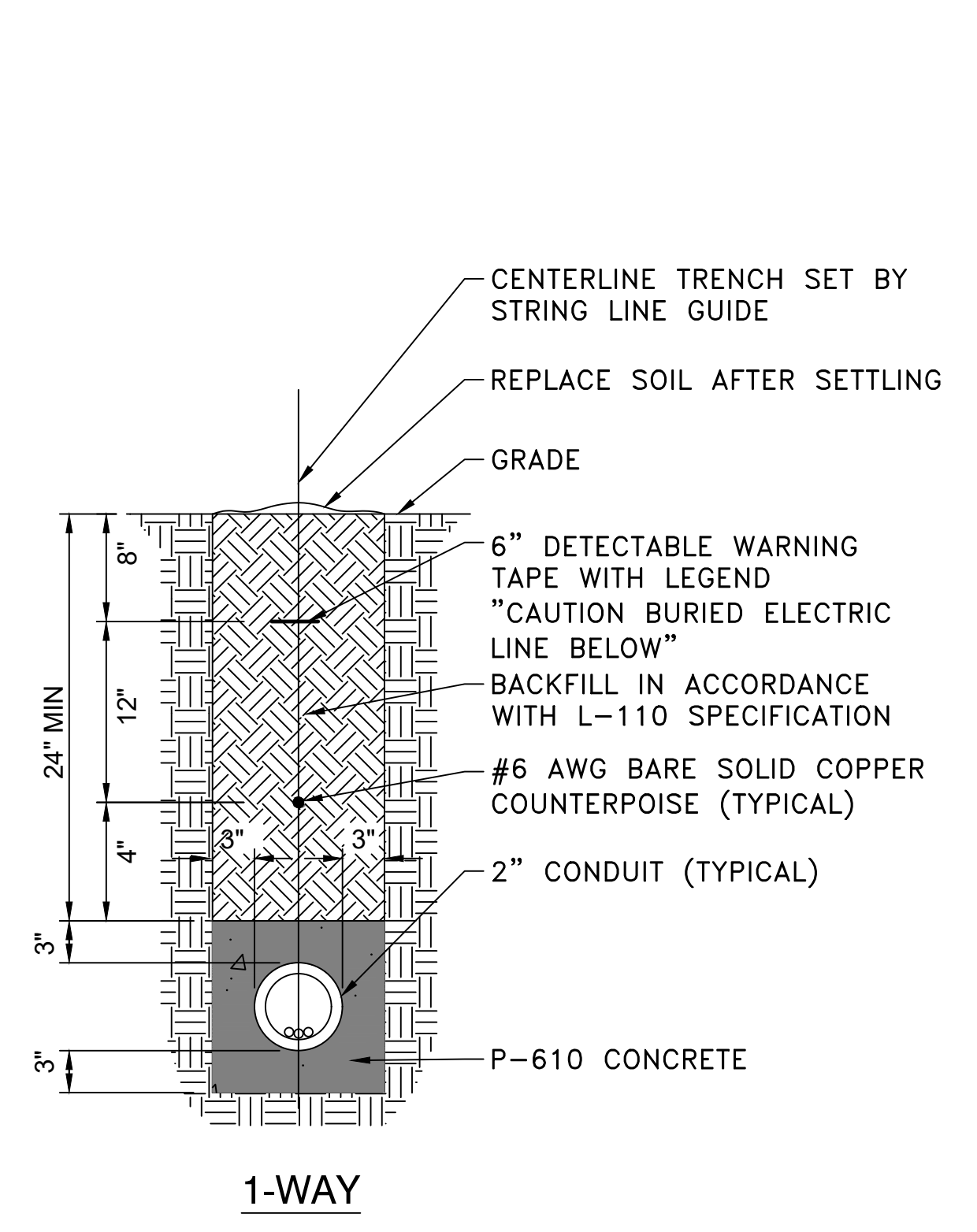
PROJECT MGR:	JEF
DESIGNER:	KKR
DRAWN BY:	DAG
CHECK BY:	JEF
SCALE:	NONE
DATE:	04/28/2023



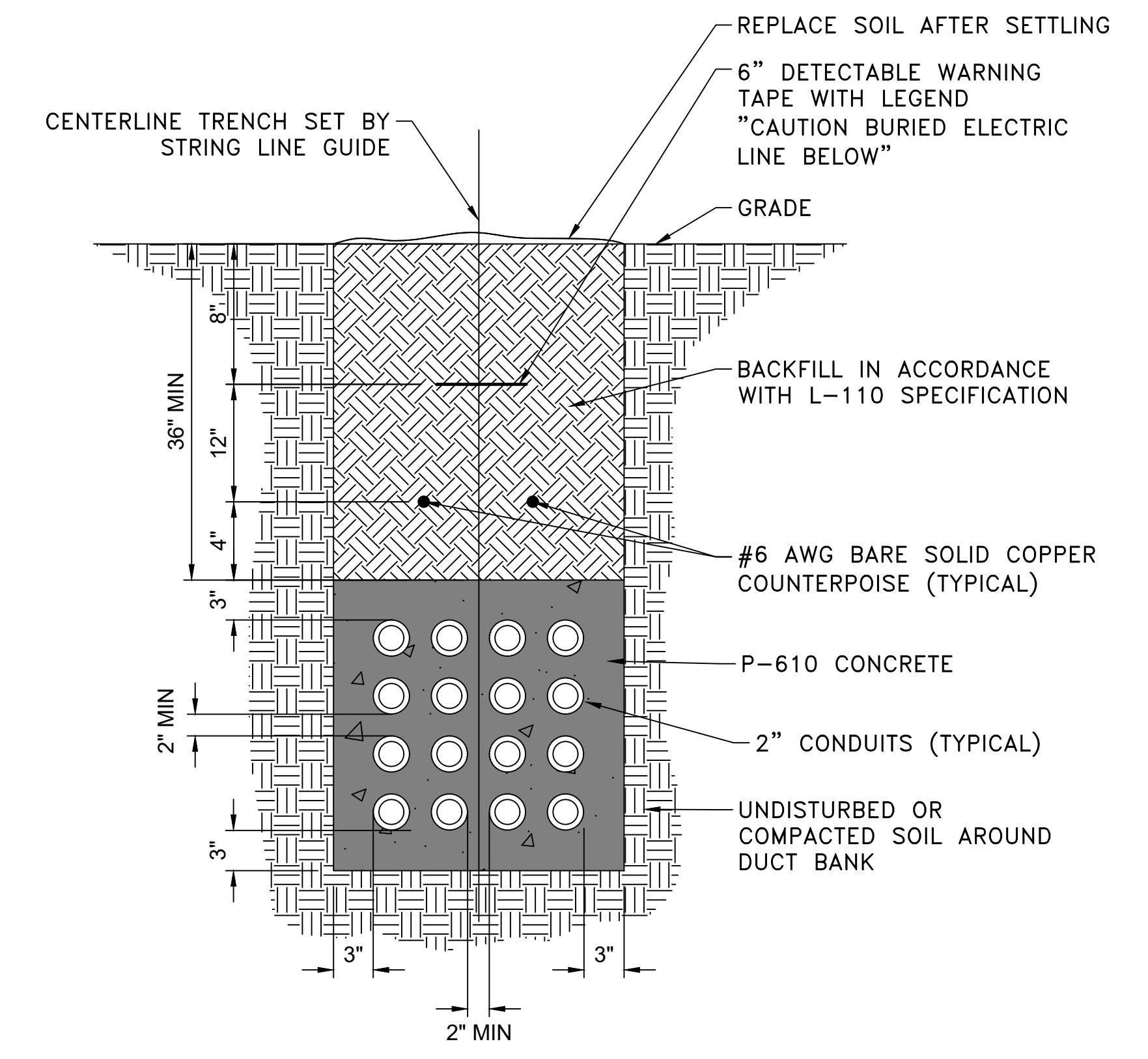
APPROVED BY: JEF

DIRECTOR  
HOUSTON AIRPORT SYSTEM

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



**1-WAY**



**16-WAY**

**ENCASED NOTES**

- COUNTERPOISE WIRES SHALL BE INSTALLED ABOVE MULTIPLE CONDUITS / DUCT BANKS FOR AIRFIELD LIGHTING CABLES, WITH THE INTENT BEING TO PROVIDE A COMPLETE CONE OF PROTECTION OVER THE AIRFIELD LIGHTING CABLES.
- INSTALL 3/4" x 10'-0" COPPERCLAD GROUND RODS AT EACH END OF ELECTRICAL DUCT AND BOND COUNTERPOISES USING EXOTHERMIC WELDS.
- INSTALL CONDUIT SPACERS WITH LOCKING COLLARS AT 5' O.C. SPACING INTERVALS. INSTALL #4 REINFORCING BARS MINIMUM 6" INTO SOIL TO ANCHOR THE ASSEMBLY PRIOR TO PLACING THE CONCRETE ENCASEMENT.
- INSTALL A COUNTERPOISE 4" ABOVE EACH CONDUIT COLUMN.
- INSTALL DUCT MARKERS IN ACCORDANCE WITH ADVISORY CIRCULAR 150/5340-30 REQUIREMENTS, INCLUDING AT THE ENDS OF DUCT BANKS.
- SIMILAR FOR OTHER DUCT SIZES.

**1 CONCRETE ENCASED DUCT BANK AND CONDUIT**  
 SCALE: NONE

**CABLE TAG NOTES:**

- ALL CABLES SHALL BE IDENTIFIED. INSTALL CABLE TAGS IN ALL ACCESSIBLE LOCATIONS INCLUDING JUNCTION BOXES, PULL BOXES, MANHOLES, HANDHOLES, AND LIGHT BASES.
- INSTALL CABLE TAGS 12" FROM THE L-823 CONNECTORS. IF NO CONNECTORS ARE REQUIRED, INSTALL A CABLE TAG NEAR EACH CABLE ENTRANCE VIA DUCT OR CONDUIT.
- CABLE IDENTIFICATION TAGS SHALL BE MADE FROM A NON-CORROSIVE STAINLESS STEEL MATERIAL WITH THE CIRCUIT AND / OR LOOP IDENTIFICATION NUMBER STAMPED OR ETCHED ONTO THE TAG.
- TAGS SHALL BE CIRCULAR IN SHAPE, 2-INCH MINIMUM DIAMETER AND 20 GAUGE NON-CORROSIVE STAINLESS STEEL MATERIAL.
- SECURE EACH TAG TO THE CABLE USING WEATHER AND ULTRAVIOLET RESISTANT NYLON CABLE TIES.
- TAG IDENTIFICATION TEXT SHALL BE COORDINATED WITH THE OWNER AND THE ENGINEER DURING SUBMITTALS PRIOR TO THE WORK. NO TAGS SHALL BE STAMPED PRIOR TO APPROVAL OF CIRCUIT NOMENCLATURE BY OWNER AND ENGINEER.

**2 TYPICAL CABLE TAG**  
 SCALE: NONE

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**ITEM P-101 PREPARATION/REMOVAL OF EXISTING PAVEMENTS****DESCRIPTION**

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

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

**EQUIPMENT AND MATERIALS**

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

**CONSTRUCTION****101-3.1 Removal of existing pavement.**

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

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

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

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

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

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

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



1/4 inch wide with a crack sealant per ASTM D6690. The crack sealant, preparation, and application shall be compatible with the surface treatment/overlay to be used. To minimize contamination of the asphalt with the crack sealant, underfill the crack sealant a minimum of 1/8 inch, not to exceed ¼ inch. Any excess joint or crack sealer shall be removed from the pavement surface.

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

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

**Gradation**

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

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

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

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

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

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

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



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

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

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

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

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

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

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

**101-3.10 Removal of Pipe and other Buried Structures.**

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

**b. Removal of Inlets/Manholes.** Not used.



## METHOD OF MEASUREMENT

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

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

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

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

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

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

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

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

## BASIS OF PAYMENT

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

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



**REFERENCES**

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

Advisory Circulars (AC)

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

ASTM International (ASTM)

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

**END OF ITEM P-101**



**ITEM P-501 CEMENT CONCRETE PAVEMENT****DESCRIPTION**

**501-1.1** This work shall consist of pavement composed of cement concrete with reinforcement constructed on a prepared underlying surface in accordance with these specifications and shall conform to the lines, grades, thickness, and typical cross-sections shown on the plans. The terms cement concrete, hydraulic cement concrete, and concrete are interchangeable in this specification.

**MATERIALS****501-2.1 Aggregates.**

**a. Reactivity.** Fine and Coarse aggregates to be used in PCC on this project shall be tested and evaluated by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and ASTM C1567. Tests must be representative of aggregate sources which will be providing material for production. ASTM C1260 and ASTM C1567 tests may be run concurrently.

**(1)** Test coarse aggregate and fine aggregate separately, in accordance with ASTM C1260; however, extend the length of test to 28 days (30 days from casting). Complete the tests within six months of the date of the concrete submittal. If expansion of either the coarse or fine aggregate exceeds 0.10%, at 28 days limit the alkali loading contributed by the cement content of the cement to be less than or equal to 3.0 lb. per cubic yard (1.8 kg per cubic meter), calculate in accordance with EB XXX. Tests must have been completed within 6 months of the date of the concrete mix submittal.

**(2)** The combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If the expansion does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

**(3)** If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) Concrete Research Division (CRD) C662 in lieu of ASTM C1567. If lithium nitrate admixture is used, it shall be nominal 30%  $\pm$ 0.5% weight lithium nitrate in water. If the expansion does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

**b. Fine aggregate.** Grading of the fine aggregate, as delivered to the mixer, shall conform to the requirements of ASTM C33 and the parameters identified in the fine aggregate material requirements below. Fine aggregate material requirements and deleterious limits are shown in the table below.



<b>Fine Aggregate Material Requirements</b>		
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
Sand Equivalent	45 minimum	ASTM D2419
Fineness Modulus (FM)	$2.50 \leq FM \leq 3.40$	ASTM C136
<b>Limits for Deleterious Substances in Fine Aggregate for Concrete</b>		
Clay lumps and friable particles	1.0% maximum	ASTM C142
Coal and lignite	0.5% using a medium with a density of Sp. Gr. of 2.0	ASTM C123
Total Deleterious Material	1.0% maximum	

**c. Coarse aggregate.** The maximum size coarse aggregate shall be 1-1/2 inch.

Aggregates delivered to the mixer shall be clean, hard, uncoated aggregates consisting of crushed stone, crushed or uncrushed gravel, air-cooled iron blast furnace slag, crushed recycled concrete pavement, or a combination. The aggregates shall have no known history of detrimental pavement staining. Steel blast furnace slag shall not be permitted. Coarse aggregate material requirements and deleterious limits are shown in the table below; washing may be required to meet aggregate requirements.

**Coarse Aggregate Material Requirements**

<b>Material Test</b>	<b>Requirement</b>	<b>Standard</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: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles at 5:1 for any size group coarser than 3/8 (9.5 mm) sieve <sup>1</sup>	ASTM D4791
Bulk density of slag <sup>2</sup>	Weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter)	ASTM C29

<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).

<sup>2</sup> Only required if slag is specified.

The amount of deleterious material in the coarse aggregate shall not exceed the following limits:



**Limits for Deleterious Substances in Coarse Aggregate**

Deleterious material	ASTM	Percentage by Mass
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than No. 200 sieve (75 µm)	ASTM C117	1.0 <sup>1</sup>
Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Chert <sup>2</sup> (less than 2.40 Sp Gr.)	ASTM C123 using a medium with a density of Sp. Gr. of 2.40)	1.0 <sup>3</sup>

<sup>1</sup> The limit for material finer than 75-µm is allowed to be increased to 1.5% for crushed aggregates consisting of dust of fracture that is essentially free from clay or shale. Test results supporting acceptance of increasing limit to 1.5% with statement indicating material is dust of fracture must be submitted with Concrete mix. Acceptable techniques to characterizing these fines include methylene blue adsorption or X-ray diffraction analysis.

<sup>2</sup> Chert and aggregates with less than 2.4 specific gravity.

<sup>3</sup> The limit for chert may be increased to 1.0 percent by mass in areas not subject to severe freeze and thaw.

**d. Combined aggregate gradation.** This specification is targeted for a combined aggregate gradation developed following the guidance presented in United States Air Force Engineering Technical Letter (ETL) 97-5: Proportioning Concrete Mixtures with Graded Aggregates for Rigid Airfield Pavements. Base the aggregate grading upon a combination of all the aggregates (coarse and fine) to be used for the mixture proportioning. Three aggregate sizes may be required to achieve an optimized combined gradation that will produce a workable concrete mixture for its intended use. Use aggregate gradations that produce concrete mixtures with well-graded or optimized aggregate combinations. The Contractor shall submit complete mixture information necessary to calculate the volumetric components of the mixture. The combined aggregate grading shall meet the following requirements:

(1) The materials selected and the proportions used shall be such that when the Coarseness Factor (CF) and the Workability Factor (WF) are plotted on a diagram as described in paragraph 501-2.1d(4) below, the point thus determined shall fall within the parallelogram described therein.

(2) The CF shall be determined from the following equation:

$$CF = \frac{\text{(cumulative percent retained on the 3/8 in. (9.5 mm) sieve)}(100)}{\text{(cumulative percent retained on the No. 8 (2.36 mm) sieve)}}$$

(3) The WF is defined as the percent passing the No. 8 (2.36 mm) sieve based on the combined gradation. However, WF shall be adjusted, upwards only, by 2.5 percentage points for each 94 pounds (42 kg) of cementitious material per cubic meter yard greater than 564 pounds per cubic yard.

(4) A diagram shall be plotted using a rectangular scale with WF on the Y-axis with units from 20 (bottom) to 45 (top), and with CF on the X-axis with units from 80 (left side) to 30 (right side). On this diagram a parallelogram shall be plotted with corners at the following coordinates (CF-75, WF-28), (CF-75, WF-40), (CF-45, WF-32.5), and (CF-45, WF-44.5). If the point determined by the intersection of the computed CF and WF does not fall within the above parallelogram, the grading of each size of aggregate used and the proportions selected shall be changed as necessary. The point determined by the plotting of the CF and WF may be adjusted during production ±3 WF and ±5 CF. Adjustments to gradation may not take the point outside of the parallelogram.

**e. Contractors combined aggregate gradation.** The Contractor shall submit their combined aggregate gradation using the following format:



**Contractor's Combined Aggregate Gradation**

Sieve Size	Contractor's Concrete mix Gradation (Percent passing by weight)
2 inch (50 mm)	*
1-1/2 inch (37.5 mm)	*
1 inch (25.0 mm)	*
3/4 inch (19.0 mm)	*
1/2 inch (12.5 mm)	*
3/8 inch (9.5 mm)	*
No. 4 (4.75 mm)	*
No. 8 (2.36 mm)	*
No. 16 (1.18 mm)	*
No. 30 (600 µm)	*
No. 50 (300 µm)	*
No. 100 (150 µm)	*

**501-2.2 Cement.** Cement shall conform to the requirements of ASTM C150 Type I or II or ASTM C595 Type IP, IS, IL, or IT.

**501-2.3 Cementitious materials.**

**a. Fly ash.** Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash shall have a Calcium Oxide (CaO) content of less than 15% and a total alkali content less than 3% per ASTM C311. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the concrete mix, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the Resident Project Representative (RPR).

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

**c. Raw or calcined natural pozzolan.** Natural pozzolan shall be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling Alkali-Silica reaction and shall have a loss on ignition not exceeding 6%. Class N pozzolan for use in mitigating Alkali-Silica Reactivity shall have a total available alkali content less than 3%.

**501-2.4 Joint seal.** The joint seal for the joints in the concrete pavement shall meet the requirements of Item P-605 and shall be of the type specified in the plans.

**501-2.5 Isolation joint filler.** Premolded joint filler for isolation joints shall conform to the requirements of ~~ASTM D1751~~ or ASTM D1752, *Type II* and shall be where shown on the plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint, unless otherwise specified by the RPR. When the use of more than one piece is required for a joint, the abutting ends shall be fastened securely and held accurately to shape by stapling or other positive fastening means satisfactory to the RPR.

**501-2.6 Steel reinforcement.** Reinforcing shall consist of *deformed bars* conforming to the requirements of ASTM 615 and *welded wire fabric conforming to ASTM A1064*. *Welded wire shall be provided in flat sheets only.*



**501-2.7 Dowel and tie bars.** Dowel bars shall be plain steel bars conforming to ASTM A615 and shall be free from burring or other deformation restricting slippage in the concrete.

**a. Dowel Bars.** Before delivery to the construction site each dowel bar shall be epoxy coated per ASTM A1078, Type 1, with a coating thickness after curing greater than 10 mils. Patched ends are not required for Type 1 coated dowels. The dowels shall be coated with a bond-breaker recommended by the manufacturer. Dowel sleeves or inserts are not permitted. Grout retention rings shall be fully circular metal or plastic devices capable of supporting the dowel until the grout hardens.

**b. Tie Bars.** Tie bars shall be deformed steel bars and conform to the requirements of ASTM A615. Tie bars designated as Grade 60 in ASTM A615 or ASTM A706 shall be used for construction requiring bent bars.

**501-2.8 Water.** Water used in mixing or curing shall be potable. If water is taken from other sources considered non-potable, it shall meet the requirements of ASTM C1602.

**501-2.9 Material for curing concrete.** Curing materials shall conform to one of the following specifications:

**a.** Liquid membrane-forming compounds for curing concrete shall conform to the requirements of ASTM C309, Type 2, Class A, or Class B.

**b.** White polyethylene film for curing concrete shall conform to the requirements of ASTM C171.

**c.** White burlap-polyethylene sheeting for curing concrete shall conform to the requirements of ASTM C171.

**d.** Waterproof paper for curing concrete shall conform to the requirements of ASTM C171.

**501-2.10 Admixtures.** Admixtures shall conform to the following specifications:

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

**b. Water-reducing admixtures.** Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D.

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

**d. Lithium Nitrate.** The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon (1.2 kg/L), and shall have the approximate chemical form as shown below:

**Lithium Admixture**

Constituent	Limit (Percent by Mass)
LiNO <sub>3</sub> (Lithium Nitrate)	30 ±0.5
SO <sub>4</sub> (Sulfate Ion)	0.1 (max)
Cl (Chloride Ion)	0.2 (max)
Na (Sodium Ion)	0.1 (max)
K (Potassium Ion)	0.1 (max)

The lithium nitrate admixture dispensing and mixing operations shall be verified and certified by the lithium manufacturer's representative.



**501-2.11 Epoxy-resin.** All epoxy-resin materials shall be two-component materials conforming to the requirements of ASTM C881, Class as appropriate for each application temperature to be encountered, except that in addition, the materials shall meet the following requirements:

- a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.
- b. Material for use for injecting cracks shall be Type IV, Grade 1.
- c. Material for bonding freshly mixed Portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete shall be Type V, Grade as approved.

**501-2.12 Bond Breaker.** Choke stone shall be an ASTM C33 Number 89 stone *and must be submitted to the engineer for approval prior to construction.*

**501-2.13 Repair Material for Partial Depth Repairs.** A rapid setting and early strength gaining material shall be used for partial depth repairs. The rapid setting and early strength gaining mixture will have a minimum compressive strength of 2,000 psi in 2 hours and 5,000 psi in 1 day when tested in accordance with ASTM C 109. Bond strength will be 2,000 psi in 7 days when tested in accordance with ASTM C 882.

### **CONCRETE MIX**

**501-3.1. General.** No concrete shall be placed until an acceptable concrete mix has been submitted to the RPR for review and the RPR has taken appropriate action. The RPR's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

**501-3.2 Concrete Mix Laboratory.** The laboratory used to develop the concrete mix shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the concrete mix must be included in the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the RPR prior to start of construction.

**501-3.3 Concrete Mix Proportions.** Develop the mix using the procedures contained in Portland Cement Association (PCA) publication, "Design and Control of Concrete Mixtures." Concrete shall be proportioned to achieve a 28-day flexural strength that meets or exceeds the acceptance criteria contained in paragraph 501-6.6 for a flexural strength of 715 psi per ASTM C78.

The minimum cementitious material shall be adequate to ensure a workable, durable mix. The minimum cementitious material (cement plus fly ash, or slag cement) shall be 517 pounds per cubic yard. The ratio of water to cementitious material, including free surface moisture on the aggregates but not including moisture absorbed by the aggregates shall be between 0.38 – 0.45 by weight.

Flexural strength test specimens shall be prepared in accordance with ASTM C192 and tested in accordance with ASTM C78. At the start of the project, the Contractor shall determine an allowable slump as determined by ASTM C143 not to exceed 2 inches for slip-form placement. For fixed-form placement, the slump shall not exceed 3 inches. For hand placement, the slump shall not exceed 4 inches.

The results of the concrete mix shall include a statement giving the maximum nominal coarse aggregate size and the weights and volumes of each ingredient proportioned on a one cubic yard (meter) basis. Aggregate quantities shall be based on the mass in a saturated surface dry condition.

If a change in source(s) is made, or admixtures added or deleted from the mix, a new concrete mix must be submitted to the RPR for approval.

The RPR may request samples at any time for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

**501-3.4 Concrete Mix submittal.** The concrete mix shall be submitted to the RPR at least 30 days prior to the start of operations. The submitted concrete mix shall not be more than 180 days old and must use the materials to be used for production for the project. Production shall not begin until the concrete mix is approved in writing by the RPR.



Each of the submitted concrete mixes (i.e, slip form, side form machine finish and side form hand finish) shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items and quantities as a minimum:

- Certified material test reports for aggregate in accordance with paragraph 501-2.1. Certified reports must include all tests required; reporting each test, test method, test result, and requirement specified (criteria).
- Combined aggregate gradations and analysis; and including plots of the fine aggregate fineness modulus.
- Reactivity Test Results.
- Coarse aggregate quality test results, including deleterious materials.
- Fine aggregate quality test results, including deleterious materials.
- Mill certificates for cement and supplemental cementitious materials.
- Certified test results for all admixtures, including Lithium Nitrate if applicable.
- Specified flexural strength, slump, and air content.
- Recommended proportions/volumes for proposed mixture and trial water-cementitious materials ratio, including actual slump and air content.
- Flexural and compressive strength summaries and plots, including all individual beam and cylinder breaks.
- Correlation ratios for acceptance testing and Contractor QC testing, when applicable.
- Historical record of test results documenting production standard deviation, when applicable.
- Alkali loading contributed by the cement per cubic yard, calculated in accordance with EB XXX.

#### **501-3.5 Cementitious materials.**

**a. Fly ash.** When fly ash is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If fly ash is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

**b. Slag cement (ground granulated blast furnace (GGBF)).** Slag cement may be used. The slag cement, or slag cement plus fly ash if both are used, may constitute between 25 to 55% of the total cementitious material by weight.

**c. Raw or calcined natural pozzolan.** Natural pozzolan may be used in the concrete mix. When pozzolan is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If pozzolan is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

#### **501-3.6 Admixtures.**

**a. Air-entraining admixtures.** Air-entraining admixture are to be added in such a manner that will ensure uniform distribution of the agent throughout the batch. The air content of freshly mixed air-entrained concrete shall be based upon trial mixes with the materials to be used in the work adjusted to produce concrete of the required plasticity and workability. The percentage of air in the mix shall be 4.5%. Air content shall be determined by testing in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag and other highly porous coarse aggregate.



**b. Water-reducing admixtures.** Water-reducing admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted with the materials to be used in the work, in accordance with ASTM C494.

**c. Other admixtures.** Set controlling, and other approved admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted with the materials to be used in the work, in accordance with ASTM C494.

**d. Lithium nitrate.** Lithium nitrate shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements in accordance with paragraph 501-2.10d.

## CONSTRUCTION METHODS

**501-4.1 Control Strip.** ~~The control strip(s) shall be to the next planned joint after the initial 250 feet of each type of pavement construction (slip-form pilot lane, slip-form fill-in lane, or fixed form). The Contractor shall demonstrate, in the presence of the RPR, that the materials, concrete mix, equipment, construction processes, and quality control processes meet the requirements of the specifications. The concrete mixture shall be extruded from the paver meeting the edge slump tolerance and with little or no finishing. Pilot, fill-in, and fixed-form control strips will be accepted separately. Minor adjustments to the mix design may be required to place an acceptable control strip. The production mix will be the adjusted mix design used to place the acceptable control strip. Upon acceptance of the control strip by the RPR, the Contractor must use the same equipment, materials, and construction methods for the remainder of concrete paving. Any adjustments to processes or materials must be approved in advance by the RPR. Acceptable control strips will meet edge slump tolerance and surface acceptable with little or no finishing, air content within action limits, strength equal or greater than requirements of 501-3.3. The control strip will be considered one lot for payment (no sublots required for control strip). Payment will only be made for an acceptable control strip in accordance with paragraph 501-8.1 using a lot pay factor equal to 100.~~

**501-4.2 Equipment.** The Contractor is responsible for the proper operation and maintenance of all equipment necessary for handling materials and performing all parts of the work to meet this specification.

**a. Plant and equipment.** The plant and mixing equipment shall conform to the requirements of ASTM C94 and/or ASTM C685. Each truck mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades. The truck mixers shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4 inch or more. The Contractor shall have a copy of the manufacturer's design on hand showing dimensions and arrangement of blades in reference to original height and depth.

Equipment for transferring and spreading concrete from the transporting equipment to the paving lane in front of the finishing equipment shall be provided. The equipment shall be specially manufactured, self-propelled transfer equipment which will accept the concrete outside the paving lane and will spread it evenly across the paving lane in front of the paver and strike off the surface evenly to a depth which permits the paver to operate efficiently.

### **b. Finishing equipment.**

**(1) Slip-form.** The standard method of constructing concrete pavements shall be with an approved slip-form paving equipment designed and operated to spread, consolidate, screed, and finish the freshly placed concrete in one complete pass of the machine so that the end result is a dense and homogeneous pavement which is achieved with a minimum of hand finishing. The paver-finisher shall be a heavy duty, self-propelled machine designed specifically for paving and finishing high quality concrete pavements.



**(2) Fixed-form.** On projects requiring less than 10,000 cubic yard of concrete pavement or irregular areas at locations inaccessible to slip-form paving equipment, concrete pavement may be placed with equipment specifically designed for placement and finishing using stationary side forms. Methods and equipment shall be reviewed and accepted by the RPR. Hand screeding and float finishing may only be used on small irregular areas as allowed by the RPR.

**c. Vibrators.** Vibrator shall be the internal type. The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without segregation or voids. The number, spacing, and frequency shall be as necessary to provide a dense and homogeneous pavement and meet the recommendations of American Concrete Institute (ACI) 309R, Guide for Consolidation of Concrete. Adequate power to operate all vibrators shall be available on the paver. The vibrators shall be automatically controlled so that they shall be stopped as forward motion ceases. The Contractor shall provide an electronic or mechanical means to monitor vibrator status. The checks on vibrator status shall occur a minimum of two times per day or when requested by the RPR.

Hand held vibrators may only be used in irregular areas and shall meet the recommendations of ACI 309R, Guide for Consolidation of Concrete.

**d. Concrete saws.** The Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions. The Contractor shall provide at least one standby saw in good working order and a supply of saw blades at the site of the work at all times during sawing operations.

**e. Fixed forms.** Straight side fixed forms shall be made of steel and shall be furnished in sections not less than 10 feet in length. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms with battered top surfaces and bent, twisted or broken forms shall not be used. Built-up forms shall not be used, except as approved by the RPR. The top face of the form shall not vary from a true plane more than 1/8 inch in 10 feet, and the upstanding leg shall not vary more than 1/4 inch. The forms shall contain provisions for locking the ends of abutting sections together tightly for secure setting. Wood forms may be used under special conditions, when approved by the RPR. The forms shall extend the full depth of the pavement section.

**501-4.3 Form setting.** Forms shall be set to line and grade as shown on the plans, sufficiently in advance of the concrete placement, to ensure continuous paving operation. Forms shall be set to withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the concrete placement.

**501-4.4 Base surface preparation prior to placement.** Any damage to the prepared base, subbase, and subgrade shall be corrected full depth by the Contractor prior to concrete placement. The underlying surface shall be entirely free of frost when concrete is placed. The prepared grade shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from concrete. Bond breaker shall be applied in accordance with 501-2.12.

**501-4.5 Handling, measuring, and batching material.** Aggregate stockpiles shall be constructed and managed in such a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the concrete batch plant. Aggregates that have become segregated or mixed with earth or foreign material shall not be used. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled or binned for draining at least 12 hours before being batched. Store and maintain all aggregates at a uniform moisture content prior to use. A continuous supply of materials shall be provided to the work to ensure continuous placement.

**501-4.6 Mixing concrete.** The concrete may be mixed at the work site, in a central mix plant or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials are placed into the drum until the drum is emptied into the truck. All concrete shall be mixed and delivered to the site in accordance with the requirements of ASTM C94 or ASTM C685.



Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or non-agitating trucks. The elapsed time from the addition of cementitious material to the mix until the concrete is discharged from the truck should not exceed **45** minutes when the concrete is hauled in non-agitating trucks, nor 90 minutes when the concrete is hauled in truck mixers or truck agitators. In no case shall the temperature of the concrete when placed exceed 90°F. Retempering concrete by adding water or by other means will not be permitted. With transit mixers additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements provided the addition of water is performed within 45 minutes after the initial mixing operations and provided the water/cementitious ratio specified is not exceeded.

**501-4.7 Weather Limitations on mixing and placing.** No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

**a. Cold weather.** Unless authorized in writing by the RPR, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40°F and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F.

The aggregate shall be free of ice, snow, and frozen lumps before entering the mixer. The temperature of the mixed concrete shall not be less than 50°F at the time of placement. Concrete shall not be placed on frozen material nor shall frozen aggregates be used in the concrete.

When concreting is authorized during cold weather, water and/or the aggregates may be heated to not more than 150°F. The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials.

Curing during cold weather shall be in accordance with paragraph 501-4.13d.

**b. Hot weather.** During periods of hot weather when the maximum daily air temperature exceeds 85°F, the following precautions shall be taken.

The forms and/or the underlying surface shall be sprinkled with water immediately before placing the concrete. The concrete shall be placed at the coolest temperature practicable, and in no case shall the temperature of the concrete when placed exceed 90°F. The aggregates and/or mixing water shall be cooled as necessary to maintain the concrete temperature at or not more than the specified maximum.

The concrete placement shall be protected from exceeding an evaporation rate of 0.2 per hour. When conditions are such that problems with plastic cracking can be expected, and particularly if any plastic cracking begins to occur, the Contractor shall immediately take such additional measures as necessary to protect the concrete surface. If the Contractor's measures are not effective in preventing plastic cracking, paving operations shall be immediately stopped.

Curing during hot weather shall be in accordance with paragraph 501-4.13e.

**c. Temperature management program.** Prior to the start of paving operation for each day of paving, the Contractor shall provide the RPR with a Temperature Management Program for the concrete to be placed to assure that uncontrolled cracking is avoided. (Federal Highway Administration HIPERPAV 3 is one example of a temperature management program.) As a minimum, the program shall address the following items:

(1) Anticipated tensile strains in the fresh concrete as related to heating and cooling of the concrete material.

(2) Anticipated weather conditions such as ambient temperatures, wind velocity, and relative humidity; and anticipated evaporation rate using Figure 19-9, PCA, Design and Control of Concrete Mixtures.

(3) Anticipated timing of initial sawing of joint.

(4) Anticipated number and type of saws to be used.



d. **Rain.** The Contractor shall have available materials for the protection of the concrete during inclement weather. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils (0.1 mm) thick of sufficient length and width to cover the plastic concrete slab and any edges. The sheeting may be mounted on either the paver or a separate movable bridge from which it can be unrolled without dragging over the plastic concrete surface. When rain appears imminent, all paving operations shall stop and all available personnel shall begin covering the surface of the unhardened concrete with the protective covering.

**501-4.8 Concrete Placement.** At any point in concrete conveyance, the free vertical drop of the concrete from one point to another or to the underlying surface shall not exceed 3 feet. The finished concrete product must be dense and homogeneous, without segregation and conforming to the standards in this specification. Backhoes and grading equipment shall not be used to distribute the concrete in front of the paver. Front end loaders will not be used. All concrete shall be consolidated without voids or segregation, including under and around all load-transfer devices, joint assembly units, and other features embedded in the pavement. Hauling equipment or other mechanical equipment can be permitted on adjoining previously constructed pavement when the concrete strength reaches a flexural strength of 550 psi, based on the average of four field cured specimens per ~~2,000~~ 4,000 cubic yards concrete placed. The Contractor must determine that the above minimum strengths are adequate to protect the pavement from overloads due to the construction equipment proposed for the project.

The Contractor shall have available materials for the protection of the concrete during cold, hot and/or inclement weather in accordance with paragraph 501-4.7.

a. **Slip-form construction.** The concrete shall be distributed uniformly into final position by a self-propelled slip-form paver without delay. The alignment and elevation of the paver shall be regulated from outside reference lines established for this purpose. The paver shall vibrate the concrete for the full width and depth of the strip of pavement being placed and the vibration shall be adequate to provide a consistency of concrete that will stand normal to the surface with sharp well-defined edges. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms. The plastic concrete shall be effectively consolidated by internal vibration with transverse vibrating units for the full width of the pavement and/or a series of equally placed longitudinal vibrating units. The space from the outer edge of the pavement to longitudinal unit shall not exceed 9 feet for slip form and at the end of the dowels for the fill-in lanes. The spacing of internal units shall be uniform and shall not exceed 18 inches.

The term internal vibration means vibrating units located within the specified thickness of pavement section.

The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without, segregation, voids, or vibrator trails and the amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete along the entire length of the vibrating unit and for a distance of at least one foot. The frequency of vibration or amplitude should be adjusted proportionately with the rate of travel to result in a uniform density and air content. The paving machine shall be equipped with a tachometer or other suitable device for measuring and indicating the actual frequency of vibrations.

The concrete shall be held at a uniform consistency. The slip-form paver shall be operated with as nearly a continuous forward movement as possible and all operations of mixing, delivering, and spreading concrete shall be coordinated to provide uniform progress with stopping and starting of the paver held to a minimum. If for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately. No tractive force shall be applied to the machine, except that which is controlled from the machine.

When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement shall be equipped with protective pads on crawler tracks or rubber-tired wheels on which the bearing surface is offset to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.



Not more than 15% of the total free edge of each 500-foot segment of pavement, or fraction thereof, shall have an edge slump exceeding 1/4 inch, and none of the free edge of the pavement shall have an edge slump exceeding 3/8 inch. (The total free edge of 500 feet of pavement will be considered the cumulative total linear measurement of pavement edge originally constructed as nonadjacent to any existing pavement; that is, 500 feet of paving lane originally constructed as a separate lane will have 1,000 feet of free edge, 500 feet of fill-in lane will have no free edge, etc.). The area affected by the downward movement of the concrete along the pavement edge shall be limited to not more than 18 inches from the edge.

When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump will be removed the full width of the slip form lane and replaced at the expense of the Contractor as directed by the RPR.

**b. Fixed-form construction.** Forms shall be drilled in advance of being placed to line and grade to accommodate tie bars / dowel bars where these are specified.

Immediately in advance of placing concrete and after all subbase operations are completed, side forms shall be trued and maintained to the required line and grade for a distance sufficient to prevent delay in placing.

Side forms shall remain in place at least 12 hours after the concrete has been placed, and in all cases until the edge of the pavement no longer requires the protection of the forms. Curing compound shall be applied to the concrete immediately after the forms have been removed.

Side forms shall be thoroughly cleaned and coated with a release agent each time they are used and before concrete is placed against them.

Concrete shall be spread, screed, shaped and consolidated by one or more self-propelled machines. These machines shall uniformly distribute and consolidate concrete without segregation so that the completed pavement will conform to the required cross-section with a minimum of handwork.

The number and capacity of machines furnished shall be adequate to perform the work required at a rate equal to that of concrete delivery. The equipment must be specifically designed for placement and finishing using stationary side forms. Methods and equipment shall be reviewed and accepted by the RPR.

Concrete for the full paving width shall be effectively consolidated by internal vibrators. The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without segregation, voids, or leaving vibrator trails.

Power to vibrators shall be connected so that vibration ceases when forward or backward motion of the machine is stopped.

**c. Consolidation.** Concrete shall be consolidated with the specified type of lane-spanning, gang-mounted, mechanical, immersion type vibrating equipment mounted in front of the paver, supplemented, in rare instances as specified, by hand-operated vibrators. The vibrators shall be inserted into the concrete to a depth that will provide the best full-depth consolidation but not closer to the underlying material than 2 inches. Vibrators shall not be used to transport or spread the concrete. For each paving train, at least one additional vibrator spud, or sufficient parts for rapid replacement and repair of vibrators shall be maintained at the paving site at all times. Any evidence of inadequate consolidation (honeycomb along the edges, large air pockets, or any other evidence) or over-consolidation (vibrator trails, segregation, or any other evidence) shall require the immediate stopping of the paving operation and adjustment of the equipment or procedures as approved by the RPR.

If a lack of consolidation of the hardened concrete is suspected by the RPR, referee testing may be required. Referee testing of hardened concrete will be performed by the RPR by cutting cores from the finished pavement after a minimum of 24 hours curing. The RPR shall visually examine the cores for evidence of lack of consolidation. Density determinations will be made by the RPR based on the water content of the core as taken. ASTM C642 shall be used for the determination of core density in the



saturated-surface dry condition. When required, referee cores will be taken at the minimum rate of one for each 500 cubic yards of pavement, or fraction. The Contractor shall be responsible for all referee testing cost if they fail to meet the required density.

The average density of the cores shall be at least 97% of the original concrete mix density, with no cores having a density of less than 96% of the original concrete mix density. Failure to meet the referee tests will be considered evidence that the minimum requirements for vibration are inadequate for the job conditions. Additional vibrating units or other means of increasing the effect of vibration shall be employed so that the density of the hardened concrete conforms to the above requirements.

**501-4.9 Strike-off of concrete and placement of reinforcement.** Following the placing of the concrete, it shall be struck off to conform to the cross-section shown on the plans and to an elevation that when the concrete is properly consolidated and finished, the surface of the pavement shall be at the elevation shown on the plans. When reinforced concrete pavement is placed in two layers, the bottom layer shall be struck off to such length and depth that the sheet of reinforcing steel fabric or bar mat may be laid full length on the concrete in its final position without further manipulation. The reinforcement shall then be placed directly upon the concrete, after which the top layer of the concrete shall be placed, struck off, and screed. If any portion of the bottom layer of concrete has been placed more than 30 minutes without being covered with the top layer or if initial set has taken place, it shall be removed and replaced with freshly mixed concrete at the Contractor's expense. When reinforced concrete is placed in one layer, the reinforcement may be positioned in advance of concrete placement or it may be placed in plastic concrete by mechanical or vibratory means after spreading.

Reinforcing steel, at the time concrete is placed, shall be free of mud, oil, or other organic matter that may adversely affect or reduce bond. Reinforcing steel with rust, mill scale or a combination of both will be considered satisfactory, provided the minimum dimensions, weight, and tensile properties of a hand wire-brushed test specimen are not less than the applicable ASTM specification requirements.

**501-4.10 Joints.** Joints shall be constructed as shown on the plans and in accordance with these requirements. All joints shall be constructed with their faces perpendicular to the surface of the pavement and finished or edged as shown on the plans. Joints shall not vary more than 1/2-inch from their designated position and shall be true to line with not more than 1/4-inch variation in 10 feet. The surface across the joints shall be tested with a 12-foot straightedge as the joints are finished and any irregularities in excess of 1/4 inch shall be corrected before the concrete has hardened. All joints shall be so prepared, finished, or cut to provide a groove of uniform width and depth as shown on the plans.

**a. Construction.** Longitudinal construction joints shall be slip-formed or formed against side forms as shown in the plans.

Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for more than 30 minutes or it appears that the concrete will obtain its initial set before fresh concrete arrives. The installation of the joint shall be located at a planned contraction or expansion joint. If placing of the concrete is stopped, the Contractor shall remove the excess concrete back to the previous planned joint.

**b. Contraction.** Contraction joints shall be installed at the locations and spacing as shown on the plans. Contraction joints shall be installed to the dimensions required by forming a groove or cleft in the top of the slab while the concrete is still plastic or by sawing a groove into the concrete surface after the concrete has hardened. When the groove is formed in plastic concrete the sides of the grooves shall be finished even and smooth with an edging tool. If an insert material is used, the installation and edge finish shall be according to the manufacturer's instructions. The groove shall be finished or cut clean so that spalling will be avoided at intersections with other joints. Grooving or sawing shall produce a slot at least 1/8 inch wide and to the depth shown on the plans.

**c. Isolation (expansion).** Isolation joints shall be installed as shown on the plans. The premolded filler of the thickness as shown on the plans, shall extend for the full depth and width of the slab at the joint. The filler shall be fastened uniformly along the hardened joint face with no buckling or debris between the filler



and the concrete interface, including a temporary filler for the sealant reservoir at the top of the slab. The edges of the joint shall be finished and tooled while the concrete is still plastic

**d. Dowels and Tie Bars for Joints**

**(1) Tie bars.** Tie bars shall consist of deformed bars installed in joints as shown on the plans. Tie bars shall be placed at right angles to the centerline of the concrete slab and shall be spaced at intervals shown on the plans. They shall be held in position parallel to the pavement surface and in the middle of the slab depth and within the tolerances in paragraph 501-4.10(f.). When tie bars extend into an unpaved lane, they may be bent against the form at longitudinal construction joints, unless threaded bolt or other assembled tie bars are specified. Tie bars shall not be painted, greased, or enclosed in sleeves. When slip-form operations call for tie bars, two-piece hook bolts can be installed.

**(2) Dowel bars.** Dowel bars shall be placed across joints in the proper horizontal and vertical alignment as shown on the plans. The dowels shall be coated with a bond-breaker or other lubricant recommended by the manufacturer and approved by the RPR. Dowel bars at longitudinal construction joints shall be bonded in drilled holes.

**(3) Placing dowels and tie bars.** Horizontal spacing of dowels shall be within a tolerance of  $\pm 3/4$  inch. The vertical location on the face of the slab shall be within a tolerance of  $\pm 1/2$  inch. The method used to install dowels shall ensure that the horizontal and vertical alignment will not be greater than  $1/4$  inch per foot, except for those across the crown or other grade change joints. Dowels across crowns and other joints at grade changes shall be measured to a level surface. Horizontal alignment shall be checked perpendicular to the joint edge. The portion of each dowel intended to move within the concrete or expansion cap shall be wiped clean and coated with a thin, even film of lubricating oil or light grease before the concrete is placed. Dowels shall be installed as specified in the following subparagraphs.

**(a) Contraction joints.** Dowels and tie bars in longitudinal and transverse contraction joints within the paving lane shall be held securely in place by means of rigid metal frames or basket assemblies of an approved type. The basket assemblies shall be held securely in the proper location by means of suitable pins or anchors. Do not cut or crimp the dowel basket tie wires.

At the Contractor's option, dowels and tie bars in contraction joints may be installed by insertion into the plastic concrete using approved equipment and procedures per the paver manufacturer's design. Approval of installation methods will be based on the results of the control strip showing that the dowels and tie bars are installed within specified tolerances as verified by cores or non-destructive rebar location devices approved by the RPR.

**(b) Construction joints.** Install dowels and tie bars by the cast-in-place or the drill-and-dowel method. Installation by removing and replacing in preformed holes will not be permitted. Dowels and tie bars shall be prepared and placed across joints where indicated, correctly aligned, and securely held in the proper horizontal and vertical position during placing and finishing operations, by means of devices fastened to the forms.

**(c) Joints in hardened concrete.** Install dowels in hardened concrete by bonding the dowels into holes drilled into the concrete. The concrete shall have cured for seven (7) days or reached a minimum flexural strength of 450 psi before drilling begins. Holes  $1/8$  inch (3 mm) greater in diameter than the dowels shall be drilled into the hardened concrete using rotary-core drills. Rotary-percussion drills may be used, provided that excessive spalling does not occur. Spalling beyond the limits of the grout retention ring will require modification of the equipment and operation. Depth of dowel hole shall be within a tolerance of  $\pm 1/2$  inch of the dimension shown on the drawings. On completion of the drilling operation, the dowel hole shall be blown out with oil-free, compressed air. Dowels shall be bonded in the drilled holes using epoxy resin. Epoxy resin shall be injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel will not be permitted. The dowels shall be held in alignment at the collar of the hole by means of a suitable metal or plastic grout retention ring fitted around the dowel.

**e. Sawing of joints.** Sawing shall commence, without regard to day or night, as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling, or tearing and before uncontrolled shrinkage cracking of the pavement occurs and shall continue without interruption until all joints have been



sawn. All slurry and debris produced in the sawing of joints shall be removed by vacuuming and washing. Curing compound or system shall be reapplied in the initial saw-cut and maintained for the remaining cure period.

Joints shall be cut in locations as shown on the plans. The initial joint cut shall be a minimum 1/8 inch wide and to the depth shown on the plans. Prior to placement of joint sealant or seals, the top of the joint shall be widened by sawing as shown on the plans.

**501-4.11 Finishing.** Finishing operations shall be a continuing part of placing operations starting immediately behind the strike-off of the paver. Initial finishing shall be provided by the transverse screed or extrusion plate. The sequence of operations shall be transverse finishing, longitudinal machine floating if used, straightedge finishing, edging of joints, and then texturing. Finishing shall be by the machine method. The hand method shall be used only on isolated areas of odd slab widths or shapes and in the event of a breakdown of the mechanical finishing equipment. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Any machine finishing operation which requires appreciable hand finishing, other than a moderate amount of straightedge finishing, shall be immediately stopped and proper adjustments made or the equipment replaced. Equipment, mixture, and/or procedures which produce more than 1/4 inch of mortar-rich surface shall be immediately modified as necessary to eliminate this condition or operations shall cease. Compensation shall be made for surging behind the screeds or extrusion plate and settlement during hardening and care shall be taken to ensure that paving and finishing machines are properly adjusted so that the finished surface of the concrete (not just the cutting edges of the screeds) will be at the required line and grade. Finishing equipment and tools shall be maintained clean and in an approved condition. At no time shall water be added to the surface of the slab with the finishing equipment or tools, or in any other way. Fog (mist) sprays or other surface applied finishing aids specified to prevent plastic shrinkage cracking, approved by the RPR, may be used in accordance with the manufacturers requirements.

**a. Machine finishing with slipform pavers.** The slipform paver shall be operated so that only a very minimum of additional finishing work is required to produce pavement surfaces and edges meeting the specified tolerances. Any equipment or procedure that fails to meet these specified requirements shall immediately be replaced or modified as necessary. A self-propelled non-rotating pipe float may be used while the concrete is still plastic, to remove minor irregularities and score marks. Only one pass of the pipe float shall be allowed. Equipment, mixture, and/or procedures which produce more than 1/4 inch of mortar-rich surface shall be immediately modified as necessary to eliminate this condition or operations shall cease. Remove excessive slurry from the surface with a cutting straightedge and wipe off the edge. Any slurry which does run down the vertical edges shall be immediately removed by hand, using stiff brushes or scrapers. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens.

**b. Machine finishing with fixed forms.** The machine shall be designed to straddle the forms and shall be operated to screed and consolidate the concrete. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

**c. Other types of finishing equipment.** Clary screeds, other rotating tube floats, or bridge deck finishers are not allowed on mainline paving, but may be allowed on irregular or odd-shaped slabs, and near buildings or trench drains, subject to the RPR's approval.

Bridge deck finishers shall have a minimum operating weight of 7500 pounds and shall have a transversely operating carriage containing a knock-down auger and a minimum of two immersion vibrators. Vibrating screeds or pans shall be used only for isolated slabs where hand finishing is permitted as specified, and only where specifically approved.

**d. Hand finishing.** Hand finishing methods will not be permitted, except under the following conditions: (1) in the event of breakdown of the mechanical equipment, hand methods may be used to finish the



concrete already deposited on the grade and (2) in areas of narrow widths or of irregular dimensions where operation of the mechanical equipment is impractical.

**e. Straightedge testing and surface correction.** After the pavement has been struck off and while the concrete is still plastic, it shall be tested for trueness with a 12-foot finishing straightedge swung from handles capable of spanning at least one-half the width of the slab. The straightedge shall be held in contact with the surface in successive positions parallel to the centerline and the whole area gone over from one side of the slab to the other, as necessary. Advancing shall be in successive stages of not more than one-half the length of the straightedge. Any excess water and laitance in excess of 1/8 inch thick shall be removed from the surface of the pavement and wasted. Any depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the smoothness requirements. Straightedge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from the straightedge and until the slab conforms to the required grade and cross-section. The use of long-handled wood floats shall be confined to a minimum; they may be used only in emergencies and in areas not accessible to finishing equipment.

**501-4.12 Surface texture.** The surface of the pavement shall be finished as designated below for all newly constructed concrete pavements. It is important that the texturing equipment not tear or unduly roughen the pavement surface during the operation. The texture shall be uniform in appearance and approximately 1/16 inch (2 mm) in depth. Any imperfections resulting from the texturing operation shall be corrected to the satisfaction of the RPR.

**a. Brush or broom finish.** Shall be applied when the water sheen has practically disappeared. The equipment shall operate transversely across the pavement surface.

**b. Burlap drag finish.** Burlap, at least 15 ounces per square yard, will typically produce acceptable texture. To obtain a textured surface, the transverse threads of the burlap shall be removed approximately one foot from the trailing edge. A heavy buildup of grout on the burlap threads produces the desired wide sweeping longitudinal striations on the pavement surface.

**c. Artificial turf finish.** Not used.

**501-4.13 Curing.** Immediately after finishing operations are completed and bleed water is gone from the surface, all exposed surfaces of the newly placed concrete shall be cured for a 7-day cure period in accordance with one of the methods below. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or lack of water to adequately take care of both curing and other requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than 1/2 hour during the curing period.

When a two-saw-cut method is used to construct the contraction joint, the curing compound shall be applied to the saw-cut immediately after the initial cut has been made. The sealant reservoir shall not be sawed until after the curing period has been completed. When the one cut method is used to construct the contraction joint, the joint shall be cured with wet rope, wet rags, or wet blankets. The rags, ropes, or blankets shall be kept moist for the duration of the curing period.

**a. Impervious membrane method.** Curing with liquid membrane compounds should not occur until bleed and surface moisture has evaporated. All exposed surfaces of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. The curing compound shall not be applied during rainfall. Curing compound shall be applied by mechanical sprayers under pressure at the rate of one gallon to not more than 150 square feet. The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application, the compound shall be stirred continuously by mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. When hand spraying is approved by the RPR, a double application rate shall be used to ensure coverage. Should the film become damaged from any cause, including sawing



operations, within the required curing period, the damaged portions shall be repaired immediately with additional compound or other approved means. Upon removal of side forms, the sides of the exposed slabs shall be protected immediately to provide a curing treatment equal to that provided for the surface.

~~**b. White burlap polyethylene sheets.** The surface of the pavement shall be entirely covered with the sheeting. The sheeting used shall be such length (or width) that it will extend at least twice the thickness of the pavement beyond the edges of the slab. The sheeting shall be placed so that the entire surface and both edges of the slab are completely covered. The sheeting shall be placed and weighted to remain in contact with the surface covered, and the covering shall be maintained fully saturated and in position for seven (7) days after the concrete has been placed.~~

~~**c. Water method.** The entire area shall be covered with burlap or other water absorbing material. The material shall be of sufficient thickness to retain water for adequate curing without excessive runoff. The material shall be kept wet at all times and maintained for seven (7) days. When the forms are stripped, the vertical walls shall also be kept moist. It shall be the responsibility of the Contractor to prevent ponding of the curing water on the subbase.~~

**d. Concrete protection for cold weather.** Maintain the concrete at a temperature of at least 50°F for a period of 72 hours after placing and at a temperature above freezing for the remainder of the 7-day curing period. The Contractor shall be responsible for the quality and strength of the concrete placed during cold weather; and any concrete damaged shall be removed and replaced at the Contractor's expense.

**e. Concrete protection for hot weather.** Concrete should be continuous moisture cured for the entire curing period and shall commence as soon as the surfaces are finished and continue for at least 24 hours. However, if moisture curing is not practical beyond 24 hours, the concrete surface shall be protected from drying with application of a liquid membrane-forming curing compound while the surfaces are still damp. Other curing methods may be approved by the RPR.

**501-4.14 Removing forms.** Unless otherwise specified, forms shall not be removed from freshly placed concrete until it has hardened sufficiently to permit removal without chipping, spalling, or tearing. After the forms have been removed, the sides of the slab shall be cured in accordance with paragraph 501-4.13.

If honeycombed areas are evident when the forms are removed, materials, placement, and consolidation methods must be reviewed and appropriate adjustments made to assure adequate consolidation at the edges of future concrete placements. Honeycombed areas that extend into the slab less than approximately 1 inch, shall be repaired with an approved grout, as directed by the RPR. Honeycombed areas that extend into the slab greater than a depth of 1 inch shall be considered as defective work and shall be removed and replaced in accordance with paragraph 501-4.19.

~~**501-4.15 Saw-cut grooving.** If shown on the plans, grooved surfaces shall be provided in accordance with the requirements of Item P-621.~~

**501-4.16 Sealing joints.** The joints in the pavement shall be sealed in accordance with Item P-605.

**501-4.17 Protection of pavement.** The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's employees and agents until accepted by the RPR. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, crossovers, and protection of unsealed joints from intrusion of foreign material, etc. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at the Contractor's expense.

Aggregates, rubble, or other similar construction materials shall not be placed on airfield pavements. Traffic shall be excluded from the new pavement by erecting and maintaining barricades and signs until the concrete is at least seven (7) days old, or for a longer period if directed by the RPR.

In paving intermediate lanes between newly paved pilot lanes, operation of the hauling and paving equipment will be permitted on the new pavement after the pavement has been cured for seven (7) days,



the joints are protected, the concrete has attained a minimum field cured flexural strength of 450 psi (3100 kPa), and the slab edge is protected.

All new and existing pavement carrying construction traffic or equipment shall be kept clean and spillage of concrete and other materials shall be cleaned up immediately.

Damaged pavements shall be removed and replaced at the Contractor's expense. Slabs shall be removed to the full depth, width, and length of the slab.

**501-4.18 Opening to construction traffic.** The pavement shall not be opened to traffic until test specimens molded and cured in accordance with ASTM C31 have attained a flexural strength of 450 pounds per square inch (3100 kPa) when tested in accordance with ASTM C78. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Prior to opening the pavement to construction traffic, all joints shall either be sealed or protected from damage to the joint edge and intrusion of foreign materials into the joint. As a minimum, backer rod or tape may be used to protect the joints from foreign matter intrusion.

**501-4.19 Repair, removal, or replacement of slabs.** New pavement slabs that are broken or contain cracks or are otherwise defective or unacceptable as defined by acceptance criteria in paragraph 501-6.6 shall be removed and replaced or repaired, as directed by the RPR, at the Contractor's expense. Spalls along joints shall be repaired as specified. Removal of partial slabs is not permitted. Removal and replacement shall be full depth, shall be full width of the slab, and the limit of removal shall be normal to the paving lane and to each original transverse joint. The RPR will determine whether cracks extend full depth of the pavement and may require cores to be drilled on the crack to determine depth of cracking. Such cores shall have a diameter of 2 inches to 4 inches, shall be drilled by the Contractor and shall be filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with a bonding agent, using approved procedures. Drilling of cores and refilling holes shall be at no expense to the Owner. Repair of cracks as described in this section shall not be allowed if in the opinion of the RPR the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of cracks shall be allowed in any panel that demonstrates segregated aggregate with an absence of coarse aggregate in the upper 1/8 inch of the pavement surface.

**a. Shrinkage cracks.** Shrinkage cracks which do not exceed one-third of the pavement depth shall be cleaned and either high molecular weight methacrylate (HMWM) applied; or epoxy resin (Type IV, Grade 1) pressure injected using procedures recommended by the manufacturer and approved by the RPR. Sandblasting of the surface may be required following the application of HMWM to restore skid resistance. Care shall be taken to ensure that the crack is not widened during epoxy resin injection. All epoxy resin injection shall take place in the presence of the RPR. Shrinkage cracks which exceed one-third the pavement depth shall be treated as full depth cracks in accordance with paragraphs 501-4.19b and 501-19c.

**b. Slabs with cracks through interior areas.** Interior area is defined as that area more than 6 inches from either adjacent original transverse joint. The full slab shall be removed and replaced at no cost to the Owner, when there are any full depth cracks, or cracks greater than one-third the pavement depth, that extend into the interior area.

**c. Cracks close to and parallel to joints.** All full-depth cracks within 6 inches either side of the joint and essentially parallel to the original joints, shall be treated as follows.

**(1) Full depth cracks and original joint not cracked.** The full-depth crack shall be treated as the new joint and the original joint filled with an epoxy resin.

**i. Full-depth crack.** The joint sealant reservoir for the crack shall be formed by sawing to a depth of 3/4 inches,  $\pm 1/16$  inch, and to a width of 5/8 inch,  $\pm 1/8$  inch. The crack shall be sawed with equipment specially designed to follow random cracks. Any equipment or procedure which causes raveling or spalling along the crack shall be modified or replaced to prevent raveling or spalling. The joint shall be sealed with sealant in accordance with P-605 or as directed by the RPR.



**ii. Original joint.** If the original joint sealant reservoir has been sawed out, the reservoir and as much of the lower saw cut as possible shall be filled with epoxy resin, Type IV, Grade 2, thoroughly tooled into the void using approved procedures.

If only the original narrow saw cut has been made, it shall be cleaned and pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures.

Where a parallel crack goes part way across paving lane and then intersects and follows the original joint which is cracked only for the remained of the width, it shall be treated as specified above for a parallel crack, and the cracked original joint shall be prepared and sealed as originally designed.

**(2) Full depth cracks and original joint cracked.** If there is any place in the lane width where a parallel crack and a cracked portion of the original joint overlap, the entire slab containing the crack shall be removed and replaced.

**d. Removal and replacement of full slabs.** Make a full depth cut perpendicular to the slab surface along all edges of the slab with a concrete saw cutting any dowels or tie-bars. Remove damaged slab protecting adjacent pavement from damage. Damage to adjacent slabs may result in removal of additional slabs as directed by the RPR at the Contractor's expense.

The underlying material shall be repaired, re-compacted and shaped to grade.

Dowels of the size and spacing specified for other joints in similar pavement on the project shall be installed along all four (4) edges of the new slab in accordance with paragraph 501-4.10d.

Placement of concrete shall be as specified for original construction. The joints around the new slab shall be prepared and sealed as specified for original construction.

**e. Spalls along joints.**

**(1)** Spalls less than one inch wide and less than the depth of the joint sealant reservoir, shall be filled with joint sealant material.

**(2)** Spalls larger than one inch and/or deeper than the joint reservoir, but less than ½ the slab depth, and less than 25% of the length of the adjacent joint shall be repaired as follows:

**i.** Make a vertical saw cut at least one inch (25 mm) outside the spalled area and to a depth of at least 2 inches (50 mm). Saw cuts shall be straight lines forming rectangular areas surrounding the spalled area.

**ii.** Remove unsound concrete and at least 1/2 inch (12 mm) of visually sound concrete between the saw cut and the joint or crack with a light chipping hammer.

**iii.** Clean cavity with high-pressure water jets supplemented with compressed air as needed to remove all loose material.

**iv.** Apply a prime coat of epoxy resin, Type III, Grade I, to the dry, cleaned surface of all sides and bottom of the cavity, except any joint face.

**v.** Fill the cavity with low slump concrete or mortar or with epoxy resin concrete or mortar.

**vi.** An insert or other bond-breaking medium shall be used to prevent bond at all joint faces.

**vii.** A reservoir for the joint sealant shall be sawed to the dimensions required for other joints, or as required to be routed for cracks. The reservoir shall be thoroughly cleaned and sealed with the sealer specified for the joints.

**(3)** Spalls deeper than 1/2 of the slab depth or spalls longer than 25% of the adjacent joint require replacement of the entire slab.

**f. Diamond grinding of Concrete surfaces.** Diamond grinding shall be completed prior to pavement grooving. Diamond grinding of the hardened concrete should not be performed until the concrete is at least 14 days old and has achieved full minimum strength. Equipment that causes ravels, aggregate fractures, spalls or disturbance to the joints will not be permitted. The depth of diamond grinding shall not exceed ½ inch and all areas in which diamond grinding has been performed will be subject to the final pavement thickness tolerances specified.



Diamond grinding shall be performed with a machine specifically designed for diamond grinding capable of cutting a path at least 3 feet wide. The saw blades shall be 1/8-inch wide with sufficient number of flush cut blades that create grooves between 0.090 and 0.130 inches wide; and peaks and ridges approximately 1/32 inch higher than the bottom of the grinding cut. The Contractor shall determine the number and type of blades based on the hardness of the aggregate. Contractor shall demonstrate to the RPR that the grinding equipment will produce satisfactory results prior to making corrections to surfaces.

Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The slurry resulting from the grinding operation shall be continuously removed and the pavement left in a clean condition. All grinding shall be at the expense of the Contractor.

*g. Pavement crack repairs on existing pavement shall be repaired in accordance with this specification and the plan details. Locations of these repairs shall be determined by the RPR in the field.*

### **CONTRACTOR QUALITY CONTROL (CQC)**

**501-5.1 Quality control program.** The Contractor shall develop a Quality Control Program in accordance with Item C-100. No partial payment will be made for materials that are subject to specific quality control requirements without an approved quality control program.

**501-5.2 Contractor Quality Control (CQC).** The Contractor shall provide or contract for testing facilities in accordance with Item C-100. The RPR shall be permitted unrestricted access to inspect the Contractor's QC facilities and witness QC activities. The RPR will advise the Contractor in writing of any noted deficiencies concerning the QC facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

**501-5.3 Contractor QC testing.** The Contractor shall perform all QC tests necessary to control the production and construction processes applicable to this specification [ ] and as set forth in the CQCP. The testing program shall include, but not necessarily be limited to, tests for aggregate gradation, aggregate moisture content, slump, and air content. A QC Testing Plan shall be developed and approved by the RPR as part of the CQCP.

The RPR may at any time, notwithstanding previous plant acceptance, reject and require the Contractor to dispose of any batch of concrete mixture which is rendered unfit for use due to contamination, segregation, or improper slump. Such rejection may be based on only visual inspection. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the RPR, and if it can be demonstrated in the laboratory, in the presence of the RPR, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

#### **a. Fine aggregate.**

**(1) Gradation.** A sieve analysis shall be made at least twice daily in accordance with ASTM C136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

**(2) Moisture content.** If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C70 or ASTM C566.

**(3) Deleterious substances.** Fine aggregate as delivered to the mixer shall be tested for deleterious substances in fine aggregate for concrete as specified in paragraph 501-2.1b, prior to production of the control strip, and a minimum of every 30-days during production or more frequently as necessary to control deleterious substances.

#### **b. Coarse Aggregate.**



**(1) Gradation.** A sieve analysis shall be made at least twice daily for each size of aggregate. Tests shall be made in accordance with ASTM C136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

**(2) Moisture content.** If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C566.

**(3) Deleterious substances.** Coarse aggregate as delivered to the mixer shall be tested for deleterious substances in coarse aggregate for concrete as specified in paragraph 501-2.1c, prior to production of the control strip, and a minimum of every 30-days during production or more frequently as necessary to control deleterious substances.

**c. Slump.** One test shall be made for each subplot. Slump tests shall be performed in accordance with ASTM C143 from material randomly sampled from material discharged from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

**d. Air content.** One test shall be made for each subplot. Air content tests shall be performed in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag or other porous coarse aggregate, from material randomly sampled from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

**e. Unit weight and Yield.** One test shall be made for each subplot. Unit weight and yield tests shall be in accordance with ASTM C138. The samples shall be taken in accordance with ASTM C172 and at the same time as the air content tests.

**f. Temperatures.** Temperatures shall be checked at least four times per lot at the job site in accordance with ASTM C1064.

**g. Smoothness for Contractor Quality Control.**

The Contractor shall perform smoothness testing in transverse and longitudinal directions daily to verify that the construction processes are producing pavement with variances less than ¼ inch in 12 feet, identifying areas that may pond water which could lead to hydroplaning of aircraft. If the smoothness criteria is not met, appropriate changes and corrections to the construction process shall be made by the Contractor before construction continues

The Contractor may use a 12-foot straightedge, a rolling inclinometer meeting the requirements of ASTM E2133, or rolling external reference device that can simulate a 12-foot straightedge approved by the RPR. Straight-edge testing shall start with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. Testing shall be continuous across all joints. The surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between the two high points. If the rolling inclinometer or external reference device is used, the data may be evaluated using either the FAA profile program, ProFAA, or FHWA profile program ProVal, using the 12-foot straightedge simulation function.

Smoothness readings shall not be made across grade changes or cross slope transitions. The transition between new and existing pavement shall be evaluated separately for conformance with the plans.

**(1) Transverse measurements.** Transverse measurements shall be taken for each day's production placed. Transverse measurements shall be taken perpendicular to the pavement centerline each 50 feet or more often as determined by the RPR. The joint between lanes shall be tested separately to facilitate smoothness between lanes.

**(2) Longitudinal measurements.** Longitudinal measurements shall be taken for each day's production placed. Longitudinal tests shall be parallel to the centerline of paving; at the center of paving



lanes when widths of paving lanes are less than 20 feet; and at the third points of paving lanes when widths of paving lanes are 20 ft or greater. When placement abuts previously placed material the first measurement shall start with one half the length of the straight edge on the previously placed material.

Deviations on the final surface course in either the transverse or longitudinal direction that will trap water greater than 1/4 inch shall be corrected with diamond grinding per paragraph 501-4.19f or by removing and replacing the surface course to full depth. Grinding shall be tapered in all directions to provide smooth transitions to areas not requiring grinding. All areas in which diamond grinding has been performed shall be subject to the final pavement thickness tolerances specified in paragraph 501-6.6.

Control charts shall be kept to show area of each day's placement and the percentage of corrective grinding required. Corrections to production and placement shall be initiated when corrective grinding is required. If the Contractor's machines and/or methods produce significant areas that need corrective actions in excess of 10 percent of a day's production, production shall be stopped until corrective measures are implemented by the Contractor.

**h. Grade.** Grade will be evaluated prior to and after placement of the concrete surface.

Measurements will be taken at appropriate gradelines (as a minimum at center and edges of paving lane) and longitudinal spacing as shown on cross-sections and plans. The final surface of the pavement will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch vertically. The documentation will be provided by the Contractor to the RPR by the end of the following working day.

Areas with humps or depression that exceed grade or smoothness and that retain water on the surface must be ground off provided the course thickness after grinding is not more than 1/2 inch less than the thickness specified on the plans. If these areas cannot be corrected with grinding then the slabs that are retaining water must be removed and replaced in accordance with paragraph 501-4.19d. Grinding shall be in accordance with paragraph 501-4.19f. All corrections will be at the Contractors expense.

**501-5.4 Control charts.** The Contractor shall maintain linear control charts for fine and coarse aggregate gradation, slump, and air content. The Contractor shall also maintain a control chart plotting the coarseness factor/workability factor from the combined gradations in accordance with paragraph 501-2.1d.

Control charts shall be posted in a location satisfactory to the RPR and shall be kept up to date at all times. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and suspension Limits, or Specification limits, applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a potential problem and the Contractor is not taking satisfactory corrective action, the RPR may halt production or acceptance of the material.

**a. Fine and coarse aggregate gradation.** The Contractor shall record the running average of the last five gradation tests for each control sieve on linear control charts. Superimposed on the control charts shall be the action and suspension limits. Gradation tests shall be performed by the Contractor per ASTM C136. The Contractor shall take at least two samples per lot to check the final gradation. Sampling shall be per ASTM D75 from the flowing aggregate stream or conveyor belt.

**b. Slump and air content.** The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for slump and air content in accordance with the following Action and Suspension Limits.

**c. Combined gradation.** The Contractor shall maintain a control chart plotting the coarseness factor and workability factor on a chart in accordance with paragraph 501-2.1d.



**Control Chart Limits<sup>1</sup>**

Control Parameter	Individual Measurements	
	Action Limit	Suspension Limit
Gradation <sup>2</sup>	*3	*3
Coarseness Factor (CF)	±3.5	±5
Workability Factor (WF)	±2	±3
Slump	+0.5 to -1 inch (+13 to -25 mm)	+1 to -1.5 inch (+25 to -38 mm)
Air Content	±1.5%	±2.0%

<sup>1</sup> Control charts shall developed and maintained for each control parameter indicated.

<sup>2</sup> Control charts shall be developed and maintained for each sieve size.

<sup>3</sup> Action and suspension limits shall be determined by the Contractor.

**501-5.5 Corrective action at Suspension Limit.** The CQCP shall indicate that appropriate action shall be taken when the process is believed to be out of control. The CQCP shall detail what action will be taken to bring the process into control and shall contain sets of rules to gauge when a process is out of control. As a minimum, a process shall be deemed out of control and corrective action taken if any one of the following conditions exists.

**a.** Fine and coarse aggregate gradation. When two consecutive averages of five tests are outside of the suspension limits, immediate steps, including a halt to production, shall be taken to correct the grading.

**b.** Coarseness and Workability factor. When the CF or WF reaches the applicable suspension limits, the Contractor, immediate steps, including a halt to production, shall be taken to correct the CF and WF.

**c.** Fine and coarse aggregate moisture content. Whenever the moisture content of the fine or coarse aggregate changes by more than 0.5%, the scale settings for the aggregate batcher and water batcher shall be adjusted.

**d.** Slump. The Contractor shall halt production and make appropriate adjustments whenever:

(1) one point falls outside the Suspension Limit line for individual measurements

OR

(2) two points in a row fall outside the Action Limit line for individual measurements.

**e.** Air content. The Contractor shall halt production and adjust the amount of air-entraining admixture whenever:

(1) one point falls outside the Suspension Limit line for individual measurements

OR

(2) two points in a row fall outside the Action Limit line for individual measurements.

**MATERIAL ACCEPTANCE**

**501-6.1 Quality Assurance (QA) Acceptance sampling and testing.** All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section, with the exception of coring for thickness determination, will be performed by the RPR. The Contractor shall provide adequate facilities for the initial curing of beams. The Contractor shall bear the cost of providing initial curing facilities and coring and filling operations, per paragraph 501-6.5b(1).



The samples will be transported while in the molds. The curing, except for the initial cure period, will be accomplished using the immersion in saturated lime water method. During the 24 hours after molding, the temperature immediately adjacent to the specimens must be maintained in the range of 60° to 80°F, and loss of moisture from the specimens must be prevented. The specimens may be stored in tightly constructed wooden boxes, damp sand pits, temporary buildings at construction sites, under wet burlap in favorable weather, or in heavyweight closed plastic bags, or using other suitable methods, provided the temperature and moisture loss requirements are met.

**501-6.2 Quality Assurance (QA) testing laboratory.** Quality assurance testing organizations performing these acceptance tests will be accredited in accordance with ASTM C1077. The quality assurance laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods will be submitted to the RPR prior to start of construction.

**501-6.3 Lot size.** Concrete will be accepted for strength and thickness on a lot basis. A lot will consist of a day's production not to 4,000 square yards. Each lot will be divided into approximately equal sublots with individual sublots between 400 to 1,200 square yards. Where three sublots are produced, they will constitute a lot. Where one or two sublots are produced, they will be incorporated into the previous or next lot. Where more than one plant is simultaneously producing concrete for the job, the lot sizes will apply separately for each plant.

**501-6.4 Partial lots.** When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot or for overages or minor placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

Where three sublots have been produced, they will constitute a lot. Where one or two sublots have been produced, they will be incorporated into the next lot or the previous lot and the total number of sublots will be used in the acceptance criteria calculation, that is,  $n=5$  or  $n=6$ .

#### **501-6.5 Acceptance Sampling and Testing.**

##### **a. Strength.**

**(1) Sampling.** One sample will be taken for each subplot from the concrete delivered to the job site. Sampling locations will be determined by the RPR in accordance with random sampling procedures contained in ASTM D3665. The concrete will be sampled in accordance with ASTM C172.

**(2) Test Specimens.** The RPR will be responsible for the casting, initial curing, transportation, and curing of specimens in accordance with ASTM C31. Two (2) specimens will be made from each sample and slump, air content, unit weight, and temperature tests will be conducted for each set of strength specimens. Within 24 to 48 hours, the samples will be transported from the field to the laboratory while in the molds. Samples will be cured in saturated lime water.

The strength of each specimen will be determined in accordance with ASTM C78. The strength for each subplot will be computed by averaging the results of the two test specimens representing that subplot.

**(3) Acceptance.** Acceptance of pavement for strength will be determined by the RPR in accordance with paragraph 501-6.6b(1). All individual strength tests within a lot will be checked for outliers in accordance with ASTM E178, at a significance level of 5%. Outliers will be discarded and the remaining test values will be used to determine acceptance in accordance with paragraph 501-6.5b.

##### **b. Pavement thickness.**

**(1) Sampling.** One core will be taken by the Contractor for each subplot in the presence of the RPR. Sampling locations will be determined by the RPR in accordance with random sampling procedures contained in ASTM D3665. Areas, such as thickened edges, with planned variable thickness, will be excluded from sample locations.



Cores shall be a minimum 4 inch in diameter neatly cut with a core drill. The Contractor will furnish all tools, labor, and materials for cutting samples and filling the cored hole. Core holes will be filled by the Contractor with a non-shrink grout approved by the RPR within one day after sampling.

**(2) Testing.** The thickness of the cores will be determined by the RPR by the average caliper measurement in accordance with ASTM C174. Each core shall be photographed and the photograph included with the test report.

**(3) Acceptance.** Acceptance of pavement for thickness will be determined by the RPR in accordance with paragraph 501-6.6.

**501-6.6 Acceptance criteria.**

**a. General.** Acceptance will be based on the following characteristics of the completed pavement discussed in paragraph 501-6.5b:

- (1) Strength
- (2) Thickness
- (3) Grade
- (4) Profilograph smoothness Not Used.
- (5) Adjustments for repairs

Acceptance for strength, thickness, and grade, will be based on the criteria contained in accordance with paragraph 501-6.6b(1), 501-6.6b(2), and 501-6.6b(3), respectively. ~~Acceptance for profilograph smoothness will be based on the criteria contained in paragraph 501-6.6b(4).~~

Production quality must achieve 90 PWL or higher to receive full payment.

Strength and thickness will be evaluated for acceptance on a lot basis using the method of estimating PWL. Production quality must achieve 90 PWL or higher to receive full pavement. The PWL will be determined in accordance with procedures specified in Item C-110.

The lower specification tolerance limit (L) for strength and thickness will be:

**Lower Specification Tolerance Limit (L)**

Strength	$0.93 \times$ strength specified in paragraph 501-3.3
Thickness	Lot Plan Thickness in inches, - 0.50 in

**b. Acceptance criteria.**

**(1) Strength.** If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment for the lot will be determined in accordance with paragraph 501-8.1.

**(2) Thickness.** If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment for the lot will be determined in accordance with paragraph 501-8.1.

**(3) Grade.** The final finished surface of the pavement of the completed project will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch vertically. The documentation, stamped and signed by a licensed surveyor shall be in accordance with paragraph 501-5.3h. Payment for sublots that do not meet grade for over 25% of the subplot shall reduced by 5% and not be more than 95%. *The surveyor shall be provided by the Contractor.*

~~**(4) Profilograph roughness for QA Acceptance.** The final profilograph shall be the full length of the project to facilitate testing of roughness between lots. The Contractor, in the presence of the RPR shall perform a profilograph roughness test on the completed project with a profilograph meeting the~~



requirements of ASTM E1274 or a Class I inertial profiler meeting ASTM E950. Data and results shall be provided within 48 hrs of profilograph roughness tests.

~~The pavement shall have an average profile index less than 15 inches per mile per 1/10 mile. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must grind" bumps and the Profile Index for the pavement using a 0.2-inch blanking band. The bump template must span one inch with an offset of 0.4 inches. The profilograph must be calibrated prior to use and operated by a factory or State DOT approved, trained operator. Profilograms shall be recorded on a longitudinal scale of one inch equals 25 feet and a vertical scale of one inch equals one inch. Profilograph shall be performed one foot right and left of project centerline and 15 feet right and left of project centerline. Any areas that indicate "must grind" shall be corrected with diamond grinding per paragraph 501-4.19f or by removing and replacing full depth of surface course, as directed by the RPR. Where corrections are necessary, a second profilograph run shall be performed to verify that the corrections produced an average profile index of 15 inches per mile per 1/10 mile or less.~~

**(5) Adjustments for repair.** Sublots with spall repairs, crack repairs, or partial panel replacement, will be limited to no more than 95% payment.

**(6) Adjustment for grinding.** For sublots with grinding over 25% of a subplot, payment will be reduced 5%.

#### **METHOD OF MEASUREMENT**

**501-7.1** Concrete pavement shall be measured by the number of square yards of reinforced pavement as specified in-place, completed and accepted.

#### **BASIS OF PAYMENT**

**501-8.1 Payment.** Payment for concrete pavement meeting all acceptance criteria as specified in paragraph 501-6.6. Acceptance Criteria shall be based on results of strength, smoothness, and thickness tests. Payment for acceptable lots of concrete pavement shall be adjusted in accordance with paragraph 501-8.1a for strength and thickness; 501-8.1b for repairs; 501-8.1c for grinding; and 501-8.1d for smoothness, subject to the limitation that:

The total project payment for concrete pavement shall not exceed 100 percent of the product of the contract unit price and the total number of square yards of concrete pavement used in the accepted work (See Note 1 under the Price Adjustment Schedule table below).

Payment shall be full compensation for all labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and on the drawings.

**a. Basis of adjusted payment.** The pay factor for each individual lot shall be calculated in accordance with the Price Adjustment Schedule table below. A pay factor shall be calculated for both strength and thickness. The lot pay factor shall be the higher of the two values when calculations for both strength and thickness are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either strength or thickness is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both strength and thickness are less than 100%.



**Price Adjustment Schedule<sup>1</sup>**

Percentage of Materials Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
96 – 100	106
90 – 95	PWL + 10
75 – 90	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject <sup>2</sup>

<sup>1</sup> Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment in excess of 100% shall be subject to the total project payment limitation specified in paragraph 501-8.1.

<sup>2</sup> The lot shall be removed and replaced unless, after receipt of FAA concurrence, the Owner and Contractor agree in writing that the lot will remain; the lot paid at 50% of the contract unit price; and the total project payment limitation reduced by the amount withheld for that lot.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 501-8.1. Payment in excess of 100% for accepted lots of concrete pavement shall be used to offset payment for accepted lots of concrete pavement that achieve a lot pay factor less than 100%; except for rejected lots which remain in place and/or sublots with adjustments for repairs.

**b. Adjusted payment for repairs.** The PWL lot pay factor shall be reduced by 5% and be no higher than 95% for sublots which contain repairs in accordance with paragraph 501-4.19 on more than 20% of the slabs within the subplot. Payment factors greater than 100 percent for the strength and thickness cannot be used to offset adjustments for repairs.

**c. Adjusted payment for grinding.** The PWL lot pay factor shall be reduced by 5% and be no higher than 95% for sublots with grinding over 25% of a subplot.

**d. Profilograph Roughness.** Not used.

**e. Payment. Payment shall be made under:**

Item P-501-8.1	10" Portland Cement Concrete Pavement– per square yard
Item P-501-8.2	12"-15" Portland Cement Concrete Pavement– per square yard
Item P-501-8.3	15" Portland Cement Concrete Pavement– per square yard
Item P-501-8.4	Concrete Pavement Partial Depth Repair – per square foot
Item P-501-8.5	Concrete Pavement Crack Repair – per linear foot
Item P-501-8.6	Concrete Pavement Crack Repair (Epoxy Injection) – per linear foot
Item P-501-8.7	14"-20" Portland Cement Concrete Pavement – per square yard
Item P-501-8.8	Concrete Joint Seal Repair – 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.



ASTM International (ASTM)

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A884	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A996	Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM A1035	Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A1078	Standard Specification for Epoxy-Coated Steel Dowels for Concrete Pavement
ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
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 C70	Standard Test Method for Surface Moisture in Fine Aggregate
ASTM C78	Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C117	Standard Test Method for Materials Finer than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C123	Standard Test Method for Lightweight Particles in Aggregate



ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C174	Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C227	Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C295	Standard Guide for Petrographic Examination of Aggregates for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland Cement Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregates by Drying
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C642	Standard Test Method for Density, Absorption, and Voids in Hardened Concrete
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C685	Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing



ASTM C881	Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1064	Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1157	Standard Performance Specification for Hydraulic Cement
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1365	Standard Test Method for Determination of the Proportion of Phases in Portland Cement and Portland-Cement Clinker Using X-Ray Powder Diffraction Analysis
ASTM C1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber and Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM E178	Standard Practice for Dealing with Outlying Observations
ASTM E1274	Standard Test Method for Measuring Pavement Roughness Using a Profilograph
ASTM E2133	Standard Test Method for Using a Rolling Inclinator to Measure Longitudinal and Transverse Profiles of a Traveled Surface

American Concrete Institute (ACI)

ACI 305R	Guide to Hot Weather Concreting
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ACI 306R	Guide to Cold Weather Concreting
ACI 309R	Guide for Consolidation of Concrete
Advisory Circulars (AC)	
AC 150/5320-6	Airport Pavement Design and Evaluation
Federal Highway Administration (FHWA)	
HIPERPAV 3, version 3.2	
Portland Concrete Association (PCA)	
PCA	Design and Control of Concrete Mixtures, 16 <sup>th</sup> Edition
U.S. Army Corps of Engineers (USACE) Concrete Research Division (CRD)	
CRD C662	Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar-Bar Method)
United States Air Force Engineering Technical Letter (ETL)	
ETL 97-5	Proportioning Concrete Mixtures with Graded Aggregates for Rigid Airfield Pavements

**END ITEM P-501**



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