AMENDMENT No. 1

REQUEST FOR COMPETITIVE SEALED PROPOSALS
(RFCSP)

PROJECT NAME: WORLD HERITAGE CENTER – RFSCP: #PW071322DH

DATE: August 26, 2022

This amendment is separated into sections for convenience; however, all Respondents, and other parties shall be responsible for reading the entire amendment. The failure to list an item or items in all affected sections of this amendment does not relieve any party affected from performing as per instructions, providing that the information is set forth one time any place in this amendment. These documents shall be attached to and become part of the Contract Documents for this project. The Respondent shall be required to acknowledge the receipt of this amendment.

1. The following changes and/or additions to the Contract Documents, via this amendment, shall apply to submittals made for and to the execution of the various parts of the work affected thereby.
2. Careful note of the Amendment shall be taken by all interested parties and all trades affected shall be fully advised in their performance of the work involved.

GENERAL INFORMATION:

1. Solicitation Dates
    a. REMOVE - Bid Opening Date: Tuesday, August 30, 2022
    b. REPLACE – Bid Opening Date: **Friday, September 2, 2022**

2. Bid Documents revised: (Attached)
    a. REMOVE: Exhibit B- General Wage Decision Number TX20220231-dated 07/08/2022
    b. REPLACE: Exhibit B- General Wage Decision Number TX20220231-dated 8/05/2022

3. Added Language
    a. ADDED: II. SCOPE OF WORK AND GENERAL REQUIREMENTS - All provisions in Respondent's proposal, including any estimated or projected costs, shall remain valid for one-hundred and fifty (150) days following the deadline date for submissions to allow for Council award.

CHANGES TO SPECIFICATIONS/PLANS: (Attached)

1. Sheet A-206 ENLARGED PLANS:
    a. Enlarged Plan 1 was revised to show a new interior elevation tag for HALL 105 south elevation (locker wall).
2. Sheet A-301 REFLECTED CEILING PLAN:
    a. Keynote legend was updated to show missing keynotes.

3. Sheet A-302 REFLECTED CEILING PLAN – ALT. 1:
    a. Keynote legend was updated to show missing keynotes.
4. Sheet A-404 SCREEN PANEL TYPES & DETAILS:
    a. Typical screen panel thickness and Kynar finish information was added.
5. Sheet A-609 WALL DETAILS:
    a. Note "CASING BEAD" at Typ. wainscot coping detail was revised to read "CASING BEAD W/WEEPSCREED".
6. Sheet A-801 INTERIOR ELEVATIONS:
    a. New interior elevation for HALL 105 south wall (locker wall) was added.
7. Sheet S-201 ROOF FRAMING PLAN
    a. Alternate #1 notations added to delineate Base Bid from Alternate #1.
8. Sheet E-301 FLOOR PLAN – ELECTRICAL – LIGHTING:
    a. Floor plan was revised with the correct custom pendant light types.
9. Sheet E-701 ELECTRICAL – ONE LINE DIAGRAM:
    a. LED interior light fixture schedule was revised to include all custom pendant light types.
10. Sheets L0.01 thru L0.04 DEMOLITION TREE PRESERVATION PLAN
    a. Clarifications on Trees to be Relocated. Reference Key. Proposed locations of the Relocated Trees are in the Planting Plan Sheets L4.01-L.404.
11. Spec. Section 102239 FOLDING GLASS-PANEL PARTITIONS:
    a. List of folding glass panel partition manufacturers was updated.
12. Spec. Section 105123 PLASTIC LAMINATE CLAD LOCKERS:
    a. List of approved locker manufacturers was updated.
13. Spec Section 051200 FL – STRUCTURAL STEEL FRAMING
    a. Structural Specification added per request.
14. Requested Geotech Report and Supplement attached.

ADDITIONAL QUESTIONS FROM PROSPECTIVE RESPONDENT:

1. **Question:** Will the GC be reimbursed for Impact fees?

    Response: COSA will be responsible for payment of Impact Fees.

2. **Question:** A-301 A-302 are missing multiple keynote number from the legend.

    Response: The numbers that are skipped or missing from the legend are items that are not used on the final plans, so we omitted them for clarity. Keynote numbers that are in the drawings but missing from the sheet legend are provided in this Addendum #1 revisions.

3. **Question:** E-101 What is the desired size of the concrete transformer pad?

    Response: We anticipate the pad size will be 8'x8'. Final confirmation of this size should be verified with CPS prior to installation.

4. **Question:** E-301 calls out (2) CL2; A-302 call out (1) CL2 and (2) CL3; Which is correct?

    Response: The Architectural Sheet is correct. Refer to Addendum 1 - CHANGES TO SPECIFICATIONS/PLANS revisions to E-301 and E-701.

5. **Question:** There is a specification for window, where is it going? (For no. 5 – The question is referring to window film (Spec Section 088700) and the locations on where it will be applied.)

   Response: Window film to be used at main entrance and at folding glass panel partition.

6. **Question:** Please provide clarification on the following items regarding Aluminum Veranda.
   1.) What is the gauge of the Aluminum Panel?
   2.) Can Munoz furnish .DWG or .DWF files prior to bid day?
   3.) Is there a color preferred regarding the Kynar Finish? Kynar has limited color selections.

   Response: 1.) Gauge of typical aluminum panels are provided in this Addendum #1 revisions. 2.) DWG files of the aluminum panel patterns will not be available prior to bid opening. 3.) Kynar finish information are provided in this Addendum #1- CHANGES TO SPECIFICATIONS/PLANS revisions.

7. **Question:** RFIs must be requested via CIVCAST, however attachments cannot be provided. How should bidders submit substitution requests if CIVCAST does not allow attachments?

   Response: Substitution requests are made through Civcast. Please submit your proposed substitution as an "equal or better" with supporting information, based on the projects plans and specifications to donna.hull@sanantonio.gov for consideration. After review, results will be posted in the addendum if approved or not as an equal.

   Response #2: See approved updated manufacturers in this Addendum #1 - CHANGES TO SPECIFICATIONS/PLANS

8. **Question:** Form 06 – Unit Pricing Form – The provided form does not have a designated line item to report the construction cost of the new world heritage center. Please advise.

   Response: This is a lump sum base bid for construction. Unit Cost and pricing are for specific base bid items only. Totals will be captured on the base bid form.

9. **Question:** Refer to form 6, line item 1 to 99 (Base Bid), are line items to report the unit pricing for the proposed landscape work and the site utilities. There are no line items to indicate the construction cost for the world heritage center. Please advise.

   Response: This is a lump sum base bid for construction. Unit Cost and pricing are for specific base bid items only. Totals will be captured on the base bid form

10. **Question:** Is there a geotechnical report available for this project?

    Response: Yes, we will include in Addendum #1 - CHANGES TO SPECIFICATIONS/PLANS.

11. **Question:** Where can we access the dwg files for this project?

    Response: CAD Drawings are not released prior to bid day. These will be released after a GC is selected.

12. Question: Is there a specification for Section 051200 Structural Framing

Response: The requested specification section will be included in Addendum #1- CHANGES TO SPECIFICATIONS/PLANS. Additional structural specifications may be provided at contractor request.

13. Question: Can COSA clarify the price hold period for bids?

Response: All provisions in Respondent's proposal, including any estimated or projected costs, shall remain valid for one-hundred and fifty (150) days following the deadline date for submissions to allow for Council award.

14. Question: Can COSA clarify if a fire suppression system (sprinklers) is to be installed? We didn't find the division for Fire Suppression in the specification, but it is mentioned in the Plumbing specifications.

Response: There is no Fire Suppression System. Disregard any Fire Suppression references that are mentioned in Division 21, 22, 23, 26 & 28 Specifications. All other applicable requirements noted in these divisions will be required.

15. Question: Sheet A-301 "Reflected Ceiling Plan" only contains key notes 3.6 and 3.7. Can COSA clarify what the rest of the key notes on the sheet point out?

Response: The numbers that are skipped or missing from the legend are items that are not used on the final plans, so we omitted them for clarity. Keynote numbers that are in the drawings but missing from the sheet legend are provided in this Addendum #1 - CHANGES TO SPECIFICATIONS/PLANS revisions.

16. Question: Can COSA provide elevations of the plastic laminate lockers to be installed?

Response: Locker elevations are provided in the Addendum #1 revisions.

17. **Question:** Can COSA give clarifications for the dome support and the roof framing on sheets S-200 and S-201? We have encountered difficulties identifying which elements belong to the parapet roof for base bid and which belong to the roof dome for Alt #1. Sheet S-200 contains information for the trellis framing which we understand to be base bi, but it also contains information for the dome support for Alt #1.

Response: Alternate clarification are provided in this Addendum #1- CHANGES TO SPECIFICATIONS/PLANS revisions.

18. **Question:** Can COSA clarify the hollow square steel header and support for storefronts in sheet S-600/3?

Response: In the isometric view on S-600, the "HSS header" is the HSS12x6 that's identified on S-200 and subsequent details. The "storefront supports" refer to the HSS4x4 tubes that support the rolled storefront angle in 3/S-600. Note that the isometric view is provided as a visual aid, only. The contractor shall refer to plans and details for further information for all conditions.

19. **Question:** Can COSA clarify the trees to be removed and the trees to remain and to be protected? Sheet C3 call for tree protection for trees that are noted to be removed in sheet L0.01.

    Response: Clarification of which trees are to be removed/to remain in Addendum #1- CHANGES TO SPECIFICATIONS/PLANS.

20. **Email Question: CEILING RFI**
    There are 5 key notes on the RCP that have no description just a tag and arrows pointing at items. List of keyed notes with no description includes 3.2, 3.3, 3.9, 3.10, 3.21, and others. The only key notes described are key notes 3.6 and 3.7. Will there be additional info on these missing key notes released?

    Response: Please refer to Revised Sheet A-301 REFLECTED CEILING PLAN. Keynote legend was updated to show missing keynotes.

Request for consideration to be a Substitute:

Substitution for Plastic Laminate Clad lockers - Scantron Duralife Lockers is an approved vendor refer to Section 105123 – Plastic-Laminate-Clad Lockers

Substitution for folding partition- spec section 10 2239- Crystal/Moderco Folding Partitions is an approved vendor refer to Spec. Section 102239 Folding Glass-Panel Partitions

END OF AMENDMENT No. 1

Exhibit B

General Decision Number: TX20220231 08/05/2022

Superseded General Decision Number: TX20210231

State: Texas

Construction Type: Building

County: Bexar County in Texas.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).
Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2022.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at https://www.dol.gov/agencies/whd/government-contracts.

Modification Number	Publication Date
0	01/07/2022
1	02/18/2022
2	02/25/2022
3	04/15/2022
4	06/17/2022
5	07/08/2022
6	07/29/2022
7	08/05/2022

ASBE0087-014 06/06/2022

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR (Duct, Pipe and Mechanical System Insulation)	$ 28.10	8.29

BOIL0074-003 01/01/2021

	Rates	Fringes
BOILERMAKER	$ 29.47	24.10

ELEC0060-003 06/01/2022

	Rates	Fringes
ELECTRICIAN (Communication Technician Only)	$ 31.95	15%+6.41

ELEC0060-004 06/01/2022

	Rates	Fringes
ELECTRICIAN (Excludes Low Voltage Wiring)	$ 31.95	15%+6.41

ELEV0081-001 01/01/2022

	Rates	Fringes
ELEVATOR MECHANIC	$ 44.80	36.885+a+b

FOOTNOTES:

A. 6% under 5 years based on regular hourly rate for all hours worked. 8% over 5 years based on regular hourly rate for all hours worked.

B. Holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; Friday after Thanksgiving Day; Christmas Day; and Veterans Day.

ENGI0450-002 04/01/2014

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
Cranes	$ 34.85	9.85

IRON0066-013 06/01/2022

	Rates	Fringes
IRONWORKER, STRUCTURAL	$ 25.25	7.28

* IRON0084-011 06/01/2022

	Rates	Fringes
IRONWORKER, ORNAMENTAL	$ 26.76	7.88

PLUM0142-009 07/01/2020

	Rates	Fringes
HVAC MECHANIC (HVAC Electrical Temperature Control Installation Only)	$ 30.25	13.36
HVAC MECHANIC (HVAC Unit Installation Only)	$ 30.25	13.36
PIPEFITTER (Including HVAC Pipe Installation)	$ 31.90	13.76
Including HVAC Pipe Installation		
PLUMBER (Excludes HVAC Pipe Installation)	$ 31.90	13.76
Excludes HVAC Pipe Installation		

SFTX0669-002 04/01/2021

	Rates	Fringes
SPRINKLER FITTER (Fire Sprinklers)	$ 31.68	22.50

SHEE0067-004 04/01/2022

	Rates	Fringes
Sheet metal worker		
Excludes HVAC Duct Installation	$ 27.89	16.25
HVAC Duct Installation Only	$ 27.89	16.25

* SUTX2014-006 07/21/2014

	Rates	Fringes
BRICKLAYER	$ 22.15	0.00

CARPENTER (Acoustical Ceiling Installation Only)	$ 17.83	0.00
CARPENTER (Form Work Only)	$ 13.63 **	0.00
CARPENTER, Excludes Acoustical Ceiling Installation, Drywall Hanging, Form Work, and Metal Stud Installation	$ 16.86	4.17
CAULKER	$ 15.00	0.00
CEMENT MASON/CONCRETE FINISHER	$ 22.27	5.30
DRYWALL FINISHER/TAPER	$ 13.81 **	0.00
DRYWALL HANGER AND METAL STUD INSTALLER	$ 15.18	0.00
ELECTRICIAN (Low Voltage Wiring Only)	$ 20.39	3.04
IRONWORKER, REINFORCING	$ 12.27 **	0.00
LABORER: Common or General	$ 10.75 **	0.00
LABORER: Mason Tender - Brick	$ 11.88 **	0.00
LABORER: Mason Tender - Cement/Concrete	$ 12.00 **	0.00
LABORER: Pipelayer	$ 11.00 **	0.00
LABORER: Roof Tearoff	$ 11.28 **	0.00
LABORER: Landscape and Irrigation	$ 8.00 **	0.00
OPERATOR: Backhoe/Excavator/Trackhoe	$ 15.98	0.00
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 14.00 **	0.00
OPERATOR: Bulldozer	$ 14.00 **	0.00
OPERATOR: Drill	$ 14.50 **	0.00
OPERATOR: Forklift	$ 12.50 **	0.00
OPERATOR: Grader/Blade	$ 23.00	5.07
OPERATOR: Loader	$ 12.79 **	0.00
OPERATOR: Mechanic	$ 18.75	5.12

OPERATOR: Paver (Asphalt, Aggregate, and Concrete).....$ 16.03 0.00

OPERATOR: Roller.....$ 12.00 ** 0.00

PAINTER (Brush, Roller and Spray), Excludes Drywall Finishing/Taping.....$ 13.07 ** 0.00

ROOFER.....$ 12.00 ** 0.00

TILE FINISHER.....$ 11.32 ** 0.00

TILE SETTER.....$ 14.94 ** 0.00

TRUCK DRIVER: Dump Truck.....$ 12.39 ** 1.18

TRUCK DRIVER: Flatbed Truck.....$ 19.65 8.57

TRUCK DRIVER: Semi-Trailer Truck.....$ 12.50 ** 0.00

TRUCK DRIVER: Water Truck.....$ 12.00 ** 4.11

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($15.00) or 13658 ($11.25). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014.

UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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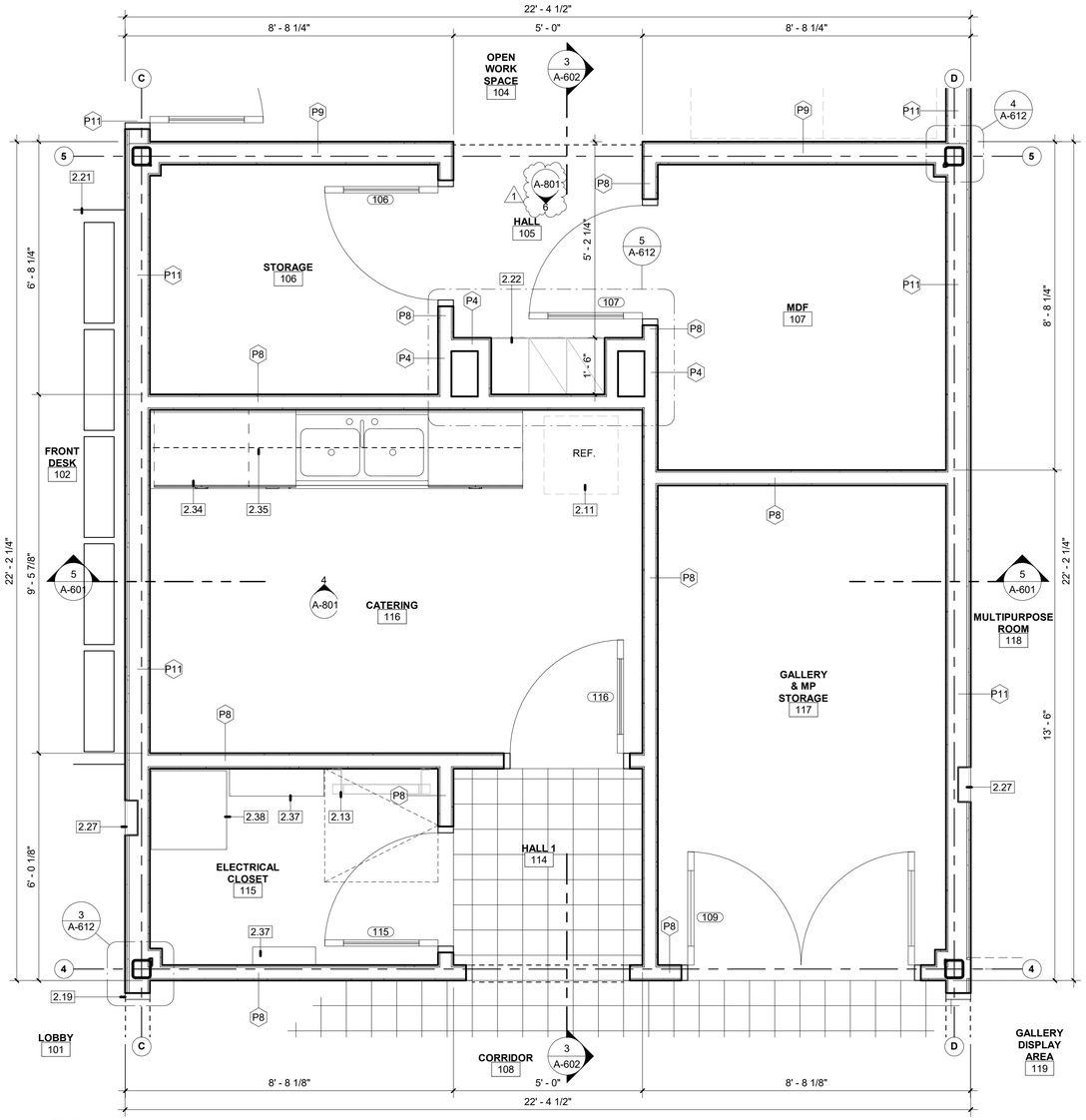
END OF GENERAL DECISION

TOILET ACCESSORY SCHEDULE

MODEL	MODEL NO.	MFR.	DESCRIPTION	MOUNTING HEIGHT	REMARKS
TA-01	B-5806X36	BOBRICK	GRAB BAR	2'-10" TO CENTER	
TA-02	B-5806X42	BOBRICK	GRAB BAR	2'-10" TO CENTER	
TA-03	KB-110-SSRE	BOBRICK	VERTICAL RECESSED BABY CHANGING STATION	5'-3" TO TOP	
TA-04	B-290-2436	BOBRICK	SS FRAMED MIRROR	3'-3" TO BOTTOM	
TA-05	B-306	BOBRICK	RECESSED SOAP DISPENSER	3'-4" TO CENTER	
TA-06	B-2890	BOBRICK	SURFACE MTD. TISSUE DISPENSER	2'-8" TO TOP	
TA-07	B-354	BOBRICK	PARTITION MTD. NAPKIN DISPOSAL	2'-8" TO TOP	NOT USED
TA-08	B-3500	BOBRICK	RECESSED NAPKIN/TAMPON VENDOR	5'-0" TO TOP	NOT USED
TA-09	B-39003	BOBRICK	RECESSED TOWEL DISPENSER/WASTE RECEPTICAL	5'-0" TO TOP	
TA-10	B-682	BOBRICK	COAT HOOK	48" TO TOP	
TA-11	B-224X36	BOBRICK	UTILITY SHELF WITH MOP/BROOM HOLDERS & RAG HOOKS	5'-0" TO CENTER	
TA-12	B-295X24	BOBRICK	SHELF	VARIES	3 AT JANITOR'S CLOSET. TOP OF SHELF AT 24", 42" & 60" A.F.F.

KEYNOTE LEGEND

2.11	REFRIGERATOR N.I.C.
2.12	DRINKING FOUNTAIN, AS SPEC.
2.13	ROOF HATCH LADDER AS SPEC.
2.19	CASED OPENING, SEE 07/A-402
2.21	CUSTOM RECEPTION DESK, SEE A-702
2.22	LOCKERS AS SPEC.
2.24	PLUMBING FIXTURE, RE. PLUMBING
2.25	CLEAR FLOOR SPACE
2.26	WHEEL CHAIR TURNING SPACE
2.27	RECESSED FIRE EXTINGUISHER CABINET, SEE 04/A-701
2.34	24" P-LAM BASE CABINETS & DRAWERS W/ONE ADJUSTABLE SHELF & SOLID SURFACE COUNTERTOP
2.35	12" P-LAM UPPER CABINETS W/TWO ADJUSTABLE SHELVES
2.36	IRRIGATION CONTROLER, RE. IRRIGATION. COORDINATE FINAL LOCATION WITH ARCHITECT
2.37	ELECTRICAL PANEL, RE. ELECTRICAL
2.38	EMERGENCY LIGHTING INVERTER, RE. ELECTRICAL

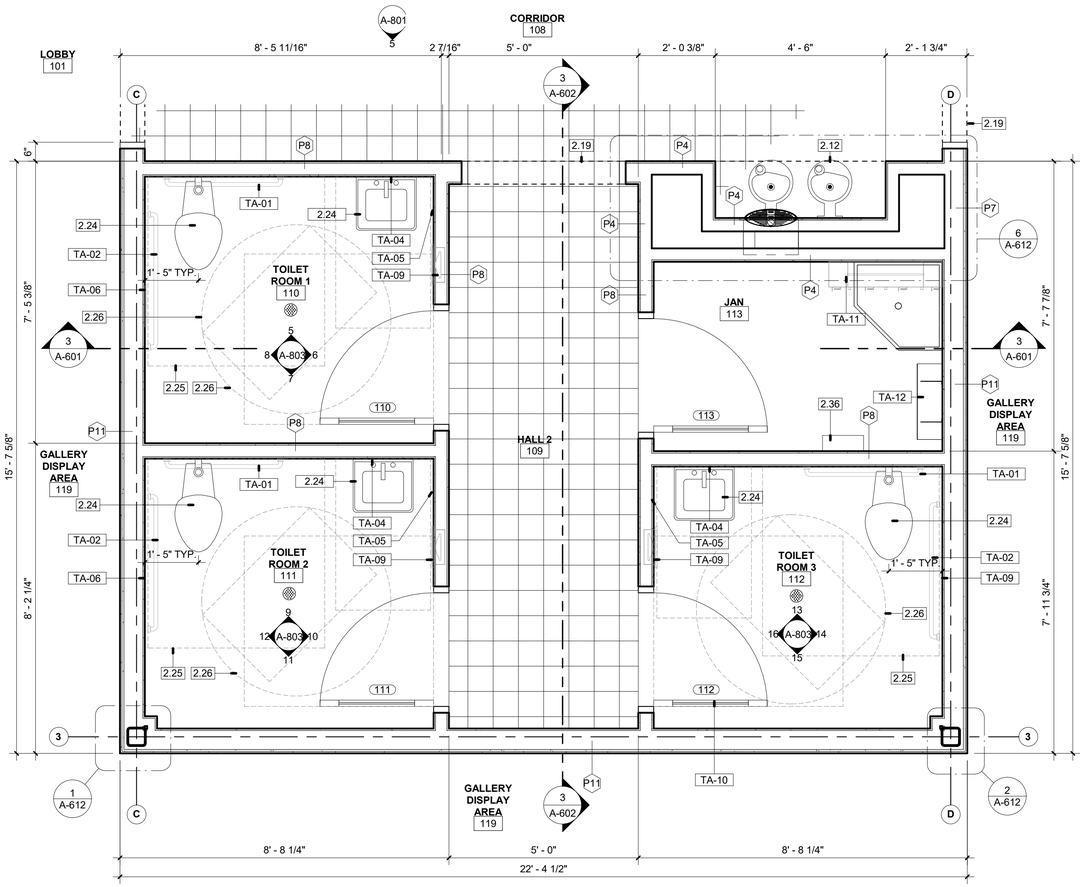


PLAN NORTH

1 ENLARGED PLAN

1/2" = 1'-0"

0' 1' 2' 4'



PLAN NORTH

2 ENLARGED PLAN

1/2" = 1'-0"

0' 1' 2' 4'

ISSUE/REVISIONS		
#	DESCRIPTION	DATE
1	ADDENDUM 1	08.23.2022

ENLARGED PLANS

WORLD HERITAGE CENTER
SAN ANTONIO, TEXAS

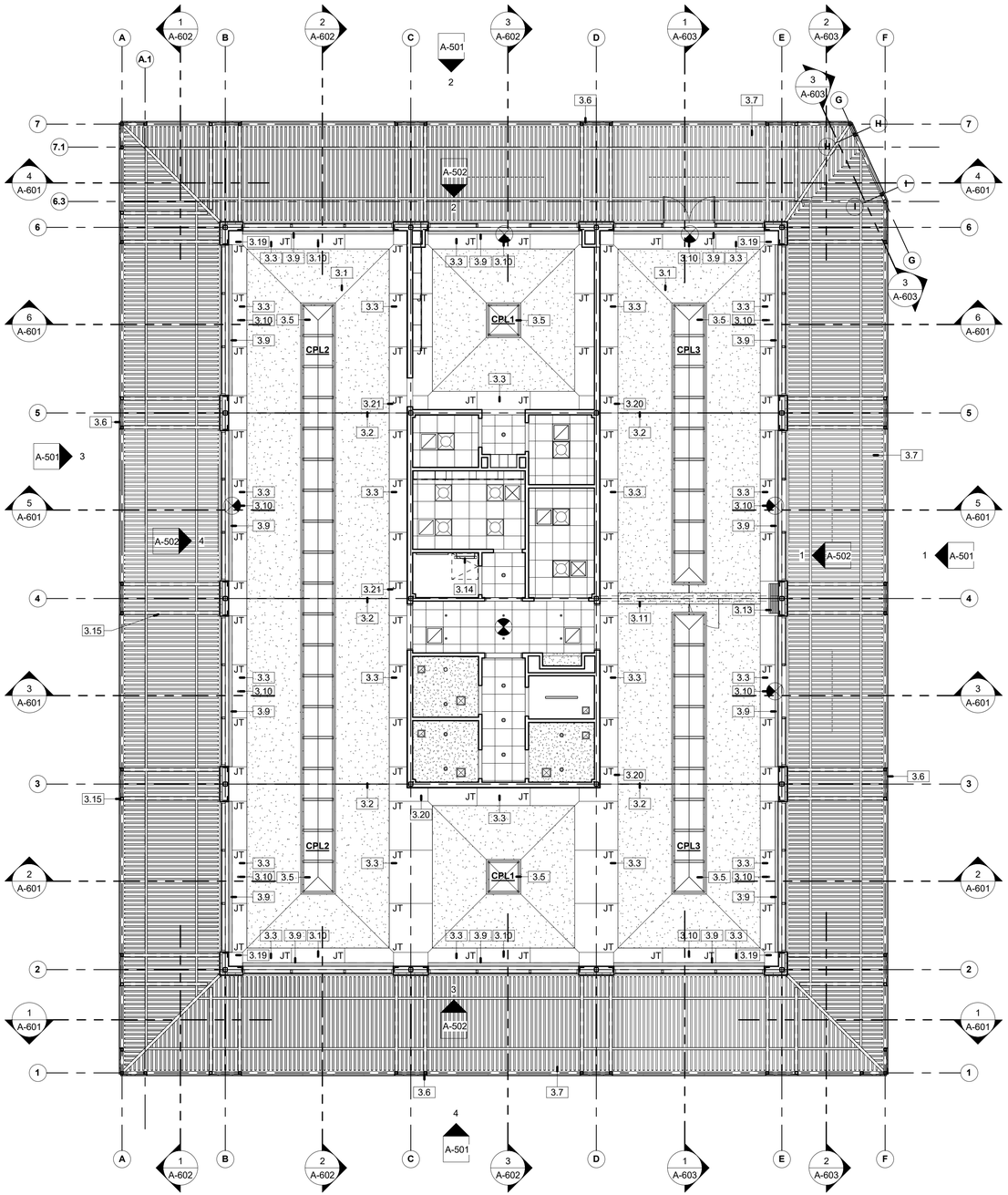
DUNAWAY
118 Broadway Suite 201, San Antonio, Texas 78205
210.227.3247
(TX REG. F-1114)

muñoz
723 S. Flores • San Antonio, Texas 78204
210.349.1163 • www.munoz-co.com

REGISTERED ARCHITECT
GEOFFREY EDWARD
78803
STATE OF TEXAS

08.23.2022

JOB NO.	A19021.00
DESIGNED BY:	VC
DRAWN BY:	VC
CHECKED BY:	-
DATE:	06.20.2022
SHEET:	A-206

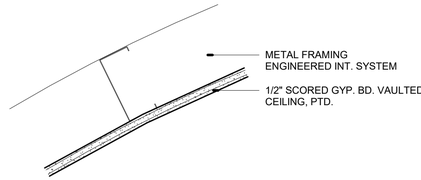


PLAN NORTH

1 REFLECTED CEILING PLAN

1/8" = 1'-0"

0' 4' 8' 16'



2 VAULTED CEILING TYP. DETAIL

3" = 1'-0"

RCP GENERAL NOTES

1. SEE FINISH SCHEDULE FOR CEILING TYPES U.N.O.
2. REFER TO LIFE SAFETY PLANS FOR RATED WALLS.
3. CEILING GRIDS CENTERED IN ROOM U.N.O.
4. ALL FIXTURES/ DEVICES MAY NOT BE INDICATED COORDINATE WITH MEP. A/V. & TELECOM DRAWINGS, AND PROVIDE ADDITIONAL FIXTURES. DEVICES AS REQUIRED.
5. REFER TO MECHANICAL FOR AIR DEVICES TYPICAL.
6. REFER TO ELECTRICAL FOR CEILING SPEAKER PLACEMENT.
7. REFER TO ELECTRICAL FOR LIGHTING AND POWER.
8. LIGHTING LAYOUT AT MECHANICAL ROOMS TO BE COORDINATED WITH M.E.P.
9. ALL CEILINGS TO BE 9'-0" A.F.F. U.N.O. - COORDINATE ANY DISCREPANCIES WITH CEILING HEIGHT AND MEP WORK WITH ARCHITECT BEFORE INSTALLATION OF ANY OVERHEAD ITEMS.
10. PROVIDE AND COORDINATE ACCESS DOORS WITH MEP.
11. SEE G-001 SCHEDULE OF ALTERNATES FOR ADD ALTERNATE 02 INFORMATION.
12. PROVIDE REMOVABLE ACOUSTICAL CEILING PANELS FOR SECURITY CAMERAS AND WIRELESS ACCESS POINTS, RE. TECHNOLOGY AND COORDINATE FINAL LOCATIONS WITH ARCHITECT.

RCP LEGEND

- OPEN TO STRUCTURE (NOT PAINTED)
- GYPSUM BOARD CEILING
- 24" X 24" LAY-IN CEILING
- BRICK BOVEDA CEILING
- RECESSED DOWN LIGHT FIXTURE
- RECESSED LED FIXTURE 24" X 24"
- RECESSED LED FIXTURE 24" X 48"
- RECESSED 12"X48" LINEAR FIXTURE
- PENDANT UTILITY FIXTURE
- LINEAR SUPPLY DIFFUSER
- SUPPLY DIFFUSER 24" X 24"
- RETURN/EXHAUST DIFFUSER 24" X 24"
- CEILING ACCESS PANEL
- PARTITIONS TO STRUCTURE

KEYNOTE LEGEND

3.1	1/2" SCORED GYP. BD. VAULTED CEILINGS, PTD. SEE 02/A-301. SEE G-001 SCHEDULE OF ALTERNATES FOR ADD ALTERNATE 02 INFORMATION
3.2	THREATED ROD WITH TURNBUCKLE RE. STRUCT.
3.3	GYP. BD. FURR DOWN WITH ACOUSTICAL PANELS AS SPEC., PTD.
3.5	CUSTOM PENDANT LIGHT FIXTURE, SEE 01/A-703 AND RE. ELECTRICAL
3.6	ALUMINUM PANEL SCREEN WALLS WITH CUSTOM CUTOUT PATTERN, KYNAR FINISH. SEE 01/A-404, 01/A-405 & 01/A-406 FOR PANEL TYPES
3.7	SECTIONAL ALUMINUM TRELLIS SYSTEM, KYNAR FINISH
3.9	MANUAL MECHOSHADE AT ALL EXT. GLASS AS SCHED.
3.10	LIGHT FIXTURE, RE. ELECTRICAL
3.11	GYP. BD. FURR DOWN, PTD.
3.13	FOLDING GLASS WALL AS SPEC.
3.14	ROOF HATCH LADDER AS SPEC.
3.15	STEEL COLUMN, PAINTED, RE. STRUCTURAL
3.19	REMOVABLE ACOUSTICAL CEILING PANEL FOR SECURITY CAMERA, RE. SECURITY
3.20	REMOVABLE ACOUSTICAL CEILING PANEL FOR WIRELESS ACCESS POINT, RE. TECHNOLOGY
3.21	REMOVABLE ACOUSTICAL CEILING PANEL FOR SECURITY CAMERA AND WIRELESS ACCESS POINT, RE. TECHNOLOGY

1

ISSUE/REVISIONS

#	DESCRIPTION	DATE
1	ADDENDUM 1	08.23.2022

REFLECTED CEILING PLAN

WORLD HERITAGE CENTER
SAN ANTONIO, TEXAS

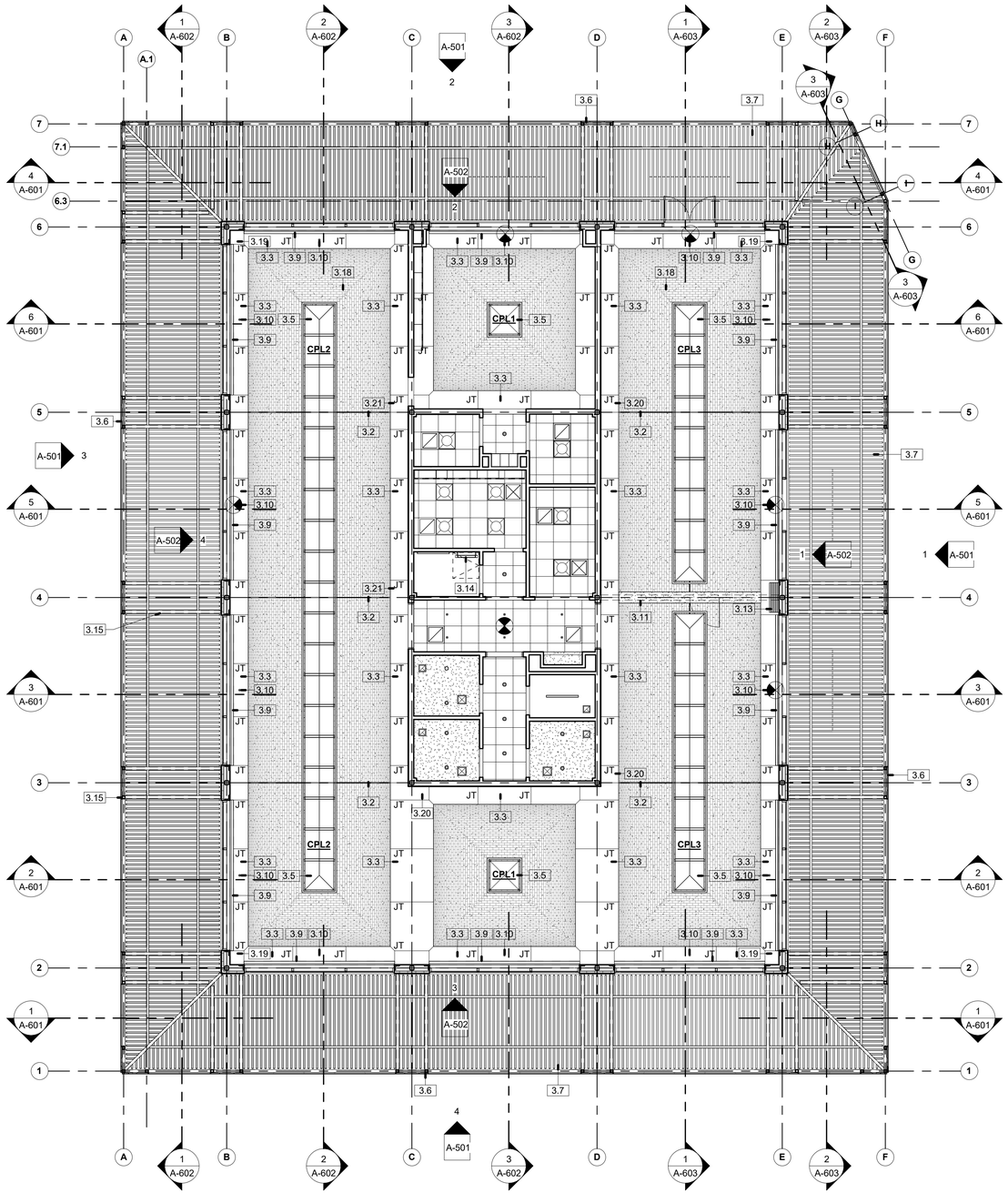
DUNAWAY
118 Broadway Suite 201, San Antonio, Texas 78205
(210) 227-2045
(TX REG. F-1114)

muñoz
723 S. Flores • San Antonio, Texas 78204
210.349.1163 • www.munoz-co.com

REGISTERED ARCHITECT
GEOFF EDWARDS
18803
STATE OF TEXAS

08.23.2022

JOB NO.	A19021.00
DESIGNED BY:	VC
DRAWN BY:	VC
CHECKED BY:	-
DATE:	06.20.2022
SHEET:	A-301

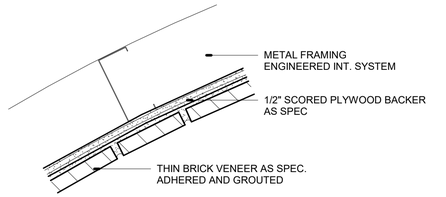


PLAN NORTH

1 REFLECTED CEILING PLAN ALT. 2

1/8" = 1'-0"

0' 4' 8' 16'



2 VAULTED CEILING TYP. DETAIL ALT. 2

3" = 1'-0"

RCP GENERAL NOTES

1. SEE FINISH SCHEDULE FOR CEILING TYPES U.N.O.
2. REFER TO LIFE SAFETY PLANS FOR RATED WALLS.
3. CEILING GRIDS CENTERED IN ROOM U.N.O.
4. ALL FIXTURES/ DEVICES MAY NOT BE INDICATED COORDINATE WITH MEP. A/V. & TELECOM DRAWINGS, AND PROVIDE ADDITIONAL FIXTURES. DEVICES AS REQUIRED.
5. REFER TO MECHANICAL FOR AIR DEVICES TYPICAL.
6. REFER TO ELECTRICAL FOR CEILING SPEAKER PLACEMENT.
7. REFER TO ELECTRICAL FOR LIGHTING AND POWER.
8. LIGHTING LAYOUT AT MECHANICAL ROOMS TO BE COORDINATED WITH M.E.P.
9. ALL CEILINGS TO BE 9'-0" A.F.F. U.N.O. - COORDINATE ANY DISCREPANCIES WITH CEILING HEIGHT AND MEP WORK WITH ARCHITECT BEFORE INSTALLATION OF ANY OVERHEAD ITEMS.
10. PROVIDE AND COORDINATE ACCESS DOORS WITH MEP.
11. SEE G-001 SCHEDULE OF ALTERNATES FOR ADD ALTERNATE 02 INFORMATION.
12. PROVIDE REMOVABLE ACOUSTICAL CEILING PANELS FOR SECURITY CAMERAS AND WIRELESS ACCESS POINTS, RE. TECHNOLOGY AND COORDINATE FINAL LOCATIONS WITH ARCHITECT.

KEYNOTE LEGEND

3.2	THREATED ROD WITH TURNBUCKLE RE. STRUCT.
3.3	GYP. BD. FURR DOWN WITH ACOUSTICAL PANELS AS SPEC., PTD.
3.5	CUSTOM PENDANT LIGHT FIXTURE, SEE 01/A-703 AND RE. ELECTRICAL
3.6	ALUMINUM PANEL SCREEN WALLS WITH CUSTOM CUTOUT PATTERN, KYNAR FINISH. SEE 01/A-404, 01/A-405 & 01/A-406 FOR PANEL TYPES
3.7	SECTIONAL ALUMINUM TRELLIS SYSTEM, KYNAR FINISH
3.9	MANUAL MECHOSHADE AT ALL EXT. GLASS AS SCHED.
3.10	LIGHT FIXTURE, RE. ELECTRICAL
3.11	GYP. BD. FURR DOWN, PTD.
3.13	FOLDING GLASS WALL AS SPEC.
3.14	ROOF HATCH LADDER AS SPEC.
3.15	STEEL COLUMN, PAINTED, RE. STRUCTURAL
3.18	1/2" SCORED PLYWOOD BACKER WITH ADHERED AND GROUTED THIN BRICK VENEER AT VAULTED CEILINGS. SEE 02/A-302. SEE G-001 SCHEDULE OF ALTERNATES FOR ADD ALTERNATE 02 INFORMATION
3.19	REMOVABLE ACOUSTICAL CEILING PANEL FOR SECURITY CAMERA, RE. SECURITY
3.20	REMOVABLE ACOUSTICAL CEILING PANEL FOR WIRELESS ACCESS POINT, RE. TECHNOLOGY
3.21	REMOVABLE ACOUSTICAL CEILING PANEL FOR SECURITY CAMERA AND WIRELESS ACCESS POINT, RE. TECHNOLOGY

1

ISSUE/REVISIONS

#	DESCRIPTION	DATE
1	ADDENDUM 1	08.23.2022

REFLECTED CEILING PLAN - ALT. 2

WORLD HERITAGE CENTER
SAN ANTONIO, TEXAS

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118 Broadway Suite 201, San Antonio, Texas 78205
210.227.3247
(TX REG. F-1114)

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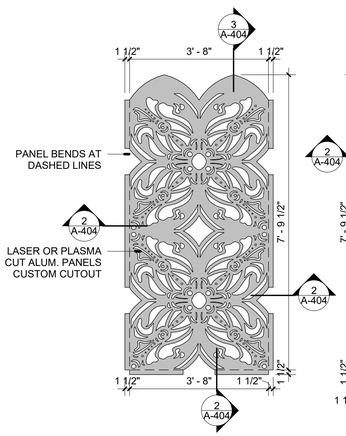
723 S. Flores • San Antonio, Texas 78204
210.349.1163 • www.munoz-co.com

REGISTERED ARCHITECT
GEOFF EDWARDS
18803
STATE OF TEXAS

08.23.2022

JOB NO.	A19021.00
DESIGNED BY:	VC
DRAWN BY:	VC
CHECKED BY:	-
DATE:	06.20.2022

SHEET: **A-302**



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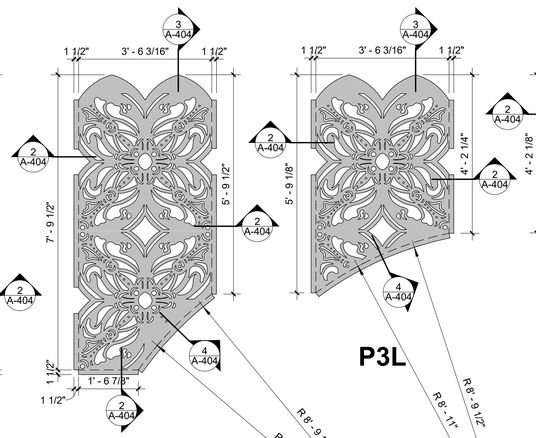

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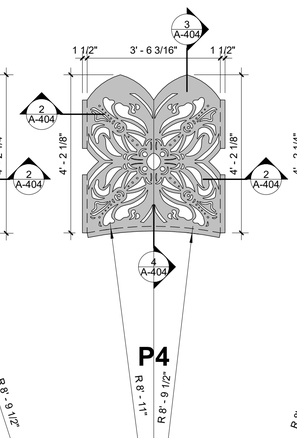
P3L



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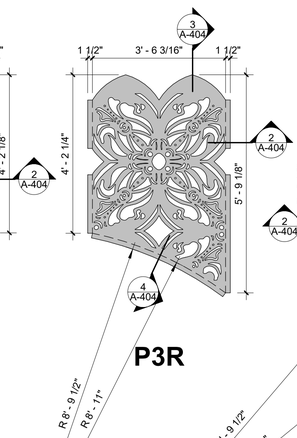

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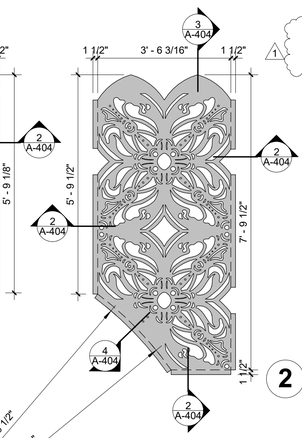
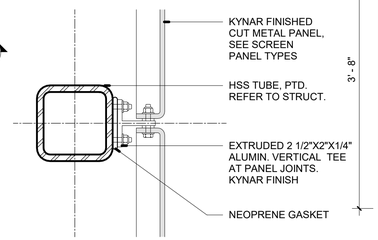
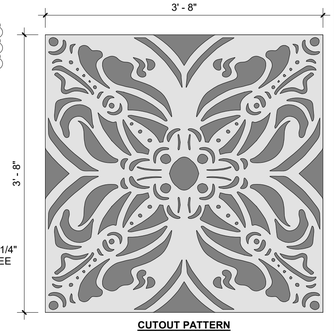


P2TR

SCREEN PANEL NOTES:
1. TYP. SCREEN PANELS TO BE 3/16" THICK ALUM. AS SPEC'D.
2. TYP. FINISH TO BE DARK BRONZE KYNAR FINISH

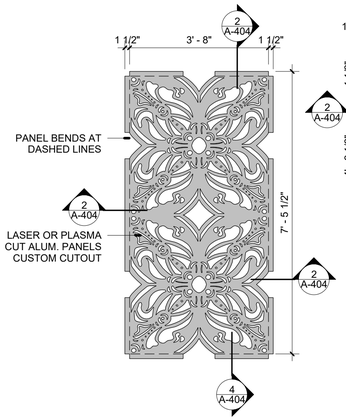


2 SCREEN PANEL DTL 1
3" = 1'-0"



CUTOUT PATTERN

6 TYP. PATTERN
1" = 1'-0"



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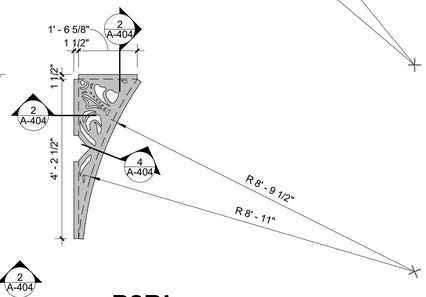

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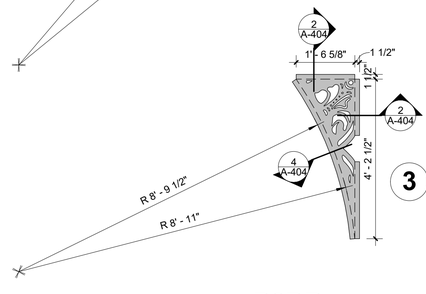

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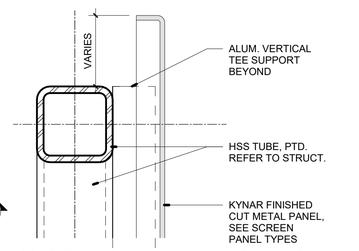
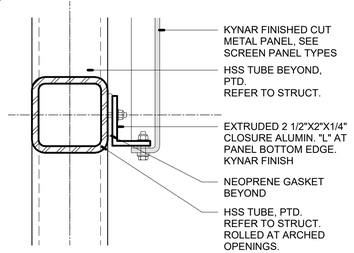
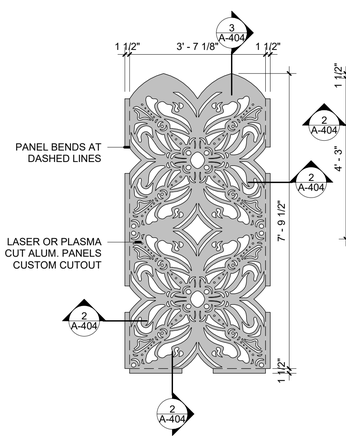


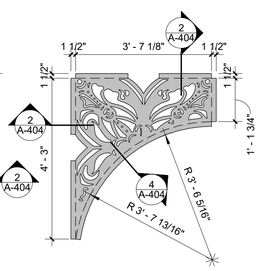
3 SCREEN PANEL DTL 2
3" = 1'-0"



4 SCREEN PANEL DTL 3
3" = 1'-0"



P5T



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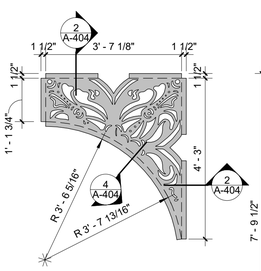

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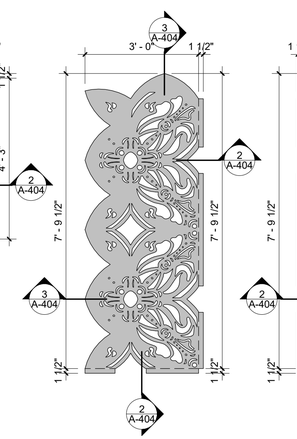

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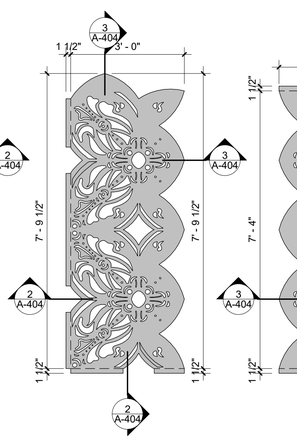

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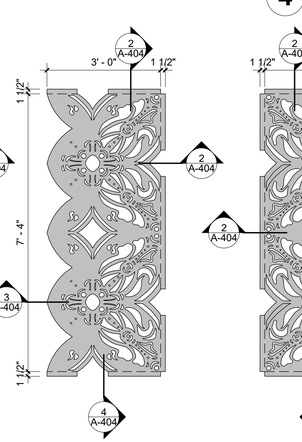

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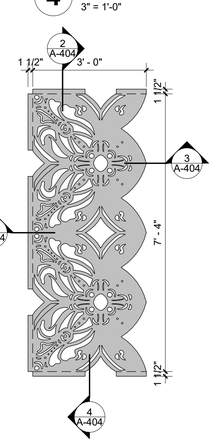
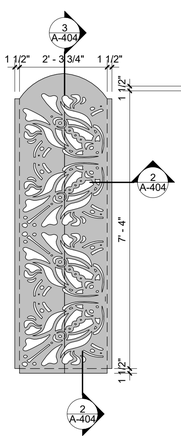


P6BR)



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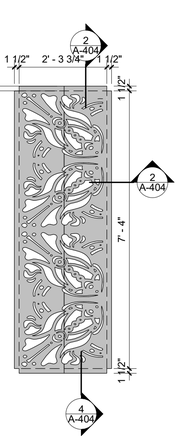

P7B

1 TYP. SCREEN PANEL TYPES
1/2" = 1'-0"

ISSUE/REVISIONS

#	DESCRIPTION	DATE
1	ADDENDUM 1	08.23.2022

SCREEN PANEL TYPES & DETAILS

WORLD HERITAGE CENTER
SAN ANTONIO, TEXAS

DUNAWAY
118 Broadway Suite 201, San Antonio, Texas 78205
210.349.1163
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723 S. Flores • San Antonio, Texas 78204
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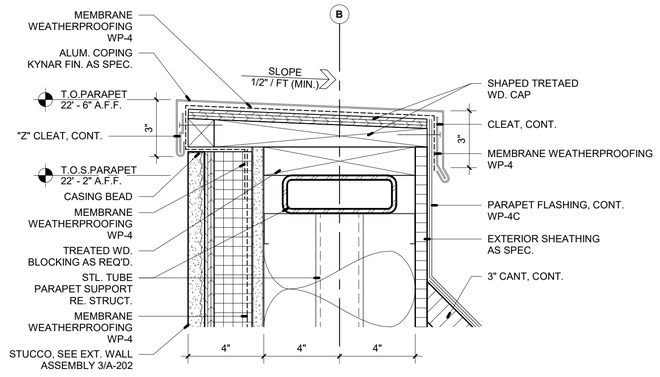
REGISTERED ARCHITECT
GEOFFREY EDWARD CLARK
78803
STATE OF TEXAS

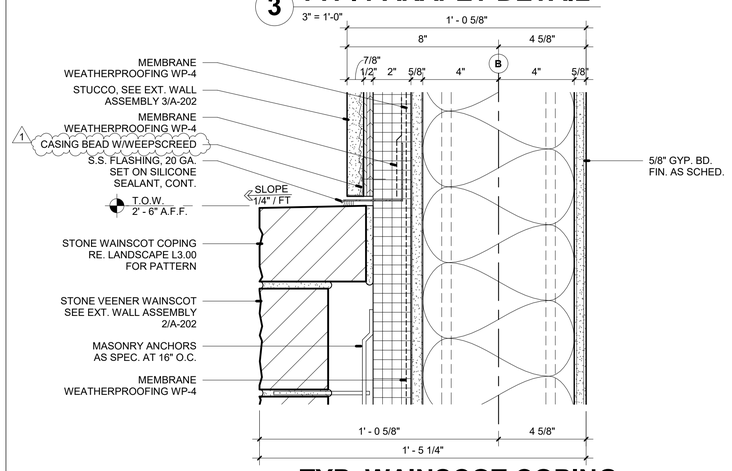
08.23.2022

JOB NO.	A19021.00
DESIGNED BY:	VC
DRAWN BY:	VC
CHECKED BY:	-
DATE:	06.20.2022
SHEET:	A-404



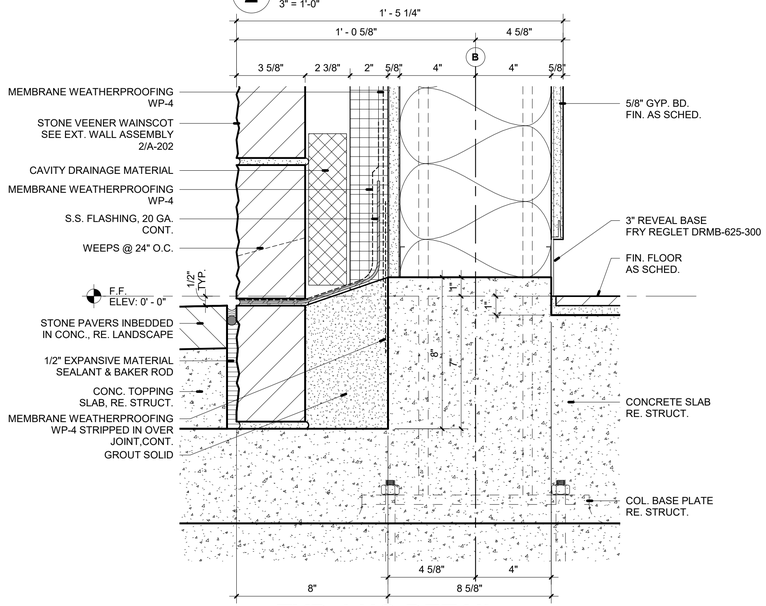
3 TYP. PARAPET DETAIL

3" = 1'-0"



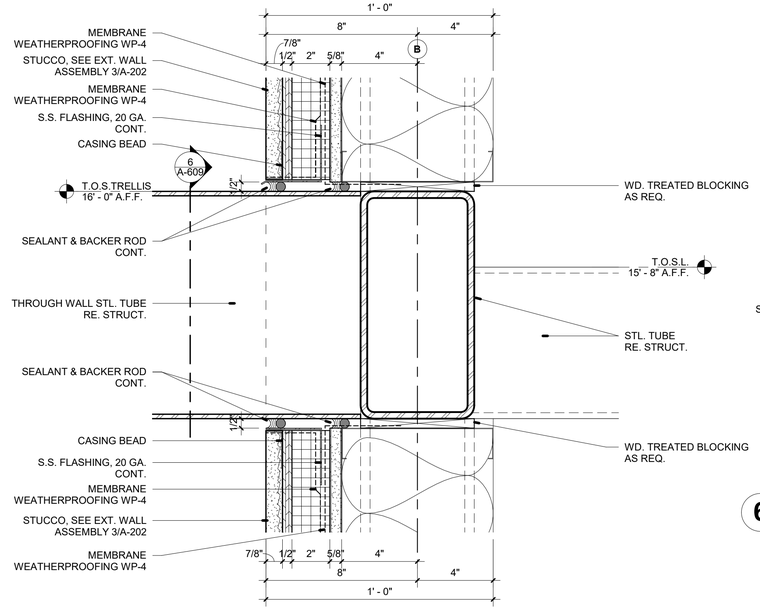
2 TYP. WAINSCOT COPING

3" = 1'-0"



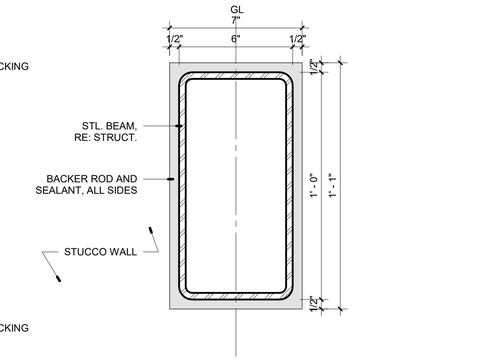
1 TYP. LUG DETAIL

3" = 1'-0"



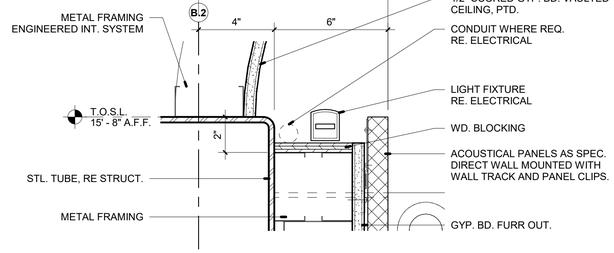
4 TYP. THROUGH WALL DETAIL

3" = 1'-0"



6 PENETRATION ELEVATION DTL.

3" = 1'-0"



5 TYP. LIGHT COVE

3" = 1'-0"

ISSUE/REVISIONS

#	DESCRIPTION	DATE
1	ADDENDUM 1	08.23.2022

WALL DETAILS

WORLD HERITAGE CENTER
SAN ANTONIO, TEXAS

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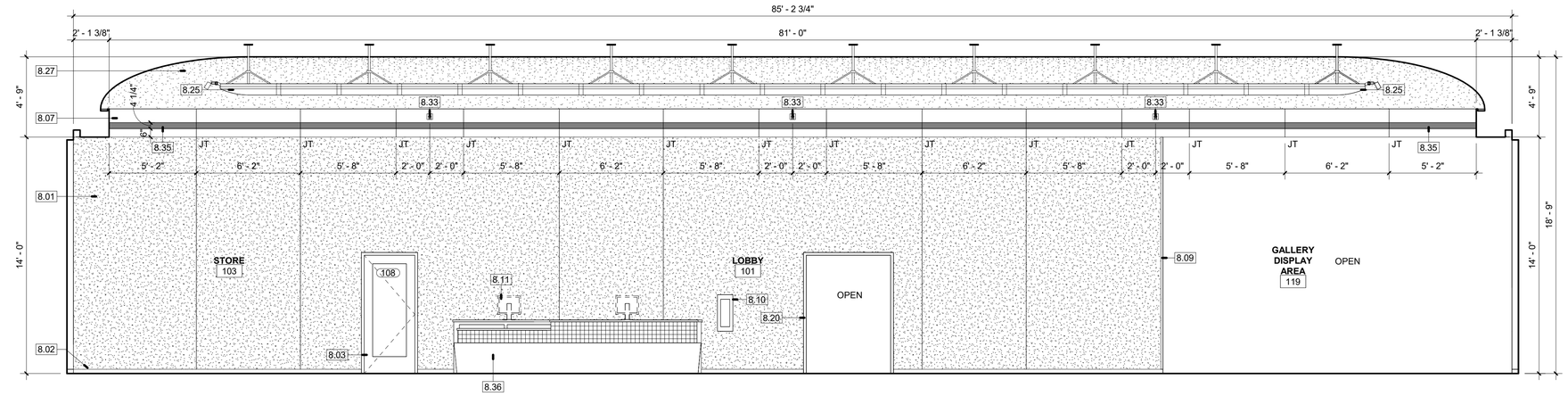
REGISTERED ARCHITECT
GEOFF EDWARDS
78803
STATE OF TEXAS

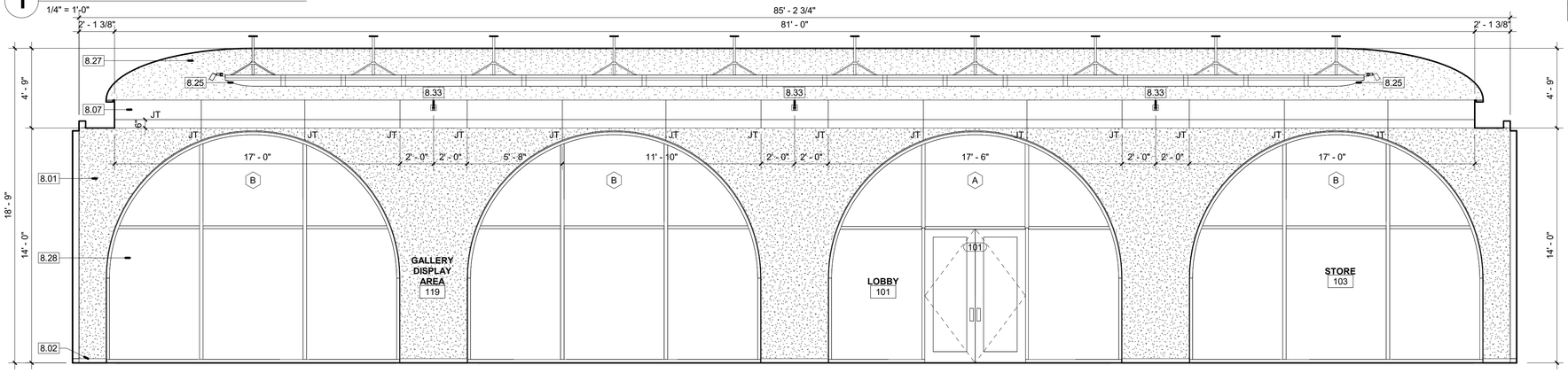
08.23.2022

JOB NO.	A19021.00
DESIGNED BY:	VC
DRAWN BY:	VC
CHECKED BY:	-
DATE:	06.20.2022
SHEET:	A-609



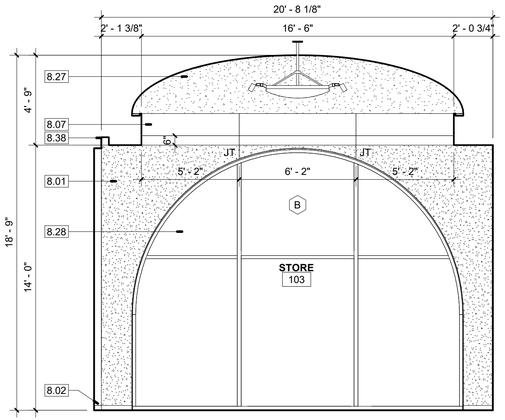
1 INTERIOR ELEVATION

1/4" = 1'-0"



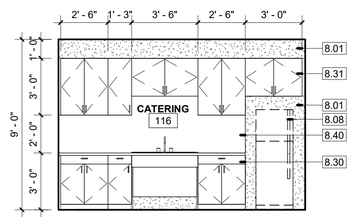
2 INTERIOR ELEVATION

1/4" = 1'-0"



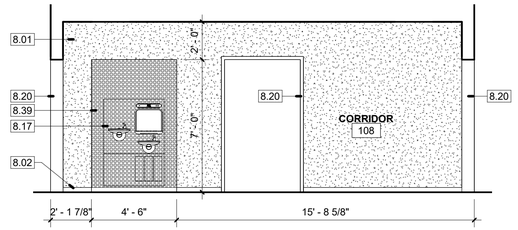
3 INTERIOR ELEVATION

1/4" = 1'-0"



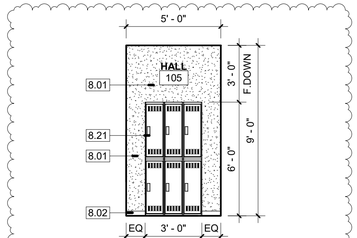
4 INTERIOR ELEVATION

1/4" = 1'-0"



5 INTERIOR ELEVATION

1/4" = 1'-0"



6 INTERIOR ELEVATION

1/4" = 1'-0"

KEYNOTE LEGEND

8.01	WALL FINISH AS SCHED.
8.02	BASE AS SCHED.
8.03	DOOR AS SCHED.
8.07	GYP. BD. FURR DOWN WITH ACOUSTICAL TREATMENT AS SPEC., PTD.
8.08	REFRIGERATOR N.I.C.
8.09	S.S. CORNER GUARD, TYPICAL, SEE 01/A-701
8.10	RECESSED FIRE EXTINGUISHER CABINET, SEE 04/A-701
8.11	COMPUTER STATIONS N.I.C.
8.17	ELECTRIC DRINKING FOUNTAIN W/ BOTTLE FILLING STATION
8.20	CASED OPENING, SEE 07/A-402
8.21	LOCKERS AS SPEC.
8.25	CUSTOM PENDANT LIGHT FIXTURE, SEE 01/A-703 AND RE. ELECTRICAL
8.27	1/2" SCORED GYP. BD. VAULTED CEILINGS, PTD. SEE 02/A-301. SEE G-001 SCHEDULE OF ALTERNATES FOR ADD ALTERNATE 02 INFORMATION
8.28	WINDOW AS SCHED.
8.30	24" P-LAM BASE CABINETS & DRAWERS W/ONE ADJUSTABLE SHELF & SOLID SURFACE COUNTERTOP
8.31	12" P-LAM UPPER CABINETS W/TWO ADJUSTABLE SHELVES
8.33	THREATED ROD WITH TURNBUCKLE, RE. STRUCT.
8.35	AIR DIFFUSER, EXTEND CONTINUOUS TO FURR DOWN ENDS, RE. MECHANICAL
8.36	CUSTOM RECEPTION DESK, SEE A-702
8.38	MANUAL MECHOSHADE AT ALL EXT. GLASS AS SCHED.
8.39	WALL TILE AS SCHED
8.40	SOLID SURFACE TOP WITH FULL HEIGHT BACKSPLASH

ISSUE/REVISIONS

#	DESCRIPTION	DATE
1	ADDENDUM 1	08.23.2022

INTERIOR ELEVATIONS

WORLD HERITAGE CENTER
SAN ANTONIO, TEXAS

DUNAWAY
118 Broadway Suite 201, San Antonio, Texas 78205
(210) 227-3247
(TX REG. F-1114)

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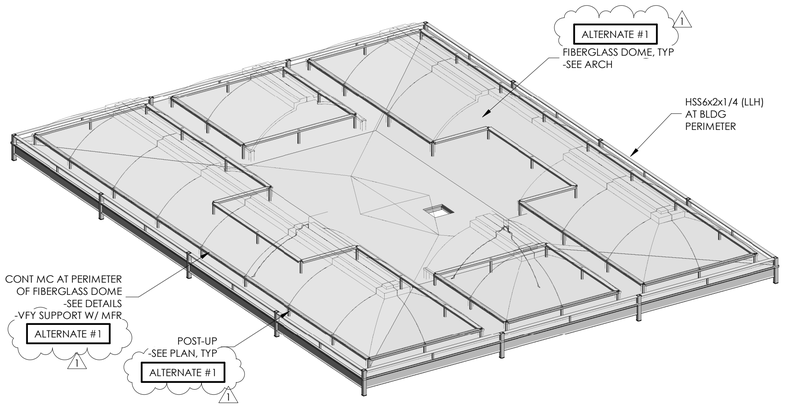
REGISTERED ARCHITECT
GEOF EDWARDS
18803
STATE OF TEXAS

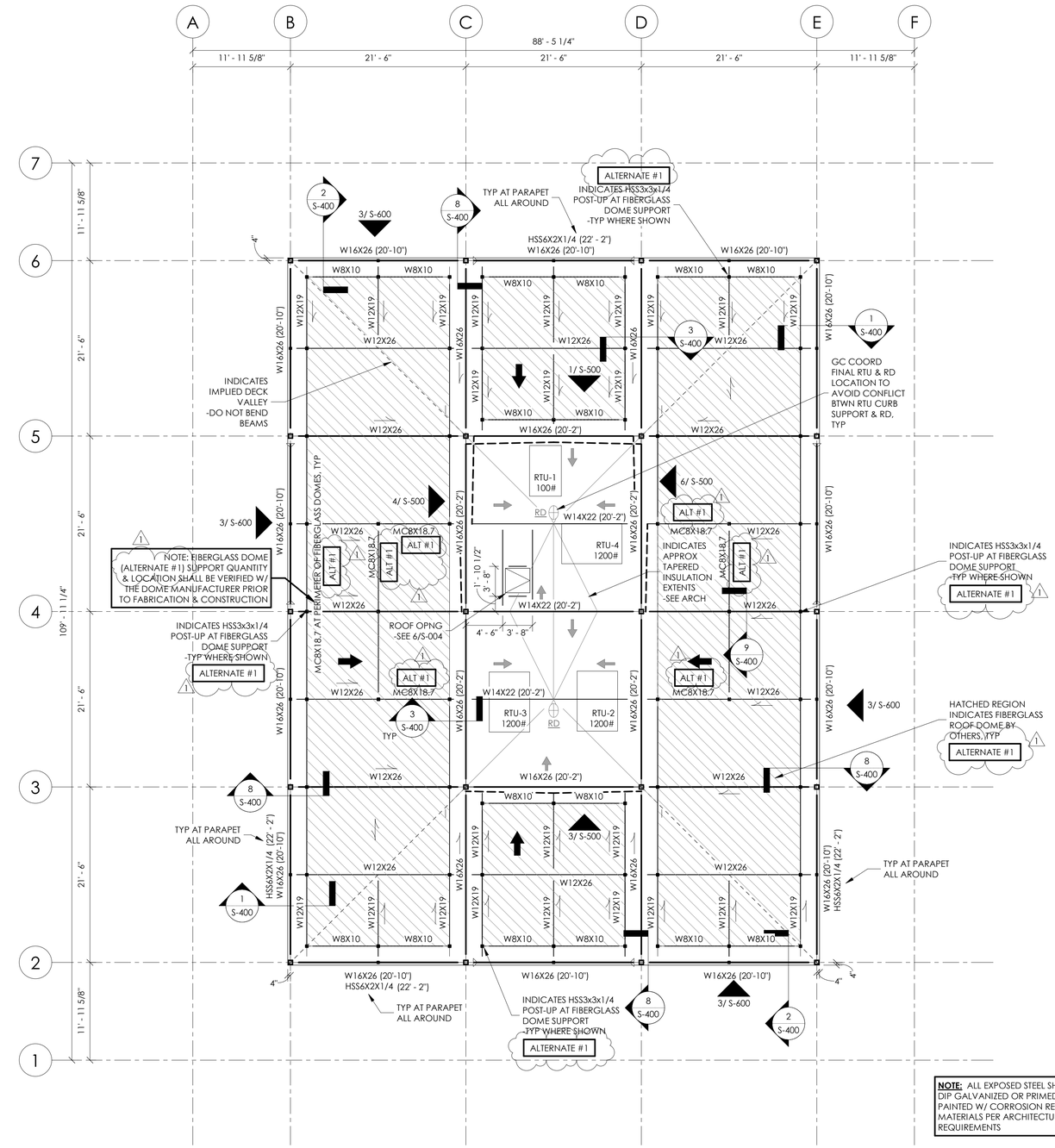
08.23.2022

JOB NO.	A19021.00
DESIGNED BY:	VC
DRAWN BY:	VC
CHECKED BY:	-
DATE:	06.20.2022
SHEET:	A-801



2 ROOF ISOMETRIC VIEW
SCALE:

NOTE:
ISOMETRIC VIEWS ARE PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY. STRUCTURAL PLAN SHEETS AND DETAILS GOVERN ANY DATA OBTAINED FROM ISOMETRIC VIEWS.



ROOF DECK:
RIGID INSULATION BOARD ON GALVANIZED 3" DEEP, 20 GA, TYPE 'NL' METAL DECK
-SEE 10/S-004

TOP OF STEEL NOTE:
TOP OF STEEL ELEVATION ABOVE REFERENCED FINISHED FLOOR ELEVATION IS SHOWN ON PLAN. TOP OF STEEL ELEVATION EQUALS BOTTOM OF DECK ELEVATION.

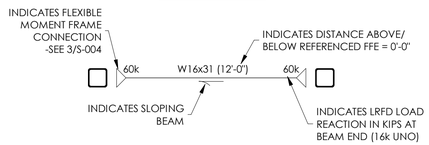
RD — INDICATES ROOF DRAIN

INDICATES ROOF DECK SPAN DIRECTION

INDICATES ROOF DECK SLOPE DIRECTION

X/S-X.X — INDICATES VERTICAL BRACING -SEE ELEVATIONS S-500

PLAN LEGEND



BEAM LEGEND

NOTE: ALL EXPOSED STEEL SHALL BE HOT-DIP GALVANIZED OR PRIMED AND PAINTED W/ CORROSION RESISTANT MATERIALS PER ARCHITECTURAL REQUIREMENTS

ROOF FRAMING PLAN
SCALE: 1/8" = 1'-0"

ISSUE/REVISIONS

#	DESCRIPTION	DATE
	100% CD	6/20/22
1	ADDENDUM #1	8/22/22

ROOF FRAMING PLAN

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SAN ANTONIO, TX

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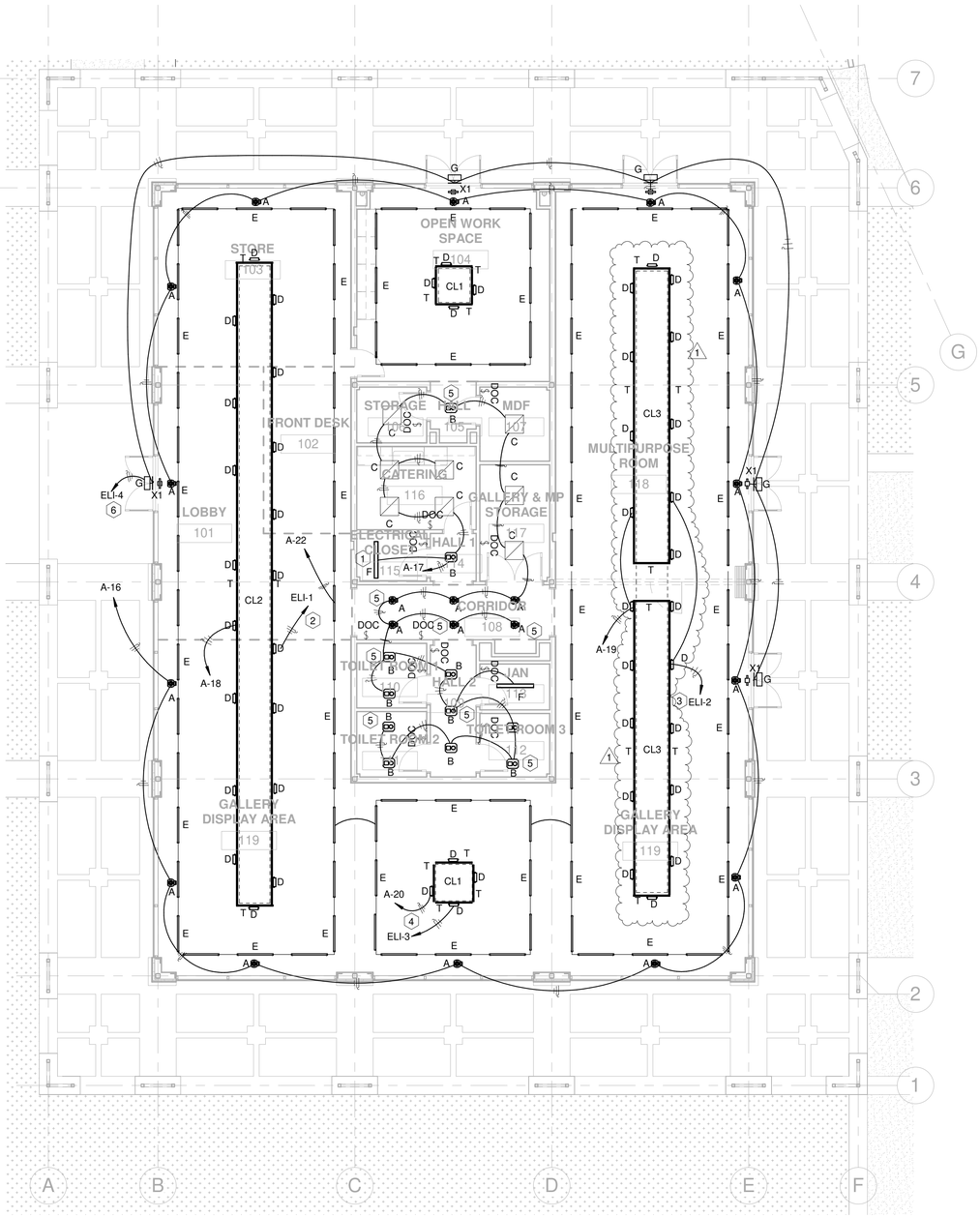
STATE OF TEXAS
NOLAN WOYNER
128820
LICENSED
PROFESSIONAL ENGINEER
08/22/2022
TBPE FIRM F-1114

JOB NO.	5675
DESIGNED BY:	KK
DRAWN BY:	KK
CHECKED BY:	NW
DATE:	JUNE 20, 2022
SHEET:	S-201



1 FLOOR PLAN - ELECTRICAL - LIGHTING
1/8" = 1'-0"

GENERAL ELECTRICAL NOTES

1. LIGHTING DESIGN BY MATHEWS LIGHTING GROUP, LLC, CONTACT BEN MATHEWS AT 210-219-9070 FOR INFORMATION ON LIGHT FIXTURES.
2. ALL LIGHTING CONTROLS SHALL COMPLY WITH IECC 2018. CONTACT BEN MATTHEWS AT 210-219-9070 FOR LUTRON CONTROLS DESIGN DOCUMENTS.
3. ALL EMERGENCY INVERTER OUTPUT CIRCUITS SHALL BE WIRED INDEPENDENTLY OF NORMAL POWER CIRCUITS IN ACCORDANCE WITH NEC ARTICLE 700.
4. ALL INTERIOR LIGHTING CONTROLS SHALL INCLUDE DIMMING AND OCCUPANCY SENSOR CONTROL.

KEYED (#) ELECTRICAL NOTES

1. LIGHTING CONTROL RELAYS AND EMERGENCY LIGHTING INVERTER (ELI) SHALL BE LOCATED IN THIS AREA. REFER TO LUTRON LIGHTING CONTROLS DESIGN DOCUMENTS.
2. PROVIDE EMERGENCY CIRCUIT TO ALL EMERGENCY TRACK DRIVERS ON THE WEST GALLERY LIGHTING TRACKS.
3. PROVIDE EMERGENCY CIRCUIT TO ALL EMERGENCY TRACK DRIVERS ON THE EAST GALLERY LIGHTING TRACKS.
4. PROVIDE EMERGENCY CIRCUIT TO ALL THE DRIVERS ON THE CENTRAL SOUTH AND OPEN WORK SPACE RM 104 LIGHTING TRACKS. SAME NORMAL POWER CIRCUIT AS SOUTH CENTRAL GALLERY TO SERVE BOTH AREAS.
5. PROVIDE EMERGENCY POWER CIRCUIT AND UL 924 RELAY TO THIS LIGHT FIXTURE FOR EGRESS LIGHTING.
6. EMERGENCY POWER CIRCUIT FOR EXTERIOR EGRESS LIGHTS TYPE 'G' AND INTERIOR EXIT SIGNS TYPE X1*. ROUTE EXTERIOR LIGHTS THROUGH LIGHTING CONTROL SYSTEM RELAY WITH PHOTOCELL AND TIME CONTROL. EXIT SIGNS SHALL REMAIN ILLUMINATED AT ALL TIMES.

0' 2' 4' 8' 16' 32'
SCALE: 1/8" = 1' - 0"

ProjectVerde
ENGINEERING
TX Registration No. F-19841
723 S. Flores,
San Antonio, Texas 78204

ISSUE/REVISIONS

#	DESCRIPTION	DATE
1	Addendum 1	08/23/2022

100% CONSTRUCTION DOCUMENTS

FLOOR PLAN - ELECTRICAL - LIGHTING

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8-23-2022
STATE OF TEXAS
James M. Drewry
63519
LICENSED
PROFESSIONAL ENGINEER

JOB NO.	A19021.00
DESIGNED BY:	JDL
DRAWN BY:	JDL
CHECKED BY:	JDL
DATE:	06/20/2022
SHEET:	E-301

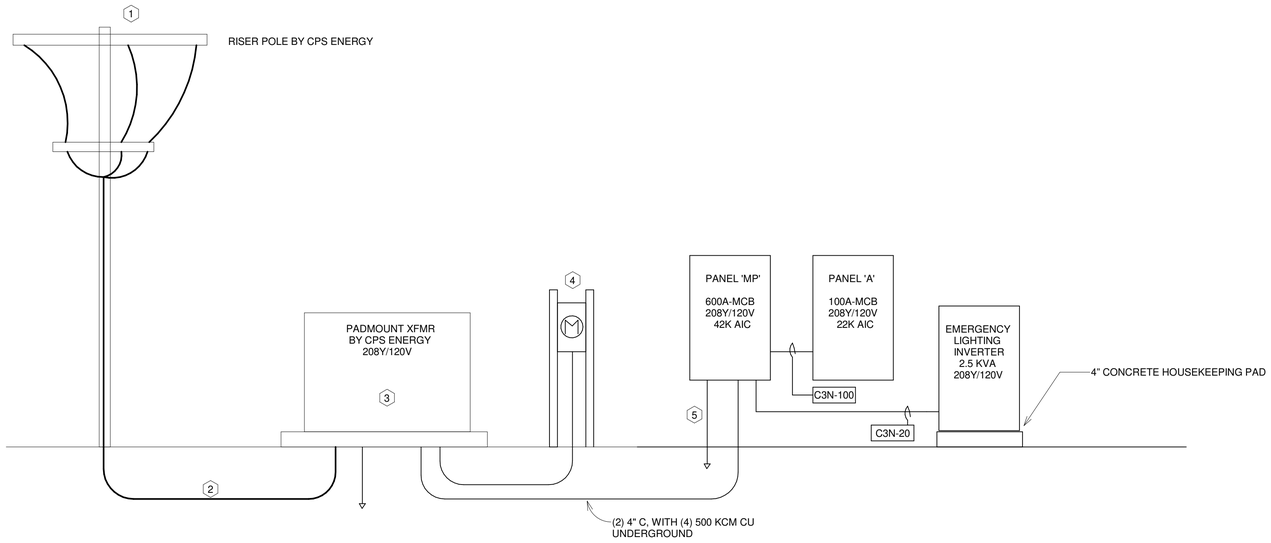
LED INTERIOR LIGHT FIXTURE SCHEDULE

Tag Mark	Description	Manufacturer	Model Number	Lumens	Color Temperature	Finish	Wattage	Input Voltage	Control Type	Comment
A	1/2" DOWNLIGHT	LUCIFER LIGHTING	A2RS-T-AD-1-WH-BK-8-12D-XX-50-B-SG-4	857	TBD	NA	12	120-277	0-10	
B	4" DOWNLIGHT	HE Williams	4DR-TL-I20-9/XX/DIM1-UNV-RW-OF-WH-N-F1	2000	TBD	WHITE	19.8	120-277	0-10	
BE	SAME AS TYPE B									
C	2X2 FLAT PANEL	HE Williams	LP-22-L40-8-XX-DIM-UNV	4000	TBD	WHITE	39.2	120-277	0-10	
CL1	4' SQ. BOVEDA	TBD	CUSTOM ORDER	TBD	TBD	TBD	TBD	120-277	0-10	
CL2	68'X4" BOVEDA	TBD	CUSTOM ORDER	TBD	TBD	TBD	TBD	120-277	0-10	
CL3	32'X4" BOVEDA	TBD	CUSTOM ORDER	TBD	TBD	TBD	TBD	120-277	0-10	
D	TRACK LIGHT HEADS	CORONET	MAG-SPT-LRG-XX-LTG3 XX	1040	TBD	TBD	17	120-277	0-10	PROVIDE 50 HEADS
E	LED TAPE IN ANGLED EXTRUSION	NOVAFLEX	NF-DS-O-64-24V-XXXX/ANGLED 3030 - CR/NF-PS-MAXX-288W-24V-0/10V	309/FT	TBD	NA	2.4W/FT	120-277	0-10	
F	4' LED STRIP	HE Williams	75S-4-L50-8-4000-DIM-UNV	5000	TBD	TBD	33	120-277	0-10	
G	EXTERIOR EGRESS	Isolite	OWL-AC-BZ-MB	1530	3000K	BZ	17	120-277		
P	REFER TO LANDSCAPE PLANS FOR TYPE "B" POLE LIGHT FIXTURE									
R	REFER TO LANDSCAPE PLANS FOR TYPE "C" BOLLARD LIGHT FIXTURE									
S	REFER TO LANDSCAPE PLANS FOR TYPE "D" IN-GRADE LIGHT FIXTURE									
T	MAGNETO TRACK, 2-CIRCUIT TRACK, LENGTH AS REQUIRED, 120V DRIVERS AS REQUIRED, 0-10 VOLT DIMMING CONTROL, WITH EMERGENCY CIRCUIT									
W	REFER TO LANDSCAPE PLANS FOR TYPE "A" WALL LIGHT FIXTURE									
X1	EXIT LIGHT	MULE	PVT-UM-G-S/R-XX	NA	NA	NA	3	120-277	NA	

LIGHTING FUNCTIONAL TESTING/PRE-COMMISSIOING PLAN

THE CONTRACTOR SHALL COMPLETE THE TASKS BELOW TO PRE-COMMISSION THE LIGHTING CONTROL SYSTEM AND SUBMIT WRITTEN DOCUMENTATION DETAILING THE TASKS BELOW. FOR EACH TASK, LIST THE DATE PERFORMED, PERSON COMPPLETING THE TASK, THE INITIAL SETTING/CONDITION., ACTONS PERFORMED, AND FINAL SETTING CONDITION. SUBMIT DOCCUMENTATION AT OR BEFORE SUBSTANTIAL COMPLETION TO FACILITATE OBTAINING THE CERTIFICATE OF OCCUPANCY. PROVIDE COPIES OF THE PRE-COMMISSIONING REPORT TO THE ENGINEER OF RECORD AND TO THE ARCHITECT.

1. ENSURE ALL LIGHT FIXTURES ARE FUNCTIONAL.
2. TEST ALL EXIT SIGNS, EMERGENCY LIGHT FIXTURES, AND EMERGENCY BATTTERY UNITS .
3. VERIFY ALL OCCUPANCY SENSORS HAVE BEEN LOCATED AND AIMED PER THE MANUFACTURER'S INSTRUCTIONS.
4. SET OCCUPANCY SENSORS TIME DELAY SETTINGS IN ACCORDANCE WITH THE MANFACTURER'S INSTRUCTIONS.
5. TEST ALL OCCUPANCY SENSORS FOR MOTION COVERAGE AND CORRECT TIME DELAY.
6. WHERE DIMMING CONTROLS ARE PROVIDED TEST THE CONTROLS FOR FULL RANGE OF DIMMING.



1 ONE-LINE DIAGRAM
NOT TO SCALE

GENERAL ELECTRICAL NOTES

1. THE CONTRACTOR SHALL COORDINATE UNDERGROUND PADMOUNT SERVICE WITH CPS REPRESENTATIVE. INSTALL UNDERGROUND DUCTBANK AND TRANSFORMER PAD IN ACCORDANCE WITH CPS ELECTRIC SERVICE STANDARDS AND PROJECT SPECIFIC DRAWINGS AND SPECIFICATIONS FURNISHED BY CPS.

KEYED (#) ELECTRICAL NOTES

1. COORDINATE LOCATION OF RISER POLE WITH CPS ENERGY.
2. PROVIDE PRIMARY VOLTAGE DUCTBANK IN ACCORDANCE WITH CPS ENERGY PROJECT SPECIFIC DIAGRAMS AND ELECTRIC SERVICE STANDARDS.
3. PROVIDE CONCRETE PAD, GROUND RODS, AND CONDUIT STUB UPS IN ACCORDANCE WITH CPS ENERGY PROJECT SPECIFIC DIAGRAMS AND ELECTRIC SERVICE STANDARDS.
4. PROVIDE GALVANIZED STEEL RACK FOR METER IN ACCORDANCE WITH PROJECT SPECIFIC DIAGRAMS AND ELECTRIC SERVICE STANDARDS.
5. PROVIDE # 2/0 CU GROUNDING ELECTRODE CONDUCTOR FROM PANEL MP GROUND BUS TO BUILDING STEEL. ALSO PROVIDE #2/0 BONDING JUMPER FROM PANEL MP GROUND BUS TO ELECTRICAL RM 115 WALL MOUNTED GROUND BUS.

ELECTRICAL LOAD ANALYSIS

HVAC EQUIPMENT:

UNIT	TYPE	VOLTAGE	PHASE	AMPS	VA	NET VA
RTU-1	ROOF-TOP	208	3	49	52959	
RTU-2	ROOF-TOP	208	3	49	52959	
RTU-3	ROOF-TOP	208	3	49	52959	
RTU-4	ROOF-TOP	208	3	25	27020	
CU-1	MINI DX	208	2	18	3744	
EF-1	EX. FAN	120	1	1	120	
					189762	189762
LIGHTING:						4147

		COUNT	LOAD		
RECEPTACLES:	DUPLEX	78	180	14040	
		FIRST 10 KVA AT 100%:		10000	
		REMAINDER AT 50%:		2020	
			NET RECEPTACLES:	12020	VA
			GRAND TOTAL:	205929	VA
			AMPERAGE AT 208Y120 VOLTS:	572	AMPS

100% CONSTRUCTION DOCUMENTS

ISSUE/REVISIONS

#	DESCRIPTION	DATE
1	Addendum 1	08/23/2022

ELECTRICAL - ONE-LINE DIAGRAM

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118 Broadway Suite 401 San Antonio, Texas 78205
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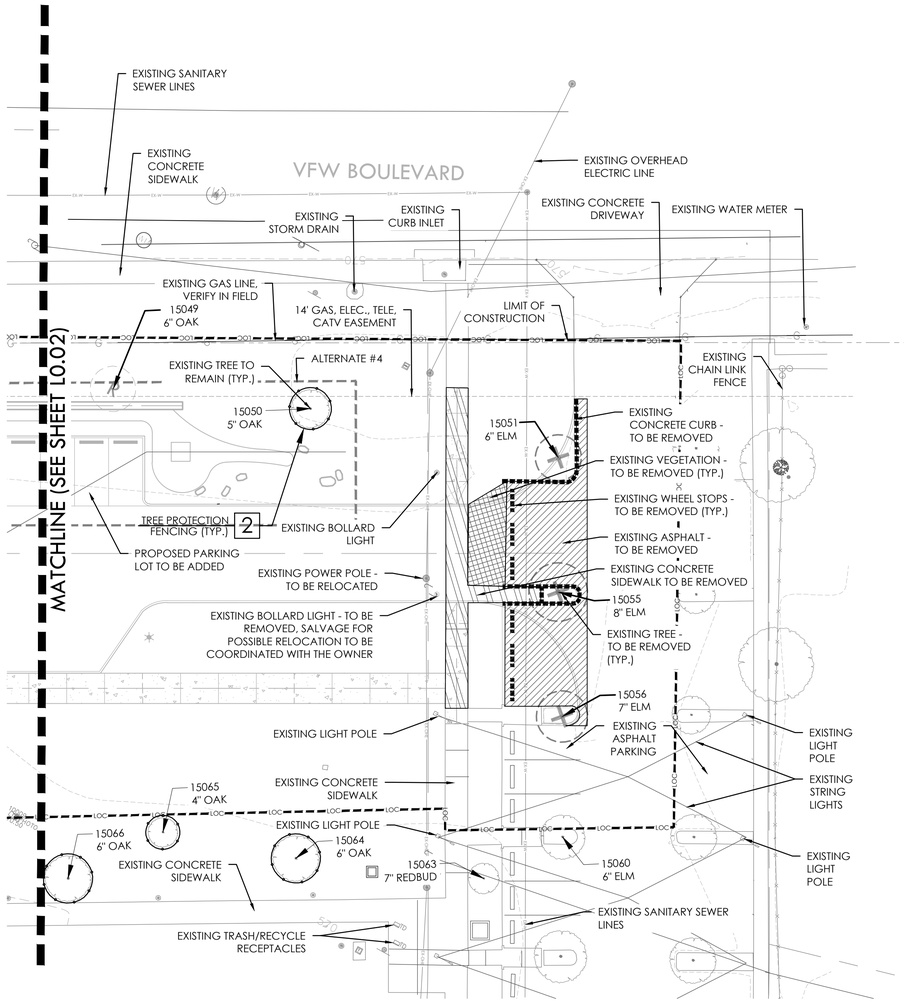
ProjectVerde
ENGINEERING
TX Registration No. F-19841
723 S. Flores,
San Antonio, Texas 78204

8-23-2022
STATE OF TEXAS
James M. Drewry
63519
LICENSED
PROFESSIONAL ENGINEER

JOB NO.	A19021.00
DESIGNED BY:	JDL
DRAWN BY:	JDL
CHECKED BY:	JDL
DATE:	06/20/2022
SHEET:	E-701



LEGEND

- PROPERTY LINE
- LIMIT OF CONSTRUCTION
- FENCE LINE
- OVERHEAD ELECTRIC (EX- OHE)
- EXISTING CONCRETE CURB TO BE REMOVED
- AREA TO BE CLEARED OF VEGETATION NECESSARY TO FACILITATE CONSTRUCTION
- AREA OF ASPHALT TO BE REMOVED
- AREA OF SIDEWALK TO BE REMOVED
- AREA OF CONCRETE DRAIN TO BE REMOVED
- TRUNK PROTECTION FENCING
- TREE PROTECTION FENCING
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED
- EXISTING TREE TO BE RELOCATED (R)

DEMOLITION KEY			
KEY	DESCRIPTION	DETAIL NO:	DETAIL SHEET:
1	TRUNK PROTECTION FENCING	A	L0.06
2	TREE PROTECTION FENCING	B	L0.06

NORTH

GRAPHIC SCALE
0 20 40
1 inch = 20'

REVISIONS			
NO.	DATE	DESCRIPTION	
#	#	#	
#	#	#	
#	#	#	
#	#	#	
#	#	#	

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tel 210.267.0246
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DEMOLITION AND TREE PRESERVATION PLAN

WORLD HERITAGE CENTER
SAN ANTONIO, TEXAS

REGISTERED LANDSCAPE ARCHITECT
BRYAN KYE MUNOZ
2369
STATE OF TEXAS
6/20/22

JOB NO.	5675.001
DESIGNED BY:	TLL
DRAWN BY:	DAM
CHECKED BY:	BKM
DATE:	06/20/2022
SHEET:	L0.01

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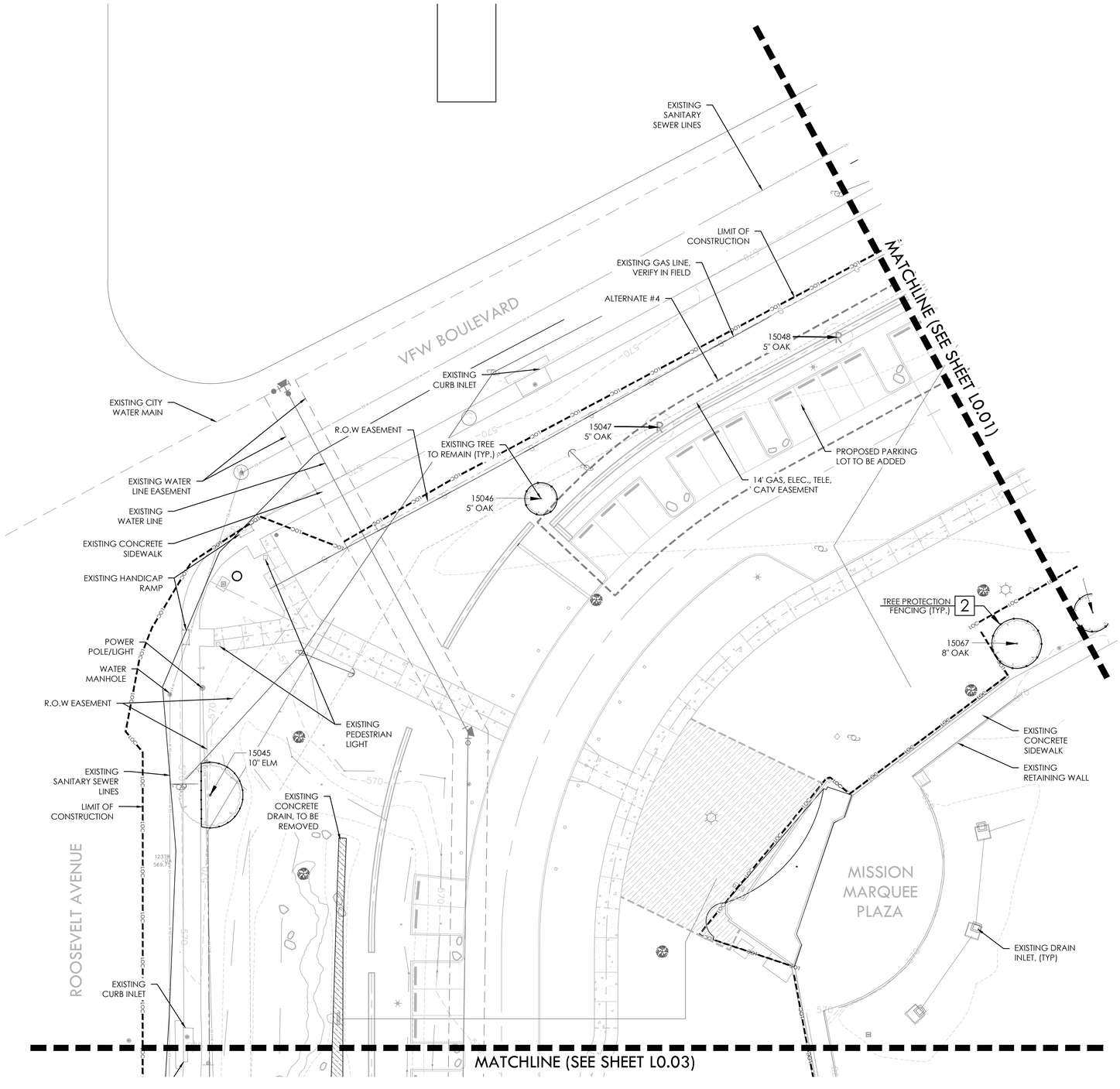
PLOTTED ON: Wednesday, August 22, 2022
PLOTTED AT: 8:31:06 PM
PLOTTED WITH: DWG To PDF.pc3



LEGEND

- PROPERTY LINE
- LIMIT OF CONSTRUCTION
- FENCE LINE
- OVERHEAD ELECTRIC (EX- OHE)
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DEMOLITION KEY

KEY	DESCRIPTION	DETAIL NO:	DETAIL SHEET:
1	TRUNK PROTECTION FENCING	A	L0.06
2	TREE PROTECTION FENCING	B	L0.06

NORTH

GRAPHIC SCALE
0 20 40
1 inch = 20'

REVISIONS

NO.	DATE	DESCRIPTION
#	#	#
#	#	#
#	#	#
#	#	#
#	#	#

DEMOLITION AND TREE PRESERVATION PLAN

WORLD HERITAGE CENTER
SAN ANTONIO, TEXAS

DUNAWAY
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REGISTERED LANDSCAPE ARCHITECT
BRYAN KYE MUNOZ
2369
STATE OF TEXAS
6/20/22

JOB NO.	5675.001
DESIGNED BY:	TLL
DRAWN BY:	DAM
CHECKED BY:	BKM
DATE:	06/20/2022
SHEET:	L0.02

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PLOTTED ON: Monday, August 22, 2022
PLOTTED AT: 6:32:09 PM
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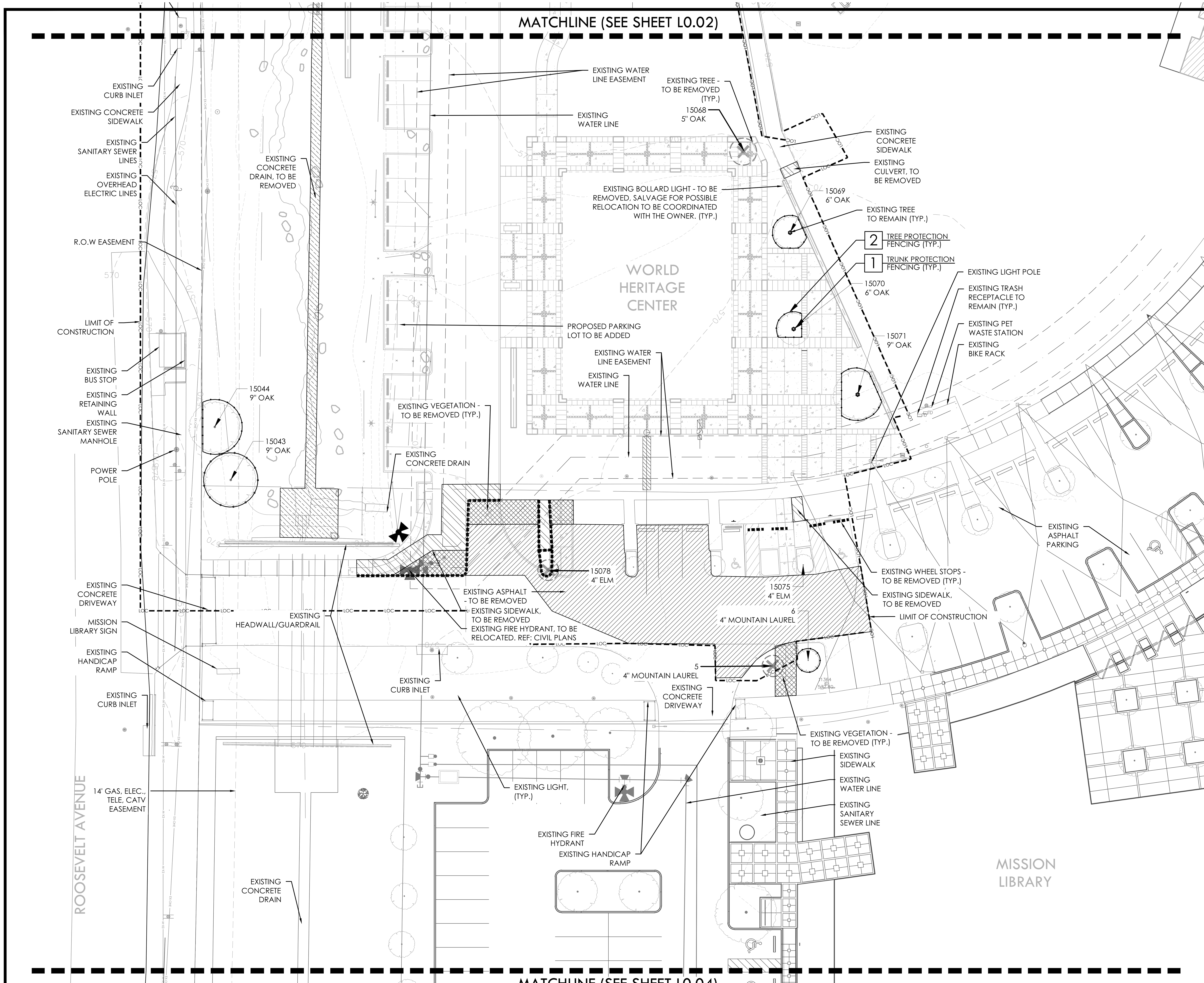
MATCHLINE (SEE SHEET L0.02)
EXISTING CURB INLET
EXISTING CONCRETE SIDEWALK
EXISTING SANITARY SEWER LINES
EXISTING OVERHEAD ELECTRIC LINES
R.O.W EASEMENT
LIMIT OF CONSTRUCTION
EXISTING BUS STOP
EXISTING RETAINING WALL
EXISTING SANITARY SEWER MANHOLE
POWER POLE
EXISTING CONCRETE DRIVEWAY
MISSION LIBRARY SIGN
EXISTING HANDICAP RAMP
EXISTING CURB INLET
14' GAS, ELEC., TELE, CATV EASEMENT
ROOSEVELT AVENUE
EXISTING CONCRETE DRAIN
EXISTING CONCRETE DRAIN, TO BE REMOVED
15044
9" OAK
15043
9" OAK
EXISTING WATER LINE EASEMENT
EXISTING WATER LINE
EXISTING TREE - TO BE REMOVED (TYP.)
15068
5" OAK
EXISTING CONCRETE SIDEWALK
EXISTING CULVERT, TO BE REMOVED
EXISTING BOLLARD LIGHT - TO BE REMOVED, SALVAGE FOR POSSIBLE RELOCATION TO BE COORDINATED WITH THE OWNER. (TYP.)
15069
6" OAK
EXISTING TREE TO REMAIN (TYP.)
2 TREE PROTECTION FENCING (TYP.)
1 TRUNK PROTECTION FENCING (TYP.)
WORLD HERITAGE CENTER
15070
6" OAK
15071
9" OAK
PROPOSED PARKING LOT TO BE ADDED
EXISTING WATER LINE EASEMENT
EXISTING WATER LINE
EXISTING VEGETATION - TO BE REMOVED (TYP.)
EXISTING CONCRETE DRAIN
EXISTING LIGHT POLE
EXISTING TRASH RECEPTACLE TO REMAIN (TYP.)
EXISTING PET WASTE STATION
EXISTING BIKE RACK
EXISTING ASPHALT PARKING
15078
4" ELM
EXISTING ASPHALT - TO BE REMOVED
EXISTING SIDEWALK, TO BE REMOVED
EXISTING FIRE HYDRANT, TO BE RELOCATED. REF: CIVIL PLANS
EXISTING HEADWALL/GUARDRAIL
15075
4" ELM
6
4" MOUNTAIN LAUREL
EXISTING WHEEL STOPS - TO BE REMOVED (TYP.)
EXISTING SIDEWALK, TO BE REMOVED
LIMIT OF CONSTRUCTION
5
4" MOUNTAIN LAUREL
EXISTING CURB INLET
EXISTING CONCRETE DRIVEWAY
EXISTING VEGETATION - TO BE REMOVED (TYP.)
EXISTING SIDEWALK
EXISTING WATER LINE
EXISTING SANITARY SEWER LINE
EXISTING LIGHT, (TYP.)
EXISTING FIRE HYDRANT
EXISTING HANDICAP RAMP
MISSION LIBRARY
MATCHLINE (SEE SHEET L0.04)

LEGEND

PROPERTY LINE	
LIMIT OF CONSTRUCTION	LOC
FENCE LINE	
OVERHEAD ELECTRIC	EX- OHE
EXISTING CONCRETE CURB TO BE REMOVED	
AREA TO BE CLEARED OF VEGETATION NECESSARY TO FACILITATE CONSTRUCTION	
AREA OF ASPHALT TO BE REMOVED	
AREA OF SIDEWALK TO BE REMOVED	
AREA OF CONCRETE DRAIN TO BE REMOVED	
TRUNK PROTECTION FENCING	
TREE PROTECTION FENCING	
EXISTING TREE TO REMAIN	
EXISTING TREE TO BE REMOVED	
EXISTING TREE TO BE RELOCATED	R

DEMOLITION KEY

KEY	DESCRIPTION	DETAIL NO:	DETAIL SHEET:
1	TRUNK PROTECTION FENCING	A	L0.06
2	TREE PROTECTION FENCING	B	L0.06

NORTH

GRAPHIC SCALE
0 20 40
1 inch = 20'

REVISIONS		
NO.	DATE	DESCRIPTION
#	#	#
#	#	#
#	#	#
#	#	#
#	#	#

DEMOLITION AND TREE PRESERVATION PLAN

DUNAWAY
118 Broadway • Suite 201 • San Antonio, Texas 78205
Tel: 210.267.5246
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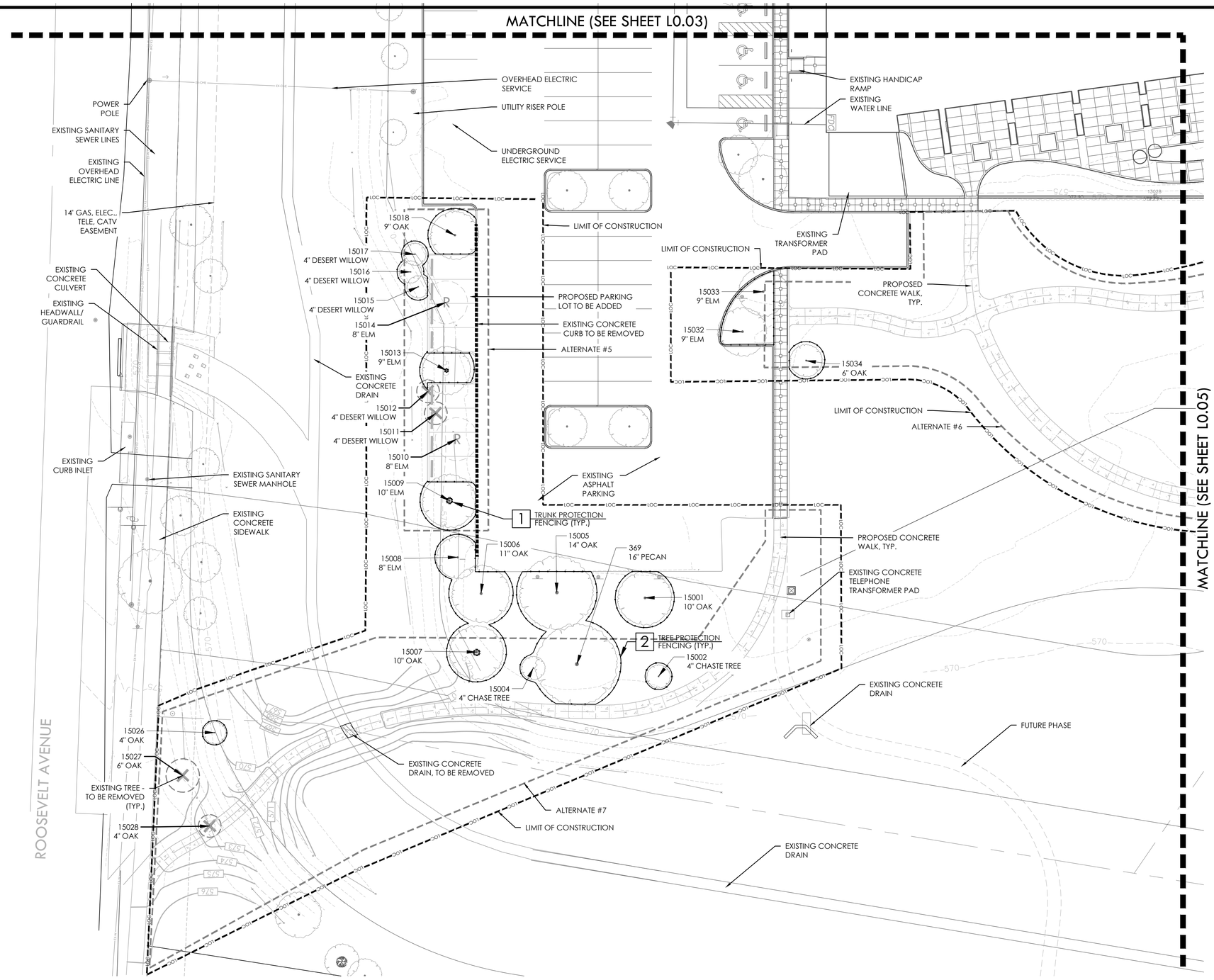
WORLD HERITAGE CENTER
SAN ANTONIO, TEXAS

REGISTERED LANDSCAPE ARCHITECT
BRYAN KYE MASKE
2369
STATE OF TEXAS
6/20/22

JOB NO.	5675.001
DESIGNED BY:	TLL
DRAWN BY:	DAM
CHECKED BY:	BKM
DATE:	06/20/2022
SHEET:	L0.03



LEGEND

- PROPERTY LINE
- LIMIT OF CONSTRUCTION
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- OVERHEAD ELECTRIC
- EXISTING CONCRETE CURB TO BE REMOVED
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1	TRUNK PROTECTION FENCING	A	L0.06
2	TREE PROTECTION FENCING	B	L0.06

NORTH

GRAPHIC SCALE
0 20 40
1 inch = 20'

REVISIONS

NO.	DATE	DESCRIPTION
#	#	#
#	#	#
#	#	#
#	#	#
#	#	#

DEMOLITION AND TREE PRESERVATION PLAN

WORLD HERITAGE CENTER
SAN ANTONIO, TEXAS

DUNAWAY
118 Broadway • Suite 201 • San Antonio, Texas 78205
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6/20/22

JOB NO.	5675.001
DESIGNED BY:	TLL
DRAWN BY:	DAM
CHECKED BY:	BKM
DATE:	06/20/2022
SHEET:	L0.04

FILE PATH: G:\Production\#00\005\05675\01\PLA\Drawings\95% CD\Plot Sheets\G:\Production\#00\005\05675\01\PLA\Drawings\95% CD\Plot Sheets\5675.001 Ex Conditions Plan

FILENAME: 5675.001 Ex Conditions Plan.dwg
PLOTTED BY: Tess Ludwig
PLOTTED ON: Monday, June 27, 2022
PLOTTED AT: 6:23:48 PM
PLOTTED WITH: ESWG to PDF.pc3

SECTION 102239

FOLDING GLASS-PANEL PARTITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes manually operated, glass-panel partitions and accessories.

B. Related Requirements:
1. Section 061053 “Miscellaneous Rough Carpentry”

2. Section 055000 "Metal Fabrications" for supports that attach supporting tracks to overhead structural system.

1.3 DEFINITIONS

A. STC: Sound Transmission Class.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For operable glass-panel partitions.

1. Include plans, elevations, sections, details, numbered panel installation sequence, and attachments to other work.
2. Indicate stacking and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.

C. Samples for Initial Selection: For each type of exposed material, finish, covering, or facing.

1. Include Samples of accessories involving color selection.

D. Samples for Verification: For each type of exposed material, finish, covering, or facing, prepared on Samples of size indicated below:

1. Panel Edge Material: Not less than 3 inches long.

2. Glass: Units 12 inches square.
3. Hardware: One of each exposed door-operating device.

E. Delegated-Design Submittal: For operable glass-panel partitions.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Partition track, track supports and bracing, switches, turning space, and storage layout.
2. Suspended ceiling components.
3. Structural members to which suspension systems are attached.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling, including the following:

    1. Lighting fixtures.
    2. HVAC ductwork, outlets, and inlets.
    3. Speakers.
    4. Sprinklers.
    5. Smoke detectors.

B. Setting Drawings: For embedded items and cutouts required in other work.

C. Qualification Data: For qualified Installer.

D. Product Certificates: For each type of operable glass-panel partition.

E. Product Test Reports: For each operable glass-panel partition, for tests performed by a qualified testing agency.

F. Sample Warranty: For manufacturer's special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For operable glass-panel partitions to include in maintenance manuals.

1. Panel finish and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
2. Seals, hardware, track, track switches, carriers, and other operating components.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of operable glass-panel partitions that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

1. Faulty operation of operable glass-panel partitions.
2. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer licensed in the state of Texas.

B. Acoustical Performance: Provide operable glass-panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:

1. Sound-Transmission Requirements: Operable glass-panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E90, determined by ASTM E413, and rated for not less than the STC indicated.

2.2 OPERABLE GLASS PANELS

A. Operable Glass Panels: Aluminum-framed glass-panel partition system, including panels, seals, suspension system, operators, and accessories.

1. Products: Subject to compliance with requirements, provide one of the following:

1. Modernfold, Inc; Acousti-Clear Automatic – Paired Panel
2. ~~Nana Wall Systems, Inc.; HSW 60~~ **Moderco** (www.moderco.com)
3. Carvart; Stackwall Motion (STAK-MT)
4. Architect approved equal

B. Panel Operation: Manually operated, individual or paired panels.

C. Panel Construction: As required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level;

plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.

1. Factory-Glazed Fabrication: Glaze operable glass panels in the factory where practical and possible for applications indicated. Comply with manufacturer's written instructions and with requirements in Section 088000 "Glazing."

D. Glass and Glazing: Glass type as specified in Section 088000 "Glazing."

E. Glass and Glazing: As follows:

1. Safety Glass Standard for Partition Panels: Glass products complying with testing requirements in 16 CFR 1201, Category II, or ANSI Z97.1, Class A.
2. Safety Glass Standard for Pass Doors: Glass products complying with testing requirements in 16 CFR 1201, Category II.
3. Glass: Manufacturer's standard safety glass and glass assemblies as indicated and complying with requirements in Section 088000 "Glazing" and as follows:

    1. Tempered Glass: ASTM C1048, Kind FT (fully tempered), Type I (transparent flat glass), Class 1 (clear), Quality-Q3.

    2. Glass Thickness: Manufacturer's standard thickness for indicated requirements and complying with requirements in Section 088000 "Glazing"
    3. Glass Vertical Edge: Manufacturer's standard.

4. Glazing System: Manufacturer's standard factory-glazing system.

F. Dimensions: Fabricate operable glass-panel partitions to form an assembled system of dimensions indicated and verified by field measurements.

1. Panel Width: Equal widths as indicated on Drawings.

G. STC: Not less than 32.

H. Panel Frame Thickness: Manufacturer's standard
1. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use, corrosion resistance, and finish indicated; ASTM B221 for extrusions; manufacturer's standard strengths and thicknesses for type of use.

    a. Frame Reinforcement: Manufacturer's standard.

I. Panel Closure: Manufacturer's standard unless otherwise indicated.

J. Hardware: Manufacturer's standard as required to operate operable glass-panel partition and accessories; with protective finish.

1. Hinges: Manufacturer's standard

K. Panel Frame Finishes:

1. Exposed Metal: As selected by Architect from manufacturer's full range as follows:
    a. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

b. Color: to be selected from manufacturer's full range of colors.

2.3 SEALS

A. Description: Seals that produce operable glass-panel partitions complying with performance requirements and the following:

1. Manufacturer's standard seals unless otherwise indicated.
2. Seals made from materials and in profiles that minimize sound leakage.
3. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable glass-panel partition perimeter and adjacent surfaces, when operable glass-panel partition is extended and closed.

2.4 SUSPENSION SYSTEMS

A. Tracks: Steel or aluminum mounted directly to overhead structural support, designed for operation, size, and weight of operable glass-panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable glass-panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.

1. Panel Guide (for paired panels only): Aluminum guide on both sides of the track to facilitate straightening of the panels; finished with factory-applied, decorative, protective finish.
2. Head Closure Trim: As required for acoustical performance; with finish to match aluminum frames.

B. Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.

C. Aluminum Finish: to match aluminum frames.

2.5 ACCESSORIES

A. Pass Doors: Swinging door built into and matching panel materials, construction, acoustical qualities, finish and thickness, complete with frames and operating hardware. Hinges finished to match other exposed hardware.

1. Accessibility Standard: Fabricate doors to comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and TAS.
2. Double Pass Door: size as indicated on Drawings.
3. Pass-Door Hardware: Equip pass door with the following:

    1. Door Seals: manufacturer's standard.
    2. Panic hardware.
    3. Concealed door closer.
    4. Latchset: Passage set.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine flooring, floor levelness, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable glass-panel partitions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install operable glass-panel partitions and accessories after other finishing operations, including painting, have been completed in area of partition installation.

B. Install panels in numbered sequence indicated on Shop Drawings.

C. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.

D. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.

3.3 ADJUSTING

A. Adjust operable glass-panel partitions, hardware, and other moving parts to function smoothly, and lubricate as recommended by manufacturer.

B. Verify that safety devices are properly functioning.

3.4 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operable-partition operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable glass-panel partitions.

END OF SECTION 102239

SECTION 105123

PLASTIC-LAMINATE-CLAD LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad lockers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker.

B. Shop Drawings: For plastic-laminate-clad lockers.

1. Include plans, elevations, sections, and attachment details.
2. Show details full size.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in lockers.
5. Show locker fillers, trim, base, sloping tops, and accessories.
6. Show locker identification system and numbering sequence.

C. Samples for Initial Selection: For each type of the following:

1. High-pressure decorative laminates.

D. Samples for Verification: For the following products:

1. Plastic-laminate-clad panels, not less than 8 by 10 inches, for each type, color, pattern, and surface finish.
2. Corner pieces of locker front frame joints between stiles and rail, as well as exposed end pieces, not less than 18 inches wide by 18 inches high by 6 inches deep.
3. Exposed cabinet hardware and accessories, one unit for each type and finish.
4. Carpet, not less than 8 by 10 inches, for each type, color, and pattern.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical locker, including door panel with specified door hardware, as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver lockers until painting and similar operations that could damage lockers have been completed in installation areas. If lockers must be stored in other-than-installation areas, store only in areas where environmental conditions are the same as those in final installation location, and comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install lockers until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where lockers are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.

1. Locate concealed framing, blocking, and reinforcements that support lockers by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where lockers are indicated to fit to other construction, establish dimensions for areas where lockers are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of concealed wood support bases.
1. Requirements are specified in Section 061053 “Miscellaneous Rough Carpentry”

B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that lockers can be supported and installed as indicated.

C. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 087100 "Door Hardware" to fabricator of lockers; coordinate Shop Drawings and fabrication with hardware requirements.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of lockers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of locks or hardware.
c. Deterioration of wood, finishes, and other materials beyond normal use.

2. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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A. Accessibility Standard: For lockerS indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and TAS.

2.2 PLASTIC-LAMINATE-CLAD LOCKERS

A. Products: Subject to compliance with requirements, provide one of the following:

1. Hollman, Inc
2. Legacy Lockers
3. Architect approved equal
4. Scantron Duralife lockers

B. Construction Style: Manufacturer's standard.

1. Reveal Dimension: Manufacturer's standard.

C. Final Assembly: Manufacturer's standard knocked-down assembly.

D. Locker Body: Fabricated from medium-density-fiberboard core panels covered on both sides with thermoset decorative overlay.

1. Side Panels: Manufacturer's standard 3/4 or 5/8 inch thick.
2. Back Panel: Manufacturer's standard 1/2 or 3/8 inch thick.
3. Top Panel: Manufacturer's standard 3/4 or 5/8 inch thick..

4. Bottom Panel: Manufacturer's standard 3/4 or 5/8 inch thick.
5. Exposed Panel Edges: High-pressure decorative laminate, Grade HGS, to match panels.

E. Plastic-Laminate-Clad Wood Doors: High-pressure decorative laminate, Grade VGS, over both sides of medium-density-fiberboard core.

1. Thickness: Manufacturer's standard 3/4 or 5/8 inch thick.
2. Panel Edges: High-pressure decorative laminate, Grade VGS, to match panels.

F. End Panels: Match style, material, construction, and finish of plastic-laminate-clad wood doors.

G. Shelves: Fabricated from medium-density-fiberboard core panels covered on both sides with thermoset decorative overlay; fixed.

1. Thickness: 3/4 inch.
2. Exposed Edges: High-pressure decorative laminate, Grade VGS, to match panels.

H. Corners and Filler Panels: 3/4-inch-thick panels. Match style, material, construction, and finish of plastic-laminate-clad wood doors.

I. Continuous Finish Base: Plastic-laminate-clad, 3/4-inch-thick panel that matches door faces; fabricated in lengths as long as practical to enclose base and base ends of lockers.

J. Continuously Sloping Tops: Plastic-laminate-clad, 3/4-inch-thick panel that matches door faces for installation over lockers with separate flat tops. Fabricate tops in lengths as long as practical, without visible fasteners at splice locations. Provide fasteners, supports, and closures, as follows:
1. Sloping-top corner fillers, mitered.

K. Plastic-Laminate Colors, Patterns, and Finishes:
1. As selected by Architect from plastic-laminate manufacturer's full range of colors and patterns.

2.3 MATERIALS

A. Composite Wood: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Thermoset Decorative Panels: Medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.
2. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
3. Softwood Plywood: DOC PS 1, medium-density overlay.

B. High-Pressure Decorative Laminate: NEMA LD 3, grades as follows:

1. Horizontal Surfaces: Grade HGS.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade HGS.

C. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

D. Anchors: Material, type, size, and finish as required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

E. Wood Support Base: 2-by-4-inch nominal-size lumber treated with manufacturer's standard preservative-treatment, pressure process.

2.4 HARDWARE

A. Cylinder Lock: Built-in, flush cam locks with five-pin tumbler keyway, keyed separately and master keyed. Furnish two change keys for each lock and two master keys.

B. Butt Hinges: 2-3/4-inch, five-knuckle steel hinges; back mounted.

1. Provide two hinges for doors 36 inches high and less.
2. Provide three hinges for doors more than 42 inches high.

C. Wire Pulls: Back mounted; 4 inches long, 5/16 inch in diameter.

D. Shelf Rests: BHMA A156.9, B04013.

E. Hooks: Manufacturer's standard, ball-pointed aluminum or steel; finished to match other locker hardware. Attach hooks with at least two fasteners.
1. Provide one double-prong ceiling hook for each compartment of double-tier lockers.

F. Exposed Hardware Finish:

1. To be selected by Architect from manufacturers full range.

2.5 ACCESSORIES

A. Number Identification Plates: 1-1/2-inch-diameter, etched, embossed, or stamped, plates with black numbers and letters at least 1/2 inch high. Identify lockers in sequence indicated on Drawings. Finish plates to match other locker hardware.

2.6 FABRICATION

A. Fabricate each locker with shelves, an individual door and frame, an individual top, a bottom, and a back, and with common intermediate uprights separating compartments.

1. Fabricate lockers to dimensions, profiles, and details indicated.
2. Ease edges of corners of solid-wood members to 1/16-inch radius.

B. Fabricate lockers square, rigid, without warp, and with finished faces flat and free of dents, scratches, and chips. Accurately factory machine components for attachments. Make joints tight and true.

1. Fabricate lockers using manufacturer's standard construction, with joints made with dowels, dados, or rabbets. Dado side panels to receive shelving except where indicated to be adjustable.
2. Fabricate lockers with joints that are dadoed or rabbeted, glued full length, and stapled. Dado side panels to receive shelving except where indicated to be adjustable.

C. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf no lower than 15 inches above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.

D. Number Identification Plates: Inlay number plates flush in each locker door, near top, centered.

E. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

F. Shop cut openings, to maximum extent possible, to receive hardware, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

G. Attach PVC edging to panels by thermally fusing edging to panels after panel fabrication.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and floors or support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify that furring is attached to concrete and masonry walls that are to receive lockers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Condition lockers to average prevailing humidity conditions in installation areas before installation.

B. Before installing lockers, examine factory-fabricated work for completeness and complete work as required, including removal of packing.

3.3 INSTALLATION

A. Install wood support base with 1/2-inch-thick, plywood top.

B. Knocked-Down Lockers: Assemble with manufacturer's standard fasteners, with no exposed fasteners on face frames.

C. Install lockers level, plumb, and true; use concealed shims.

D. Connect groups of lockers together with manufacturer's standard fasteners, through predrilled holes, with no exposed fasteners on face frames. Fit lockers accurately together to form flush, tight, hairline joints.

E. Install lockers without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings, providing unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Installation Tolerance: No more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line. Shim as required with concealed shims.

F. Locker Anchorage:
1. Fasten lockers through back, near top and bottom, at ends with No. 8 flush-head wood screws sized for 1-inch penetration into wood framing, blocking, or furring and spaced not more than 16 inches o.c.

G. Scribe and cut corner and filler panels to fit adjoining work using fasteners concealed where practical. Repair damaged finish at cuts.

H. Attach sloping-top units to lockers, with end panels covering exposed ends.

I. Install number identification plates after lockers are in place.

1. Attach number identification plate on each locker door, near top, centered, with at least two screws with finish matching the plate.

3.4 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors to operate easily without binding.

3.5 PROTECTION

A. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes, or replace lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105123

SECTION 051200

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Structural steel.
2. Prefabricated building columns.
3. Shear stud connectors.
4. Shrinkage-resistant grout.

B. Related Requirements:

1. Section 051213 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
2. Section 053100 "Steel Decking" for field installation of shear stud connectors through deck.
3. Section 055000 "Metal Fabrications" for **steel lintels and shelf angles not attached to structural-steel frame**, **miscellaneous steel fabrications** and other steel items not defined as structural steel.
4. Section 133419 "Metal Building Systems" for structural steel.

1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Anchor rods.
5. Threaded rods.
6. Forged-steel hardware.
7. Slide bearings.
8. Prefabricated building columns.
9. Shop primer.
10. Galvanized-steel primer.
11. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
5. Identify members not to be shop primed.

C. Delegated-Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data **signed and sealed by the qualified professional engineer responsible for their preparation**.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Survey of existing conditions.

C. Source quality-control reports.

D. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU

B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.
2. ANSI/AISC 341.
3. ANSI/AISC 360.
4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Connection Design Information:
1. Option 2: Fabricator's experienced steel detailer shall select or complete connections in accordance with ANSI/AISC 303.

a. Select and complete connections using **schematic details indicated and ANSI/AISC 360** .
b. Use **Load and Resistance Factor Design; data are given at factored-load level**.

2. Option 3 and 3B: Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.

a. Use **Load and Resistance Factor Design; data are given at factored-load level**.

2.2 STRUCTURAL-STEEL MATERIALS

A. <Double click to insert sustainable design text for recycled content.>

B. W-Shapes: **ASTM A992**

C. Channels, Angles: **ASTM A36**.

D. Plate and Bar: **ASTM A36**.

E. Cold-Formed Hollow Structural Sections: **ASTM A500, Grade B** or **ASTM A500, Grade C** structural tubing.

F. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.

1. Weight Class: **Standard**,**Extra strong**, **Double-extra strong** as indicated in the construction documents..

G. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F959, Type 325-1 , compressible-washer type with plain finish.

B. High-Strength A490 Bolts, Nuts, and Washers: ASTM F3125, Grade A490, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F959, Type 490-1, compressible-washer type with plain finish.

C. Galvanized High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

1. Finish: **Hot-dip or mechanically deposited galvanize coating**.

D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125, Grade F1852, Type 1, **heavy-hex** head assemblies, consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

E. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

2.4 RODS

A. Headed Anchor Rods: **ASTM F1554, Grade 36 ASTM F1554, Grade 55, weldable**.

1. Nuts: ASTM A563 **heavy-**hex carbon steel.
2. Plate Washers: ASTM A36 carbon steel.
3. Washers: ASTM F436 , Type 1, hardened carbon steel.
4. Finish: **Plain ~~Hot-dip zinc coating, ASTM A153, Class C~~**.

B. Threaded Rods: **ASTM A36**.

1. Nuts: ASTM A63 **heavy-**]hex carbon steel.
2. Washers: **ASTM F436 , Type 1, hardened**carbon steel.
3. Finish: **Plain**.

2.5 FORGED-STEEL STRUCTURAL HARDWARE

A. [**Clevises**] [**and**] [**Turnbuckles**]: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1035.

B. Eye Bolts and Nuts: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1030.

C. Sleeve Nuts: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1018.

2.6 PRIMER

A. Steel Primer:
1. SSPC-Paint 23, latex primer.

B. Galvanized-Steel Primer:**MPI#26**,**MPI#80**,**MPI#134**.

1. Etching Cleaner: MPI#25, for galvanized steel.
2. Galvanizing Repair Paint: **SSPC-Paint 20 ASTM A780**].

2.7 SHRINKAGE-RESISTANT GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.8 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.

4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

C. Bolt Holes: Cut, drill,or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with **SSPC-SP 1.**

F. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1 and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. **Do not thermally cut bolt holes or enlarge holes by burning.**
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.9 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: **Snug tightened**.

B. Weld Connections: Comply with AWS D1.1 **and AWS D1.8** for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.10 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize **lintels**, **shelf angles** and any structural steel outside of the building envelope.

2.11 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces .
6. Corrosion-resisting (weathering) steel surfaces.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
1. SSPC-SP 6 (WAB).

C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner **or in accordance with SSPC-SP 16**.

D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.12 SOURCE QUALITY CONTROL

A. Testing Agency: **Engage** a qualified testing agency to perform shop tests and inspections.

1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. Bolted Connections: Inspect shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1 and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E165.

b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
c. Ultrasonic Inspection: ASTM E164.
d. Radiographic Inspection: ASTM E94.

4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1 for stud welding and as follows:

a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.
b. Conduct tests in accordance with requirements in AWS D1.1 on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.

5. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates **Bearing Plates and Leveling Plates**: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. **Snug-tighten** anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. **Comply with manufacturer's written installation instructions for grouting.**

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection[**unless approved by EOR. Finish thermally cut sections within smoothness limits in AWS D1.1**.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: **Snug tightened**.

B. Weld Connections: Comply with AWS D1.1/D1.1M **and AWS D1.8** for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs **where indicated**, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.5 REPAIR

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting:

1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

2. Cleaning and touchup painting are specified in **Section 099113 "Exterior Painting." Section 099123 "Interior Painting." Section 099600 "High-Performance Coatings."**

C. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: **Engage** a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1.

a. In addition to visual inspection, test and inspect full penetration groove field welds in accordance with AWS D1.1 and the following inspection procedures,
1) Ultrasonic Inspection: ASTM E164.

END OF SECTION 051200

Geotechnical Engineering Study

World Heritage Visitor Center
San Antonio, Texas

Arias Job No. 2019-823

ARIAS
GEOPROFESSIONALS

Prepared For
Dunaway Associates, L.P.
November 4, 2020

ARIAS
GEOPROFESSIONALS

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November 4, 2020
Arias Job No. 2019-823

Via Email: bmask@dunawayassociates.com

Mr. Bryan Mask
Regional Manager/Associate Principal
Dunaway Associates, L.P.
118 Broadway, Suite 201
San Antonio, Texas 78205

RE: Geotechnical Engineering Study
World Heritage Visitor Center
San Antonio, Texas

Dear Mr. Mask:

This report presents the results of a Geotechnical Engineering Study for the proposed construction of the World Heritage Visitor Center to be located in the Mission Marque Plaza area between Roosevelt Avenue and Padre Drive and south of VFW Boulevard in San Antonio, Texas. This study was authorized on December 18, 2019 by the signing of the Dunaway Associates, L.P. Subconsultant Agreement B003929.001 and in accordance with Arias Proposal No. 2019-823, dated September 11, 2019.

The purpose of this geotechnical engineering study was to establish foundation and pavement engineering properties of the subsurface soil and groundwater conditions present at the site. The scope of the study is to provide geotechnical engineering criteria for use by design engineers in preparing the foundation and pavement design. Our findings and recommendations should be incorporated into the design and construction documents for the proposed development.

The long-term success of the project will be affected by the quality of materials used for construction and the adherence of the construction to the project plans and specifications. The quality of construction can be evaluated by implementing Quality Assurance (QA) testing. As the Geotechnical Engineer of Record (GER), we recommend that the earthwork and foundation construction be tested and observed by Arias in accordance with the report recommendations. A summary of our qualifications to provide QA testing is discussed in the "Quality Assurance Testing" section of this report. Furthermore, a message to the Owner with regard to QA testing is provided in the GBA publication included in Appendix E.

Thank you for the opportunity to be of service to you.

Sincerely,
Arias & Associates, Inc.
TBPE Registration No: F-32

Kacy M. Crawford, P.E.
Geotechnical Engineer

STATE OF TEXAS
JERRY D. SHEPHERD
112142
LICENSED
PROFESSIONAL ENGINEER
11-4-20

Jerry D. Shepherd, P.E., D.GE
Senior Geotechnical Engineer

REPORT FORMAT INFORMATION

To improve clarity in the intent of our geotechnical recommendations for this project, the report is organized into two separate and equally important sections.

Section I – *Synopsis* is a summary of our geotechnical recommendations specific to this project.

Section II - The *Main Report* contains more detailed information including foundation design parameters and site work recommendations.

A study of both of the above referenced sections is recommended for the Project Team Members. Arias cautions that Section I is a consolidated quick reference overview of the more detailed geotechnical recommendations contained in Section II and should not be utilized exclusively from the remainder of the report.

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SECTION I: SYNOPSIS

This synopsis includes a brief description of the project, subsurface findings, preferred foundation type, generalized earthwork requirements for construction, and specific items of concern from a geotechnical standpoint for consideration during the design, construction, and maintenance phases of this project.

Table 1: Project Description

Project:	World Heritage Visitor Center
Project Location:	Mission Marque Plaza area between Roosevelt Avenue and Padre Drive and south of VFW Boulevard in San Antonio
Proposed Development:	1-Story Building, and associated pavements
Preferred Foundation Type:	Stiffened Beam and Slab On Grade or Drilled Piers
Improved Site Condition (Design PVR):	1-inch

Table 2: Existing Conditions at Time of Geotechnical Study

Ground Cover:	Grass
Predominant Soil Types:	Lean Clay (CL), Clayey Sand (SC), Fat Clay (CH) and Clayey Gravel (GC) with variable sand and gravel percentages
Plasticity Index (PI):	Range: 17 - 59; Average: 37
Groundwater Depth Measured:	None Encountered during the Field Exploration on October 5, 2020
Estimated Potential Vertical Rise (PVR):	Approximately 3 to 5 inches

Table 3: Building Pad Recommendations for 1-inch Design PVR

Recommended Foundation Type:	Stiffened Beam and Slab on Grade
Site Improvement Method:	Undercut and Replace with Compacted Select Fill in Moisture Controlled Lifts at the building
Improved Site Condition (PVR):	1-inch
Minimum Undercut Depth:	6 feet
Exposed Subgrade Preparation (See Note 3):	Proof roll with rubber-tired vehicle weighing at least 20 tons such as a loaded dump truck
Pumping/Rutting Areas Discovered During Proof rolling:	Remove to firmer materials and replace with compacted select fill under direction of Geotechnical Engineer's representative
Scarify, Moisten & Compact Exposed Subgrade:	**12 inches**
Minimum Thickness of Select Fill	**6 Feet**
Select Fill Type:	• LEAN CLAY (CL) with LL <40, PI = 8 – 20, #200>50%, 3" Maximum Particle Size. • Working Surface: Top 6" to be Crushed Limestone Base Meeting Requirements of TxDOT Item 247 Type A, Grade 1 or 2
Moisture Barrier:	See Note 8

Notes:

1. The building pad improvements will be used with a stiffened beam and slab on grade foundation.
2. Following stripping operations, undercut the existing soils from beneath the slab area to at least the depth provided above. Undercutting should extend laterally to provide at least a 5-foot overbuild beyond the building perimeter and to the width of any adjacent sidewalks wider than five (5) feet.
3. The exposed subgrade should be thoroughly rolled with a heavily loaded dump truck weighing at least 20 tons. A minimum of 20 passes should be performed with passes alternating in directions perpendicular to each other. Any area that yields under the roller loading should be undercut to the depth specified by the geotechnical engineer and replaced with compacted select fill as specified by the Geotechnical Engineer and outlined in Table 6. If deleterious material, rubble, or debris is encountered, they should be removed to firmer materials and disposed of properly. The void should then be replaced with properly compacted select fill. It is important that the site preparation operations be observed and tested by an Arias representative to verify that these recommendations are followed.
4. After the recommended undercut of five (5) feet has been completed, the exposed subgrade should then be removed to a depth of at least 12 inches, proof rolled as shown in Note 3 above, then moisture conditioned and compacted in maximum 6-inch compacted lifts as specified in SECTION I, Table 6 (Project Compaction, Moisture and Testing Requirements).
5. The building pad should be constructed using select fill. The select fill should be placed within 48 hours of completion of the subgrade compaction and should be placed in maximum 8-inch loose lifts as specified in SECTION I, Table 6 (Project Compaction, Moisture and Testing Requirements).
6. For construction equipment access, and to help in providing a more "all-weather" working surface, we recommend placing six (6) inches of compacted crushed limestone base meeting the requirements of 2004 TXDOT Item 247, Type A, Grade 1 or 2 on top of the select fill which counts as part of the five (5) feet of select fill.
7. If additional select fill thickness is necessary to achieve final design grade, fill should consist of material meeting the requirements in Table 3 above.

8. A horizontal barrier should extend at least 10 feet horizontally beyond the perimeter of the foundation of the building. The barrier can consist of concrete or asphalt paving, concrete flatwork or at least 24" of compacted onsite or import clay (PI between 20 and 40). All joints within the pavement, flatwork, and at pavement/flatwork interfaces should be sealed. Any landscaping located within 10 feet of each structure foundation should be placed in watertight above-grade planter boxes with drainage discharge on top of adjacent flatwork/paving. We recommend that the beams for the building be constructed to a depth of at least 36 inches to aid in reducing the potential for moisture fluctuation beneath the building pad. The final grade beam depth and recommended construction should be determined by the structural engineer. The slab vapor retarder plastic should be extended from beneath the slab down the inside face (building pad side) of the grade beam trench.

Table 4: Drilled Pier Foundation Recommendations-See Tables 13 & 14

Recommended Foundation Type:	Drilled Pier Foundations with Suspended Floor Slab
Scarify, Moisten & Compact Exposed Subgrade:	A minimum of 12 inches Designed for positive drainage to maintain moisture conditions beneath the floor slab. A minimum 2% subgrade slope to appropriate sumps is recommended to prevent ponding of surface water.
Minimum Crawl Space, Void or Clear Space Between underlying subgrade soils and Floor Slab, Grade Beams and suspended utilities:	18 inches
Minimum Pier Depth:	Straight shaft drilled Piers at least 25 feet below the existing surface. **Deeper depths may be required to resist compressive, uplift, pullout, or lateral loads as determined by the Project Structural Engineer. If piers are designed to be deeper than 30-feet, we should be contacted to provide additional borings and recommendations.**

Table 5: Recommended Pavement Sections

Layer	Material	Flexible Asphaltic Concrete				Rigid Concrete			
		Parking Area & Light Duty		Drive Through Lane, Bus Lane & Medium Duty		Parking Area & Light Duty		Access Drive, Truck Lane & Medium Duty	
Surface	HMAC/PCC	2”		4”	2”	5”	6”	6”	7”
	Type B	--		--	4”				
Base	Flexible Base	12”	10”	16”	10”	--	--	--	--
Subgrade	Moisture conditioned *Moisture conditioned flexible asphalt sections should also have Tensar TX-140 geogrid installed over the 6-inch moisture conditioned subgrade	*6”	--	*6”	--	--	6”	--	6”
	Lime Treated See Note 8 below	--	6”	--	6”	6”	--	6”	--

Notes:

1. Asphaltic concrete pavements founded on top of expansive soils will be subjected to PVR soil movements estimated and presented in this report (*i.e.,* approximately 3 to 5 inches). These potential soil movements are typically activated to some degree during the life of the pavement. Consequently, pavements can be expected to crack and require periodic maintenance. Periodic/preventative maintenance should be planned for to reduce deterioration of the pavement structure while aiding to preserve the investment.

2. Light duty areas include parking and drive lanes that are subjected to passenger vehicle traffic only. Light duty areas exclude entrance aprons and drives to the site and single access route drive lanes to parking areas.

3. Medium duty areas include entrance aprons and drives into the site, single access route drive lanes to parking areas, and areas where paving will be subjected to bus traffic and lightly loaded trucks. Medium duty areas exclude areas where tractor trailers may travel or park, dock areas, areas where trash collection vehicles may travel and load or unload.

4. Heavy duty areas include areas subjected to 18-wheel tractor trailers, trash collection vehicles, dumpster pad including access routes to the loading and unloading areas, and areas where truck turning and maneuvering may occur. **At least eight (8)-inch thick concrete is recommended for heavy duty pavement areas and is not shown in Table 5. Furthermore, although flexible pavement options for medium duty including bus lane are shown in the table above, we would recommend that all areas subject to bus traffic consist of an 8-inch thick concrete section. Flexible pavement under bus loading and turning could exhibit signs of early distress and require additional and more frequent maintenance.**

5. During the paving life, maintenance to seal surface cracks within concrete or asphalt paving and to reseal joints within concrete pavement should be undertaken to achieve the desired paving life. Perimeter drainage should be controlled to reduce the influx of surface water from areas surrounding the paving. Water penetration into base or subgrade materials, sometimes due to irrigation or surface water infiltration leads to pre-mature paving degradation. Curbs should be used in conjunction with paving to reduce potential for infiltration of moisture into the base course. Curbs should extend the full depth of the base course and should extend at least 3 inches into the underlying clayey subgrade. The base layer should be tied into the area inlets to drain water that may collect in the base.

6. For flexible pavements only where the moisture conditioned subgrade option will be utilized, Tensar TX-140 geogrid should be installed over the 6-inch moisture conditioned subgrade and beneath the compacted crushed limestone base material.

7. Material specifications, construction considerations, and section requirements are presented under "Pavement Subgrade and Section Materials" included in Section II of this report.

8. **Subgrade materials must be sampled and tested for soluble sulfate content before using any chemical treatment additive such as lime, cement, and/or fly ash.**

Table 6: Project Compaction, Moisture and Testing Requirements

Description	Material	Percent Compaction	Optimum Moisture Content	Testing Requirement
		Compaction Test TxDOT 113-E for gravelly soils, and TxDOT 114-E for clayey soils		
Building Pad	Scarified, Moisture Conditioned On-site Soil (Subgrade)	≥ 95%	0 to +4%	1 per 2,500 SF; min. 3 tests
	Select Fill Body	≥ 98%	-1 to +3%	1 per 2,500 SF; min. 3 tests
	Base Material Cap	≥ 95% (ASTM D 698)	-1 to +3%	1 per 2,500 SF; min. 3 tests
Pavement Areas	Scarified, Moisture Conditioned On-site Soil (Subgrade)	≥ 95%	0 to +4%	1 per 2,500 SF; min. 3 tests
	General Fill (Onsite Material)	≥ 95%	0 to +4%	1 per 2,500 SF; min. 3 per lift
	Base Material	≥ 95% (ASTM D 1557)	±3%	1 per 2,500 SF; min. 3 per lift
Non-Structural Areas (Outside Building)	General Fill (On-site Material)	≥ 95%	0% to +4%	1 per 2,500 SF; min. 3 per lift

SECTION II: MAIN REPORT

PROJECT AND SITE DESCRIPTION

The proposed project will consist of the construction of an approximate 10,000 square foot single-story building with parking area and connecting entry drives located in the Mission Marque Plaza area between Roosevelt Avenue and Padre Drive and south of VFW Boulevard in San Antonio, Texas. Associated on site pavements will also be constructed.

Structural loading has not been provided to us prior to the preparation of this Geotechnical Engineering Study Report. However, due to our experience with similar size and types of structures, we have assumed that the expected interior column loads will be approximately 60 kips, exterior column loads will be approximately 100 kips, and wall loads are expected to be approximately 1.0 to 2.5 kips per linear foot of wall.

A Site Vicinity Map is provided as Figure 1 in Appendix A.

This study was authorized on December 18, 2019 by the signing of the Dunaway Associates, L.P. Subconsultant Agreement B003929.001 and in accordance with Arias Proposal No. 2019-823, dated September 11, 2019.

For the purposes of this geotechnical engineering study, we are assuming that the acceptable design PVR for the grade supported building is 1-inch. If a different foundation type or magnitude of PVR is desired, we should be contacted to provide additional recommendations for additional PVR values.

SOIL BORINGS

Three (3) soil borings were drilled at the approximate locations shown on the Boring Location Plan provided as Figure 2 in Appendix A. The boring depths were measured from below the existing ground surface elevation that existed during the drilling and sampling activities on October 5, 2020. One (1) boring was drilled in the proposed building area, and two (2) borings were drilled within the planned new pavement areas. Table 7 below summarizes the boring details.

Table 7: Boring Details Summary

Boring No.	Structure	Depth, feet	Coordinates	
			Latitude	Longitude
B-1	Building	30	29°21'56.41"N	98°28'50.3130"W
B-2	Pavement	10	29°21'57.24"N	98°28'50.77"W
B-3		10	29°21'59.69"N	98°28'49.37"W

All of the borings were sampled in accordance with ASTM D1586 procedures for Split Spoon sampling techniques and in accordance with ASTM D 1587 thin wall tube sampling as described in Appendix C. A truck-mounted drill rig using continuous flight augers together with the sampling tool noted was used to secure the subsurface soil samples.

Soil classifications and borehole logging were conducted during the exploration by our engineering technician working under the supervision of the Project Geotechnical Engineer. Final soil classifications, as seen on the boring logs included in Appendix B, were determined by the Project Geotechnical Engineer based on laboratory and field test results and applicable ASTM procedures. A key to the terms and symbols used on the boring logs is also included in Appendix B.

LABORATORY TESTS

As a supplement to the field exploration, laboratory testing was performed to determine soil water content, Atterberg Limits, and percent passing the US Standard No. 200 sieve. The laboratory test results are reported in the attached boring logs included in Appendix B. The soil laboratory testing for this project was done in accordance with applicable ASTM procedures and specifications and definitions for these tests are listed in Appendix C**.**

Remaining soil samples recovered from this exploration will be routinely discarded following submittal of this report.

SUBSURFACE CONDITIONS

Generalized stratigraphy and groundwater conditions encountered are discussed in the following sections. The subsurface and groundwater conditions are based on conditions encountered at the boring locations to the depths explored.

Geology

A Geologic Map for the project sites is presented in Figure 4 of Appendix A. The earth materials underlying the majority of the proposed project area have been regionally mapped as Fluviatile Terrace Deposits (Qt). Bedrock at the site would be residual clay of the Wilcox Group (EPAwi)

Fluviatile Terrace Deposits are stream bed deposits typically consisting of clays, sands, silts, and gravels. Such deposits can contain point bars, cutbanks, oxbows, and abandoned channel segments associated with variations in stream bed activity. As a result, soil profiles in terrace deposit areas may vary greatly over relatively short distances. Key geotechnical engineering concerns for development supported on this formation are the expansive nature of the clays, the consistency or relative density of the deposits, and the absence/presence as well as thickness of potentially water-bearing gravels. Due to the alluvial nature of these deposits, significant variations can occur over short distances.

Wilcox Group primarily consists of mudstone, and weathered clays. These materials are typically dark brown to gray in color, contain a variable sand percentage, are glauconitic and ironstone concretions. Minor lithologic units consist of sandstones, and the potential for lignite in localized areas. The unit is up to 1,000 feet thick in the San Antonio Area.

Site Stratigraphy and Engineering Properties

The generalized subsurface stratigraphy encountered at this site is summarized in the Table 8 below. The presence and thickness of the various subsurface materials can be expected to vary away from and between the exploration locations. The descriptions generally conform to the Unified Soils Classification System.

Table 8: Generalized Soil Conditions

Stratum	Depth (ft)	Material Type	PI range	No. 200 range	PP range	N Range
I	0 to 4	Brown SANDY LEAN CLAY (CL) – stiff to very stiff Not encountered at Boring B-3	22 - 27	61 - 68	--	11 - 22
II	4 to 13	Gray & Tan – CLAYEY SAND with GRAVEL (SC), CLAYEY GRAVEL with SAND (GC) – medium dense to very dense Only encountered in Boring B-1	17 - 55	16 - 37	--	24 – 50/5”
IA	4 – 13 to 10 - 30	Brown & Dark Brown FAT CLAY (CH), FAT CLAY with SAND (CH), SANDY LEAN CLAY (CH), LEAN CLAY (CL), stiff to very stiff	17 - 59	83 - 100	4.5+	20 - 28

Where: Depth - Depth from existing ground surface at the time of geotechnical study, feet
PI - Plasticity Index, %
No. 200 - Percent passing #200 sieve, %
PP - Pocket Penetrometer, tsf
N - Standard Penetration Test (SPT) N-value, blows per foot
-- - No test taken in that stratum
* - Only one test in that stratum

Groundwater

A dry soil sampling method was used to obtain the soil samples at the project site. Groundwater was not encountered during the field exploration on October 5, 2020. The open boreholes were backfilled using soil cuttings generated from the drilling process. Groundwater levels will often change significantly over time and should be verified immediately prior to construction. Water levels in open boreholes may require several hours to several days to stabilize depending on the permeability of the soils. Groundwater levels at this site may differ during construction because fluctuations in groundwater levels can result from seasonal conditions, rainfall, drought, or temperature effects.

Pockets or seams of gravels, sands, silts or open fractures and joints can store and transmit "perched" groundwater flow or seepage. Should dewatering become necessary, it is considered means and methods and is solely the responsibility of the contractor.

MOISTURE VARIATIONS AND ESTIMATED MOVEMENT

Structural damage can be caused by volume changes in clay soils. Clays can shrink when they lose water and swell (grow in volume) when they gain water. The potential for expansive clays to shrink and swell is typically related to the Plasticity Index (PI). Clays with a higher PI generally have a greater potential for soil volume changes due to moisture content variations. The soils found at this site are capable of swelling and shrinking in volume dependent on potentially changing soil water content conditions during or after construction. The term swelling soils implies not only to the tendency to increase in volume when water is available, but also to decrease in volume or shrink if water is removed.

The measured PIs of the near-surface soil samples obtained at this site suggest that the soils have a moderately high to very high potential for shrinking and swelling due to fluctuations in soil moisture content. Several methods exist to evaluate swell potential of expansive clay soils. We have estimated potential heave utilizing the TXDOT method (Tex 124-E). Using the TXDOT method, we estimate that the PVR is approximately **3 to 5 inches** considering the existing soil moisture conditions at the time of the sampling activities.

It has been our experience that the PVR method can sometimes underestimate the potential shrink/swell movements. Fluctuations in the soil moisture content generated from climatic conditions (*i.e.*, droughts or floods) or as a result of development (*e.g.*, irrigation of landscaping in the immediate vicinity of the foundations, poor surface drainage, leaking plumbing or water lines) may result in greater shrink/swell movements than calculated.

FOUNDATION DESIGN CONSIDERATIONS

Both shallow and deep foundation types are utilized in areas with expansive soils. Deep drilled piers are suited to structures with moderate to heavy loading conditions. The piers, when properly founded, can reduce foundation movement of the superstructure. Grade beams, isolated from the soil, typically span between the piers.

A shallow foundation type consisting of a slab-on-grade is a common alternate approach for small to moderate size structures. When founded within expansive soils, subgrade improvement is recommended in order to reduce potential soil and foundation movement to a magnitude acceptable to the owner and design team. Some aesthetic distress is normally acceptable to the owner and design team with this foundation alternative.

Each approach has its advantages and disadvantages in terms of cost and overall performance. Structures founded on expansive clay soils can be expected to experience some distress.

As previously noted in this report, expansive clays shrink when they lose water and swell or grow in volume when they gain water content. Change in soil moisture is the single most important factor affecting the shrinking and swelling of clays. Therefore, soils having a high Plasticity Index and located in an area that the soil moisture varies considerably from drought to wet seasons will typically experience the highest magnitude of foundation movement. Surface and subsurface drainage and the presence of trees and/or other large vegetation can also affect foundation performance significantly.

Structures constructed during dry periods on expansive soils generally experience the greatest amount of foundation movement. This is a result of water gaining access under the foundation. Water access under the foundation can occur from various sources including subsurface "perched" groundwater infiltration, poor surface drainage, leaking irrigation or plumbing lines, and/or climate change. Often, movement of a foundation placed on highly expansive clay will be minimal provided the soil moisture content remains stable over time. Although initial construction cost is generally higher, a structurally suspended floor slab system is often used instead of a soil supported floor slab on an improved building pad in order to reduce the risk of excessive foundation movements and floor/wall cracking due to moisture fluctuations in the expansive clays.

Recommended Foundation Types

Due to the relatively high PVR (3 to 5 inches) at this site, we recommend that the World Heritage Visitor Center building be supported on either a stiffened beam with a slab on grade foundation or a drilled pier foundation with a suspended floor slab. Recommendations for both foundation types are provided in subsequent sections of this report

The project team may determine that another foundation type is desired for this project during the design phase. Should an alternate foundation type be desired, we should be contacted to provide additional geotechnical design data for the alternate foundation type as a Supplement to this Geotechnical Report.

RECOMMENDATIONS FOR GRADE SUPPORTED STRUCTURES

The following sections contain the foundation recommendations for the grade supported structure at the site.

Recommended Building Pad Improvement for 1" PVR

Grade-supported foundation elements for the proposed building will require additional site improvement recommendations in order to reduce the PVR or soil shrink-swell potential of the expansive clays. In this area, a PVR of 1-inch is typically an acceptable amount of

movement for structures of this type and the recommendations provided in this report are based on this assumption. Although this is a typically acceptable magnitude of movement in this area, it should be understood that a 1-inch PVR can result in some cracking requiring periodic maintenance; but the structural integrity of the building should be maintained. Recommendations are presented in Table 3 shown in Section I and are valid only for a 1-inch design PVR.

The building pad, plus a 5-foot overbuild or greater to include adjacent flatwork, should be stripped of vegetation and excavated, as necessary, to provide the required select fill thickness beneath the slab. Any existing fill material, deleterious materials, and other debris that are encountered during the excavation of the building area should be removed. Remove and replacement of onsite soils should be conducted according to the table below.

Table 9: Remove and Replace Values

Design PVR	Removal Depth of Onsite Soils	Minimum Replacement with Select Fill
1 inch	6 feet	**A minimum of 6 feet**

It is essential that, prior to the placement of select fill, the exposed subgrade area of the excavation should be proof rolled to identify any soft areas, if present. Proof rolling should be accomplished using a loaded dump truck weighing at least 20 tons. Weak or soft areas evidenced during proof rolling, should be over-excavated and replaced as outlined in Table 3 of this report. After proof rolling, the subgrade should be removed to a depth of 12 inches and reconditioned and compacted as shown in Note 4 of Table 3.

In unpaved areas at the perimeter of the planned building, a **2-foot thick clay cap** (see Note 8, Table 3) should be constructed over the select fill overbuild. This clay cap should aid in reducing the chances for surface water from infiltrating into the more previous select fill and ponding on top of the underlying, less permeable clay subgrade. A PVR exceeding 1-inch can occur if water is allowed to readily pond on top of the clay subgrade beneath the select fill body. Clean onsite soils (PI of 20 to 40, if present) can be used to construct the clay cap. The clay cap should be moisture conditioned to between 0 and +4 percentage points of optimum moisture content and then compacted to at least 95 percent of the maximum dry density determined by ASTM D 698.

Exterior grade beams based at the recommended depth, and founded within the compacted select fill, should be designed for the allowable soil bearing capacity of 2,000 pounds per square foot (psf). Exterior grade beams may be thickened and widened at concentrated loads to serve as spread footings. The exterior grade beams should be a minimum of 12 inches wide. The exterior grade beams should extend at least 36 inches below final grade

within the compacted select fill. The structural engineer should determine the grade beam and slab depths/thicknesses and reinforcement as well as the potential need and details for interior stiffening beams and other foundation elements.

We recommend that at least a 10-mil vapor retarder be used under the slab. The vapor retarder should conform to ASTM E1745, Class C or better and shall have a maximum water vapor permeance of 0.044 perms when tested in accordance with ASTM E96. A 10 mil Stego Wrap by Stego Industries LLC or other similar products meeting these requirements would be acceptable.

Stiffened Beam Slab on Grade Design Parameters

A grid type beam and slab-on-grade is generally used to support structures upon expansive soils where soil conditions are relatively uniform, and where uplift and settlement can be tolerated. The intent of a stiffened beam and slab-on-grade foundation is to allow the structure and foundation to move up and down with soil movements while providing enough stiffness to limit differential movements within the superstructure to an acceptable magnitude.

There are various design methods for use by the structural engineer to select the grade beams depths and beam spacing's for this project. The foundations may be designed using the Building Research Board No. 33 (BRAB Report) as a guideline. Alternatively, the foundation may be designed based on the Design of Slab-On-Ground Foundations published by the Wire Reinforcement Institute, Inc. (WRI-August 1981). Provided in the following sections are design criteria for both methods.

Tables 10 through 12 below present the design criteria for the proposed building.

Table 10: BRAB and WRI Foundation Design Criteria for 1-inch PVR

Design Method	BRAB	WRI
Design PVR	1"	1"
Climatic Rating (Cw) – San Antonio, Texas	17	17
Effective Plasticity Index for Site Improvement to 1" PVR	32	32
Support Index (C)	0.82	--
Soil/Climatic Rating Factor (1-C)	--	0.18
Unconfined Compressive Strength (tsf)	1.2	--

Note: The above design values assume that the building pad has been improved as outlined in this report for an approximate 1-inch design PVR.

A stiffened slab on grade foundation may also be designed for the structure using the 3rd Edition of the Design of Post-Tensioned Slabs-on-Ground published by the Post-Tensioning Institute. These values were estimated from the "Volflo" computer program in consideration of the soil conditions in the area of each of the planned buildings. Provided in the following table are design criteria for this method for design PVR value of 1-inch.

Table 11: PTI Slab-on-Grade Soil Design Criteria (3rd Edition)

DESIGN PVR	About 1 inch
Depth to Constant Soil Suction	15 Feet
Constant Soil Suction	3.8 pF
Edge Moisture Variation Distance **Center Lift, e_m** **Edge Lift, e_m**	 8.3 feet 4.2 feet
Differential Soil Movement **Center Lift, y_m** **Edge Lift, y_m**	 1.8 inches 1.2 inches
Coefficient of Slab-Subgrade Friction, μ	0.75

Note: The above design values assume that the building pad has been improved as outlined in this report for an approximate 1-inch design PVR.

Arias is providing design values for BRAB, WRI, and PTI methods for the Structural Engineer's consideration and possible use. Arias recommends the final design methodology for the planned foundation be selected by the project Structural Engineer based on his knowledge and experience with similar foundation conditions.

Table 12: Allowable Bearing Pressure and Beam Penetration

Allowable Bearing Pressure	2,000 psf
Bearing Stratum at Bottom of Grade Beams/Footings	Compacted Select Fill
Min. Penetration of Beams/Footings Below Final Grade for Bearing Pressure Requirements	36 inches

Note: Actual beam depth should be determined by structural engineer. Minimum penetration below final grade is necessary to reduce scour potential and the potential for water penetration under the foundation

The grade beams/footings should be based at the recommended depth or deeper, founded within the compacted select fill, and should be designed for the allowable soil bearing capacity provided above. Grade beams may be thickened and widened at concentrated loads to serve as spread footings. The beams and widened columns should be a minimum of 10 and 12 inches wide, respectively, for shear resistance. The grade beams should extend at least 36 inches below final grade within the compacted select fill. It is critical that all grade beams bear in similar materials in order to reduce the potential for differential movements.

RECOMMENDATIONS FOR DRILLED PIERS

Straight shaft drilled piers can be used for the foundation for the World Heritage Visitor Center building. Recommendations for evaluation of axial capacity and lateral capacity for

the piers are presented in the following tables. Pier capacities for axial loading were evaluated based on design methodologies included in FHWA-IF-99-025 - Drilled Shafts: Construction Procedures and Design Methods.

Table 13: Drilled Pier Design Parameters Axial Capacity

Depth	Material	Recommended Design Parameters		
		Allowable Skin Friction, psf	Allowable End Bearing, psf	Uplift Force, kips
0 to 5	SANDY LEAN CLAY (CL), FAT CLAY (CH), FAT CLAY with SAND (CH), CLAYEY SAND with GRAVEL (SC)	NEGLECT		
5 to 10	CLAYEY SAND with GRAVEL (SC), LEAN CLAY (CL), FAT CLAY with SAND (CH)	750	--	80*D
10 to 13	CLAYEY GRAVEL with SAND (GC)	1,000		
13 to 30	FAT CLAY (CH)	800	8,000	
Constraints to be Imposed During Pier Design				
Minimum embedment depth		Straight shaft drilled Piers at least 25 feet below the existing surface. **Deeper depths may be required to resist compressive, uplift, pullout, or lateral loads as determined by the Project Structural Engineer. If piers are designed to be deeper than 30-feet, we should be contacted to provide additional borings and recommendations.**		
Under reamed (belled) piers		Belled piers may be necessary in order to resist the uplift force. The bell diameter should not be more than 3 times the shaft diameter		
Minimum Void Space under Grade Beams, Pier Caps and suspended floor system		18 inches		

Notes:

1. For straight shaft piers, the contribution of the soils for the top 5 feet of soil embedment and for a length equal to at least 1 pier diameter from the bottom of the shaft should be neglected in determination of friction capacity for compression loading. The recommended design parameters include a factor of safety of 3 for end bearing and 2 for skin friction.
2. Total and differential settlement of piers are expected to be less than 1 inch and ½ inch, respectively. Estimated settlements are based on performance of properly installed piers in the South Texas areas. A detailed settlement estimate is outside of the scope of this service.
3. Sufficient reinforcing steel should be placed within the pier to account for tension and lateral loading as applicable. Pier vertical reinforcing steel should be designed to resist the uplift forces from swelling soils and uplift and lateral forces from wind loading. The final reinforcing requirements should be determined by the project structural engineer. Tensile rebar steel should be designed in accordance with ACI Code Requirements.
4. A minimum shaft diameter of 18 inches is recommended. Larger shaft diameters may be required. Straight-shaft piers should be spaced at least 3 diameters apart center-to-center. If the recommended pier spacing cannot be maintained, Arias should be consulted to consider the group effect of closely spaced piers.

5. The uplift force resulting from expansion of soils in the active zone may be computed using the above formula in Table 13 above where D is the shaft diameter in feet. For drilled straight-sided piers, the contribution from soils to resist uplift is the allowable skin friction resistance of the soils below the 15-ft deep estimated active zone. For uplift loading only, the allowable skin resistance for the bottom 1 pier diameter can be used. Sustained dead loads will also aid in resisting uplift forces. Pier depths greater than 25 feet may be required to: (1) resist expansive soil uplift forces, and/or (2) as a result of axial or lateral loading requirements. It should also be noted that relatively shallow piers at this site will be subject to the potential magnitude of PVR movements as noted previously. In addition, shallow piers may exhibit rotation, tilt, etc. The Owner and Design Team must understand and accept the risks associated with shallow piers at this site.

6. Uplift resistance can also be increased by installing a bell at the planned bearing depth. The uplift resistance for an under reamed (belled) pier can be evaluated by utilizing the bell as an anchor. For this case, the diameter of the bell may be evaluated by equating the net upward force (uplift force less sustained compressive load) to the soil bearing capacity above the bell as determined by the following formula:

Where: UR (net) = 9 * (B^2 - D^2)
UR (net) = net upward resistance in kips
B = under-ream diameter in feet
D = shaft diameter in feet

7. If bells are used, the piers should be spaced at a minimum of 2 bell diameters apart measured from the center of each pier. If the recommended pier spacing of the belled piers cannot be maintained, Arias should be consulted to consider the group effect of closely spaced piers.

Lateral pile analyses including capacity, maximum shear, and maximum bending moment will be evaluated by the project structural engineer using LPILE or similar software. In the following table, Arias presents geotechnical input parameters for the encountered soils at the project site. Please note that the depths to the top and bottom of each layer were interpreted using approximate elevation data at the explored boring locations and layer boundaries as shown on the boring logs.

Table 14: Drilled Pier Geotechnical Input Parameters for LPILE Analyses: B-1

Depth, Feet	Description	γ_e	C_u	ϕ	K Static / Cyclic	e_{50}
0 to 5	SANDY LEAN CLAY (CL), FAT CLAY (CH), FAT CLAY with SAND (CH), CLAYEY SAND with GRAVEL (SC)	Neglect				
5 to 10	CLAYEY SAND WITH GRAVEL (GC)	125	--	30	90	--
10 to 13	CLAYEY GRAVEL WITH SAND (SC)	125	--	35	90	--
13 to 30	FAT CLAY (CH)	120	2000	0	500/200	0.10

Where: γ_e = effective soil unit weight, pcf
c_u = undrained soil shear strength, psf
ϕ = undrained angle of internal friction, degrees
K = soil modulus, pci
e_{50} = 50% strain value

Suspended Floor Slab

We recommend that the floor slab supported by the drilled piers be structurally suspended above grade and supported on straight shaft or belled drilled piers. A void space, or crawl space, of at least 18 inches must be constructed to isolate the slab and grade beams from the soil subgrade. Construction options to create this void space may include the use of cardboard carton forms (void boxes), soil retainers, and/or formwork. The use of a suspended floor slab should significantly reduce the chances for differential vertical foundation movement and distress associated with the highly expansive soils encountered at this site. However, even with this system some nominal upward movement may occur.

If void boxes are used to create the void beneath the floor slab, care must be taken not to damage the boxes prior to or during concrete placement. The void boxes should be protected from the elements (rain and excessive moisture) at all times. The void boxes should have a tight fit to the pier foundations. Furthermore, the void boxes should be designed to deteriorate properly after construction so that pressures from swelling soils will collapse the carton forms rather than be transmitted to the overlying grade beams and/or floor slab. The carton form supplier should provide a technical representative to attend a preconstruction meeting, and to also be present during the start of foundation construction, to instruct the workforce in proper carton form construction techniques.

Soil retainers such as precast concrete panels should be placed vertically along the exterior grade beams to: (1) prevent soil from sloughing under the grade beams; and (2) reduce the risk of significant water from migrating into the void space under the floor system. Backfill against the retainers and exterior grade beams should consist of compacted clay soil to aid in preventing the easy movement of outside surface water from infiltrating under the floor system. The backfill clay soil should be compacted to at least 95 percent of the Standard Proctor maximum dry density as evaluated by ASTM D 698 at moisture contents ranging from optimum to plus four (+4) percentage points of optimum moisture content.

Positive drainage should also be provided for the building so that surface water does not enter beneath the foundation or enter into air vents that may be situated in the exterior grade beam. Roof drains should be tied to storm drains or be discharged on top of pavements well outside of the building footprint.

Formwork other than carton forms may be used to create the crawl space beneath the building. Provisions should be made to collect and dispose of any surface and/or subsurface water that may enter in the crawl space. This can generally be accomplished by constructing a 4-inch-thick unreinforced lean concrete slab or “mudmat” on the surface of the crawl space beneath the concrete floor. The surface of the “mudmat” should be sloped to drain to a sump where the water can be collected and pumped away from the building. These steps can help reduce the potential for soil moisture fluctuations under the floor which can often lead to pier

and floor movement. Proper ventilation should be provided to help limit moisture from collecting in the crawl space. In some instances, forced-air-ventilation/circulation is used to reduce moisture accumulation and humidity in the crawl space. Mold growth may occur if the crawl space is not adequately ventilated.

It should also be noted that the subsurface materials encountered in our borings generally consisted of medium dense to very dense clayey sands and clayey gravels and stiff to very stiff clays. Thus, we anticipate that high-torque drilling equipment will be required for pier installation at this site. Groundwater can also be encountered especially within the more granular soils which are more susceptible to sloughing/caving. The Contractor should be familiar with and prepared for such conditions.

Design Measures to Reduce Changes in Soil Moisture for Proposed Structure

Additionally, the design and construction of the foundation should also include the following elements:

- Roof drainage should be controlled by gutters and carried well away from the building. The ground surface adjacent to the perimeter should be sloped and maintained a minimum of 5% grade away from the building for 10 feet to result in positive surface flow or drainage away from the perimeter.

- Hose bibs, sprinkler heads, and other external water connections should be placed well away from the foundation perimeter such that surface leakage cannot readily infiltrate into the subsurface or compacted fills placed under the proposed foundation and slab.

- No trees or other vegetation over six (6) feet in height shall be planted within 20 feet of the structure unless specifically accounted for in the foundation design.

- Utility bedding should not include gravel within four (4) feet of the perimeter of the foundation. Compacted clay or flowable fill trench backfill should be used in lieu of permeable bedding materials between two (2) feet inside the building to a distance of 4 feet beyond the exterior of the building edge to reduce the potential for water to infiltrate within utility bedding and backfill material.

- Paved areas around the structure are helpful in maintaining equilibrium within the soil water content. If possible, pavement and sidewalks should be located immediately adjacent to, and sloped away from the new building.

- Flower beds and planter boxes should be piped or watertight to prevent water infiltration under the building. Experience indicates that landscape irrigation is a common source of foundation movement problems and pavement distress.

- Site work excavations should be protected and backfilled without delay to reduce changes in the natural moisture regime.

See **ADDITIONAL DESIGN CONSIDERATIONS** shown subsequently for further discussion of utilities.

Flatwork Considerations

Minor differential movements between the planned structures and abutting sidewalks should be expected if the flatwork is supported on similar conditions. Flatwork supported on the unimproved, natural site conditions will result in foundation movements of the magnitudes reported in the PVR section. We recommend that the flatwork be designed to include details that permit foundation movements without resulting in vertical separations and without distressing either element. Control joints should include steel reinforcing to prevent vertical shear, but to allow bending.

The flatwork and abutting sidewalks should be designed and constructed to allow for positive drainage away from the foundation. The planned site grading should allow for potential future differential movements and should **never** be allowed to reach a level or negative slope that promotes drainage toward the foundation.

IBC Site Classification and Seismic Design Coefficients

Section 1613 of the International Building Code (2015) requires that every structure be designed and constructed to resist the effects of earthquake motions, with the seismic design category to be determined in accordance with Section 1613 or ASCE 7. Site classification according to the International Building Code (2015) is based on the soil profile encountered to the 100-foot depth. The stratigraphy at the site location was explored to a maximum 30-foot depth.

Soils having similar consistency were extrapolated to be present between the 30 and 100-foot depths. On the basis of the site class definitions included in the 2015 Code and the encountered generalized stratigraphy, we characterize the site as Site Class D.

Seismic design coefficients were determined using the on-line software, Seismic Hazard Curves and Uniform Response Spectra, version 5.1.0, dated February 10, 2011 accessed at (http://earthquake.usgs.gov/hazards/designmaps/javacalc.php). Analyses were performed considering the 2015 International Building Code. Input included GPS coordinates and Site Class D. Seismic design parameters for the site are summarized in the following table.

Table 15: Seismic Design Parameters

Site Classification	F_a	F_v	S_s	S_1
D	1.6	2.4	0.051g	0.022g

Where: Fa = Site coefficient
Fv = Site coefficient
Ss = Mapped spectral response acceleration for short periods
S_1 = Mapped spectral response acceleration for a 1-second period

ADDITIONAL DESIGN CONSIDERATIONS

Utilities

Utilities which go through the slabs should be designed with some flexibility to allow free movement in the lines as a result of potential soil shrinkage or swelling.

CONSTRUCTION RECOMMENDATIONS

Site Preparation

Strip away any existing topsoil, grass, organics, and deleterious debris as needed and dispose outside of the foundation area.

Drilled Pier Construction Considerations

The contractor should verify groundwater conditions before production pier installation begins. Comments pertaining to high-torque drilling equipment, groundwater, slurry, and temporary casing are based on generalized conditions encountered at the explored locations. Conditions at individual pier locations may differ from those presented and may require that these issues be implemented to successfully install piers. Construction considerations for drilled pier foundations are outlined in the following table.

Table 16: Drilled Pier Installation Considerations

Recommended installation procedure	FHWA-NHI-10-016, May 2010
High-torque drilling equipment anticipated	Yes; dense and very stiff soils were encountered
Groundwater anticipated	Potentially, groundwater was not encountered in the borings during drilling. Contractor should be prepared for such conditions.
Temporary casing anticipated	Potentially, groundwater could be encountered in areas between the boring locations. The extent of casing use depends upon subsurface soil and groundwater conditions encountered during construction. Contractor should be prepared for such conditions.
Slurry installation anticipated	Possible if subsurface soil and groundwater conditions dictate.
Concrete placement	Same day as drilling. If a pier excavation cannot be drilled and filled with concrete on the same day, temporary casing or slurry may be needed to maintain an open excavation

Maximum water accumulation in excavation	**2 inches MAXIMUM**
Concrete installation method needed if water accumulates	Tremie, or pump to displace water. If tremie is used, care should be taken to place the tremie in the center of the shaft and not allow the concrete to ricochet of shaft walls and/or reinforcing steel. Pump discharge should be placed at the bottom of the shaft to start so that groundwater, if encountered, is forced to the top of the concrete.
Quality assurance monitoring	Geotechnical engineer's representative should be present during drilling of all piers, should observe drilling and verify the installed depth, should verify material type at the base of excavation, cleanliness of base, depth of existing groundwater, if present, and should observe placement of reinforcing and placement of concrete.

Notes:

1. The contractor should verify groundwater conditions before production pier installation begins. Temporary casing may be needed due to groundwater conditions, dependent on seasonal conditions. Payment provisions for temporary casing and for placement of concrete by the tremie method are recommended for inclusion in the Contract Documents.
2. Comments pertaining to high-torque drilling equipment, groundwater, temporary casing, and slurry drilling methods are based on generalized conditions encountered at the explored locations. Importantly, these are considered means and methods and are the sole responsibility of the contractor. Conditions at individual pier locations may differ from those presented and may require that these techniques be implemented to successfully install piers.
3. The following installation techniques will aid in successful construction of the shafts:
    a. The clear spacing between rebar or behind the rebar cage should be at least 3 times the maximum size of coarse aggregate.
    b. Centralizers on the rebar cage should be installed to keep the cage properly positioned.
    c. Cross-bracing of a reinforcing cage may be used when fabricating, transporting, and/or lifting. However, experience has shown that cross-bracing can contribute to the development of voids in a concrete shaft. Therefore, we recommend the removal of the cross-bracing prior to lowering the cage in the open shaft.
    d. The use of a tremie or pump should be employed so that concrete is directed in a controlled manner down the center of the shaft to the shaft bottom. The concrete should not be allowed to ricochet **off the pier reinforcing steel nor off the pier side walls.**
    e. The pier concrete should be designed to achieve the desired design strength when placed at a 7-inch slump, plus or minus 1-inch tolerance. Adding water to a mix designed for a lower slump does not meet these recommendations.

PAVEMENT RECOMMENDATIONS

Pavement Design Parameters and Assumptions

The pavement recommendations were prepared in accordance with the 1993 AASHTO Guide for the Design of Pavement Structures for asphalt and the ACI 330R (Guide for Design and Construction of Concrete Parking Lots) for concrete. No traffic specific design information was received for this project. Therefore, the following design parameters and assumptions were used in our analysis:

Table 17: Pavement Design Parameters and Assumptions

Traffic Load for Light Duty Pavement	15,000 equivalent single axle loads (ESALs)
Traffic Load for Medium Duty Pavement	50,000 equivalent single axle loads (ESALs) with Bus traffic
Average Daily Truck Traffic vehicle with at least 6 Wheels	One (1)
Concrete Compressive Strength	4,000 psi
Raw Subgrade California Bearing Ratio (CBR)	2.0 for clayey subgrade
Raw Subgrade Modulus of Subgrade Reaction, k in pci	75 for clayey subgrade

Options for section thickness for flexible and rigid pavements are provided in SECTION I: SYNOPSIS, Table 5. Note that the truck lane traffic sections correspond to only one (1) heavy-duty truck per day. If more heavy-duty truck traffic is anticipated, we recommend the use of an eight (8)-inch thick concrete pavement. We have been informed that bus traffic is expected for the drive and parking area pavements. These areas are considered in Table 5 as Drive Through Lane, Bus Lane & Medium Duty. However, although the flexible pavement options for medium duty including bus lane are shown, we would recommend that all areas subject to bus traffic consist of an 8-inch thick concrete section. Flexible pavement under bus loading and turning could exhibit signs of early distress and require additional and more frequent maintenance.

Areas subjected to truck traffic stopping, starting, loading, unloading or turning, such as the Dumpster, should not utilize asphalt pavement. For these areas, a concrete section is recommended.

Rigid Concrete Pavement Joints

Placement of expansion joints in concrete paving on potentially expansive subgrade or on granular subgrade subject to piping often results in horizontal and vertical movement at the joint. Many times, concrete spalls adjacent to the joint and eventually a failed concrete area is the result. This problem is primarily related to water infiltration through the joint.

One method to mitigate the problem of water infiltration through the joints is to eliminate all expansion joints that are not absolutely necessary. It is our opinion that expansion or isolation joints are needed only adjacent where the pavement abuts intersecting drive lanes and other structures. Elimination of all expansion joints within the main body of the pavement area would significantly reduce access of moisture into the subgrade. Regardless of the type of expansion joint sealant used, eventually openings in the sealant occur resulting in water infiltration into the subgrade.

The use of sawed and sealed joints should be designed in accordance with current Portland Cement Association (PCA) or American Concrete Institute (ACI) guidelines. Research has proven that joint design and layout can have a significant effect on the overall performance of concrete pavement.

Recommendations presented herein are based on the use of reinforced concrete pavement. Local experience has shown that the use of distributed steel placed at a distance of 1/3 slab thickness from the top is of benefit in crack control for concrete pavements. Improved crack control also reduces the potential for water infiltration.

Performance Considerations

Our pavement recommendations have been developed to provide an adequate structural thickness to support the anticipated traffic volumes shown in Table 17. Some shrink/swell movements due to moisture variations in the underlying soils, or potential movement from settling utility backfill material, should be anticipated over the life of the pavements. The owner should recognize that over a period of time, pavements may crack and undergo some deterioration and loss of serviceability. We recommend the project budgets include an allowance for maintenance such as patching of cracks or occasional overlays over the life of the pavement.

Pavement Subgrade and Section Materials

Recommendations for the planned pavement subgrade and section materials are as follows:

Table 18: Pavement Subgrade Materials

Subgrade Preparation Prior to Paving Section Construction	
Minimum undercut depth	6 inches or as needed to remove organics and existing pavement/foundations. All soft, wet and loose materials should also be removed down to firmer natural materials
Reuse excavated soils	Provided they are free of roots and debris and meet the material requirements for their intended use
Horizontal extent for undercut	2 feet beyond the paving limits
Exposed subgrade treatment **(before moisture conditioning or lime treatment)**	Proof roll with rubber- tired vehicle weighing at least 20 tons such as a loaded dump truck with Geotechnical Engineer's representative present during proof rolling (See Note 3 Table 3).
Pumping/rutting areas discovered during proof rolling	Pumping and/rutting should be expected and then remove to firmer materials and replace with compacted general or select fill under direction of Geotechnical Engineer's representative

Table 19: Fill Requirements and Subgrade Treatment Options

Fill Requirements for Grade Increases	
General fill type	Material free of roots, debris and other deleterious material with a maximum rock size of 3 inches; on-site clays having CBR > 2.0 may be used
Minimum general fill thickness	As required to achieve grade
Maximum general fill loose lift thickness	8 inches
General fill compaction and moisture criteria	ASTM D 698 ≥ 95% compaction at 0 to +4 from optimum
Subgrade Treatment Option - Moisture Conditioning	
Depth of moisture conditioning	9 inches (disk in place and moisture condition)
Compaction and moisture criteria	ASTM D 698 ≥ 95% compaction at 0 to +4 from optimum
In-Place Density and Moisture Verification Testing	
Testing frequency (Subgrade)	1 test per 2,500 square feet with minimum of 3 tests

Table 20: Subgrade Treatment Option - Lime Treatment

Subgrade Treatment Option - Lime Treatment	
Treatment depth	6 inches
Treatment type	Hydrated lime
Application rate (estimated)	6 - 8% by dry weight
Soil dry unit weight (estimated)	105 pcf but may be variable
Determination of application rate	The actual application rate should be determined by laboratory testing of soil samples taken after the pavement subgrade elevation has been achieved. The quantity of lime should be sufficient to result in a pH of at least 12.4 when tested in accordance with ASTM C 977, Appendix XI. Alternately, the optimum lime content may be determined through Atterberg limits testing on treated samples with varying percentages of lime. **Lime treatment of the subgrade is only recommended if additional soluble sulfate testing of the exposed subgrade is performed prior to the use of lime, cement or other calcium-based treatment agents and the test results indicate an acceptable level of sulfate content.**
Treatment procedure	TxDOT Item 260 and 264
Treatment layer compaction and moisture criteria	ASTM D 698 ≥ 95% compaction at 0 to +4 from optimum
In-Place Density and Moisture Verification Frequency	
Test frequency (all materials)	1 test per 2,500 square feet (min. 3 tests)

Table 21: Flexible Pavement Requirements

Flexible Pavement Section Requirements	
Flexible Base Material Type	2004 TxDOT Item 247, Type A, Grade 1 or 2
Maximum Flexible Base Loose Lift Thickness	9 inches
Flexible Base Placement Criteria	Compact to > 95% maximum dry density at -2 to +3 percentage points of optimum moisture content (ASTM D 1557)
Hot Mix Asphaltic Concrete (HMAC) Type	2004 TxDOT Item 340, Type D
HMAC Placement Criteria	91% to 95% Theoretical Lab Density (TEX 207 F)

Table 22: Rigid Pavement Section Materials

Portland Cement Concrete Section Requirements	
Minimum compressive strength at 28 days	4,000 psi at 28 days
Desired slump during placement	5 ± 1 inch
Reinforced Steel	At Least #4 @ 18" each way placed D/3 from top of slab
Construction Joint Dowels	• Light duty 5, 6-inch section: 5/8" diameter, 12" long @ 12" on center and lubricated both sides, dowel embedment of 5". • Medium duty 6 , 7 -inch section: 3/4" diameter, 14" long @ 12" on center and lubricated both sides, dowel embedment of 6". • Heavy duty 8-inch section: 1" diameter, 14" long @ 12" on center and lubricated both sides, dowel embedment of 6".
Expansion Joints	May be eliminated except at tie-ins with existing concrete and structures
Contraction Joints – transverse and longitudinal	Meet spacing and sawing requirements of ACI 330R (Guide for Design and Construction of Concrete Parking Lots)
Placement	In accordance with ACI 304R (guide for measuring, mixing, transporting, and placing), ACI 305R (hot weather concreting, and ACI 306R (cold weather concreting)

To help reduce degradation of the prepared subgrade, paving preferably should be placed within 14 days. If pavement placement is delayed, protection of the subgrade surface with an emulsion-based sealer should be considered. Alternately, the paving section could be

slightly overbuilt so blading performed to remove distressed sections does not reduce the treated subgrade thickness.

CONSTRUCTION CRITERIA

Site Preparation

Strip away any existing asphalt, concrete, topsoil, grass, organics, soft or wet materials, and deleterious debris as needed and dispose outside of the building area. Undercut to the required depth and extent as noted in the main report. Additional excavation may be required to remove existing fill materials, utilities or foundations. Additional excavation may also be necessary due to encountering deleterious materials such as buried debris and/or rubble, or undesirable soft and wet subgrade conditions and/or existing fill materials. The site representative of the geotechnical engineer should observe undercutting operations. Unless passing density reports are provided for a specific area, existing fill soils found during the excavation should be considered as uncertified and removed to suitable natural soils.

After the surface materials are removed, the exposed subgrade surface should be proof rolled with a heavily loaded dump truck weighing at least 20 tons. Any areas which excessively yield or pump under the wheel loading should be undercut to the depth specified by the geotechnical engineer's representative and replaced with compacted select fill to existing grade as specified. The voids in undercut areas can be backfilled and compacted with on-site general fill materials.

Table 23: Site Work (Non Structural/General Fill) Requirements

Stripping Depth	6-inch minimum or as needed to remove any existing asphalt, concrete, and vegetation
Non-Structural/General Fill Type	On-site material free of roots, debris and other deleterious material with a maximum particle size of 4 inches
Maximum Non-Structural/General Fill Loose Lift Thickness	9 inches

The backfill should be placed and compacted in accordance with the General Fill requirements in Table 6 in Section I.

At least one (1) density test should be conducted per 2,500 square feet of prepared fill and subgrade with a minimum of three (3) density tests taken per lift within the pad area.

Drainage

Good positive drainage during and after construction is very important to reduce expansive soil volume changes that can detrimentally affect the performance of the planned development. Proper attention to surface and subsurface drainage details during the design

and construction phase of development can aid in preventing many potential soil shrink-swell related problems during and following the completion of the project.

Earthwork and Foundation Acceptance

Exposure to the environment may weaken the soils at the foundation bearing level if the excavation remains open for long periods of time. Therefore, it is recommended that all foundation excavations be extended to final grade and constructed as soon as possible in order to reduce potential damage to the bearing soils. If bearing soils are exposed to severe drying or wetting, the unsuitable soil must be re-conditioned or removed as appropriate and replaced with compacted fill, prior to concreting. The foundation bearing level should be free of loose soil, ponded water or debris and should be observed prior to concreting by the geotechnical engineer or his representative.

Foundation concrete should not be placed on soils that have been disturbed by rainfall or seepage. If the bearing soils are softened by surface water intrusion during exposure or by desiccation, the unsuitable soils must be removed from the foundation excavation and replaced with compacted select fill prior to placement of concrete.

Subgrade preparation and fill placement operations should be monitored by the geotechnical engineer or his representative. As a guideline, at least one in-place density test should be performed for each 2,500 sq. ft. of compacted surface per lift or a minimum of three (3) tests per lift. Any areas not meeting the required compaction should be recompacted and retested until compliance is met.

GENERAL COMMENTS

The scope of this study is to provide geotechnical engineering criteria for use by design engineers in preparing the foundation and pavement designs. Environmental studies of any kind were not a part of our scope of work or services.

This report was prepared as an instrument of service for this project exclusively for the use of Dunaway Associates, L.P. and the project design team. If the development plans change relative to site layout, size, grades, or anticipated loads or if different subsurface conditions are encountered, we should be informed and retained to ascertain the impact of these changes on our recommendations. We cannot be responsible for the potential impact of these changes if we are not informed.

Geotechnical Design Review

Arias should be given the opportunity to review the design and construction documents. The purpose of this review is to check to see if our geotechnical recommendations are properly interpreted into the project plans and specifications. Please note that design review was not included in the authorized scope and additional fees may apply.

Subsurface Variations

Soil and groundwater conditions may vary between the sample boring locations. Transition boundaries or contacts, noted on the boring logs to separate soil types, are approximate. Actual contacts may be gradual and vary at different locations. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions or highly variable subsurface conditions are encountered during construction, we should be contacted to evaluate the significance of the changed conditions relative to our recommendations.

Quality Assurance Testing

The long-term success of the project will be affected by the quality of materials used for construction and the adherence of the construction to the project plans and specifications. As Geotechnical Engineer of Record (GER), we should be engaged by the Owner to provide Quality Assurance (QA) testing. Our services will be to evaluate the degree to which constructors are achieving the specified conditions they're contractually obligated to achieve and observe that the encountered materials during earthwork for foundation and pavement installation are consistent with those encountered during this study. In the event that Arias is not retained to provide QA testing, we should be immediately contacted if differing subsurface conditions are encountered during construction. Differing materials may require modification to the recommendations that we provided herein. A message to the Owner with regard to the project QA is provided in the GBA publication included in Appendix E.

Arias has an established in-house laboratory that meets the standards of the American Standard Testing Materials (ASTM) specifications of ASTM E-329 defining requirements for Inspection and Testing Agencies for soil, concrete, steel and bituminous materials as used in construction. We maintain soils, concrete, asphalt, and aggregate testing equipment to provide the testing needs required by the project specifications. All of our equipment is calibrated by an independent testing agency in accordance with the National Bureau of Standards. In addition, Arias is accredited by the American Association of State Highway & Transportation Officials (AASHTO), the United States Army Corps of Engineers (USACE) and the Texas Department of Transportation (TxDOT), and also maintains AASHTO Materials Reference Laboratory (AMRL) and Cement and Concrete Reference Laboratory (CCRL) proficiency sampling, assessments and inspections.

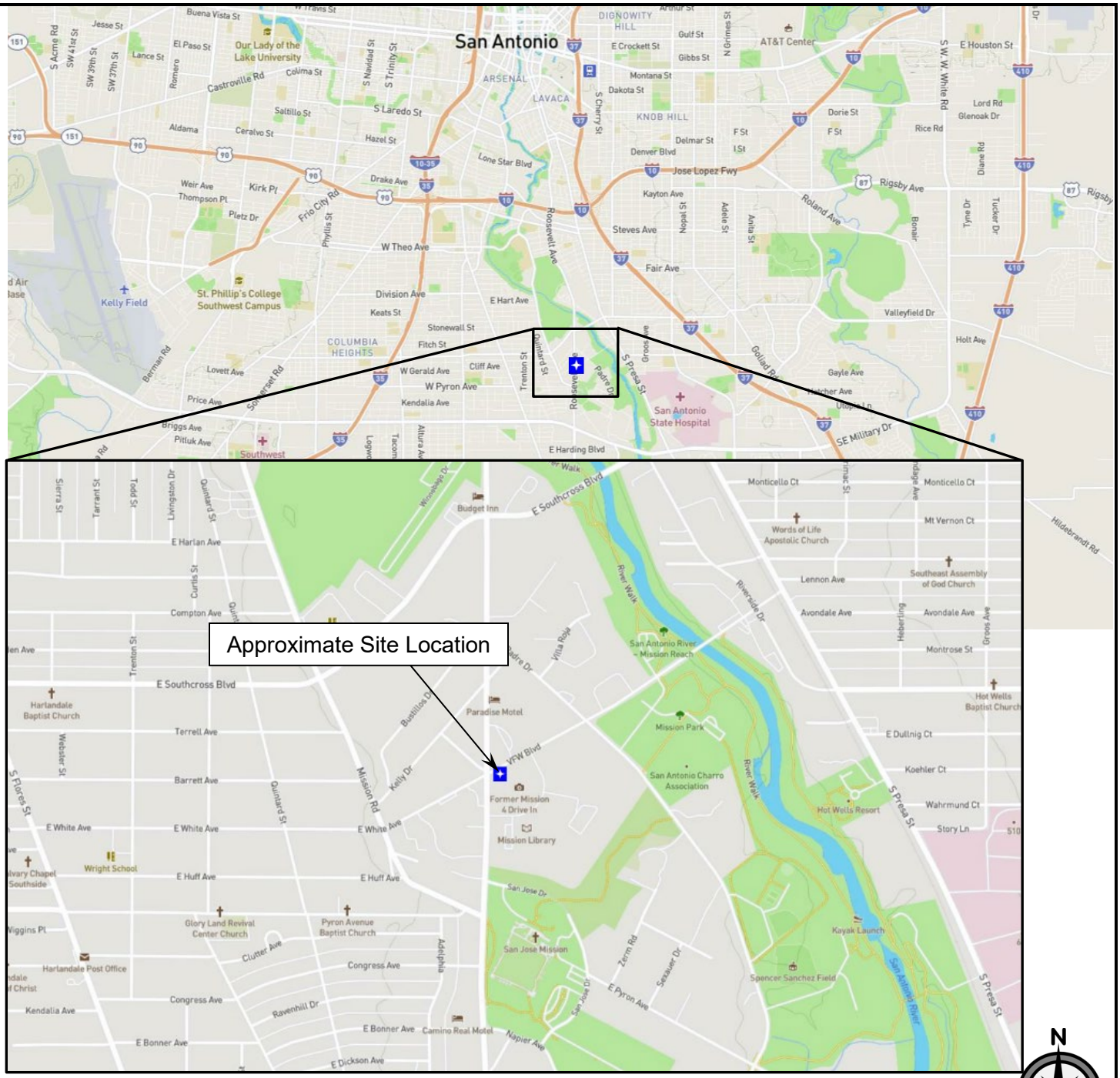
Furthermore, Arias employs a technical staff certified through the following agencies: The National Institute for Certification in Engineering Technologies (NICET), the American Concrete Institute (ACI), the American Welding Society (AWS), the Precast/Prestressed Concrete Institute (PCI), the Mine & Safety Health Administration (MSHA), the Texas Asphalt Pavement Association (TXAPA) and the Texas Board of Professional Engineers (TBPE). Our services are conducted under the guidance and direction of a Professional Engineer (P.E.) licensed to work in the State of Texas, as required by law.

Standard of Care

Subject to the limitations inherent in the agreed scope of services as to the degree of care and amount of time and expenses to be incurred, and subject to any other limitations contained in the agreement for this work, Arias has performed its services consistent with that level of care and skill ordinarily exercised by other professional engineers practicing in the same locale and under similar circumstances at the time the services were performed.

Information about this geotechnical report is provided in the GBA publication included in Appendix D.

APPENDIX A: FIGURES AND SITE PHOTOGRAPHS



ARIAS GEOPROFESSIONALS
142 Chula Vista, San Antonio, Texas 78232
Phone: (210) 308-5884 • Fax: (210) 308-5886

VICINITY MAP

World Heritage Center
San Antonio, Texas

Date: November 3, 2020	Job No.: 2019-823
Drawn By: RWL	Checked By: CMS
Approved By: CMS	Scale: N.T.S.

Figure 1

ARIAS GEOPROFESSIONALS
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Phone: (210) 308-5884 • Fax: (210) 308-5886

BORING LOCATION PLAN

World Heritage Center
San Antonio, Texas

Date: November 3, 2020	Job No.: 2018-823
Drawn By: RWL	Checked By: CMS
Approved By: CMS	Scale: N.T.S.

REVISIONS:

No.:	Date:	Description:

Figure 2

Photo 1 – View looking at Boring B-1 drilling operations.

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142 Chula Vista, San Antonio, Texas 78232
Phone: (210) 308-5884 • Fax: (210) 308-5886

SITE PHOTOS

World Heritage Center
San Antonio, Texas

Date: November 3, 2020	Job No.: 2019-823
Drawn By: TAS	Checked By: RPG
Approved By: SAH	Scale: N.T.S.

Appendix A

APPENDIX B: BORING LOGS AND SYMBOL KEY SHEET

Boring Log No. B-1

Project: **World Heritage Visitor Center**
San Antonio, Texas

Sampling Date: 10/5/20

Coordinates: N29°21'56.41" W98°28'50.3"

Location: See Boring Location Plan

Backfill: Cuttings

Soil Description	Depth (ft)	SN	WC	PL	LL	PI	PP	N	-200
SANDY LEAN CLAY (CL), very stiff, brown		SS	8					16	
		SS	10	17	44	27		20	68
CLAYEY SAND with Gravel (SC), very dense, gray and tan	5	SS	7					79/12"	
- medium dense from 6'-8'		SS	6	15	32	17		24	37
- very dense from 8'-10'		SS	8					50/5"	
CLAYEY GRAVEL with Sand (GC), dense, reddish brown	10	SS	8	26	81	55		46	16
FAT CLAY (CH), very stiff, brown		T	28	26	85	59	4.5+		100
	15								
		SS	28					20	
	20								
		T	27	27	85	58	4.5+		99
	25								
		SS	29					27	
	30								

Borehole terminated at 30 feet

Groundwater Data:
During drilling: Not encountered

Field Drilling Data:
Coordinates: Hand-held GPS Unit
Logged By: L. Arizola
Driller: Eagle Drilling, Inc.
Equipment: Truck-mounted drill rig

Single flight auger: 0 - 30 ft

Nomenclature Used on Boring Log

Split Spoon (SS)

Thin-walled tube (T)

WC = Water Content (%)
PL = Plastic Limit
LL = Liquid Limit
PI = Plasticity Index
PP = Pocket Penetrometer (tsf)

N = SPT Blow Count
-200 = % Passing #200 Sieve

Arias Geoprofessionals

Job No.: 2019-823

2019-823.GPJ 11/3/20 (BORING LOG SA13-02.ARIASSA12-01.GDT.LIBRARY2013-01.GLB)

Boring Log No. B-2

Project: **World Heritage Visitor Center**
San Antonio, Texas

Sampling Date: 10/5/20

Coordinates: N29°21'57.24" W98°28'50.77"

Location: See Boring Location Plan

Backfill: Cuttings

Soil Description	Depth (ft)	SN	WC	PL	LL	PI	PP	N	-200
SANDY LEAN CLAY (CL), stiff, brown		SS	10	17	39	22		11	61
- very stiff from 2'-4'		SS	11					22	
LEAN CLAY (CL), very stiff, brown	5	SS	13	18	48	30		28	85
		T	15				4.5+		
		SS	13	14	31	17		25	88
	10								
Borehole terminated at 10 feet									

Groundwater Data:
During drilling: Not encountered

Field Drilling Data:
Coordinates: Hand-held GPS Unit
Logged By: L. Arizola
Driller: Eagle Drilling, Inc.
Equipment: Truck-mounted drill rig

Single flight auger: 0 - 10 ft

Nomenclature Used on Boring Log

Split Spoon (SS)

Thin-walled tube (T)

WC = Water Content (%)
PL = Plastic Limit
LL = Liquid Limit
PI = Plasticity Index
PP = Pocket Penetrometer (tsf)

N = SPT Blow Count
-200 = % Passing #200 Sieve

Arias Geoprofessionals

Job No.: 2019-823

Boring Log No. B-3

Project: **World Heritage Visitor Center**
San Antonio, Texas

Sampling Date: 10/5/20

Coordinates: N29°21'59.69" W98°28'49.37"

Location: See Boring Location Plan

Backfill: Cuttings

Soil Description	Depth (ft)	SN	WC	PL	LL	PI	N	-200
FAT CLAY (CH), stiff, brown		SS	8				11	
FAT CLAY with Sand (CH), very stiff, dark brown		T	15	21	65	44		95
	5	SS	15				26	
- brown from 6'-10'		SS	15	21	61	40	24	83
		SS	17				24	
	10							
Borehole terminated at 10 feet								

Groundwater Data:
During drilling: Not encountered

Field Drilling Data:
Coordinates: Hand-held GPS Unit
Logged By: L. Arizola
Driller: Eagle Drilling, Inc.
Equipment: Truck-mounted drill rig

Single flight auger: 0 - 10 ft

Nomenclature Used on Boring Log

Split Spoon (SS)

Thin-walled tube (T)

WC = Water Content (%)
PL = Plastic Limit
LL = Liquid Limit
PI = Plasticity Index
N = SPT Blow Count

-200 = % Passing #200 Sieve

Arias Geoprofessionals

Job No.: 2019-823

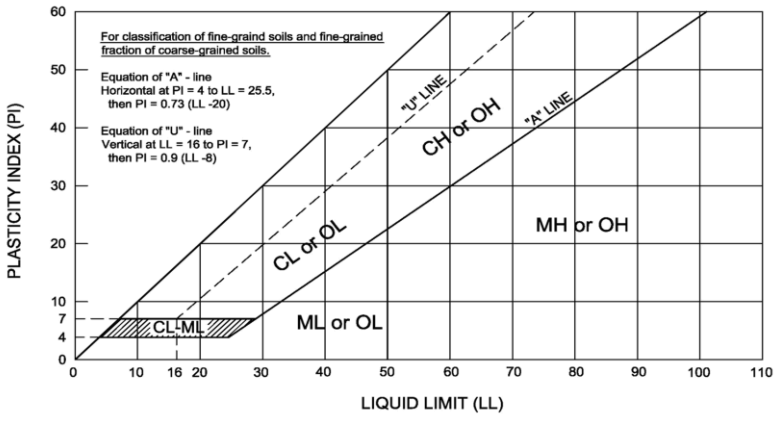
KEY TO TERMS AND SYMBOLS USED ON BORING LOGS

MAJOR DIVISIONS					GROUP SYMBOLS		DESCRIPTIONS
COARSE-GRAINED SOILS	More than half of material LARGER than No. 200 Sieve size	GRAVELS	More than Half of Coarse fraction is LARGER than No. 4 Sieve size	Clean Gravels (little or no Fines)	GW		Well-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines
					GP		Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines
				Gravels with Fines (Appreciable amount of Fines)	GM		Silty Gravels, Gravel-Sand-Silt Mixtures
					GC		Clayey Gravels, Gravel-Sand-Clay Mixtures
		SANDS	More than half of Coarse fraction is SMALLER than No. 4 Sieve size	Clean Sands (little or no Fines)	SW		Well-Graded Sands, Gravelly Sands, Little or no Fines
					SP		Poorly-Graded Sands, Gravelly Sands, Little or no Fines
				Sands with Fines (Appreciable amount of Fines)	SM		Silty Sands, Sand-Silt Mixtures
					SC		Clayey Sands, Sand-Clay Mixtures
FINE-GRAINED SOILS	More than half of material SMALLER than No. 200 Sieve size	SILTS & CLAYS		Liquid Limit less than 50	ML		Inorganic Silts & Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts with Slight Plasticity
					CL		Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
		SILTS & CLAYS		Liquid Limit greater than 50	MH		Inorganic Silts, Micaceous or Diatomaceous Fine Sand or Silty Soils, Elastic Silts
					CH		Inorganic Clays of High Plasticity, Fat Clays
FORMATIONAL MATERIALS		SANDSTONE					Massive Sandstones, Sandstones with Gravel Clasts
		MARLSTONE					Indurated Argillaceous Limestones
		LIMESTONE					Massive or Weakly Bedded Limestones
		CLAYSTONE					Mudstone or Massive Claystones
		CHALK					Massive or Poorly Bedded Chalk Deposits
		MARINE CLAYS					Cretaceous Clay Deposits
		GROUNDWATER					Indicates Final Observed Groundwater Level Indicates Initial Observed Groundwater Location

Density of Granular Soils	
Number of Blows per ft., N	Relative Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium
30 - 50	Dense
Over 50	Very Dense

Consistency and Strength of Cohesive Soils		
Number of Blows per ft., N	Consistency	Unconfined Compressive Strength, q_u (tsf)
Below 2	Very Soft	Less than 0.25
2 - 4	Soft	0.25 - 0.5
4 - 8	Medium (Firm)	0.5 - 1.0
8 - 15	Stiff	1.0 - 2.0
15 - 30	Very Stiff	2.0 - 4.0
Over 30	Hard	Over 4.0

PLASTICITY CHART (ASTM D 2487-11)



Arias Geoprofessionals

KEY TO TERMS AND SYMBOLS USED ON BORING LOGS

TABLE 1 Soil Classification Chart (ASTM D 2487-11)

Criteria of Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name[B]
COARSE-GRAINED SOILS	Gravels (More than 50% of coarse fraction retained on No. 4 sieve)	Clean Gravels (Less than 5% fines[C])	Cu ≥ 4 and 1 ≤ Cc ≤ 3[D]	GW	Well-Graded Gravel[E]
			Cu < 4 and/or [Cc < 1 or Cc > 3][D]	GP	Poorly-Graded Gravel[E]
		Gravels with Fines (More than 12% fines[C])	Fines classify as ML or MH	GM	Silty Gravel[E,F,G]
			Fines classify as CL or CH	GC	Clayey Gravel[E,F,G]
More than 50% retained on No. 200 sieve	Sands (50% or more of coarse fraction passes No. 4 sieve)	Clean Sands (Less than 5% fines[H])	Cu ≥ 6 and 1 ≤ Cc ≤ 3[D]	SW	Well-Graded Sand[I]
			Cu < 6 and/or [Cc < 1 or Cc > 3][D]	SP	Poorly-Graded Sand[I]
		Sands with Fines (More than 12% fines[H])	Fines classify as ML or MH	SM	Silty Sand[F,G,I]
			Fines classify as CL or CH	SC	Clayey Sand[F,G,I]
FINE-GRAINED SOILS	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean Clay[K,L,M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K,L,M]
		organic	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OL	Organic Clay[K,L,M,N] / Organi Silt[K,L,M,O]
50% or more passes the No. 200 sieve	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat Clay[K,L,M]
			PI plots on or below "A" line	MH	Elastic Silt[K,L,M]
		organic	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OH	Organic Clay[K,L,M,P] / Organic Silt[K,L,M,Q]
HIGHLY ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-inch (75mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name

[C] Gravels with 5% to 12% fines require dual symbols:
- GW-GM well-graded gravel with silt
- GW-GC well-graded gravel with clay
- GP-GM poorly-graded gravel with silt
- GP-GC poorly-graded gravel with clay

[D] $Cu = D_{60}/D_{10}$ $\quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[E] If soil contains ≥ 15% sand, add "with sand" to group name

[F] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM

[G] If fines are organic, add "with organic fines" to group name

[H] Sand with 5% to 12% fines require dual symbols:
- SW-SM well-graded sand with silt
- SW-SC well-graded sand with clay
- SP-SM poorly-graded sand with silt
- SP-SC poorly-graded sand with clay

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name

[J] If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay

[K] If soil contains 15% to < 30% plus No. 200, add "with sand" or "with gravel," whichever is predominant

[L] If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name

[N] PI ≥ 4 and plots on or above "A" line

[O] PI < 4 or plots below "A" line

[P] PI plots on or above "A" line

[Q] PI plots below "A" line

TERMINOLOGY

Boulders	Over 12-inches (300mm)	**Parting**	Inclusion < 1/8-inch thick extending through samples
Cobbles	12-inches to 3-inches (300mm to 75mm)	**Seam**	Inclusion 1/8-inch to 3-inches thick extending through sample
Gravel	3-inches to No. 4 sieve (75mm to 4.75mm)	**Layer**	Inclusion > 3-inches thick extending through sample
Sand	No. 4 sieve to No. 200 sieve (4.75mm to 0.075mm)		
Silt or Clay	Passing No. 200 sieve (0.075mm)		
Calcareous	Containing appreciable quantities of calcium carbonate, generally nodular		

Stratified	Alternating layers of varying material or color with layers at least 6mm thick
Laminated	Alternating layers of varying material or color with the layers less than 6mm thick
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture planes appear polished or glossy sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay
Homogeneous	Same color and appearance throughout

KEY TO TERMS AND SYMBOLS USED ON BORING LOGS

Hardness Classification of Intact Rock

Class	Hardness	Field Test		Approximate Range of Uniaxial Compression Strength kg/cm² (tons/ft²)
I	Extremely hard	Many blows with geologic hammer required to break intact specimen.		> 2,000
II	Very hard	Hand held specimen breaks with hammer end of pick under more than one blow.		2,000 – 1,000
III	Hard	Cannot be scraped or pealed with knife, hand held specimen can be broken with single moderate blow with pick.		1,000 – 500
IV	Soft	Can just be scraped or peeled with knife. Indentations 1mm to 3mm show in specimen with moderate blow with pick.		500 – 250
V	Very soft	Material crumbles under moderate blow with sharp end of pick and can be peeled with a knife, but is too hard to hand-trim for triaxial test specimen.		250 – 10

Rock Weathering Classifications

Grade	Symbol	Diagnostic Features
Fresh	F	No visible sign of Decomposition or discoloration. Rings under hammer impact.
Slightly Weathered	WS	Slight discoloration inwards from open fractures, otherwise similar to F.
Moderately Weathered	WM	Discoloration throughout. Weaker minerals such as feldspar decomposed. Strength somewhat less than fresh rock, but cores cannot be broken by hand or scraped by knife. Texture preserved.
Highly Weathered	WH	Most minerals somewhat decomposed. Specimens can be broken by hand with effort or shaved with knife. Core stones present in rock mass. Texture becoming indistinct, but fabric preserved.
Completely Weathered	WC	Minerals decomposed to soil, but fabric and structure preserved (Saprolite). Specimens easily crumbled or penetrated.
Residual Soil	RS	Advanced state of decomposition resulting in plastic soils. Rock fabric and structure completely destroyed. Large volume change.

Rock Discontinuity Spacing

Description for Structural Features: Bedding, Foliation, or Flow Banding	Spacing	Description for Joints, Faults or Other Fractures
Very thickly (bedded, foliated, or banded)	More than 6 feet	Very widely (fractured or jointed)
Thickly	2 – 6 feet	Widely
Medium	8 – 24 inches	Medium
Thinly	2½ – 8 inches	Closely
Very thinly	¾ – 2½ inches	Very closely
Description for Micro-Structural Features: Lamination, Foliation, or Cleavage	**Spacing**	**Descriptions for Joints, Faults, or Other Fractures**
Intensely (laminated, foliated, or cleaved)	¼ – ¾ inch	Extremely close
Very intensely	Less than ¼ inch	

Engineering Classification for in Situ Rock Quality

RQD %	Velocity Index	Rock Mass Quality
90 – 100	0.80 – 1.00	Excellent
75 – 90	0.60 – 0.80	Good
50 – 75	0.40 – 0.60	Fair
25 – 50	0.20 – 0.40	Poor
0 – 25	0 – 0.20	Very Poor

APPENDIX C: LABORATORY AND FIELD TEST PROCEDURES

FIELD AND LABORATORY EXPLORATION

The field exploration program included drilling at selected locations within the site and intermittently sampling the encountered materials. The boreholes were drilled using single flight augers (ASTM D 1452). Samples of encountered materials were obtained using a split-barrel sampler while performing the Standard Penetration Test (ASTM D 1586) and with a thin walled Shelby Tube Sampler (ASTM D 1587). The sample depth interval and type of sampler used is included on the soil boring log. Arias' field representative visually logged each recovered sample and placed a portion of the recovered sampled into a plastic bag for transport to our laboratory.

SPT N values and blow counts for those intervals where the sampler could not be advanced for the required 18-inch penetration are shown on the soil boring log. If the test was terminated during the 6-inch seating interval or after 10 hammer blows were applied used and no advancement of the sampler was noted, the log denotes this condition as blow count during seating penetration. Penetrometer readings recorded for thin-walled tube samples that remained intact also are shown on the soil boring logs.

Arias performed soil mechanics laboratory tests on selected samples to aid in soil classification and to determine engineering properties. Tests commonly used in geotechnical exploration, the method used to perform the test, and the designation on the boring log where data are reported are summarized as follows:

Test Name	Test Method	Log Designation
Water (moisture) content of soil and rock by mass	ASTM D 2216	WC
Liquid limit, plastic limit, and plasticity index of soils	ASTM D 4318	PL, LL, PI
Amount of material in soils finer than the No. 200 sieve	ASTM D 1140	-200

The laboratory results are reported on the soil boring logs listed in Appendix B.

APPENDIX D: GBA INFORMATION – GEOTECHNICAL REPORT

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed*. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

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APPENDIX E: PROJECT QUALITY ASSURANCE

A Message to Owners from ASFE/GBA

Construction-materials engineering and testing (CoMET) consultants perform quality-assurance (QA) services to evaluate how well constructors are achieving the specified conditions they're contractually obligated to achieve. Done right, QA can save you time and money while helping you manage project risks by detecting molehills before they grow into mountains you and the design team are forced to climb.

Done right, QA can save you time and money; prevent claims and disputes; and reduce risks. Many owners don't do QA right because they follow bad advice.

It's ironic that, as important as CoMET consultants can be, some owners and design professionals treat them as though they were commodities. Often referred to incorrectly as "testing labs," CoMET consultants create the last line of defense against costly construction errors and the delays, change orders, claims, disputes, and litigation that can result. Why would owners entrust such an important responsibility to the firm offering to fulfill it for the lowest fee as opposed to the one whose qualifications enable it to offer the best service and the most value? The answer: Too many owners follow bad advice; e.g., "CoMET consultants are all the same. They all follow the same standards. They all have accredited laboratories and certified personnel. Go with the low bidder." That's bad advice because there's no such thing as a standard QA scope of service, meaning that – to bid – each interested firm *must* develop its own scope…and it has to be a cheap scope in order to offer the low fee the owner apparently prefers. A cheap scope cannot help but jeopardize service quality, aggravating risk for you and the entire project team. Of course, some firms will offer what seems to be a better scope at a "low-ball," less-than-cost bid in order to win the commission and then earn a profit through multiple change orders.

You have too much at stake to follow bad advice. Consider these facts.

Fact: ***Most CoMET firms are not accredited,*** including some that say they are and some that don't even follow the correct standards, even when they say they do. And the quality of those that are accredited varies significantly; some practice at a high level; others just barely scrape by. As such, while accreditation is extremely important, it is far from being a "be-all and end-all." It signifies only that a firm's facilities or operations met the *minimum criteria* of an accrediting body whose concerns in some cases may have little to do with your project. And the condition of what an accrediting body typically evaluates – management systems, technical staff, facilities, and equipment – can change substantially between on-site accreditation assessments.

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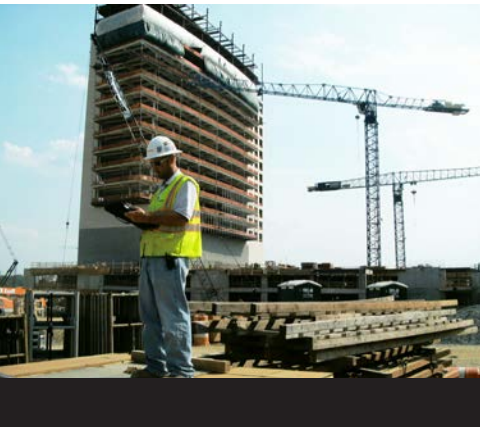


Most CoMET firms are not accredited and it's dangerous to assume CoMET personnel are certified.

Fact: ***It's dangerous to assume CoMET personnel are certified.*** Many have no credentials; some are certified by organizations of questionable merit, while others have a valid certification, but *not* for the services they're assigned. All too many have little training or none at all.

Some CoMET firms – the "low-cost providers" – *want* you to believe that price is the only difference between QA providers. It's not: Firms that sell low price typically lack:

- facilities appropriate for many of the projects they accept,
- equipment that is well maintained and properly calibrated,
- field and laboratory personnel who are well trained and appreciate the importance of their responsibilities,
- management with the education, experience, and judgment to provide technical oversight, and
- the professional-liability insurance you should require to enjoy peace of mind.

Quality-oriented firms invest in the facilities, equipment, personnel, and insurance needed to achieve quality in quality assurance.

Quality-oriented firms invest in the facilities, equipment, personnel, and insurance needed to achieve quality in quality assurance.

To derive maximum value from your QA investment, have the CoMET firm's project manager serve actively on the project team from beginning to end, a level of service that's relatively inexpensive and can pay huge dividends. During the project's planning and design stages, experienced CoMET professionals can help the design team develop consistent, cost-effective technical specifications and establish appropriate observation, testing, and instrumentation protocols. They can analyze plans and specs much as constructors do, looking for the little errors, omissions, conflicts, and ambiguities that often lead to the misunderstandings and confusion that become the basis for big extras and big claims. They can also provide guidance about operations and materials that need closer review than others, because of their criticality or potential for error or abuse, and even suggest reduced levels of review or testing for areas of a less critical nature, based on local experience. You can also benefit from a CoMET professional's frank assessments of the various constructors that have expressed interest in the project.

To derive maximum value, have the CoMET project manager serve actively on the project team from beginning to end.

CoMET consultants' construction-phase QA services focus on two distinct issues:

- those that relate to geotechnical engineering and
- those that relate to the other elements of construction.

Geotechnical-engineering issues are critically important because they are essential to the "observational method" geotechnical engineers use to help their clients save time and money while maintaining a "healthy respect" for the unknown in the underground.

In essence, the observational method is an overall approach that begins during the earliest element of the design phase and carries through

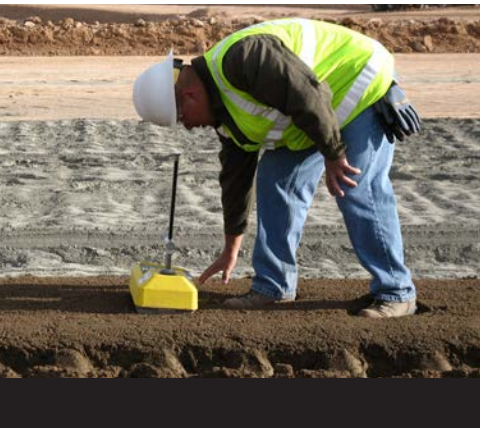
to the construction phase. Geotechnical engineers initiate this approach by applying their knowledge of local geological conditions to develop an economical subsurface-sampling plan. Proper execution of the plan should derive just enough samples from just enough areas to permit an experienced geotechnical engineer to develop an assumed-subsurface profile. Because so much depends on the reliability of each sample, quality-focused geotechnical engineers often insist that their own personnel perform or oversee the sampling process, from obtaining the samples to packaging, storing, and transporting them to a trusted laboratory, using their own equipment and facilities or relying on others' they know they can trust.

Combining the assumed subsurface profile with knowledge of what is being constructed – e.g., its dimensions, weight, anticipated use, and performance objectives – geotechnical engineers develop *provisional* recommendations for the structure's foundations and for the specifications of various "geo" elements, like excavations, site grading, foundation-bearing grades, and roadway and parking-lot preparation and surfacing. When geotechnical engineers know that their personnel will be on site observing subsurface conditions as they are exposed, they usually will recommend the most cost-effective design their assumptions make practical, knowing that – if their assumed-subsurface profile is "off" in any significant way – the variances will be caught (that's what they teach their field personnel to do), permitting them to "tweak" their recommendations in the field. *It is essential to realize that geotechnical engineers cannot finalize their recommendations until they or their field representatives are on site to observe what's excavated to verify that the subsurface conditions the engineers predicted are those that actually exist.*

Geotechnical engineers cannot finalize their recommendations until they are on site to verify that the subsurface conditions they predicted are those that actually exist. Entrusting geotechnical field observation to someone other than the geotechnical engineer of record creates a significant risk.

Insofar as **other elements of construction** are concerned, many geotechnical-engineering firms have obliged their clients by expanding their field-services mix, so they're able to perform overall construction QA, encompassing – in addition to geotechnical issues – reinforced concrete, structural steel, structural masonry, fireproofing, and so on. Unfortunately, that's caused some confusion. Believing that all CoMET consultants are alike, some owners take bids for the overall CoMET package, including the geotechnical field observation, thus curtailing services of the geotechnical engineer of record (GER). ***Entrusting geotechnical field observation to someone other than the GER creates a significant risk.***

GERs have developed a variety of protocols to optimize the quality of their field-observation procedures. Quality-focused GERs meet with their field representatives before the representatives leave for a project site, to brief them on what to look for and where, when, and how to look. (***No one can duplicate this briefing***, because no one else knows as much about a project's geotechnical issues.) And once they arrive at a project site, the field representatives know to maintain timely, effective communication with the GER, because that's what the GER has trained them to do. By contrast, it's extremely rare for a different



firm's field personnel to contact the GER, even when they're concerned or confused about what they observe, because they regard the GER's firm as "the competition." Convoluted project-communications protocols can make this communications breakdown even worse.

A different firm is often willing to perform on-site geotechnical review for less money than the GER, frequently because it treats geotechnical field services as a "loss leader" in order to obtain the far larger, overall CoMET commission. Given the significant risk that supplanting the GER creates, accepting the offer is almost always penny-wise and pound-foolish. Still, because some owners accept bad advice, it's commonly done, helping to explain why ***"geo" issues are the number-one source of construction-industry claims and disputes.***

Divorcing the GER from geotechnical field operations is almost always penny-wise and pound-foolish, helping to explain why "geo" issues are the number-one source of construction-industry claims and disputes.

To derive the biggest bang for the QA buck, identify three or even four quality-focused CoMET consultants. (If you don't know any, use the "Find a Geoprofessional" service available free at www.asfe.org.) Ask about the firms' ongoing and recent projects and the clients and client representatives involved; *insist upon receiving verification of all claimed accreditations, certifications, licenses, and insurance coverages.*

Insist upon receiving verification of all claimed accreditations, certifications, licenses, and insurance coverages.

Once you identify the two or three most qualified firms, meet with their key personnel, preferably at their own facility, so you can inspect their laboratory, speak with management and technical staff, and form an opinion about the firm's capabilities and attitude.

Insist that each firm's designated project manager and lead field representative participate in the meeting. You will benefit when those individuals are seasoned QA professionals familiar with construction's rough-and-tumble. Ask about others the firm will assign, too. There's no substitute for experienced, certified personnel who are familiar with the codes and standards involved and know how to:

- read and interpret plans and specifications;
- perform the necessary observation, inspection, and testing;
- document their observations and findings;
- interact with constructors' personnel; and
- respond to the unexpected.

Important: Many of the services CoMET QA field representatives perform – like observing operations and outcomes – require the good judgment afforded by extensive training and experience. Who will be on hand when the unexpected occurs: a 15-year "veteran" or a rookie?

Many of the services CoMET QA field representatives perform require good judgment.

Also consider the tools CoMET personnel use. Some firms are fanatical about proper maintenance and calibration; others, less so. Ask to see the firm's calibration records. If the firm doesn't have any, or if they are not current, be cautious: *You cannot trust test results derived using equipment that may be out of calibration.* Also ask if the firm's laboratory participates in

proficiency testing, relying on a program like the one sponsored by the American Association of State Highway and Transportation Officials (AASHTO). And be sure to ask a firm's representatives about their reporting practices, including report distribution and timeliness, how they handle notifications of nonconformance, and how they resolve complaints.

Once you identify your preferred firm, meet with its representatives again. Provide the approved plans and specifications and other pertinent materials, like a construction schedule, and discuss what's needed to finalize a scope of service that reflects what will be happening on site and when it will occur. Recognize that most CoMET services are performed periodically or randomly, not continuously. Also recognize that a CoMET consultant's field representatives cannot be in all places at all times, an important issue when multiple activities are ongoing simultaneously. Ask for guidance about appropriate staffing levels and discuss the trade-offs that may be available.

Creating a detailed scope of CoMET QA service can help avoid surprises. Still, scope flexibility is needed to deal promptly with the unanticipated, like the additional services required to check the rework performed because of an error caught in QA.

Scope flexibility is needed to deal promptly with the unanticipated.

For financing purposes, some owners require the constructor to pay for CoMET services. ***Consider an alternative approach*** so you don't convert the constructor into the CoMET consultant's client. If it's essential for you to fund QA via the constructor, have the CoMET fee included as an allowance in the bid documents. This arrangement ensures that you remain the CoMET consultant's client, and it prevents the CoMET fee from becoming part of the constructor's bid-price competition. (Note that the International Building Code (IBC) *requires the owner to pay* for Special Inspection (SI) services commonly performed by the CoMET consultant as a service separate from QA, to help ensure the independence of the SI process. Because failure to comply could result in denial of an occupancy or use permit, having a contractual agreement that conforms to local code requirements is essential.)

If it's essential for you to fund QA via the constructor, have the CoMET fee included as an allowance in the bid documents. Note, too, that the International Building Code (IBC) requires you to pay for Special Inspection (SI) services.

CoMET consultants can usually quote their fees as unit fees, unit fees with estimated total (invoiced on a unit-fee basis), or lump-sum (invoiced on a percent-completion basis referenced to a schedule of values). No matter which method is used, estimated quantities need to be realistic. Some CoMET firms lower their total-fee estimates by using quantities they know are too low and then request change orders long before construction and the need for QA are complete.

Once you and the CoMET consultant settle on the scope of service and fee, enter into a written contract. Established CoMET firms have their own contracts; most owners sign them. Some owners prefer to use different contracts, but that can be a mistake when the contract was prepared for construction services. *Professional services are different.* Wholly avoidable problems occur when a contract includes provisions that don't apply to the services involved and fails to include those that do.

Some owners create wholly avoidable problems by using a contract prepared for construction services.

This final note: CoMET consultants perform QA for owners, not constructors. While constructors are commonly given review copies of QA reports *as a courtesy*, you need to make it clear that constructors do *not* have a legal right to rely on those reports; i.e., if constructors want to forgo their own observation and testing and rely on results derived from a scope created to meet *only* the needs of the owner, they *must do so at their own risk.* In all too many cases where owners have failed to make that clear, constructors have alleged that they *did* have a legal right to rely on QA reports and, as a result, the CoMET consultant – not they – are responsible for their failure to deliver what they contractually promised to provide. The outcome can be delays and disputes that entangle you and all other principal project participants. Avoid that. Rely on CoMET professionals with the resources and attitude needed to manage this and other risks as an element of a quality-focused service. Involve them early. Keep them engaged. And listen to what they say. Good CoMET consultants can provide great value.

For more information, speak with representatives of a firm that's part of ASFE/ The Geoprofessional Business Association (GBA) or contact GBA staff. In either case, your inquiries will be warmly welcomed.

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May 28, 2021
Arias Job No. 2019-823, Supplement 1

Via Email: bmask@dunawayassociates.com

Mr. Bryan Mask
Regional Manager/Associate Principal
Dunaway Associates, L.P.
118 Broadway, Suite 201
San Antonio, Texas 78205

RE: Moisture Conditioning Option
World Heritage Visitor Center
San Antonio, Texas

Dear Mr. Mask:

It is our understanding that a beam and slab on grade type foundation has been chosen for the support of the above referenced project. In order to provide an additional option for the soil improvements measures for the above referenced project, we recommend that the following procedures be followed in order to reduce the PVR to 1 inch or less utilizing moisture conditioned on- site soils. This proposed treatment method is to use a portion of the site soils in a heightened uniform moisture conditioned state.

We first recommend that at least 8 feet of the site materials be removed to achieve the subgrade elevation with the 5 feet lateral overbuild. The following provides recommendations for the moisture conditioning of the site soils. The purpose of these recommendations is to obtain a relatively uniform stable zone of soil beneath the structure.

1) After a minimum of 8 feet of the site soils are removed and stockpiled on the site, the subgrade should then be moisture conditioned and recompacted. The subgrade should be scarified a minimum of 8 inches deep and water should be added. The subgrade should be compacted to 93% of standard proctor density (ASTM D698) within +2% to +7% of optimum moisture.

2) The stockpiled site clay soil may then be placed back into the excavation. The site clay should be pulver mixed in-place to reduce the clay clod size to 4 inches or smaller to allow water to be more effectively distributed throughout the soil lift. Because this method causes the soil to be wet of optimum moisture, the contractor should be well experienced

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in these techniques and expect relatively wet soil conditions for constructability. The site clays should be placed in 8-inch loose lifts to a 6-foot compacted moisture conditioned thickness. Each lift should be moisture conditioned and tested as outlined above.

3) The final 2 feet minimum should consist of select fill placed, compacted, and tested to 95% minimum of ASTM D698, within -1% to +3% of optimum moisture. The select fill should meet the requirements as per our original Geotechnical report and may consist of pit run select fills. Consideration should be given to constructing the top 6 inches of the select fill of crushed limestone base meeting the requirements of TxDOT Item 247, Type A, Grade 1 or 2. This will aid in providing a better all-weather working surface of the fill pad. Four in-place density tests minimum per lift of select fill and for the subgrade are recommended.

4) Water seepage either by landscape watering, rain events, and/or leaking plumbing into the building select fill and select fill overbuild could cause additional swelling of the site clays which would translate to possible movements of the building superstructure. In order to aid in minimizing the potential for water seepage into the foundation soils it is recommended that a clay liner or concrete/asphalt flatwork be used at the perimeter of the foundation over the select fill overbuild for weather protection. If a clay liner is chosen, it should consist of a minimum of 24 inches of the site clays over the select fill overbuild at the building perimeter. The clays should be placed at 90% of standard proctor density within -2% to +4% of optimum moisture in 8-inch loose lifts.

5) Sprinkler heads and other external water connections should be placed well away from the foundation perimeter. No trees or other vegetation over 5 feet in height shall be placed within 15 feet of the structure. Utility bedding should not include gravel near the perimeter of the foundation. Compacted clay or flowable fill should be used in lieu of permeable bedding materials between 2’ to 4’ beyond the exterior of the building perimeter. Flower beds and planters should have the 24-inch clay liner beneath. Roof drainage should be controlled by gutters and carried well away from the structure.

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Our findings and recommendations as stated in our original Geotechnical report also should be incorporated into the design and construction documents for the proposed development. Please consult with us, as needed, during any part of the design or construction process.

We recommend that all foundation construction be tested and observed by one of our representatives in accordance with the report recommendations.

Thank you for the opportunity to be of service to you.
Sincerely,

Arias Geoprofessionals

TX Firm F-32,

Mark J. O'Connor, P.E.

Senior Geotechnical Engineer

May 28, 2021