MORE THAN ARCHITECTS

ADDENDUM

NO. 2

TO THE DRAWINGS AND THE PROJECT MANUAL

PROJECT NAME: Tomball ISD Intermediate School Replacement

CLIENT NAME: Tomball ISD

LOCATION: Tomball, TX

PROJECT NUMBER: 00802-04-01

PROPOSAL DATE: Thursday, August 13, 2026, 2:00 PM

ADDENDUM DATE: Friday, August 7, 2026

For additional information regarding this project, contact Caitlin Munch.

08/07/2026

THIS ADDENDUM INCLUDES:

General Items	06 Sheet
Civil Items	08 Sheets + 13 Specification Sections
Landscape Items	00 Sheets
Irrigation Items	00 Sheets
Architectural Site Items	05 Sheet
Structural Items	19 Sheets
Architectural Items	17 Sheets + 16 Specification Section
Foodservice Items	--
Plumbing Items	13 Sheets + 01 Specification Section
Mechanical Items	12 Sheets + 07 Specification Sections
Electrical Items	03 Sheets + 01 Specification Section
Technology Items	02 Sheets
Audiovisual Items	05 Sheets + 01 Specification Section
Theatrical Items	01 Specification Section

AND ALL ATTACHED REVISED DRAWING REFERENCES IN THE ADDENDUM

Huckabee

Project Name: Tomball Intermediate School
Client: Tomball ISD
Tomball, TX
Project Number: 00788-002

STATE OF TEXAS
SARA KAROUNI
145244
LICENSED
PROFESSIONAL ENGINEER
08/07/2026
F-9756

CIVIIL ITEMS FOR ADDENDUM NO. 2

NOTICE TO PROPOSERS:

A. This Addendum shall be considered part of the contract documents for the above-mentioned project as though it had been issued at the same time and incorporated integrally therewith. Where provisions of the following supplementary data differ from those of the original contract documents, this Addendum shall govern and take precedence.
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REFERENCE IS MADE TO THE DRAWINGS AND THE PROJECT MANUAL AS NOTED:

PROJECT MANUAL:

DRAWINGS:

AD No 1, Civil. Item 1: **To the Drawings, C1.4, "DEMOLITION PLAN"**
Description.

- Note 43 states that existing asphalt is to be removed. Could you please confirm that asphalt is correct and not concrete?
  Response: No asphalt removal is included in the project demolition scope. Accordingly, Demolition Keynote 43 has been removed from the demolition plans.

AD No 1, Civil. Item 1: **To the Drawings, C3.2, "DIMENSION CONTROL & SIGNAGE PLAN (2 OF 2)"**
Description.

- Sheet C3.2 is calling for the generator to be by others. Please Confirm.
  Response: The "By Others" callout indicates that the generator is not included within the Civil scope of work. The generator is addressed under the applicable MEP plans.

AD No 1, Civil. Item 2: **To the Drawings, C5.2, "UTILITY PLAN – WATER & SANITARY (2 OF 2)"**
Description.

- Please refer to Sheet C5.2 – Utilities Plan and the image below for reference. Kindly confirm the location of the proposed 12-inch water line.
  Response: The callout on Sheet C5.2 has been adjusted to clearly reference the proposed 12-inch water line shown above. The plans have been updated accordingly for clarity.

AD No 1, Civil. Item 3: **To the Drawings, C3.2, "DIMENSION CONTROL & SIGNAGE PLAN (2 OF 2)"**
Description.

- Refer to Sheet C3.2. The plan indicates "by others" items such as: Prop. Generator, Prop. Elec. Transformer, and Prop. Fence. Please confirm all work associated for or with these "by others" items are NIC "Not in Contract".

Response: The "By Others" callouts indicate that these items are not included within the Civil scope of work and are to be coordinated under the applicable disciplines.

AD No 1, Civil. Item 4: **To the Drawings, C2.1, "STORM WATER POLLUTION PREVENTION PLAN"**
Description.

- Inlet protection barrier type I has been added to the additional inlet added to the art courtyard.

AD No 1, Civil. Item 5: **To the Drawings, C3.2, "DIMENSION CONTROL & SIGNAGE PLAN (2 OF 2)"**
Description.

- The previous grass area where the art courtyard is located has been updated to reflect 4.5 inch concrete. The area has been designed to prevent ponding with an additional storm inlet.
- The center courtyard has been updated to accurately reflect the latest landscape design.

AD No 1, Civil. Item 6: **To the Drawings, C4.2, "GRADING PLAN (2 OF 2)"**
Description.

- The grading in the art courtyard area has been updated to prevent any ponding.

AD No 1, Civil. Item 7: **To the Drawings, C6.2, "UTILITY PLAN – STORM SEWER (2 OF 2)"**
Description.

- An inlet has been added to the art courtyard area to help prevent ponding.
- Additional 8" storm sewer has been proposed to tie the new inlet into the storm sewer system.

AD No 1, Civil. Item 8: **To the Drawings, C7.1, "DRAINAGE AREA MAP"**
Description.

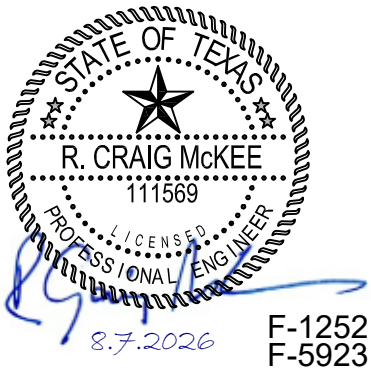
- Drainage areas nearing the art courtyard have been updated to account for the additional inlet.

AD No 1, Civil. Item 9: **To the Drawings, C7.2, "DRAINAGE AREA CALCULATIONS"**
Description.

- The drainage area calculations have been updated to include the additional inlet added in the art courtyard to prevent ponding.

END OF ARCHITECTURAL ADDENDUM

Project Name: Tomball Intermediate School
Client: Tomball ISD
Tomball, TX
Project Number: 00802-04-01



F-1252
F-5923

STRUCTURAL ITEMS FOR ADDENDUM NO. 2

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REFERENCE IS MADE TO THE DRAWINGS AND THE PROJECT MANUAL AS NOTED:

PROJECT MANUAL:

DRAWINGS:

AD No 2, Struc. Item 1: To the Drawings, Sheet S2.01," DEEP FOUNDATION ELEMENTS PLAN - AREA A"

- Revised pile cap.
- Revised pile location.
- Revised steel column to CMU pilaster.

AD No 2, Struc. Item 2: To the Drawings, Sheet S2.06," DEEP FOUNDATION ELEMENTS PLAN - AREA F"

- Revised pile cap.

AD No 2, Struc. Item 3: To the Drawings, Sheet S2.07," ANCHOR ROD PLACEMENT PLAN - AREA A"

- Revised pile cap.
- Revised pile location.
- Revised steel column to CMU pilaster.

AD No 2, Struc. Item 4: To the Drawings, Sheet S2.12," ANCHOR ROD PLACEMENT PLAN - AREA F"

- Revised base plates.

AD No 2, Struc. Item 5: To the Drawings, Sheet S2.13," FOUNDATION PLAN - AREA A"

- Revised pile cap.
- Revised pile location.
- Revised steel column to CMU pilaster.

AD No 2, Struc. Item 6: To the Drawings, Sheet S2.15," FOUNDATION PLAN - AREA C"

- Added thickened slab note.

AD No 2, Struc. Item 7: To the Drawings, Sheet S2.17," FOUNDATION PLAN - AREA E"

- Added thickened slab note.

AD No 2, Struc. Item 8: To the Drawings, Sheet S2.18," FOUNDATION PLAN - AREA F"

- Added note regarding overhead grille.

Huckabee

- Added thickened slab note.

AD No 2, Struc. Item 9: To the Drawings, Sheet S3.02," TYPICAL FOUNDATION DETAILS"
- Added base plate information for W14 columns.

AD No 2, Struc. Item 10: To the Drawings, Sheet S3.05," TYPICAL ISOLATED INTERIOR PILE CAP DETAILS"
- Added pile cap configuration.

AD No 2, Struc. Item 11: To the Drawings, Sheet S3.07," FOUNDATION DETAILS"
- Added chamfer to grade beam and revised outside face of finish location.

AD No 2, Struc. Item 12: To the Drawings, Sheet S5.01," TYPICAL CMU DETAILS"
- Added detail.

AD No 2, Struc. Item 13: To the Drawings, Sheet S5.04," TYPICAL CMU DETAILS"
- Revised steel column to CMU pilaster.

AD No 2, Struc. Item 14: To the Drawings, Sheet S6.01," FLOOR & LOW ROOF FRAMING PLAN - AREA A"
- Revised steel column to CMU pilaster.

AD No 2, Struc. Item 15: To the Drawings, Sheet S6.06," ROOF FRAMING PLAN - AREA A"
- Revised steel column to CMU pilaster.

AD No 2, Struc. Item 16: To the Drawings, Sheet S7.11," FRAMING SECTIONS"
- Revised skylight detail.

AD No 2, Struc. Item 17: To the Drawings, Sheet S7.17," FRAMING SECTIONS"
- Revised detail.

AD No 2, Struc. Item 18: To the Drawings, Sheet S7.21," FRAMING SECTIONS"
- Revised skylight detail.

AD No 2, Struc. Item 19: To the Drawings, Sheet S8.03," BRACED FRAME ELEVATIONS"
- Added detail callouts.

END OF STRUCTURAL ADDENDUM

Project Name: Tomball Intermediate School
Client: Tomball ISD
Tomball, TX
Project Number: 00802-04-01

08/07/2026

ARCHITECTURAL ITEMS FOR ADDENDUM NO. 2

NOTICE TO PROPOSERS:

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REFERENCE IS MADE TO THE DRAWINGS AND THE PROJECT MANUAL AS NOTED:

PROJECT MANUAL:

AD No 2, Arch. Item 1: To the Project Manual, 00 0110,"TABLE OF CONTENTS"
Updated for specification revisions.

AD No 2, Arch. Item 2: To the Project Manual, 01 2100,"ALLOWANCES"
1.04 C – Updated with Site Signage Allowance.
1.04 D – Updated with Traffic Light Allowance.

AD No 2, Arch. Item 3: To the Project Manual, 01 2300,"ALTERNATES"
Revised number of days in 1.03 B.
Updated 1.05 Schedule of Alternates.

AD No 2, Arch. Item 4: To the Project Manual, 04 2000,"UNIT MASONRY"
1.05 C 1 – Added calculations requirements where required.
1.07 4 – Added requirements for Air and Water Barrier in correspondence with mock-up approval.
2.02 B 3 – Added note.
2.05 F 1 – Revised note for horizontal reinforcement at stack bond coursing.
3.04 I 1 – Updated Bond section.
3.05 X – Updated note for horizontal reinforcement at stack bond coursing.
3.04 – Revised section.

AD No 2, Arch. Item 5: To the Project Manual, 07 2200,"ROOF AND DECK INSULATION"
1.04 C – Revised section for Wind Uplift Data
2.01 A 2 – Revised insulation materials thickness requirement to match drawings.
2.01 D – Revised Cover Board requirements.

AD No 2, Arch. Item 6: To the Project Manual, 07 4213,"METAL WALL PANELS"
1.04 B & C – Updated requirements for submittal phase of Metal Wall Panel Shop drawings.
2.04 B – Revised fastener requirements
3.02 A – Updated Preparation requirements for substrates.
3.03 A & E – Clarified Installation requirements.

AD No 2, Arch. Item 7: To the Project Manual, 07 5216,"SBS MODIFIED BITUMINOUS ROOFING"
1.09 5 C – Revised section for Wind Uplift Data

AD No 2, Arch. Item 8: To the Project Manual, 07 5419,"POLYVINYL CHLORIDE (PVC) ROOFING"
Added specification.

AD No 2, Arch. Item 9: To the Project Manual, 07 6200,"SHEET METAL FLASHING"
2.02 F – Added additional information for Stainless Sheet Metal.
2.03 1, 3, & 4 – Revised information for Flashing Underlayment.
2.05 K, M, & N – Updated information for clarification.

AD No 2, Arch. Item 10: To the Project Manual, 08 3323,"OVERHEAD COILING DOORS"
Revised to recessed overhead coiling doors per details.

AD No 2, Arch. Item 11: To the Project Manual, 08 3326,"OVERHEDA COILING GRILLES"
Revised to recessed overhead coiling grilles per details.

AD No 2, Arch. Item 12: To the Project Manual, 08 4313,"ALUMINUM FRAMED STOREFRONTS"
2.04 7 D – Updated Maximum U-Factor information for clarification.

AD No 2, Arch. Item 13: To the Project Manual, 08 4413,"GLAZED ALUMINUM CURTAIN WALLS"
2.03 E 2 – Updated Overall U- Value information for clarification.

AD No 2, Arch. Item 14: To the Project Manual, 08 8000,"GLAZING"
1.05 D – Updated for clarification.

AD No 2, Arch. Item 15: To the Project Manual, 10 2600,"WALL AND DOOR PROTECTION"
Changed from surface mounted to flush mounted.

AD No 2, Arch. Item 16: To the Project Manual, 14 2400,"HYDRAULIC ELEVATORS"
Revised Warranty

AD No 2, Arch. Item 17: To the Project Manual, 01 4339,"MOCK UP WALL CONSTRUCTION", 09 2236,"LATH", & 09 2400,"CEMENT PLASTERING",
Deleted specifications.

AD No 2, Arch. Item 18: To the Project Manual, 32 3113,"CHAIN LINK FENCES AND GATES"
Added requirement for privacy fabric at chain link fencing.

DRAWINGS:

AD No 2, Arch. Item 19: To the Drawings, Sheet G1.12,"GENERAL DATA – VOLUME 01"
Revised Alternates to correspond with specifications.

AD No 2, Arch. Item 20: To the Drawings, Sheet G1.22,"GENERAL DATA – VOLUME 02"
Revised Alternates to correspond with specifications.

AD No 2, Arch. Item 21: To the Drawings, Sheet G2.01,"CODE ANALYSIS MASTER PLAN – LEVEL 01"
Updated Knox Box annotations to denote recessed mounting.

AD No 2, Arch. Item 22: To the Drawings, Sheet G3.01,"ROOF, EXTERIOR WALL, & INTERIOR PARTITION TYPES"
Updated annotations for Wall Types W102, W102-E, and W202.

AD No 2, Arch. Item 23: To the Drawings, Sheet G5.01,"SCHEDULE OF MATERIALS AND COLORS"
Updated BSS description to clarify base type.
Added BTP01 to the schedule.

AD No 2, Arch. Item 24: To the Drawings, Sheet G5.02,"SCHEDULE OF MATERIALS AND COLORS"
Added AP06 to the schedule.

AD No 2, Arch. Item 25: To the Drawings, Sheet AS1.02,"ENLARGED ARCHITECTURAL SITE PLAN"
Updated Knox Box annotation to denote recessed mounting.
Added note for privacy fabric at black vinyl chain link fence.

AD No 2, Arch. Item 26: To the Drawings, Sheet AS2.03,"FENCE & GATE DETAILS"
Updated Gate Schedule comments to reference correct details.

AD No 2, Arch. Item 27: To the Drawings, Sheet AS2.04,"VEHICULAR GATE DETAILS"
Added note for privacy fabric at black vinyl chain link fence.

AD No 2, Arch. Item 28: To the Drawings, Sheet AS2.05,"DUMPSTER ENCLOSURE & MONUMENT SIGN"
Added note for privacy fabric at black vinyl chain link fence.

AD No 2, Arch. Item 29: To the Drawings, Sheet AS2.06,"MISC. SITE DETAILS"
Revised graphic application in detail 7/AS2.06.

AD No 2, Arch. Item 30: To the Drawings, Sheet A1.1F,"FLOOR PLAN – LEVEL 1 – AREA F"
Updated Knox Box annotation to denote recessed mounting.

AD No 2, Arch. Item 31: To the Drawings, Sheet A3.01,"DOORS SCHEDULES"
Added special note 13 to door D113 within Overhead Door Schedule.

AD No 2, Arch. Item 32: To the Drawings, Sheet A4.1B,"FINISH PLAN – LEVEL 01 – AREA B"
Added note for accent paint in LG CONFERENCE ROOM B112 and COUNSELORS OFFICE B131.
Added PNT02 to finish tag. Typical for all conference rooms and offices.

AD No 2, Arch. Item 33: To the Drawings, Sheet A4.1E,"FINISH PLAN – LEVEL 01 – AREA E"
Added notes to clarify finishes on stair E121.
Added notes for accent paint in FLEX ROOM E114 and CLASSROOM E119.
Added PNT02 to finish tag. Typical for all flex rooms and classrooms.

AD No 2, Arch. Item 34: To the Drawings, Sheet A4.1F,"FINISH PLAN – LEVEL 01 – AREA F"
Updated finish tags in SERVERY F132 and SERVERY A125.
Added finish tags to show the extend of TC01,02 on serving line walls.

AD No 2, Arch. Item 35: To the Drawings, Sheet A4.2C,"FINISH PLAN – LEVEL 02 – AREA C"
Updated notes for stairs C204 to clarify finish on stair landing.

AD No 2, Arch. Item 36: To the Drawings, Sheet A4.2E,"FINISH PLAN – LEVEL 02 – AREA E"
Updated finish tags for stair E222.
Updated notes for stairs E222 and E217 to clarify finish on stairs.

AD No 2, Arch. Item 37: To the Drawings, Sheet A4.30,"FINISH PLAN – EQUIPMENT PLATFORMS"
Updated finish tag to show finishes information.

AD No 2, Arch. Item 38: To the Drawings, Sheet A4.34,"INTERIOR ELEVATIONS"
Detail # : Added additional fabric covered seat at learning stair.

AD No 2, Arch. Item 39: To the Drawings, Sheet A4.37,"INTERIOR ELEVATIONS"
Detail #2: Updated elevation to show the front of the serving line.

AD No 2, Arch. Item 40: To the Drawings, Sheet A4.38,"INTERIOR ELEVATIONS"
Detail #8: Updated wainscot tiles pattern to include TP04.

AD No 2, Arch. Item 41: To the Drawings, Sheet A4.44,"INTERIOR DETAILS AND TYPICAL INTERIOR FINISH DETAILS"
Detail #18: Removed "FIRE BARRIER" note on corner guard detail for clarification.

AD No 2, Arch. Item 42: To the Drawings, Sheet A6.14,"WALL SECTIONS"
Detail #3: Updated Kalwall slope and connection details.

AD No 2, Arch. Item 43: To the Drawings, Sheet A6.17,"FOUNDATION DETAILS"
Detail #1: Updated slab perimeter to include 1" chamfered edge. Updated masonry location and air space depth within wall.
Detail #2: Updated slab perimeter to include 1" chamfered edge. Updated masonry location and air space depth within wall.
Detail #3: Updated slab perimeter to include 1" chamfered edge. Updated masonry location and air space depth within wall.

AD No 2, Arch. Item 44: To the Drawings, Sheet A6.18,"FOUNDATION DETAILS"
Detail #1: Updated slab perimeter to include 1" chamfered edge. Updated masonry location and air space depth within wall.
Detail #2: Updated slab perimeter to include 1" chamfered edge. Updated masonry location and air space depth within wall.
Detail #3: Updated slab perimeter to include 1" chamfered edge. Updated masonry location and air space depth within wall.

AD No 2, Arch. Item 45: To the Drawings, Sheet A6.19,"FOUNDATION DETAILS"
Detail #1: Updated slab perimeter to include 1" chamfered edge. Updated masonry location and air space depth within wall.
Detail #2: Updated slab perimeter to include 1" chamfered edge. Updated masonry location and air space depth within wall.

AD No 2, Arch. Item 46: To the Drawings, Sheet A6.23,"WALL SECTION DETAILS"
Detail #6: Updated Kalwall head detail.
Detail #7: Updated Kalwall sill detail.

AD No 2, Arch. Item 47: To the Drawings, Sheet A6.41,"RAILING TYPES AND DETAILS"
Detail #10: Updated annotation.
Detail #11: Updated annotation.

AD No 2, Arch. Item 48: To the Drawings, Sheet A7.01,"ROOF PLAN"
Detail #1: Updated Kalwall system layout and slope.

AD No 2, Arch. Item 49: To the Drawings, Sheet A7.02,"ENLARGED PLAN - SKYLIGHT"
Detail #1: Updated Kalwall system layout and slope.

END OF ARCHITECTURAL ADDENDUM

Project Name: Tomball Intermediate School
Client: Tomball ISD
Tomball, TX
Project Number: 00802-04-01

THE SEAL APPEARING ON THIS DOCUMENT
WAS AUTHORIZED BY
BRANDON K. ADAMS, PE #142295 ON 08/06/2026

PLUMBING ITEMS FOR ADDENDUM NO. 2

NOTICE TO PROPOSERS:

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REFERENCE IS MADE TO THE DRAWINGS AND THE PROJECT MANUAL AS NOTED:

PROJECT MANUAL:

AD No 1, Plumb. Item 1: To the Project Manual, Section 22 1005, "Plumbing Piping"

1) Added Sub Soil Drainage Piping to spec section.

DRAWINGS:

AD No 1, Plumb. Item 2: To the Drawings, Sheet P0.02," PLUMBING SCHEDULES"

1) Added FS2 to Plumbing Fixture Schedule.
2) Revised EWH6 on Domestic Electric Water Heater Schedule.

AD No 1, Plumb. Item 3: To the Drawings, Sheet P2.0F, "PLUMBING PLAN – UNDER SLAB – AREA F"

1) Revised FD3 tag to FD2 at floor sink by Cooler/Freezers.

AD No 1, Plumb. Item 4: To the Drawings, Sheet P2.1A," PLUMBING PLAN – LEVEL 01 – AREA A"

1) Clarified condensate scope serving HVAC equipment.

AD No 1, Plumb. Item 5: To the Drawings, Sheet P2.1B," PLUMBING PLAN – LEVEL 01 – AREA B"

1) Clarified condensate scope serving HVAC equipment.

AD No 1, Plumb. Item 6: To the Drawings, Sheet P2.1C," PLUMBING PLAN – LEVEL 01 – AREA C"

1) Clarified condensate scope serving HVAC equipment.

AD No 1, Plumb. Item 7: To the Drawings, Sheet P2.1E," PLUMBING PLAN – LEVEL 01 – AREA E"

1) Clarified condensate scope serving HVAC equipment.

AD No 1, Plumb. Item 8: To the Drawings, Sheet P2.1F," PLUMBING PLAN – LEVEL 01 – AREA F"

1) Clarified condensate scope serving HVAC equipment.

AD No 1, Plumb. Item 9: To the Drawings, Sheet P2.2A," PLUMBING PLAN – LEVEL 02 – AREA A"

1) Clarified condensate scope serving HVAC equipment.

AD No 1, Plumb. Item 10: To the Drawings, Sheet P2.2C," PLUMBING PLAN – LEVEL 02 – AREA C"

1) Clarified condensate scope serving HVAC equipment.

AD No 1, Plumb. Item 11: To the Drawings, Sheet P2.2E," PLUMBING PLAN – LEVEL 02 – AREA E"

1) Clarified condensate scope serving HVAC equipment.

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AD No 1, Plumb. Item 12: To the Drawings, Sheet P2.2F," PLUMBING PLAN – LEVEL 02 – AREA F"

1) Clarified condensate scope serving HVAC equipment.

AD No 1, Plumb. Item 13: To the Drawings, Sheet P4.01," PLUMBING ENLARGED PLAN – KITCHEN"

1) Revised FD3 tag to FD2 at floor sink by Cooler/Freezers.

AD No 1, Plumb. Item 14: To the Drawings, Sheet P5.06," PLUMBING RISER DIAGRAMS"

1) Revised FD3 tag to FD2 at floor sink by Cooler/Freezers.

END OF PLUMBING ADDENDUM

Project Name: Tomball ISD New Intermediate School
Client: Tomball ISD
Tomball, Texas
Project Number: 01909-05-01

THE SEAL APPEARING ON THIS DOCUMENT
WAS AUTHORIZED BY
GABRIEL R. GARCIA, PE #125068 ON 08/07/2026

MECHANICAL ITEMS FOR ADDENDUM NO. 2

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REFERENCE IS MADE TO THE DRAWINGS AND PROJECT MANUAL AS NOTED:

PROJECT MANUAL:

AD No 2, Mech. Item 1: To the Project Manual, Section 23 0913, "Instrumentation and Control Devices for HVAC"

1) Updated wall mounted room sensors to indicate blank cover plate with no display or override buttons

AD No 2, Mech. Item 2: To the Project Manual, Section 23 0923, "Direct Digital Control System for HVAC"

1) Updated manufacturers and bid alternate instructions

AD No 2, Mech. Item 3: To the Project Manual, Section 23 2123, "Hydronic Pumps"

1) Updated approved manufacturers

AD No 2, Mech. Item 4: To the Project Manual, Section 23 3600, "Air Terminal Units"

1) Updated approved manufacturers

AD No 2, Mech. Item 5: To the Project Manual, Section 23 6426, "Rotary Screw Water Chillers"

1) Updated manufacturers and bid alternate instructions

AD No 2, Mech. Item 6: To the Project Manual, Section 23 7313, "Modular Central Station Air Handling Units"

1) Updated manufacturers and bid alternate instructions

AD No 2, Mech. Item 7: To the Project Manual, Section 23 8126.13, "Small Capacity Split System Air Conditioners"

1) Updated approved manufacturers

AD No 2, Mech. Item 8: To the Project Manual, Section 23 8200, "Convection Heating and Cooling Units"

1) Updated approved manufacturers

AD No 2, Mech. Item 9: To the Project Manual, Section 23 7433, "Dedicated Outdoor Air Units"

1) Remove specification from the set in its entirety.

DRAWINGS:

AD No 2, Mech. Item 10: To the Drawings, Sheet M2.1B, "Mechanical Plan Level 01 – Area B"

1) Ceiling Mounted exhaust fans moved to align with ceilings/walls at single hole restrooms

AD No 2, Mech. Item 11: To the Drawings, Sheet M2.1F, "Mechanical Plan Level 01 – Area F"

1) Single Zone AHU space sensors updated to reflect combination sensors per control diagrams

AD No 2, Mech. Item 12: To the Drawings, Sheet M2.1F, "Mechanical Plan Roof – Area A, B, C"

1) OA intakes shifted away from roof edge to provide clearance.

AD No 2, Mech. Item 13: To the Drawings, Sheet M2.1F, "Mechanical Plan Level 01 – Area F"

1) Single Zone AHU space sensors updated to reflect combination sensors per control diagrams

AD No 2, Mech. Item 14: To the Drawings, Sheet M3.1F, "Mechanical Piping Plan Level 01 – Area F"

1) Updated heating water pipe size.

AD No 2, Mech. Item 15: To the Drawings, Sheet M3.2E, "Mechanical Piping Plan Level 02 – Area E"

1) Updated heating water piping to reflect the re-heat coil in AHU 12

AD No 2, Mech. Item 16: To the Drawings, Sheet M3.2F, "Mechanical Piping Plan Level 02 – Area F"

1) Updated heating water piping to reflect the re-heat coil in AHU 6

AD No 2, Mech. Item 17: To the Drawings, Sheet M4.1, "Mechanical Service Yard"

1) Updated heating water piping to reflect the re-heat coil in AHU 8

AD No 2, Mech. Item 18: To the Drawings, Sheet M4.3, "Mechanical Piping Riser Diagrams"

1) Updated heating water riser diagrams to include the additional heating water coils at AHUs 6, 8, & 12.

AD No 2, Mech. Item 19: To the Drawings, Sheet M5.1, "Mechanical Control Diagrams"

1) Updated control diagrams

AD No 2, Mech. Item 20: To the Drawings, Sheet M5.2, "Mechanical Control Diagrams"

1) Updated control diagrams

AD No 2, Mech. Item 21: To the Drawings, Sheet M5.3, "Mechanical Control Diagrams"

1) Updated control diagrams

AD No 2, Mech. Item 22: To the Drawings, Sheet M5.4, "Mechanical Control Diagrams"

1) Updated control diagrams

END OF MECHANICAL ADDENDUM

Project Name: Tomball ISD New Intermediate School
Client: Tomball ISD
Tomball, Texas
Project Number: 01909-05-01

THE SEAL APPEARING ON THIS DOCUMENT
WAS AUTHORIZED BY
B. KYLE HASKOVEC, PE #143448 ON 08/06/2026

ELECTRICAL ITEMS FOR ADDENDUM NO. 2

NOTICE TO PROPOSERS:

A. This Addendum shall be considered part of the contract documents for the above-mentioned project as though it had been issued at the same time and incorporated integrally therewith. Where provisions of the following supplementary data differ from those of the original contract documents, this Addendum shall govern and take precedence.

B. Proposers are hereby notified that they shall make any necessary adjustments in their estimate on account of this Addendum. It will be construed that each Proposer's proposal is submitted with full knowledge of all modifications and supplemental data specified therein. Acknowledge receipt of this addendum in the space provided on the proposal form. Failure to do so may subject Proposer to disqualification.

REFERENCE IS MADE TO THE DRAWINGS AND PROJECT MANUAL AS NOTED:

PROJECT MANUAL:

AD No 2, Elec. Item 1: To the Project Manual, Section 26 3213, "Engine Generators"

1) To Section 2.02, paragraph "D", changed fuel type from diesel to gaseous (natural gas)
2) To section 2.03 paragraph "B", changed fuel type to reflect gaseous (natural gas) generator equipment.

DRAWINGS:

AD No 2, Elec. Item 1: To the Drawings, Sheet E0.02, "ELECTRICAL POWER SITE PLAN"

1) Updated kW value of generator note to 200 kW to match information on riser diagram.

AD No 2, Elec. Item 2: To the Drawings, Sheet E2.1D, "POWER PLAN – LEVEL 01 – AREA D"

1) Added connection for motorized door in Corridor D113.

AD No 2, Elec. Item 3: To the Drawings, Sheet E5.03, "ELECTRICAL PANEL SCHEDULES"

1) Added circuit to panel 2-L1 for motorized door.

END OF ELECTRICAL ADDENDUM

Project Name: Tomball Intermediate School
Client: Tomball ISD
Tomball, TX
Project Number: 00802-04-01

TECHNOLOGY ITEMS FOR ADDENDUM NO. 2

NOTICE TO PROPOSERS:

A. This Addendum shall be considered part of the contract documents for the above-mentioned project as though it had been issued at the same time and incorporated integrally therewith. Where provisions of the following supplementary data differ from those of the original contract documents, this Addendum shall govern and take precedence.
B. Proposers are hereby notified that they shall make any necessary adjustments in their estimate on account of this Addendum. It will be construed that each Proposer's proposal is submitted with full knowledge of all modifications and supplemental data specified therein. Acknowledge receipt of this addendum in the space provided on the proposal form. Failure to do so may subject Proposer to disqualification.

REFERENCE IS MADE TO THE DRAWINGS AND THE PROJECT MANUAL AS NOTED:

DRAWINGS:

AD No 2, TECH. Item 1: **T0.00 GENERAL NOTES AND LEGENDS**
- Added POS symbol to Symbol Legend – Structured Cabling Systems

AD No 2, TECH. Item 2: **T1.1F FLOOR PLAN – LEVEL 01 – AREA F**
- Added POS Data Drop Locations to Kitchen Area
- Added Dual Data Drop to Main Mech Room F121 for Irrigation Controller

END OF TECHNOLOGY ADDENDUM

Project Name: Tomball Intermediate School
Client: Tomball ISD
Tomball, TX
Project Number: 00802-04-01

AV/TS ITEMS FOR ADDENDUM NO. 2

NOTICE TO PROPOSERS:

A. This Addendum shall be considered part of the contract documents for the above-mentioned project as though it had been issued at the same time and incorporated integrally therewith. Where provisions of the following supplementary data differ from those of the original contract documents, this Addendum shall govern and take precedence.
B. Proposers are hereby notified that they shall make any necessary adjustments in their estimate on account of this Addendum. It will be construed that each Proposer's proposal is submitted with full knowledge of all modifications and supplemental data specified therein. Acknowledge receipt of this addendum in the space provided on the proposal form. Failure to do so may subject Proposer to disqualification.

REFERENCE IS MADE TO THE DRAWINGS AND THE PROJECT MANUAL AS NOTED:

PROJECT MANUAL:

AD No 2, AV/TS. Item 1: **11 6162 – THEATRICAL LIGHTING SYSTEMS**
- This specification section is new and is hereby incorporated into the Project Manual.

AD No 2, AV/TS. Item 2: **27 4116 – INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT**
- Revised 1.07, F – AV Presentation System language.
- Added 2.03, P, Q & R – Added missing microphones
- Added 2.04, I – AES converter
- Revised 2.19, B – Wall Mounted Equipment Rack

DRAWINGS:

AD No 2, AV/TS. Item 3: **AV11.11 – CAFETORIUM FUNCTIONAL DIAGRAMS**
- Revised Detail 5 – AV FUNCTIONAL DIAGRAM

AD No 2, AV/TS. Item 4: **AV11.12 – CAFETORIUM DETAILS**
- Details 3 & 4 - Corrected encoder Type numbers
- Removed redundant ALS Receivers from loose equipment schedule

AD No 2, AV/TS. Item 5: **AV11.13 – OFFICE AND MEETING ROOMS FUNCTIONAL DIAGRAMS AND DETAILS**
- Revised Details 1 & 3.

AD No 2, AV/TS. Item 6: **AV11.21 – MUSIC ROOM DETAILS**
- Added Detail 5 - Microphone Plate Detail

AD No 2, AV/TS. Item 7: **AV11.31 – GYMNASIUM DETAILS**
- Added Details 3 & 4 - Plate and Panel details

END OF AV/TS ADDENDUM

Huckabee

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END OF SECTION

SECTION 01 2100
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowances.

B. Contingency allowance.

C. Payment and modification procedures relating to allowances.

1.02 CASH ALLOWANCES

A. Cash Allowances shall be included in the contract sum.

B. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will not be included in Change Orders authorizing expenditure of funds from this Cash Allowance. These costs shall be included in base contract sum unless noted otherwise

C. Costs Not Included in Cash Allowances: Product handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage; and labor for installation and finishing. These costs shall be included in base contract sum unless noted otherwise.

D. Architect Responsibilities:
   1. Consult with Contractor for consideration and selection of products, and installers.
   2. Select products in consultation with Owner and transmit decision to Contractor.
   3. Prepare Change Order.

E. Contractor Responsibilities:
   1. Assist Architect in selection of products, suppliers, and installers.
   2. Obtain proposals from suppliers and installers and offer recommendations.
   3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
   4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.

F. Differences in costs will be adjusted by Change Order.

G. At closeout of Contract, funds remaining in Cash Allowance will be credited to Owner by Change Order.

1.03 CONTINGENCY ALLOWANCE

A. Contingency Allowance shall be included in the contract sum.

B. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will not be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.

C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.04 ALLOWANCES SCHEDULE

A. Section 01 5000 - Temporary Facilities and Control: Include the stipulated sum of $1,500 for purchase of project identification sign.

B. Owners Contingency Allowance: Include the stipulated sum/price of $3,000,000 for use upon Architect's and Owner's instructions.

C. Site Signage Allowance: Include the stipulated sum of $15,000 for purchase, delivery, and installation of site signage and graphics as directed by the Owner and Architect.

D. Traffic Light Allowance: Include the stipulated sum of $500,000 for purchase, delivery, and installation of traffic lights as directed by the Owner and Architect in coordination with the City and State.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2300
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

1.02 RELATED REQUIREMENTS

A. Document 00 1119 - Request for Competitive Sealed Proposals.

1.03 PROCEDURES

A. Proposers are required to submit alternate proposals to add work or to deduct work from the base proposal as described below. Failure to submit alternate amounts in spaces provided on proposal form is basis for disqualification of proposal.

B. The successful proposer shall not modify, withdraw or cancel any of the alternate proposals or any part thereof for 120 days after date of receipt of proposals, unless specifically noted otherwise.

C. Contractor shall be responsible for any changes in the work affected by acceptance of these alternates. Include within the alternative proposal prices all costs, including materials, installations, and fees.

D. Claims for additional dollars resulting from changes caused by the alternates will not be allowed.

E. Refer to the drawings and project manual for items of work affected by alternates.

F. Alternates will be exercised at the option of the Owner.

G. Coordinate related work and modify surrounding work as required to complete the Work, including changes under each alternate, when acceptance is designated in the Owner - Contractor Agreement.

1.04 ACCEPTANCE OF ALTERNATES

A. Indicate variation of proposal price for alternates described below and list on the proposal form or any supplement to it, which requests a 'difference' in proposal price by adding to or deducting from the base proposal price or by indicating "No Charge".

B. Indicating "No Bid" as an alternate is unacceptable and is reason for rejection of the proposal.

C. Alternates quoted on Bid / Proposal Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

D. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.05 SCHEDULE OF ALTERNATES

A. Alternate NO. 1: Section 23 6426 - Rotary-Screw Water Chillers - Owner will select one alternate from Alternates 1A — 1C to be included with the Base Proposal. Do not include Rotary-Screw Water Chillers in the Base Proposal.

1. Alternate NO. 1A: Provide Rotary-Screw Water Chillers as manufactured by Carrier Corporation as specified and as shown on the drawings.
2. Alternate NO. 1B: Provide Rotary-Screw Water Chillers as manufactured by Trane Technologies, PLC as specified and as shown on the drawings.
3. Alternate NO. 1C: Provide Rotary-Screw Water Chillers as manufactured by JCI/York as specified and as shown on the drawings.

B. Alternate NO. 2: Section 23 7313 — Modular Central-Station Air-Handling Units - Owner will select one alternate from Alternates 2A — 2C to be included with the Base Proposal. Do not include Modular Central-Station Air-Handling Units in the Base Proposal.
   1. Alternate NO. 2A: Provide Modular Central-Station Air-Handling Units as manufactured by Carrier Corporation as specified and as shown on the drawings.
   2. Alternate NO. 2B: Provide Modular Central-Station Air-Handling Units as manufactured by Trane Technologies, PLC as specified and as shown on the drawings.
   3. Alternate NO. 2C: Provide Modular Central-Station Air-Handling Units as manufactured by JCI/York as specified and as shown on the drawings.

C. Alternate NO. 3: Section 23 0923 — Direct-Digital Control Devices for HVAC - Owner will select one alternate from Alternates 3A — 3B to be included with the Base Proposal. Do not include Direct-Digital Control for HVAC in the Base Proposal.
   1. Alternate NO. 3A: Provide Direct-Digital Control Devices for HVAC as manufactured by Automated Logic as specified and as shown on the drawings.
   2. Alternate NO. 3B: Provide Direct-Digital Control Devices for HVAC as manufactured by Unify Controls as specified and as shown on the drawings.

D. Alternate NO. 4: Provide PEX piping in lieu of 1-1/2” Pipe and Below Copper piping.

E. Alternate NO. 5: Provide Striping with Fire Turning Circle as specified and as shown on the drawings.

F. Alternate NO. 6: Provide optional adjustment to Base Proposal.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Standard Concrete Masonry Units.
B. Clay facing brick.
C. Calcium Silicate Masonry
D. Reinforcement and anchorage.
E. Flashings.
F. Lintels.
G. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 2000 - Concrete Reinforcing: Reinforcing steel for grouted masonry.
B. Section 04 0100 - Maintenance of Masonry.
C. Section 04 0511 - Masonry Mortaring and Grouting.
D. Section 05 5000 - Metal Fabrications: fabricated steel items.
E. Section 06 1000 - Rough Carpentry: Nailing strips built into masonry.
F. Section 07 2100 - Thermal Insulation: Insulation for cavity spaces.
G. Section 07 2700 - Air and Water Barriers: Air and water-resistive barriers applied to the exterior face of the backing sheathing or masonry.
H. Section 07 6200 - Sheet Metal Flashing and Trim: Metal through-wall masonry flashings.
I. Section 07 8400 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.
J. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. ASTM C90 - Standard Specification for Dry-Cast Loadbearing Concrete Masonry Units; 2024a.
B. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2017a.
C. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2016.
D. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
E. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.
F. NCMA TEK 19-7 - Characteristics of Concrete Masonry Units with Integral Water Repellent, 2008
G. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meetings
   1. Comply with provisions of Section 01 3000 - Administrative Requirements.

2. Not less than one week prior to commencing all masonry related items a pre-installation conference shall be held at the site. Attendance is mandatory for all trades affected by this section. The general contractor shall be responsible for coordinating this conference with all affected trades (Including but not limited to jobsite superintendent, masonry contractor, masonry foreman, waterproofing and flashing contractor, concrete block insulator and architect). The architect will conduct the business of this meeting. All masonry work that takes place prior to this conference shall be marked as rejected and shall be removed, no exceptions.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, masonry reinforcement, size and type of fasteners, and accessories for brick/blockwork support system. Shop drawings shall indicate all required mechanical duct openings and all MEP penetrations through CMU/masonry, including opening size, location, and elevation. Shop drawings that do not show required duct openings and penetrations shall be rejected without review and returned as Revise and Resubmit.
   1. Submit delegated design calculations or sealed shop drawings, for anchors that do not match drawings or where required to comply with requirements in Par. 2.05,B.

D. Samples: Submit four samples of facing brick and architectural masonry units to illustrate color, texture, and extremes of color range. Sample shall be of actual unit specified to be installed.

E. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
   1. Maintain one copy of each document on project site.

B. At all units (concrete masonry, stone, cast stone or other) for which an integral water repellent was specified to be in the units, perform the Water Droplet Test as recommended in the performance criteria of NCMA TEK 19-7 associated with the Water Droplet Test Method.

C. Certifications
   1. Do not commence placement of masonry until mortar mix designs have been reviewed and approved by the Testing Laboratory and all governmental agencies having jurisdiction and until copies are at the job site.

1.07 MOCK-UP

A. Field Sample (Panels for texture and color approvals only)
   1. In an area on the site where approved by the Architect, provide sample masonry panels.
      a. Make each sample panel approximately 4'-0" high and 6'-0" long.
      b. Provide one sample panel for each combination of masonry units, bond pattern, mortar color, and joint type used in the Work.
      c. For renovation projects, locate panel adjacent to existing building to allow side by side viewing of both existing building and panel. Panel shall be located in an area that receives both direct sun and shade.
      d. Revise as necessary to secure approval from Owner and Architect.
      e. Completely demolish and remove from the job site upon completion and acceptance of the work.

B. Mock-Ups (Wall for quality control purposes)
   1. A mock-up wall shall be constructed only after the pre-installation conference.

2. The Architect shall select a section of exterior wall within the building that shall be used for a wall mock-up to determine quality of workmanship for the entire project. The mock-up shall consist of approximately 50 lineal feet of exterior wall and shall include straight wall, corners, control and expansion joints, window installation, anchors and reinforcing, and flashings. This mock-up shall incorporate all aspects of the accepted masonry sample panel as well including proper cleaning techniques. Cleaning agent manufacturer's representative shall be on site to observe and instruct the cleaning portion.
3. Installation of all materials and products into the wall shall be in accordance with all applicable specifications as noted in the project manual and as shown on the drawings.
4. Air and water barrier specified in 07 2700, and flashing mockups must be completed and approved before the cladding mockup can proceed.
5. Upon completion and acceptance of the wall mock-up and quality of workmanship, the wall shall be photographically documented by the Contractor as a record. Provide one copy of photos to each the Owner, the Architect and the Contractor. The wall shall then be incorporated into the project and shall be the standard for all masonry work on the project.
6. No work shall proceed until the mock-up wall is approved.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. All masonry products stored on site shall be properly covered from the weather to prevent deterioration and moisture penetration. Broken or damaged masonry products shall be rejected. Do not double-stack pallets.

C. Storage and protection of masonry embedded flashing;
1. Comply with manufacturer's recommendations for storage and handling of each product.
2. Wall Flashing and Surface Conditioner shall be delivered in the original, unopened manufacturer's containers with all labeling information fully visible.
3. On-Site Storage of unopened cartons shall be such that the material is kept dry and is not stored at temperatures in excess of 100 deg. F. Pallets of cartons should not be double stacked for on-site storage.
4. Surface Conditioner is non-flammable. Refer to product label before use.

D. Acceptance at Site
1. Deliver materials in manufacturer's unopened containers, fully identified with name, brand, type, and grade.
2. Materials with missing or illegible identification shall be rejected.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Manufacturers:
1. Best Block Construction Materials: www.bestblock.com.
2. Boral Concrete Products: www.boralconcreteproducts.com
3. Oldcastle Architectural, Jewell Concrete Products: www.jewellcp.com.
4. Spectra Development Corporation: www.spectraglaze.com.
5. Texas Building Products, Inc.: www.texasbuildingproducts.com.
6. Trenwyth Industries, Inc.: www.echelonmasonry.com.
7. Substitutions: See Section 01 6000 - Product Requirements.

B. Standard Concrete Masonry Units: Comply with referenced standards and as follows:
1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
2. Special Shapes: Provide non-standard blocks configured for corners, lintels, headers, control joint edges, and other detailed conditions.

3. Use bullnose type concrete masonry units at all edges and exterior corners.
4. Load Bearing/Non-Load Bearing Units: ASTM C90, lightweight.
5. Load-Bearing Units/ Non-Loadbearing Units: ASTM C90, normal weight
   a. Provide at all sound wall locations unless noted otherwise.
6. 4" wide units shall be provided as hollow cell units.

2.02 BRICK UNITS

A. Manufacturers:
1. Acme Brick Company: www.brick.com
2. Elgin Butler Company: www.elginbutler.com.
3. Endicott Clay Products Co: www.endicott.com.
4. General Shale Brick: www.generalshale.com.
5. Meridian Brick LLC : www.meridianbrick.com/#sle.
6. Interstate Brick: www.interstatebrick.com
7. Sioux City Brick: www.siouxcitybrick.com
8. Summit Brick: www.summitbrick.com
9. Kansas Brick and Tile/Cloud Ceramics: www.kansasbrick.com
10. Substitutions: See section 01 6000 - Product Requirements.

B. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
1. Color and texture: Refer to Schedule of Materials and Colors on the drawings.
2. Nominal size: Slim Utility. See drawings
3. Provide solid brick for row lock sills and corbeled areas.
4. Special shapes: Provide special shapes at all intersections not equal to 90 degrees to conform to the brick selected or of the same type and finish in the brick allowance. Where solid brick are noted on the plans, provide brick of appropriate size without cores.
5. Compressive strength: As measured in accordance with ASTM C67.

C. Thin Brick Veneer: ASTM C 1088, Type TBS, tested in accordance with ASTM C 67
1. Thickness: 1"
2. Nominal face size: Utility with smooth backs.
3. Color and texture: Refer to Schedule of Materials and Colors on the drawings.
4. Special shapes: Provide special shapes at all intersections not equal to 90 degrees to conform to the brick selected.
5. Thin-Set Bonding Mortar
   a. Polymer fortified, thin-set mortar for interior installation of thin brick
   b. Meet or exceed ANSI A118.4 Shear Bond Strength Requirements & ANSI A118.11.
   c. Basis of Design: Laitcrete MVIS Veneer Mortar
6. Water Crack Isolation Membrane:
   a. Single component, load bearing, fluid applied, bulk water managment and crack isolation membrane.
   b. Meet or exceed ANSI A118.12.
   c. Basis of Design: Laitcrete MVIS WCI Water Crack Isolation membrane.
7. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.
   a. Thickness: ½ inch.
   b. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.03 CALCIUM SILICATE MASONRY UNITS

A. Manufacturers:
1. Arriscraft International Inc,; www.arriscraft.com.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Calcium Silicate Masonry Units: ASTM C73, Grade SW; solid units having been pressure formed and autoclaved; 3-5/8" bed depth; modular sizes as indicated on drawings; sandblasted or rocked finish as scheduled on exposed faces and ends; special shapes as indicated; and having the following typical average properties when tested to the identified standard.
   1. Compressive Strength: 6815 psi, to ASTM C170.
   2. Absorption: 10.3 percent, to ASTM C97.
   3. Density: 120 lbs/ft3, to ASTM C97.
   4. Modulus of Rupture: 800 psi, to ASTM C99.
   5. Color and size: Refer to Schedule of Materials and Colors on the drawings.
   6. Acceptable Product: Arriscraft – Renaissance Masonry.

C. Fabricate calcium silicate masonry units to the following tolerances.
   1. Unit Length: plus or minus 1/16".
   2. Unit Height: plus or minus 1/16".
   3. Deviation from Square: plus or minus 1/16", with measurement taken using the longest edge as the base.
   4. Bed Depth: plus or minus 1/8".
   5. Custom Dimensions: plus or minus 1/8".
   6. Unit Face Deviations: plus or minus 3/8”.

D. Mascot Engraving: Mascot engraving and shading to be completed on site post material installation. Subcontractor shall price shading material on engraving, Owner and Architect to review at submittal.
   1. Tommy Schlitzberger
      Schlitzberger Stone Designs
      6343 Alder Dr., Houston, Texas 77081.
      C: 713-545-6897
      T: 713-987-0375
      https://www.stonedesignsinc.com
   2. Christine Lee
      Stone Creations of Texas
      15734 Farm To Market 2920Tomball, TX 77377.
      P: 281-541-5276
      http://Stonecreationsoftexas.com

2.04 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 0511.

2.05 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
   1. Blok-Lok Limited: www.blok-lok.com/#sle.
   2. Hohmann & Barnard, Inc: www.h-b.com/sle.
   3. PROSOCO, Inc: www.prosoco.com.
   4. WIRE-BONDwww.wirebond.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. In addition to all other specification requirements, veneer anchors shall be designed by a professional engineer licensed in Texas, hired by the Contractor, where the horizontal distance is greater than 4 1/2 inches between the inside face of the masonry veneer (e.g. brick, concrete masonry, cast stone, etc...) and the outside face of the structural backup system (e.g. CMU, face of cold formed metal framing members, etc...).

C. Reinforcing Steel: Type specified in Section 03 2000; size as indicated on drawings; uncoated finish.

D. Wire reinforcement: Reinforced hot dip galvanized wall reinforcing in conformance with ASTM A951, for high tensile steel. hot-dipped galvanized to comply with ASTM A153, Class BMill-galvanized wire reinforcement shall not be permitted on any part of the project. 9 gage wire, deformed to develop minimum surface bond of 527 PSI when cast in ASTM Class A mortar cubes. Provide rod spacings and veneer anchor dimensions to locate rods and veneer anchors in mortar to comply with the requirements of the applicable version of the Masonry Standards Joint Committee document TMS 402, referring to the construction drawings for dimensions of wythe thicknesses and dimensions between wythes.

E. Veneer anchor wires: Reinforced hot dip galvanized wire in conformance with ASTM A951, for high tensile steel, hot-dipped galvanized to comply with ASTM A153, Class B. Mill-galvanized wire reinforcement shall not be permitted on any part of the project. 9 gage wire. Provide rod spacings and veneer anchor dimensions to locate rods and veneer anchors in mortar to comply with the requirements of the applicable version of the Masonry Standards Joint Committee document TMS 402, referring to the construction drawings for dimensions of wythe thicknesses and dimensions between wythes.

F. Horizontal Bedjoint Reinforcement in Concrete Masonry, and Masonry Veneer Anchors with Concrete Masonry Backup Systems: Install bedjoint reinforcement at 16" on center in all concrete masonry walls, excluding masonry veneer wythes unless they are laid at the same time as backup masonry. Horizontal bedjoint reinforcement, as well as deformed rebar, shall continue through all crack control joints in all concrete masonry walls (both load-bearing and non-load-bearing, both interior and exterior).
   1. Masonry veneer in stack bond coursing requires horizontal bed joint reinforcement per TMS 402.
   2. Single-wythe concrete masonry walls without masonry veneer: Ladder Type, using #220 Ladder-Mesh as manufactured by Hohmann & Barnard, Inc or equal.
   3. Single-wythe concrete masonry backup with masonry veneer laid after backup wythe: Install one of the following two options:
      a. Provide bedjoint reinforcement with eyelets flush-welded, so as to avoid wire buildup of wire laminations, and adjustable double-pintle-leg anchors at 16" on center along the bedjoint reinforcement, using Adjustable Truss Lox-All Adjustable Eye-Wire with TRU-JOINT as manufactured by Hohmann & Barnard, Inc or equal, or
      b. Provide bedjoint reinforcement without eyes, as noted above for Single-wythe concrete masonry walls without masonry veneer, and in alternating bedjoints with bedjoint reinforcement so as to avoid wire buildup of wire laminations, provide Adjustable Wall Ties (Pintles and Eyes) as manufactured by Hohmann & Barnard, Inc or equal, at 16" on center each way.
   4. Multiple-wythe concrete masonry walls, excluding masonry veneer wythes: Composite Truss Type with two rods in each wythe, using #140 Truss Twin-Mesh as manufactured by Hohmann & Barnard, Inc or equal. At walls with more than two structural wythes, alternate pairs of wythes being tied together at 8" on center so that each pair of wythes is being tied together at 16" on center.
      a. To anchor masonry veneer to multiple-wythe concrete masonry backup systems: Install Adjustable Wall Ties (Pintles & Eyes) as manufactured by Hohmann & Barnard, Inc or equal at 16" on center each way.

G. ~~Masonry Veneer Anchors with Cast-in-place Concrete Backup Systems:~~
   1. ~~At concrete backup systems with temporary forms that are removed, one of the following options shall be installed:~~

a. ~~Before concrete is poured, mount 22 ga hot-dip galvanized dovetail channels to receive dovetail veneer anchors, using #305 Dovetail Slot as manufactured by by Hohmann & Barnard, Inc or equal. After concrete is poured and temporary forms are removed, install 12 ga hot-dip galvanized dovetail anchors with vee wall ties at 16" on center each way, using #315 Flexible Dovetail Brick Tie as manufactured by Hohmann & Barnard, In., or equal.~~
b. ~~If dovetail channels are not installed as noted above, the Contractor shall be permitted to install a two-piece concrete anchored adjustable wire tie system at 16" on center each way, using HB-5213 Adjustable Veneer Anchor as manufactured by Hohmann & Barnard, Inc. or equal with concrete screws as recommended by the manufacturer.~~

H. Masonry Veneer Anchors with Stud Backup Systems: Install a two piece anchored adjustable wire tie system at 16" on center each way, with screws as recommended by the manufacturer and as required by the applicable version of TMS 402.
1. Exterior stud walls with masonry veneer:
a. HB-213X Adjustable Veneer Anchor as manufactured by Hohmann & Barnard, Inc.
b. Substitutions: See Section 01 6000 - Product Requirements.
2. Interior stud walls with masonry veneer:
a. DW-10 Wall Ties as manufactured by Hohmann & Barnard, Inc.
b. Substitutions: See Section 01 6000 - Product Requirements.

2.06 FLASHINGS

A. Through Wall Flashing Materials: Products as specified in Sections 07 2700 and 07 6200.

2.07 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
1. Manufacturers:
a. Blok-Lok Limited: www.blok-lok.com.
b. Hohmann & Barnard, Inc: www.h-b.com/sle.
c. WIRE-BOND: www.wirebond.com/#sle.
d. Substitutions: See Section 01 6000 - Product Requirements.

B. Joint Filler: Closed cell polyethylene; oversized 50 percent to joint width; self expanding; 1/2 inch wide by maximum lengths available.
1. Manufacturers:
a. Hohmann & Barnard, Inc: www.h-b.com/sle.
b. WIRE-BOND: www.wirebond.com/#sle.
c. Substitutions: See Section 01 6000 - Product Requirements.

C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
a. Manufacturers:
1) CavClear Inc., CavClear Masonry Mat MDCD, www.CavClear.com.
2) Hohmann & Barnard, Inc; Mortar Trap: www.h-b.com/sle.
3) Mortar Net Solutions; MortarNet: www.mortarnet.com/#sle.
4) Substitutions: See Section 01 6000 - Product Requirements.

D. Nailing Strips: Softwood lumber, preservative treated; as specified in Section 06 1000.

E. Weeps:
1. Type: Molded PVC grilles, insect resistant.

F. ~~Cavity Vents:~~

1. ~~Type: Molded PVC grilles, insect resistant.~~

G. Bond Break Material - Provide one layer of 6 mil polyethylene equal to “Visqueen Vapour Barrier” as a bond breaker between all clay masonry and CMU in the same wythe. Rake joint back 3/8” and provide continuous sealant at joint.

2.08 LINTELS

A. All concrete masonry lintels, not including 4" nominal concrete masonry veneer lintels, shall be reinforced concrete masonry lintels as specified on the Structural Drawing Sheets unless steel beam supports are shown on the Structural Drawings. Where steel beam supports are shown, the concrete masonry shall be bonded to the top of the steel beam with 1/2" diameter Nelson D2Lbars x 24" long at 16" on center.

B. All exterior masonry veneer supports over openings shall be as shown on the Structural Drawings.

C. For interior masonry veneers with an air space between the veneer and backup, Interior masonry veneer supports over openings shall be the same as for exterior veneer supports, as shown on the Structural Drawings.

D. For interior masonry veneer with a mortar-filled collar joint shown on the Drawings, interior masonry veneer supports shall be loose steel lintels as scheduled on the Structural Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall note that the dimensions shown on the floor plans and plan details are nominal masonry dimensions. The contractor is responsible for coordinating the masonry layout to provide 3/8” joints. If conflict occurs, contractor shall contact Architect prior to installing masonry.

B. Verify that field conditions are acceptable and are ready to receive masonry.

C. Verify that related items provided under other sections are properly sized and located.

D. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

C. Surface Preparation for Masonry Units
   1. Do not commence installation until foundations are clean, rough, and level.
   2. Remove all laitance and foreign material from top of foundation.
   3. Verify that the foundation elevation is such that the bed joint thickness will be between 3/8" and 1/2", and that the foundation edge is true to line.
   4. Clean projecting dowels free from loose scale, dirt, concrete, and other material that will inhibit bond.
   5. Verify that dowels are in proper location.

D. Surface Preparation for Rubberized Asphalt Flashing
   1. Apply primer by brush or heavy nap, natural-material roller at rate recommended by manufacturer prior to flashing installation. Allow primer to dry completely before flashing application.

E. Collection System and Weeps
   1. Clean flashing and weep holes so they are free of mortar droppings and debris immediately prior to installing collection system or weep.
   2. Remove projecting mortar and other protrusions from substrate.
   3. Remove mortar and debris from cavity spaces, wall ties, and reinforcing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

B. Masonry Cold Weather Construction:
   1. When ambient air temperature is below 40°F, cold weather procedures shall be implemented.
   2. Preparation: Comply with the following requirements prior to conducting masonry work:
      a. Masonry units shall not be laid when unit temperature is below 20°F, or when units contain frozen moisture, visible ice, or snow on their surface.
      b. Visible ice and snow shall be removed from the top surface of existing foundations and masonry that will receive new construction. These surfaces shall be heated above freezing using methods that do not result in damage.
   3. Construction: These requirements apply to work in progress and are based on ambient air temperature. Do not heat water or aggregates used in mortar or grout above 140°F. Comply with the following requirements when the following ambient air temperatures exist:
      a. 40°F to 32°F:
         1) Heat sand or mixing water to produce mortar temperature between 40°F and 120°F at the time of mixing.
         2) Heat grout materials when the temperature of the materials is below 32°F.
      b. Below 32°F to 25°F:
         1) Heat sand and mixing water to produce mortar temperature between 40°F and 120°F at the time of mixing. Maintain mortar temperature above freezing until used in masonry.
         2) Heat grout aggregates and mixing water to produce grout temperature between 70°F and 120°F at the time of mixing. Maintain grout temperature above 70°F at the time of grout placement.
      c. Below 25°F to 20°F: Meet all requirements listed under Below 32°F to 25°F, and comply with the following:
         1) Heat masonry surfaces under construction to a minimum temperature of 40°F.
         2) Wind breaks or enclosures shall be used when wind velocity exceeds 15 mph.
         3) Heat masonry to a minimum temperature of 40°F prior to grouting.
      d. Below 20°F: Meet all requirements listed under Below 25°F to 20°F, and comply with the following:
         1) An enclosure and auxiliary heat shall be provided to maintain air temperature above 32°F within the enclosure.
   4. Protection: These requirements shall apply after masonry is placed and are based on anticipated minimum daily temperature for grouted masonry and anticipated mean daily temperature for ungrouted masonry. Protect completed masonry in the following manner:
      a. 40°F to 25°F: Protect newly constructed masonry by covering with a weather-resistive membrane for 24 hr after being completed.
      b. Below 25°F to 20°F: Cover newly constructed masonry completely with weather-resistive insulating blankets, or equal protection, for 24 hr after completion of work. Extend the time period to 48 hr for grouted masonry, unless the only cement in the grout is Type III portland cement.
      c. Below 20°F: Maintain newly constructed masonry temperature above 32°F for at least 24 hr after being completed by using heated enclosures, electric heating blankets, infrared lamps, or other acceptable methods. Extend the time period to 48 hr for grouted masonry, unless the only cement in the grout is Type III portland cement.

C. Hot weather Construction:
   1. Preparation: Prior to conducting masonry work:
      a. When the ambient air temperature exceeds 100°F, or exceeds 90°F with a wind velocity greater than 8 mph:

1) Maintain sand piles in a damp, loose condition.
2) Provide necessary conditions and equipment to produce mortar having a temperature below 120°F.
3) Fog spray or wet scratch coats until damp prior to installation of adhered veneer.

b. When the ambient temperature exceeds 115°F, or exceeds 105°F with a wind velocity greater than 8 mph, meet all requirements listed under Section a above, and shade materials and mixing equipment from direct sunlight.

2. Construction: While masonry work is in progress:
   a. When the ambient air temperature exceeds 100°F, or exceeds 90°F with a wind velocity greater than 8 mph:
      1) Maintain temperature of mortar and grout below 120°F.
      2) Flush mixer, mortar transport container, and mortar boards with cool water before they come into contact with mortar ingredients or mortar.
      3) Maintain mortar consistency by retempering with cool water.
      4) Use mortar within 2 hr of initial mixing.
   b. When the ambient temperature exceeds 115°F, or exceeds 105°F with a wind velocity greater than 8 mph, meet all requirements listed under Section a above and use cool mixing water for mortar and grout. Ice is permitted in the mixing water prior to use. Do not permit ice in the mixing water when added to the other mortar or grout materials.
3. Protection: When the mean daily temperature exceeds 100°F or exceeds 90°F with a wind velocity greater than 8 mph, fog spray newly constructed masonry until damp, at least three times a day until the masonry is three days old.

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Bed joints in masonry units shall course out with bed joints in adjacent masonry wythes at vertical intervals of 16”.

D. Cut out and repoint defective joints.

E. On all joints exposed to the weather, tool and make smooth, solid, and watertight.

F. All joints shall be thumbprint hard prior to tooling.

G. Use 18” sled on bed joints, brush wall, and retool joints.

H. Concrete Masonry Units:
1. Bond: Running.
2. Coursing: One unit and one mortar joint to equal 8 inches.
3. Mortar Joints: Concave at conditions exposed to view. Strike joints flush where a fluid applied weather barrier will be installed as specified in Section 07 2700 - Air and Water Barriers.
4. Align vertical cells of hollow units to maintain a clear and unobstructed system of flues.

I. Brick Units:
1. Bond: 1/3rd Running and Stacked where indicated on the drawings.
2. Coursing: Three units and three mortar joints to equal 8 inches.
3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

F. Interlock intersections and external corners, except for units laid in stack bond.

G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

J. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

L. Brick and CMU wythes shall be laid in a true and straight alignment. Exterior masonry shall be laid-up separately.

M. Unless otherwise indicated on the Drawings, install masonry plumb, level, and true to line, with square angles and corners. Do not commence installation of the work until horizontal and vertical alignment of the foundation is within 1” plumb and the lines shown on the Drawings.

N. Use line blocks whenever possible. When it is absolutely necessary to use a line pin, fill the hole immediately after the pin is withdrawn.

O. Use only masonry that are clean and free from dust and other foreign matter and lay only dry masonry units.

P. Do not use bonding headers on grouted masonry unless specifically so directed by the Architect.

Q. Masonry with cracks and or chipped faces will be rejected if non-compliant with the limits noted in ASTM C216. If such units are discovered in the finished wall, the Contractor shall remove the units and replace with new units at no cost to the Owner.

R. Lay only dry concrete masonry units.

S. Accurately fit the units to plumbing, ducts, openings, and other interfaces, neatly patching all holes.

T. Keep the walls continually clean, preventing grout and mortar stains. If grout does run over, clean immediately.

U. Bed joints: A complete mortar-to-unit bond is required on all masonry.
   1. Avoid fins of bed joints protruding into grout space or cavity.
      a. If they occur, leave in place if not projecting more than the bed joint thickness.
      b. Do not, in any case, cut off and drop into the grout space or cavity.

V. Head joints: Regardless of thickness, completely fill with mortar or grout. Do not slush full.

W. Lay both Wythes of the wall to a line.

X. Provide reinforcement at bed joints of stack bond masonry (per TMS 402/602) or as shown on the drawings, fully embedded in grout and not in mortar or mortar joints. Provide required metal accessories to insure adequate alignment of steel during grout filling operations.

Y. At locations where items are mounted on/against split face CMU (i.e. door/window jambs, fire extinguisher cabinets, electric water coolers, etc.), grind split face CMU to allow flush, level installation.

3.06 WEEPS

A. Place weep vents in head joints at exterior wythe of cavity wall located immediately above all flashings, ledges, heads of lintels, sills, and low roof to high wall conditions spaced 24 inches on center for clay and stone masonry units and 32 inches on center for concrete masonry units, unless otherwise shown. Leave the side of the masonry units clear from mortar (unbuttered) forming the vent space.
   1. Place the vent material into joint, directly on top of flashing material, prior to installing the second masonry unit.
   2. Install the weep vents as the wall is being erected so joints do not become filled with mortar or debris.
   3. Install a minimum of two weeps above each exterior door/window.

B. ~~Install cavity vents in veneer and cavity walls at 24 or 32 inches on center horizontally near top of walls.~~

3.07 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install 1 continuous row at base of wall and over all wall openings directly on flashing. To prevent mortar bridging between the outer wythe and inner wall, install flashing extending from the bottom of the collection system to at least 6" above the top of the collection system.

D. Install with the offset edge pointing up the wall.

E. Lay the first 1 or 2 courses of masonry at flashing level, then install the collection system continuously by placing it against the inside of the openings. No fasteners or adhesives are required.

F. Compress the collection system horizontally so it can be forced into cavities slightly smaller than its nominal thickness without affecting performance. When forcing the collection system into a cavity, be sure mortar has set sufficiently to resist outward pressure from product.

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

A. Refer to the Structural and Architectural Drawings for reinforcement required in masonry.

B. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

C. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

D. Place continuous joint reinforcement in first and second joint below top of walls.

E. Lap joint reinforcement ends minimum 6 inches.

F. Do not install masonry anchors at locations where fasteners will penetrate through wall flashing.

G. Do not use reinforcement having any of the following defects.
   1. Bar lengths, depths, or bends exceeding the specified tolerances.
   2. Bends or kinks not indicated on the Drawings or required for the Work.
   3. Bars with cross-section reduced due to excessive rust or other causes.

H. Masonry Tie Installation: Set wall plate in full bed of compatible sealant over substrate. Install fasteners to engage structural framing/masonry, ensuring fasteners are installed snug and straight. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 16 inches horizontally and 16 inches vertically.

3.09 MASONRY FLASHINGS

A. Coordinate masonry work with installation of metal and membrane through wall flashings in accordance with Sections 07 2700 and 07 6200.

B. Laying Masonry Walls at Flashings:
   1. Provide a solid surface at flashing areas using inverted lintels, solid or filled masonry units. Flash at all breaks in wall face where cells are not grouted.
   2. At wall base flashings, place mortar bed on top of flashing.

3.10 GROUTED COMPONENTS

A. Fill one cell of CMU with grout and 1 - #5 bar vertical at each window and door jamb in CMU walls, from floor level to top of wall.

B. Fill 3 cells of CMU with grout and 1 - #5 bar vertical in each cell at all exterior corners of CMU walls, fill full height of wall and extend #5 bar into bond beam a minimum of 6” then bend 90° and extend a minimum of 6”.

C. See drawings for other areas of grout fill required in CMU.

D. Where the collar joint is to be grouted between the wythes of masonry, provide expanded metal or mortar/grout screen at the beginning of the grout.

E. All vertical bars shall be dowelled to the foundations with same size reinforcing bar.

F. Lap splices minimum 48 bar diameters.

G. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

H. Place and consolidate grout fill without displacing reinforcing.

I. At bearing locations, fill masonry cores with grout for a minimum 8 inches either side of opening.

3.11 CONTROL AND EXPANSION JOINTS

A. Locate 3/8” wide expansion and control joints as indicated on the drawings. However in no case shall they exceed 20’-0” in distance. Contractor shall ensure that joints occur at intervals no more than as noted above and notify the Architect for coordination of placement if additional joints are required. Keep vertical joints straight, true and continuous from top to bottom of masonry.
   1. Expansion joints shall be completely free of mortar and the joint reinforcement shall not continue across the expansion joint. Keep vertical joints straight, true and continuous from top to bottom of masonry. Detail joint as shown on the drawings
   2. At control joints horizontal reinforcing shall run continuous through joint. Detail joint as shown on the drawings.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

C. Form expansion joint as detailed on drawings.

3.12 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 8 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.13 TOLERANCES

A. Maximum Variation from Alignment of Columns: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.14 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 FIELD QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

3.16 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.17 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

B. The masonry walls shall be covered at the end of each workday and when work is not in progress. The walls shall be covered with heavy plastic sheeting or water repellent tarps and shall extend a minimum of 2’-0” down each side of the wall and be securely held in place.

END OF SECTION

SECTION 07 2200
ROOF AND DECK INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Roof and Deck Insulation.

1.02 RELATED WORK

A. Section 06 1000 - Rough Carpentry

B. Section 07 5216 - SBS Modified Bituminous Roofing

C. Section 07 6200 - Sheet Metal Flashing and Trim

1.03 SYSTEM DESCRIPTION

A. Install rigid board insulation and coverboard as required to achieve a complete and proper substrate for the roof membrane system and associated crickets, saddles, and taper to provide complete drainage of stormwater. Refer to Part 2 and Drawings for insulation thicknesses required.

1.04 SUBMITTALS

A. Submit manufacturer's installation instructions, samples and product data, in accordance with the provisions of Division 1.

B. Submit fastening and adhesive patterns for field, perimeter, and corner areas to sufficiently comply with wind loads calculated in accordance with ASCE 7, as referenced by applicable Codes.

C. Wind uplift data: Submit test reports confirming proposed roof assembly has been tested at wind uplift pressures equal to or greater than the unfactored design wind pressures specified or shown on S-drawings with a factor of safety of two.

D. Submit roof plan indicating proposed dimensions of perimeter and corner zones, complying with minimum requirements specified in the Drawings.

E. Submit tapered insulation layout plans.

F. Submit manufacturer's certificate, in accordance with the provisions of Section 013300, that products meet or exceed specified requirements.

G. Submit certification from roof membrane manufacturer that board insulation materials are acceptable for use with roof membrane materials.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable local building codes for roof assembly requirements.

1.06 QUALITY ASSURANCE

A. Comply with PIMA and NRCA standards and requirements.

B. Materials shall comply with the requirements to meet UL Class A Ratings (UL 790 and UL 1256 Standard) and FM Global Class 1 (FM 4450 and FM 4470) requirements.

C. Contractor shall provide in-place mock-ups to illustrate insulation offsets and staggers in accordance with the requirements in this Section.

D. Work shall not commence prior to the Pre-Roofing Conference.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver and store products in accordance with the provisions of Division 1.

B. Any material becoming wet or damaged, including water stained facers will be rejected and shall be removed from the jobsite immediately and replaced at Contractor's expense. Any insulation found to be improperly stored at the jobsite shall be considered wet at the discretion of the Architect and removed from the jobsite.

C. Materials Stored on Roof Levels for Immediate Use Only:
   1. Comply with maximum roof live loads specified by the Structural Engineer.
   2. Distribute to prevent concentrated loads that would impose excessive strain on deck or structural members.
   3. Positively secure to prevent displacement by wind.
   4. Tarp for protection from exposure as noted above.
   5. Material storage on roof levels overnight is not allowed.

1.08 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of Division 1.

B. Coordinate the work of installing roof membrane and flashing as the work of this Section proceeds.

C. Plan roof layout with respect to roof deck slope to prevent rainwater drainage into completed roofing. All roof drains and/or scuppers shall be installed prior to beginning with installation. Contractor shall coordinate location and heights of drains/scuppers to ensure ponding does not occur after roof installation. Improper coordination for drainage components resulting in ponding or shaved rigid insulation will require correction at the Contractor's expense.

D. Do not install more insulation than can be covered with the complete roof system in the same day.

E. Do not install roofing until all wood blocking, roof curbs, and penetrations have been installed.

F. Do not install materials in fog and/or inclement weather or when rain is predicted (30% or more possibility) or when ambient temperature is below 40 F. The Contractor shall suspend work if in their opinion, wind speed will impede the proper installation of the roofing work or cause a danger to personnel or the property.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

A. Flat Stock Polyisocyanurate Insulation, ASTM C1289, Type II, Class 2, Grade 2 (20 psi) closed cell foam core bonded to coated fiberglass facers, 4'x4' maximum board dimension,
   1. Maximum board thickness: 2.6".
   2. System Thickness (metal and membrane roofs over conditioned space): Two (2) layers as indicated on the drawings to meet R-25.

B. Tapered Polyisocyanurate Insulation, ASTM C1289, Type II, Class 2, Grade 2 (20 psi) closed cell foam core bonded to coated fiberglass facers, slope as indicated in the Drawings,
   1. Maximum board thickness: 2.6", except in locations where at least 3 layers of insulation are present.
   2. System thickness (membrane roofs over conditioned space): Total average thickness 5" minimum, with average calculated based on a maximum variation of 1 inch.

C. Tapered Edge Strips expanded perlite, ASTM C 728, Type 1.

D. Cover Board: Unfaced or premium roof grade faced gypsum coverboard, USG Securock (ASTM C 1278), Densdeck Prime (ASTM C 1177), or approved equivalent, ½" thickness.

2.02 ACCESSORIES

A. General: Provide fasteners approved by insulation manufacturer, meeting wind uplift requirements as specified.

B. Metal Decks: No. 12 hex-head fastener with coating which exceeds F.M. Specification No. 4470
   1. Induction welding type metal plates, approved by roof membrane manufacturer.

C. Insulation Adhesive: manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
   1. Modified asphaltic, asbestos-free, cold-applied adhesive.
   2. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
   3. Full-spread spray-applied, low-rise, two-component urethane adhesive. .

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean deck and ensure deck is dry prior to the application of new roof assembly.

B. Wet, water stained, warped, discolored, or physically damaged insulation and/or insulation facers will be rejected and must be removed from the project site.

C. Verify that:
   1. Roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set and comply with specified minimum flashing height requirements.
   2. Wood nailing strips at perimeter edges and parapet walls are in place and are fastened in accordance with applicable codes.
   3. Deck conditions are free and clear of dirt, rust, moisture, debris, and surface conditions are in accordance with manufacturer required guidelines for adhesion.
   4. Under deck conditions are clear for fastener installation. Contractor is responsible for field verifying the roof deck underside to ensure no equipment or MEP lines will be damaged from new fasteners. All damaged components will be the responsibility of the Contractor.
   5. Insulation strips are installed according to acoustical roof deck manufacturer’s written instructions.

D. Installation of materials means acceptance of conditions of substrate.

3.02 INSULATION INSTALLATION

A. Only install materials that can be temporarily sealed at the end of the workday. All open roof areas are to be temporarily sealed at the end of each workday or when inclement weather is expected. Any installed roof materials that become wet must be removed and replaced prior to continuing roofing

B. Verify and document in Daily Report that the existing deck/substrate is functional; insulation board is free from moisture and suitable as substrate for roof membrane.

C. Attachment Schedule: Comply with approved fastening patterns and zone widths.
   1. Metal Decks with Membrane Roofing:
      a. Mechanically fasten first layer of insulation to achieve uplift pressures indicated in Drawings in field, perimeter, and corners, and per approved fastening patterns based on pull out testing performed in accordance with Section 07 01 50. Ensure proper fastener engagement in substrate to provide full pullout resistance.
      b. Install subsequent layers of insulation and coverboard in adhesive in accordance with approved ribbon spacing patterns for field, perimeter, and corner areas and as specified below.
   2. Metal Decks with Metal Roofing:
      a. Mechanically fasten all layers of insulation to substrate, with boards laid in staggered pattern.
      b. Provide a minimum 8 fasteners per 4’x8’ board, with additional fasteners as required to ensure a smooth substrate for installation of underlayment materials and panel clips.

D. Mechanical Fastener Installation, General:

1. Mechanically fasten first layer boards with approved fasteners and plates.
2. Ensure that fasteners penetrate top flange of deck ¾-inch, do not penetrate bottom flange of deck. Reinstall fasteners that do not engage top flute of deck.
3. Provide fasteners in location per the approved fastening pattern and layout provided by the manufacturer. Provide required edge distance between fasteners and edge of boards.

E. Adhesive Application, General:
1. Install insulation and coverboard layers in low-rise foam adhesive in accordance with approved ribbon spacing patterns and shop drawings for field, perimeter, and corner areas. Install adhesive in “picture frame” pattern in addition to ribbons required to achieve Code required resistance to wind uplift in field, perimeter, and corner zones. “Picture frame” pattern shall consist of a single bead of adhesive applied within 2” of board perimeter.
2. Do not allow the adhesive application to precede the board placement by more than three board lengths.
3. Allow low-rise foam adhesive to rise between ¾” to 1” prior to placement of boards, or as required by the manufacturer.
4. Firmly press each insulation board into adhesive by “walking-in” each board immediately after placement. Provide a minimum of five (5) weighted five (5) gallon buckets per board at corners and center of each board. Boards not properly adhered will require to be removed and replaced.
5. Stagger end joints in adjacent boards. Stagger successive layers in both vertical and horizontal directions. Minimum horizontal stagger is 2-feet; minimum vertical stagger is 12-inches.
6. Butt edges for snug contact. Repair voids greater than ¼” wide by filling with like material.
7. Tapered Insulation Sumps and Crickets:
    a. Curbs: Install upslope crickets at all curbs wider than 12 inches.
    b. Drains: Install a minimum 4’-0” by 4’-0” tapered insulation sump at all primary roof drains. Install a minimum 4’-0” by 2’-0” tapered insulation sump at all primary scuppers.
    c. Gutters: Install a minimum 1’-0” wide tapered edge to increase slope at membrane roof gutter edges.

F. Failure to install the roof insulation fasteners and/or low-rise foam adhesive as described in these specifications and the approved manufacturer’s assembly letter will be considered defective workmanship and application of the roof system by the Contractor. Contractor shall remove and replace all roof system materials with non-compliant attachment at no cost to the Owner.

END OF SECTION

SECTION 07 4213
METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Complete manufactured metal panel systems for walls and soffits, including related flashings, accessory components, and attachment of metal panel systems, including all required subgirt assemblies for walls and soffits to approved substrates.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Wall panel substrate.

B. Section 06 1000 - Rough Carpentry

C. Section 07 2100 - Thermal Insulation.

D. Section 07 2700-Air and Water Barriers: Air and water barrier under wall panels.

1.03 REFERENCE STANDARDS

A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

B. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2020.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

D. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2021a.

E. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate allowable system pressures, dimensions, layout, joints, construction details, methods of anchorage, and and all design data indicated in 2.02, A.
   1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

C. Shop drawing sheets that include engineering information designed by the Contractor's Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor's Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

D. Samples: Submit two samples of wall panel and soffit panel, 12 inch by width of panel in size illustrating finish color, sheen, and texture.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in installing products of the type specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Furnish a written warranty signed by the Panel Applicator for a two (2) year period from the date of substantial completion of the building guaranteeing materials and workmanship for the preformed metal panel system, flashings and penetrations.

C. Furnish manufacturer's standard 20-year written finish warranty stating that architectural fluorocarbon finish will be:
   1. Free from fading or color change in excess of 5 NBS units as measured per ASTM D2244;
   2. Will not chalk in excess of a numerical rating of 7 when measured in accordance with standard procedures specified in ASTM D4214;
   3. Will not peel, crack, chip or delaminate

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers:
   1. Berridge Manufacturing Company: www.berridge.com.
   2. Centria: www.centria.com.
   3. Fabral Wall and Roof Systems: www.fabral.com
   4. Longboard Products: www.longboardproducts.com.
   5. MBCI: www.mbci.com.
   6. McElroy Metal: www.mcelroymetal.com.
   7. Petersen Aluminum Corporation: www.pac-clad.com.
   8. Zeeff Panel Systems: www.zeeffpanels.com.

2.02 MANUFACTURED METAL PANELS

A. Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Provide exterior panels, soffit panels, and subgirt framing assembly.
   2. Design Loads: In addition to the self-weight of the panel systems, metal panel systems shall be designed to resist the maximum of the following: Wind Pressures indicated on the Structural Drawings, or the wind pressures required by the version of ASCE 7 referenced in the version of the International Building Code (IBC) for this project.
   3. Anchorage: Provide anchorage into approved substrate for complete metal panel system capable of resisting all required loads and pressures (i.e. gravity and wind).
   4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.

6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
7. Corners: Factory-fabricated in one continuous piece with minimum 2 inch returns.
8. Provide continuity of air barrier and vapor retarder seal at building enclosure elements in accordance with materials specified in Section 07 2700.
9. Custom Fluoropolymer Coating System: Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss as scheduled in Schedule of Materials and Colors.

B. Exterior Wall Panels:
1. Profile: Vertical and horizontal, as indicated; style as indicated.
2. Material: Precoated aluminum sheet, 20 gage, 0.032 inch minimum thickness.
3. Panel Width: 16 inches.
4. Color: As scheduled in Schedule of Materials and Colors.

C. Screen Wall Panels:
1. Profile: As indicated on the drawings; Corrugated panels, with 2.67” x 7/8” deep profile ribs.
2. Material: Precoated aluminum sheet, 20 gage, 0.032 inch minimum thickness.
3. Perforation: 1/8” round holes on .324” staggered centers, 13.5% open area
4. Panel Width: 36 inches.
5. Color: As scheduled in Schedule of Materials and Colors.

D. Soffit Panels:
1. Profile: See Schedule of Materials on the drawings.
2. Material: Precoated 6063-T5 aluminum sheet.
3. Panel Width: 6 inches.
4. Perforated Metal Soffit Panels: Where noted on the drawings as vented soffits panels, panel shall have perforations providing 12% net free vent area.
5. Color: As scheduled in Schedule of Materials and Colors.

E. Metal Framing Members: Include sub-girts, zee-clips, base and sill angles and channels, hat-shaped and rigid channels, and furring channels required for complete installation. Where installed in horizontal orientation, provide vented or slotted sub-girts, furring’s and/or channels to provide adequate drainage.
1. Provide material strength, dimensions, configuration as required to meet applied loads and in compliance with applicable building code.
2. Sheet Steel Components: ASTM A653/A653M galvanized to G90/Z275 or zinc-iron alloy-coated to A60/ZF180; or ASTM A792/A792M aluminum-zinc coated to AZ60/AZM180.
3. Stainless Steel Sheet Components: ASTM A480/A480M.
4. Aluminum Components: ASTM B209/B209M; or ASTM B221 (ASTM B221M).

F. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

G. Expansion Joints: Same material, thickness and finish as exterior sheets; 22 gage, 0.0299 inch thick; manufacturer's standard brake formed type, of profile to suit system.

H. Trim, Closure Pieces, Caps, Flashings, Facias, and Infills: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

I. Anchors: Galvanized steel.

2.03 MATERIALS

A. Precoated Steel Sheet: Aluminum-zinc alloy-coated steel sheet, ASTM A792/A792M, Commercial Steel (CS)) or Forming Steel (FS), with AZ50/AZM150 coating; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.04 ACCESSORIES

A. Concealed Sealants: Non-curing butyl sealant or tape sealant.

B. Fasteners: Manufacturer's standard type to suit application and as shown on approved shop drawings or delegated design submittal; steel, hot dip galvanized.

C. Field Touch-up Paint: As recommended by panel manufacturer.

D. Bituminous Paint: Asphalt base.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

3.02 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane. Space at intervals indicated on approved shop drawings or delegated design submittal.

3.03 INSTALLATION

A. Install panels on walls and soffits in accordance with manufacturer's instructions and as shown on approved shop drawings or delegated design submittal.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports.

E. Provide expansion and control joints where indicated on approved shop drawings or delegated design submittal or as recommended by the manfacturer.

F. Use concealed fasteners unless otherwise approved by Architect.

G. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.04 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.05 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

D. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

END OF SECTION

SECTION 07 5216
SBS MODIFIED BITUMINOUS ROOFING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. SBS modified bitumen membrane roofing.

B. All roofing and flashing work shall be completed as shown on the drawings and here-in specified, and shall be installed in strict accordance with the Roofing Manufacturer's specifications and details. It is the Roofing Contractor's responsibility to ensure that all roofing details and installations comply with the manufacturer's specifications in order to secure the full roofing warranty as specified. Any modifications in roofing details shall be submitted with shop drawings for Architect's approval.

1.02 RELATED SECTIONS

A. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Section in Division 1 of these specifications.

B. Section 01 4500 – Quality Control.

C. Section 06 1000 – Rough Carpentry.

D. Section 07 2200 – Roof and Deck Insulation.

E. Section 07 6200 – Sheet Metal Flashing and Trim.

F. Section 07 7200 – Roof Accessories.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) – Latest Edition:
   1. D 41 Asphalt Primer Used in Roofing and Waterproofing.
   2. D 4586 Asphalt Roof Cement, Asbestos Free, SBS compatible.
   3. D 5147 Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material
   4. D 6162, D 6163, D 6164 Standard Specifications for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials (various reinforcement types)

B. National Roofing Contractor's Association (NRCA): Roofing Manual, Membrane Roof Systems, 2019.

C. FM Global Loss Prevention Data Sheets 1-28 through 1-54, Latest Edition.

D. ASCE 7-(per governing building code). - American Society Of Civil Engineers "Minimum Design Loads for Buildings and Other Structures"

E. Underwriters Laboratory Building Materials Directory, Latest Edition.

1.04 QUALITY ASSURANCE

A. Manufacturer:
   1. Company specializing in manufacturing the products specified in this Section with a minimum of five years documented experience.
   2. Obtain primary products, including roof membrane, base flashings, membrane adhesives and adhesives products from a single manufacturer. Provide secondary products recommended by the manufacturer of primary products for use with roofing system provided.

3. The roofing systems manufacturer shall provide non-sales related field auditors for the purpose of performing quality assurance inspections, both in-progress and final inspections. Provide copies of the manufacturer's field auditor inspection report to the contractor, roof consultant, and building owner.

B. Contractor:
   1. Be currently approved and certified to install low slope roof systems that qualify for the primary roofing material manufacturer's 20-Year No Dollar Limit (NDL) Guarantee; and use only skilled roofers completely familiar with the products and the manufacturer's current recommended methods of installation.
   2. Contractor shall maintain a permanent office for conduct of business and shall operate its own full-service sheet metal shop and be an active NRCA authorized ES-1 fabricator.
   3. Submit a letter from the roofing material manufacturer proposed for the project, stating that your company is an approved and certified applicator, and that your company is approved to install that manufacturer's Twenty (20) Year No Dollar Limit (NDL) Guarantee.
   4. Successful completion of minimum three (3) similar projects during that time. Contractor to provide project reference contact names, phone numbers, and emails as part of submittal process.
   5. All torching operations must be performed by CERTA (Certified Roofing Torch Applicator) trained applicators with up to date certifications.
   6. Evidence of Contractor's qualification to do business in the State of Texas where the project is located or covenant to obtain such qualification prior to award of the contract.
   7. Workers:
      a. Project Manager, Superintendent, and Foreman: Minimum five years roofing experience and employed by Contractor for a minimum one year prior to Bid Date.
      b. Designate a responsible Project Manager or Superintendent to inspect all installed Work, particularly tie-ins and temporary flashings, at end of each working day and as otherwise required to ensure water-tightness.
         1) Verify Inspection by signature on approved Daily Inspection Form signifying installation is in accordance with specified requirements.

C. Regulatory Requirements:
   1. New Roof System shall be classified by Underwriters Laboratories Inc., UL 90, as a "Class A " rated roof covering.
   2. System shall meet the minimum Wind Uplift Requirements per ASCE 7-(per governing building code) for approved assembly and specified warranty coverage.
   3. Follow local, state, and federal requirements, safety standards, and codes.
   4. Refer to applicable building codes for roofing system installation requirements and limitations. When conflict exists, the more restrictive document will govern.

D. Pre-installation Conference:
   1. Two weeks prior to roofing installation, conduct pre-installation conference at project site.
   2. Attendance: Owner, Architectural Observer, Roof Consultant, General Contractor, General Contractor and Roofing Contractor project superintendents, roof applicator (foreman), and roof manufacturer's technical representative.
   3. Agenda:
      a. Scheduling of roofing operation.
      b. Daily production anticipated.
      c. Designation of key individuals and their respective responsibilities.
      d. Processing procedures of field and change orders.
      e. Review of staging and material storage locations.
      f. Accommodations for temporary services (water, power).
      g. Coordination of work by other trades.
      h. Protection of completed roofing.

i. Emergency rain protection procedures.
j. Discussion of process for manufacturer's inspection and acceptance of completed roofing and flashings.
k. Manufacturer's deck inspection to be performed.

E. Installation:
1. Installation shall be in accordance with procedures and standards set forth by National Roofing Contractors Association.
2. Installation shall be in accordance with manufacturer's current published application procedures and general recommendations of National Roofing Contractor's Association. Follow Underwriters Laboratories' requirements acceptable for use with specified products or systems.
3. Roofing shall be as described in this section and shall be provided and approved by roof system manufacturer. Materials not manufactured or provided by manufacturer shall have written approval from manufacturer stating that materials are acceptable and are compatible with other materials and systems required.

F. There shall be no deviations made from manufacturer's published specification, this specification, or approved shop drawings without prior written approval of Architect, Architectural Observer, Roof Consultant and Roof Membrane Manufacturer’s representative.

G. Perform work on this section in accordance with best standards of practice relating to trades involved.

H. Pullout Tests: Conduct pullout test on deck using appropriate fastener prior to roof system installation. Pull out test shall be performed in accordance with ANSI/SPRI FX-1 2016 Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners. Submit pullout results for manufacturer's review to determine specific fastening pattern for this project. Submit copy of pullout results to Architect.

I. Material Manufacturer's Inspection Paid for By Contractor:
1. Inspections shall be made during Project schedule by authorized representative of roof system manufacturer to ensure that said Project is installed in accordance with manufacturer's requirements. Manufacturer shall provide written report to the Architect within five days of each inspection stating acceptance of Contractor procedures and outlining items of non-compliance with manufacturer's requirements.

J. Material Manufacturer's Final Inspection:
1. Manufacturer's authorized representative shall provide final inspection at completion of project to ensure that project has been completed in accordance with manufacturer's requirements. Upon approval and acceptance of the entire project, the manufacturer's warranty shall be written, executed, and furnished to Owner.
2. Contractor shall pay for manufacturer's final inspection and additional inspections.

K. Laboratory Testing and Samples:
1. At Owner's request, obtain 3 field samples of completed roof membrane and assembly. Take samples at locations designated by Owner's Representative, Architectural Observer, and test for compliance with requirements on Contract Documents and with manufacturer's published performance criteria. Test shall be performed by nationally recognized testing laboratory in accordance with accepted ASTM methods. Contractor shall assume costs for extraction and patch of samples. Owner will assume costs for testing of field sample.
2. If, for any reason, areas that are tested by Owner fail to meet manufacturer's requirements, then subsequent expense for retesting of those areas will be the responsibility of the Contractor.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible. Any materials delivered to the site must be stored immediately by the Contractor in a compliant manner.

B. Store materials in accordance with the Polyisocyanurate Insulation Manufacturers Association (PIMA) Technical Bulletin #109 and manufacturer's recommendations in a secure manner to avoid damage, danger to occupants, or theft.
   1. Store rolled goods on clean, raised platforms. Store other materials in dry area, protected from water and direct sunlight.
   2. All materials must be covered with breatheable tarps and on pallets. Polyethylene covers or manufacturer’s wrap are not acceptable field storage coverings. Contractor shall cut wrapped board goods to allow venting of condensation during storage.
   3. Adhesives, flashing cements, and pail goods must be stored inside lockable trailers and in original containers with lids tightly in place.

C. Provide continuous protection of materials against deterioration for duration of project.

D. Any material becoming wet or damaged, including water stained facers will be rejected and shall be removed from the jobsite immediately and replaced at Contractor’s expense. Any insulation found to be improperly stored at the jobsite shall be considered wet at the discretion of the Architect and removed from the jobsite.

E. Materials Stored on Roof Levels for Immediate Use Only:
   1. Comply with maximum roof live loads specified by the Structural Engineer.
   2. Distribute to prevent concentrated loads that would impose excessive strain on deck or structural members.
   3. Positively secure to prevent displacement by wind.
   4. Tarp for protection from exposure as noted above.
   5. Material storage on roof levels overnight is not allowed.

1.06 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Apply roofing in dry weather.
   2. Do not install roofing in fog and/or inclement weather or when rain is predicted (30 % or more possibility) or when ambient temperature is below 40 degrees Fahrenheit. The Contractor shall suspend Work, if in his/her opinion, wind speed will impede the proper installation of the roofing Work, or cause a danger to its personnel, or the Owner's property.
   3. Roof deck shall be dry and free from any moisture, ice or other deleterious materials prior to roofing. Observe wind chill, humidity and other hot/cold weather conditions for proper application.
   4. Do not expose stored roofing materials and accessories to constant temperature in excess of 180 degrees Fahrenheit. Provide a minimum of two (2) fire extinguishers immediately adjacent to locations of stored and in-use flammable goods.

B. Restore to original condition or replace work and materials damaged during handling.

C. Emergency Equipment: Maintain on site equipment necessary to apply emergency temporary seals in event of sudden storms or inclement weather.

1.07 SEQUENCING AND SCHEDULING

A. Roof system shall be sealed in a watertight manner every day. Moisture confirmed present within the new roof system including water stained facers by the Architect’s Roof Consultant will be cause for rejection and installation of new roofing at Contractor’s expense.

B. Coordinate roofing schedule with work of other trades. Contractor is responsible for ensuring that new roof penetrations are coordinated to be fully sealed and/or flashed the same day they are created.

C. Notify manufacturer's representative forty-eight hours in advance for deck acceptance.

D. Apply roof installation with respect to deck slope. Avoid situations where excessive drainage could pass into completed roofing.

E. Maintain communication with roofing manufacturer's representative to inform of progress and to schedule periodic sample testing.

F. On Parapet Wall Conditions, roofing may not proceed until all walls are complete.

G. All wood blocking, roof curbs, and penetrations shall be installed and secured prior to beginning with roof installation.

H. All roof drains and/or scuppers shall be installed prior to beginning with roof installation. Contractor shall coordinate location and heights of drains and scuppers. Improper coordination of drainage components will require to be corrected at Contractor’s expense.

1.08 WARRANTY

A. Manufacturer's Warranty:
   1. Manufacturer's twenty (20) year "non-prorated, no dollar limit" system warranty shall cover product quality, performance and workmanship, including roofing and membrane flashings. Warranty shall include insulation, coverboard, and roof membrane from roof surface up into parapet cap without exclusions. Warranty shall include full cost of repair and replacement of all damaged roof assembly components. The manufacturer’s warranty shall commence upon the project’s date of substantial completion.
   2. Wind Rider: Warranty shall provide coverage for wind gusts of up to 90 miles per hour. Warranty shall include inspections as required by the Manufacturer after wind events exceeding 55 mph or major storm events.
   3. Hail Rider: Warranty shall provide coverage for up to 2-inch diameter hail impacts.

B. Provide three (3) Roof Warranty Signs at the completion of the project. Signs shall be placed on roof at locations determined by the Owner.
   1. Warranty Signs: 24” x 24” x .080 aluminum with a baked enamel background and black lettering, secured to avoid penetration of roof or wall waterproofing membranes, to read as follows:

WARNING:
ROOF AREA: (Roof designation)
ROOF WARRANTY NUMBER: (Manufacturer’s Warranty Number)
THIS ROOF IS UNDER WARRANTY UNTIL
(Date)
(MANUFACTURER)
(Manufacturer’s Phone No.)
DO NOT MAKE ALTERATIONS OR REPAIRS
TO THIS ROOF WITHOUT APPROVAL FROM OWNER
CONTACT
OWNER CONTACT INFOMRATION
(Owner's Phone No.)
FOR APPROVAL AND/OR TO REPORT DAMAGE REQUIRING REPAIRS

C. Contractor's Warranty: In addition, Contractor shall furnish written warranty agreeing to replace failing roofing or flashing due to defective material or workmanship. Warranty shall include other work performed by Contractor but which may be described in other sections including, but not limited to, Sealants and Caulking, Sheet Metal, Insulation, and Roof Accessories. Warranty shall include membrane from roof surface up into parapet cap without exclusions. Warranty period is two (2) years from the date of the project's substantial completion.
   1. Contractor shall coordinate and perform a roof inspection with the roof material manufacturer's representative and the Owner's representative annually, and during the ninety (90) day period preceding the expiration date of the Contractor's warranty. All deficient items identified during these inspections, including blisters and moisture between plies, shall be repaired by Contractor at no expense to the Owner.

1.09 SUBMITTALS

A. Shop drawings, product data, and samples under provisions of Section 01 3300 – Submittals Procedures.

B. Submit the following items:
   1. Contractor's executed insurance certificate.
   2. Detailed project sequencing, staging, material loading, manpower plans, and detailed project construction schedule for approval.
   3. Sample of warranty that is to be issued upon project completion.
   4. Product Data: for all materials specified and proposed for use on the Project. Submit MSDS for all sealants, adhesives and sealant primers.
   5. Shop Drawings: shall be approved by the membrane manufacturer and Architect for approval prior to work start.
      a. Roof plan drawing indicating:
         1) Fastening pattern zone widths.
         2) Detail callouts for each roof area condition.
         3) Tapered insulation layout including sumps at primary roof drains and/or scuppers.
         4) Walkpad layout around all motorized equipment, landings for ladders, around roof hatches, in front of doors, and any other locations shown in the drawings or required by the manufacturer, whether shown on the drawings or not.
      b. Details:
         1) Provide details of all flashing conditions required for the project. If details are being generated based on Architect's drawings, Contractor shall clearly indicate all deviations being proposed.
         2) Provide manufacturer's standard details (subject to contract document requirements), including:
            (a) Base flashings, penetrations, and membrane terminations.
            (b) Fastening patterns for field, perimeter, and corners.
      c. Wind uplift data: Submit test reports confirming proposed roof assembly has been tested at wind uplift pressures equal to or greater than the unfactored design wind pressures specified or shown on S-drawings with a factor of safety of two.
   6. Contractor shall submit written statement that their company or any subcontractor they may use is not employing workers classified as undocumented workers on this project.

C. Manufacturer Certificate: Provide project specific system letter, signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article. Include evidence of compliance, including:
   1. Compliance with performance requirements.
   2. All roofing system components are listed for the project, including and not limited to base sheets, adhesives, fasteners, mastics, insulation, coverboards, liquid flashings, and membranes.

3. Components are physically and chemically compatible for installation as designed.
4. All proposed materials, including those by other manufacturer's, are acceptable to membrane manufacturer for use in system and are not excluded from the warranty.
5. Proposed system meets all criteria for issuance of required manufacturer's warranty
6. Identify fastening patterns to be used in field, perimeter, and corner.
7. Specifically identify and define any deviations.
    a. Items not clearly identified to be deviations by the Contractor do not represent acceptance to modify or change the project requirements. All deviations must be clearly identified and accepted by the Architect.

D. Closeout Submittals:
1. Submit under provisions of Section 01 7800 – Closeout Submittals.
2. Manufacturer's final report and fully executed warranty.
3. Submit updated Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
    a. All mastics, glues, and adhesives
    b. Thermal insulation (excluding fiberglass, foam, rubber)
    c. Sealant (interior use only)

PART 2 – PRODUCTS

2.01 PRIMARY MATERIALS

A. Roofing Membrane Assembly:
1. Two-ply roof membrane assembly complying with ASTM D6163 Type I or II or D6164, Type I or II, Grade S (base ply) and Grade G (cap sheet); consisting of a prefabricated, reinforced, homogeneous Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt base (and where required for specified warranty term, interply) membrane, applied over a prepared substrate followed by a white granulated reinforced fire rated finish ply.

B. White granulated finish ply must have a minimum roof reflectance and emittance to meet three-year aged solar reflectance of 0.55, three-year aged thermal emittance of 0.75, and/or three-year aged solar reflectance index of 64, or greater.

C. Flashing Membrane Assembly.
1. Two-ply modified bitumen, reflective granule surfaced sheet over a smooth base ply, with reinforcing impregnated and coated with high quality Styrene-Butadiene-Styrene (SBS) modified bitumen.

2.02 MEMBRANE

A. Acceptable Manufacturers and Products:
1. Siplast:
    a. Base Ply: Paradiene 20 TG, Paratech 180 Base TG.
    b. Top Ply: Paratech 180 Cap TG, Paradiene 30 FR TG C.
2. Soprema:
    a. Base Ply: Elastophene or Sopralene Flam 180.
    b. Top Ply: Elastophene or Sopralene Flam 180 FR GR.
3. US Ply:
    a. Base Ply: DuraFlex 190S TG.
    b. Top Ply: Duraflex G4FRTG, 190FRTG.
4. CertainTeed:
    a. Base Ply: Flintlastic Poly SMS, Flintlastic Base 20 T.
    b. Top Ply: Flintlastic GTS-FR Coolstar.
5. Johns-Manville:
    a. Cap Sheet: Dynaweld Cap 180 FR
    b. Base Ply: Dynaweld 180 S

6. Approved equivalent.

B. Products furnished for roofing system shall be products of single manufacturer.

2.03 INSULATION

A. Reference Section 07 2200 – Roof and Deck Insulation of these specifications for Roof and Deck Insulation.

2.04 FASTENERS

A. Fasteners shall be compatible with all materials with which they come in contact so that dielectric corrosion does not occur.
   1. Wood Substrate:
      a. Flashing Nails: flat head ring shank, galvanized steel; length as required to provide 1-inch penetration minimum into substrate.
      b. Screws: No. 10 stainless steel wood screws with stainless steel bonded neoprene washers of length necessary to penetrate wood substrate one inch.
   2. Metal Substrate:
      a. Minimum No. 10 stainless steel sheet metal screws or as necessary to suit application with stainless steel bonded neoprene washers where exposed.
   3. Concrete and Masonry Substrate:
      a. Round head stainless steel drive pin and neoprene washer with lead expansion anchor, FS FF-S-325, group IV, Type II.
         1) Acceptable Product: Rawl Plug, The Rawl Plug Company, Inc. or approved equivalent
      b. Flat head stainless steel concrete/masonry screw, 3/16” diameter, length sufficient to provide 1” min. embedment into substrate.
         1) Acceptable Product: Tapcon Concrete/Masonry Anchors or approved equivalent.

B. Termination Bar: Stainless steel bar with a mill finish, width one inch (1"), thickness 0.100" ± .008", flat, having predrilled holes eight inches (8") on center. Install where perimeter flashings exceed 24” or as required by the manufacturer.

2.05 RELATED MATERIALS

A. Asphalt Primer: ASTM D41; approved by roof system manufacturer.

B. Cold Adhesive: Asphalt cutback adhesive, with non-asbestos fibers and bond enhancing modifiers, as recommended by manufacturer.

C. Asphaltic Plastic Cement: Approved by roof system manufacturer, SBS compatible.
   1. Inclines Up to ½" Per Foot: ASTM D4586, Type I.
   2. Inclines Exceeding ½" Per Foot: ASTM D4586, Type II.

D. Cant Strip:
   1. Non-Structural: Perlite, solid.
   2. Structural: Fire retardant treated wood, note that stainless steel fasteners are required at all locations for securement of fire retardant treated wood.
   3. Cant Height Above Substrate: 3-5/8" minimum.

E. Edge Sealant: Rubberized Neoprene based sealant.

F. Wood Nailers and Blockings: Reference Section 06 1000 – Rough Carpentry
   1. Where lumber or plywood is indicated or specified as “treated”, comply with applicable requirements of the American Wood Preservers Association (AWPA) Standard C2 for Lumber and C9 for Plywood.
   2. Pressure treated wood components shall be with “water-borne” preservatives only, and to comply with the American Wood Preservers Bureau (AWPA) LP-2 Directive.

G. Walk Tread: Shall be pre-formed, skid-resistant surface, constructed with modified asphalt, 36” x 36” surfaced with ceramic granules (Color as approved by owner) for use around all mechanical and HVAC equipment and between roof access points and equipment regardless if shown on the Drawings.

H. Fiberglass Coated Membrane: A non-rotting, non-absorbent woven fiberglass membrane having a vinyl coating designed for membrane reinforcement for all roof repairs. Compatible with either tar or asphalt bituminous, having ten (10) open-weave squares per inch.

I. Single Ply Flashing Membrane: 60 mil minimum, PVC or KEE membrane fully adhered to plywood or coverboard wall substrates receiving roof flashings in excess of 24” in height. Membrane shall be approved by the primary roof system manufacturer and incorporated into the system warranty. Provide membrane coated metal receiver at base of flashing membrane and heat weld membrane to coated metal. Refer to Section 076200 for attachment and detailing of metal flashings.

J. Sealant: Shall be a one-component urethane non-sag, gun grade sealant designed for use in active exterior joints, and shall meet or exceed Federal Specification No. 1 TT-S-00230C, Type II, Class A, ASTM C920. Where joint surfaces are contained or are contaminated with bituminous materials, provide manufacturer's modified-type sealant (modified with coal-tar or asphalt as required), or approved equal.

K. Ceramic Granules: # 11 grade specification ceramic granules of color scheme matching the granule surfacing of the finished ply.

L. Liquid-Applied Reinforced Flashing System: Single-component, poly-methyl-methacrylate (PMMA) resin with polyester reinforcing fleece fabric fully embedded into the resin to form roof system flashings, provided by primary roof membrane manufacturer.

2.06 MISCELLANEOUS MATERIALS

A. Best grade or quality approved by roofing manufacturer for specific application.

2.07 ASBESTOS CONTAINING MATERIALS

A. No asbestos containing materials shall be used on jobsite or incorporated into work.

PART 3 - EXECUTION

3.01 GENERAL

A. Perform work of this Section in accordance with the manufacturer and the best standards of practice relating to trades involved, unless modified by these specifications. Consider roof system manufacturer's technical specifications part of this specification and use as reference for specific application procedures and recommendations.

B. Follow local, state and federal regulations, safety standards and codes. When conflict exists, the more restrictive document shall govern.

C. Follow insurance underwriter's requirements acceptable for use with specified products or systems.

D. Roofing application shall only be performed when ambient temperature is greater than 40 F and rising, and shall include wind and wind chill factors.

E. Complete roofing, flashing, sheet metal, and other related items daily.

F. Install cap sheet within 30 days of application of base ply, or sooner, if specifically recommended by the manufacturer.

3.02 EXAMINATION OF SURFACES

A. Examine roof deck and related surfaces, and verify that there are not conditions such as inadequate anchorage, foreign materials, moisture, ridges, or other conditions which would prevent satisfactory installation of roofing system.

B. Correct conditions requiring correction or completion prior to installation of roofing system. Notify Owner's Representative (Architectural Observer, Contractor Officer) of unacceptable conditions.

C. Do not proceed until defects are corrected.

D. Verify location of interior ducts, electrical lines, piping, conduit, and similar obstructions. Perform work in manner to avoid contact with above mentioned items.

E. Verify debris has been removed.

F. Start of work under this Part Three constitutes acceptance of deck substrate and site conditions by roofing contractor.

3.03 PREPARATION

A. Sleeves and Curbs: Clean, secure, and extend sleeves, curbs, ducts and other work which pass through roof as required to receive new roofing system. Ensure all curbs and penetrations provide a minimum flashing height of twelve inches above the planned roof system thickness at each location. Verify that 2'-0" minimum clearance is provided between all penetrations and from roof perimeters and planned roof system valleys leading to drainage points. Do not begin roofing until all penetration conditions have been verified to meet these requirements.

B. Prior to application of membrane, remove foreign matter from substrate. Debris between substrate and roof membrane is not acceptable.

C. Carefully broom clean substrate immediately prior to roofing application.

3.04 ROOF MEMBRANE INSTALLATION

A. Apply roof system in strict accordance with manufacturer's published recommendations. Do not use membrane roll hooks in a manner that damages roof ply during torching operations.

B. Base Ply Membrane Application: Over the specified insulation system, embed the base ply by torching, starting at the low point, laying sheets at a right angle to the slope of the deck, heat welding to the specified substrate, lapping sides and ends a minimum of 3 inches. Heat weld membrane in an "L" pattern, ensuring 1/8" minimum to ¼" maximum "bleed out" along laps to provide full adhesion without damaging membrane.
   1. Perform light rolling or brooming promptly to eliminate air pockets, wrinkles, creases, and fishmouths, and to insure proper adhesion.
   2. Extend base ply up cant strips, extending two inches (2") minimum above cant. Lap end joints at least 3 inches.
   3. Install base ply continuously in one direction from the field of the roof to the top of the cant.
   4. At end laps, cut the under ply side lap 45 degrees as recommended by the membrane Manufacturer.
   5. Prevent foot or vehicle traffic from crossing newly laid base ply sheets until bitumen cools to below softening point, or adhesive is cured.
   6. Install water cutoffs at the end of the day's operation. Remove prior to resuming additional work. Seal perimeters into watertight condition.

C. Application of modified bitumen cap sheet:
   a. Offset side laps and end laps from those of the base ply.
   b. Embed cap sheet by torching, starting at the low point, laying plies at a right angle, heat welding to the top face of the interply sheets, lapping sides minimum of 3 inches and end laps a minimum of 6 inches. Ensure sufficient "bleed out" along laps to provide full adhesion without damaging membrane.
   c. Stagger laps between plies. For torched applications, heat and embed granule surface at top surface end laps to aid adhesion.
   d. At end laps, cut the under ply side lap 45 degrees as recommended by the membrane Manufacturer.

e. Perform light rolling or brooming promptly to eliminate air pockets, wrinkles, creases, and fishmouths, and to insure proper adhesion.
f. Extend top ply up cant strips, extending two inches (2") minimum above cant. Lap end joints at least 3 inches.
g. Install top ply continuously in one direction from the field of the roof to the top of the cant.
h. Broadcast mineral granules over all bitumen or adhesive overruns to ensure a monolithic surface color.
i. Install water cutoffs at the end of the day's operation. Remove prior to resuming additional work. Seal perimeters into watertight condition.

3.05 MODIFIED BITUMEN BASE FLASHING

A. Place cant strips on top of roof insulation or nailer. Nail to deck and to wall or vertical nailer where possible. If not possible to nail, secure by applying plastic roof cement.

B. General:
1. Apply flashings only after cant and roofing membrane is in place. Prepare the surface area that is to receive flashing coverage by torch heating and embedding granular surfaces and by application of asphalt primer; allowing primer to dry thoroughly.
2. Install each ply by torching or setting in cold adhesive using 3'-0" widths (cut off the end of roll) always lapping the factory selvage edge. Stagger the laps of the top flashing layer from lap seams in the base layer. Extend the base ply flashing sheet a minimum of 6 inches beyond the toe of the cant onto the prepared surface of the finished roof and up the wall to a minimum 12 inch flashing height. Extend top ply of flashing an additional 6 inches beyond edge of base ply onto the prepared roof membrane surface and up the wall to a minimum 12 inch flashing height. Heat weld laps of adhered flashing plies.
3. Exert pressure on the flashing sheet during application to ensure complete contact with the wall/roof surfaces, preventing air pockets. Check and seal all loose laps and edges. Nail the top edge of the flashing on 8 inch centers with specified fasteners or termination bar.

C. Flashing Application - masonry surfaces: Clean and prime surface of masonry prior to installation of flashings.

D. Flashing Application - wood surfaces: Install mechanically fastened base sheet over all wood surfaces prior to torching base ply, with specified capped roofing nails at 6" o.c. in each direction, or set base ply in cold adhesive after cleaning and priming surface of wood. Top ply may be torched or adhered in place, heat weld all laps.

E. Metal surfaces are not acceptable for application of base flashing membrane.

F. Inside and Outside Corners: All corners, inside and out, require a boot to provide positive weather protection at the lap joint. Boot size must be a minimum of 1-1/2 inches radius beyond all intersecting surfaces, and have a minimum of 1/4 inch follow of modified bitumen beyond all edges.

G. Fully bond flashing to substrate. Ensure flashing material conforms and adheres to vertical cant and horizontal substrates.

H. Install three course membrane and mastic over top of secured flashings, extending 2" below fastener caps and 3" above top edge of membrane. Ensure full embedment of membrane in mastic to eliminate voids.

I. At wall surfaces higher than 24" in height, provide single ply flashing membrane fully adhered to plywood or coverboard substrate, extending over parapet wall to lap over and air barrier transition membrane at exterior face 3" minimum.

3.06 METAL FLANGE FLASHINGS (PLUMBING VENTS ONLY)

A. Refer to sheet metal specification for fabrication and installation procedures.

B. Sheet metal flanges shall be 4" wide and flat, without creases or bends.

C. Prime and set flanges in bed of plastic cement at one gallon per 100 linear foot of 4" wide flange.

D. Nail flanges 3" on center and stagger.

E. Prime metal surfaces with asphalt primer on both sides and permit to dry prior to application of modified bitumen flashing strip. Apply asphalt primer at one gallon per 100 sq. feet minimum.

F. Extend modified bitumen flashing strip 4" minimum beyond edge of sheet metal flange.

G. Provide stainless steel mesh set in sealant at the top of all open plumbing vents, to prevent vermin entry.

H. Flanged flashings are prohibited at piping/conduit routed through the roof, and at round vents. Curbs shall be used for these conditions, with base flashing and sheet metal flashings as specified in Section 07 6200 and as indicated in the Drawings.

I. PMMA flashing systems at plumbing vents is also acceptable with the approval of the Architect.

3.07 LIQUID-APPLIED, SINGLE-COMPONENT, PMMA FLASHING SYSTEM APPLICATION:

A. Refer to manufacturer’s details drawings, product data sheets and published general requirements for application rates and specific installation instructions

B. Pre-cut polyester reinforcing fleece to conform to roof terminations, transitions and penetrations being flashed. Ensure a minimum 2 in overlap of fleece at side and end-laps. Ensure the completed liquid-applied flashing membrane is fully reinforced.

C. Apply the base coat of liquid-applied flashing resin onto the substrate using a brush or roller, working the material into the surface for complete coverage and full adhesion at 2.0 gallons per square.

D. Immediately apply the reinforcing into the wet base coat of resin. Using a brush or roller, work the into the wet resin while applying the second coat of resin to completely encapsulate the fleece at 2.0 gallons per square, and extend the liquid resin 1 inch beyond the fleece.

E. Allow the liquid membrane to sufficiently cure for then apply the finish coat of resin.

3.08 SCUPPER FLASHING

A. Fabricate scupper flanges with a minimum 4” width, all joints soldered in accordance with Section 07 6200.

B. The primary roof scupper shall be set at 1/2" below the surface of the roof membrane to promote drainage, and a minimum 1/2" per foot tapered insulation shall be present at the sump area of 2’-0” x 4’-0” minimum.

C. Coordinate scupper installation with waterproofer. Scupper opening shall be fully flashed with air barrier transition membrane in accordance with Section 072726 and the Drawings prior to installation of scupper flashings.

D. Install wood nailers at scupper opening, height to match roof system at overflow conditions, height set at 1/2” below surface of roof system at primary conditions.

E. Extend field membrane and base flashing into scupper opening.

F. Clean and prime (as required) all surfaces to receive scupper sleeve, install full bed of sealant at roofing surfaces to receive scupper flange.

G. Secure scupper flange to wood nailers or wood cants and wall surfaces with flat head stainless steel screws at 4" o.c. maximum, or as required to provide a flat substrate for flashings.

H. Install membrane scupper flashings and PMMA liquid flashing in accordance with roof membrane manufacturer requirements. Extend liquid flashing 6” minimum beyond edge of membrane flashings. At primary scuppers, extend liquid flashing to cover 2’-0” x 4’-0” sump area.

3.09 STRUCTURAL PIPE FLASHINGS AND HOSE BIBS

A. Provide liquid applied PMMA flashing system at all structural pipes penetrating the roof for support of rooftop structures and at hose bibs. Refer to “PMMA LIQUID FLASHINGS” for installation procedures.

B. Provide umbrella flashing as specified in Section 07 62 00 over termination of PMMA flashing system.

3.10 KITCHEN EXHAUST FANS

A. Provide a solid curb for roof flashing installation. Vented and/or hinged curbs are unacceptable. Coordinate with mechanical contractor to provide vented extensions for mounting of hinge kits for fan maintenance.

B. Provide PMMA liquid flashings over all roof membrane surfaces within 4’-0” of all kitchen exhaust fans handling grease laden air.

3.11 DAILY SEAL

A. Install temporary water cut-offs at completion of each day's work and remove upon resumption of work.

B. Ensure that water does not flow beneath completed sections of membrane system, including completion of flashings, terminations, and daily seals. When possible, install starting at highest point of project area, working to lowest point.

C. Temporarily seal loose membrane edge with hot asphalt. Exercise caution to ensure that membrane is sealed near drains in manner to prevent water migration below membrane and not to impede drainage.

D. Install primary two-ply night seal beneath daily night seal in such manner to seal both new and existing roof system to roof deck to prevent moisture migration from either old roof or new roof.

E. Install daily night seals by extending new roof membrane beyond insulation and sealing to existing deck surface using hot asphalt.

F. When work is resumed, remove and dispose of membrane where asphalt or other sealants were previously applied before resuming installation.

3.12 WALKPADS

A. Provide and install walkpads in 36” x 36” sections, set in adhesive and heat welded to membrane surface. Provide 3” gaps between walkpads for drainage. Walkpads are required around each mechanical unit requiring maintenance and from roof access points to mechanical units and as shown in the drawings or described in this specification section. At a minimum Contractor shall install walkpads around all motorized equipment (i.e. exhaust fans, mechanical units, condensers, etc.), ladder landings, doors, hose bibs, and roof hatches regardless if not shown in the Drawings.

3.13 FIELD QUALITY CONTROL

A. Provide manufacturer site visit reports as identified in this Section to Owner, Architect, and Roof Consultant.

B. All roof membrane deficiencies i.e., fishmouths, dry laps, irregular or contaminated surfaces, etc. shall be corrected at the direction of the Owner, Architect, and/or Roof Consultant in accordance with manufacturer's recommended procedures at no cost to Owner.

C. Roof Consultant will periodically review installed membrane during construction and at Substantial Completion with a capacitance based moisture meter. In the event that readings indicate suspected wet substrate, Contractor shall remove roofing to confirm the presence of moisture. If moisture is present, a full roof scan will be required at Contractor's expense, and all areas identified as "wet" will be replaced with dry materials by Contractor. Patched areas of roofing shall receive an additional PMMA coating application extending 12' beyond repair area. A final moisture scan shall be provided to verify that all moisture within the roof assembly has been removed, at Contractor's expense.

3.14 ADJUSTING

A. Restore to original condition or replace work or materials damaged during handling of roofing materials.

3.15 CLEANING

A. Remove trash, debris, equipment, and parts from jobsite.

B. Remove stains from roof surfaces, walls, walkways, roof top equipment, and driveways.

3.16 PROTECTION

A. Coordinate work to avoid traffic on completed work.

B. Do not store materials on newly completed roof areas without protection.

C. Where unavoidable, protection for light to medium weight materials or foot traffic shall include a minimum 1" thickness insulation board with a minimum 1/2" plywood board on top, strapped together and/or weighted to resist wind uplift while in use.

END OF SECTION

SECTION 07 5419
POLYVINYL-CHLORIDE (PVC) ROOFING

PART 1 PRODUCTS

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Qualifications, Standards and Materials for new roof assembly
   2. Adhered polyvinyl-chloride (PVC) roofing system, smooth type.
   3. Roofing accessory materials
   4. Traffic pads

B. Related Requirements:
   1. Section 061000 – Rough Carpentry
   2. Section 072200 - Roof and Deck Insulation
   3. Section 076200 - Sheet Metal Flashing and Trim

1.03 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference:
   1. Conference may not be held until all roofing related submittals have been approved. Installation may not proceed until after Conference is held. Schedule Conference a minimum of two (2) weeks prior to beginning installation of roofing.
   2. Follow provisions under Division 01 Section – Project Meetings.
   3. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   4. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   5. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   6. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   7. Review structural loading limitations of roof deck during and after roofing.
   8. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
   9. Review governing regulations and requirements for insurance and certificates if applicable.
   10. Review temporary protection requirements for roofing system during and after installation.
   11. Review roof observation and repair procedures after roofing installation.

1.05 SUBMITTALS

A. Pre-Installation Submittals:
   1. Submit product data and shop drawings under provisions of appropriate Division 01 Section - Submittals.
   2. Product Data: For each type of product.
   3. Shop Drawings: For roofing system.

a. Provide certification to comply with the contract document drawings and specifications without deviation under provisions of Section 013300, Submittals.
b. For any proposed deviations, provide shop drawings indicating clearly proposed changes. Provide manufacturer's standard details (subject to contract document requirements), including
1) Base flashings, penetrations, and membrane terminations.
(a) Provide minimum flashing height of 12" above finished roof surface.
(b) Provide details showing integration of roof membrane and adjacent materials (i.e., weather resistive barrier) to provide continuous air barrier.
(c) Detail leading edges intended for sheet flow per manufacturer's standard edge drainage details to ensure water freely drains.
2) Fastening patterns for field, perimeter, and corners.

4. Qualification Data: For Installer and manufacturer, submit all items noted in "Quality Assurance" section 1.6.
5. Manufacturer Certificate: Provide project specific system letter, signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article. Include evidence of compliance, including:
a. Compliance with performance requirements.
b. Roofing system components are listed for the project.
c. Components are physically and chemically compatible for installation as designed.
d. All proposed materials listed, including those by other manufacturers, are acceptable to membrane manufacturer for use in system.
e. Proposed system meets all criteria for issuance of required manufacturer's warranty.
f. Contractor is certified by the manufacturer for issuance of required manufacturer's warranty.
g. Identify and provide drawing layout for fastening patterns to be used in field, perimeter, and corner.
h. Specifically identify and define any deviations.
6. Product Test Reports: For components of roofing system, for tests performed by manufacturer and witnessed by a qualified testing agency.
7. Research/Evaluation Reports: For components of roofing system, from ICC-ES.
8. Sample Warranties: For manufacturer's system warranty to be provided at completion of project.

B. Closeout Submittals:
1. Fully executed warranty.
2. As-built shop drawings noting changes made during installation.
3. Maintenance information for the roof system.

1.06 QUALITY ASSURANCE

A. Manufacturer:
1. Company specializing in manufacturing the products specified in this Section with a minimum of five years documented experience.
2. Obtain primary products, including roof membrane, base flashings, membrane adhesives and adhesives products from a single manufacturer. Provide secondary products recommended by the manufacturer of primary products for use with roofing system provided.
3. The roofing systems manufacturer shall provide non-sales related field auditors for the purpose of performing quality assurance inspections, both in-progress and final inspections. Provide copies of the manufacturer's field auditor inspection report to A/E and Owner.

B. Contractor:

1. Submit documentation that Contractor is currently approved and certified to install low slope roof systems that qualify for the primary roofing material manufacturer's 20-Year system warranties.
2. Submit documentation that Contractor has a permanent office for conduct of business and operates its own full-service sheet metal shop.
3. Submit a letter from a minimum of three (3) roofing materials manufacturers listed in Part 2, stating that your company has been an approved or certified applicator for a minimum of three (3) years and that your company is approved to install those manufacturers' 20-Year System Warranties.
4. Submit evidence of successful completion of a minimum of five (5) projects of comparable size of the specified systems during that time.
    a. Project references shall include each type of roofing specified:
        1) Fully adhered smooth PVC with adhered coverboard/insulation
    b. Contractor shall submit project name, reference name and contact information, and the type of roof system installed.
5. Submit evidence of Contractor's qualification to do business in the State of Texas where the project is located or covenant to obtain such qualification prior to award of the contract.
6. Workers: Submit documentation or certification that all workers to be employed on the Project are direct employees of Primary Contractor. Subcontract labor employed by the roofing subcontractor is prohibited.
    a. Project Manager: Submit resume documenting a minimum five (5) years roofing experience and employment by Contractor for a minimum one (1) year prior to Bid Date.
    b. Superintendent: Submit resume documenting a minimum five (5) years roofing experience and employment by Contractor for a minimum one (1) year prior to Bid Date.
    c. Tradesmen: Minimum 50-percent of installation crew to have been employed by Contractor for a minimum six months prior to Bid Date.
    d. Provide confirmation that the Superintendent or Foreman will inspect all installed Work, particularly tie-ins and temporary flashings, at end of each working day and as otherwise required to ensure water-tightness.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials in accordance with manufacturer's printed instructions. Deliver materials in manufacturer's original wrappers, dry, and undamaged with seals and labels intact.

B. Overnight rooftop storage of materials is prohibited unless approved by Owner. All materials shall be stored in a secure manner to avoid damage, danger to occupants, or theft.
    1. If inside storage is not available at the job site, protect materials by covering with breathable tarpaulins. Polyethylene covers and manufacturer's packaging are not acceptable field storage coverings.
    2. Store rolled goods on end on raised platforms, and protected from the weather until installed in the roofing system.

C. Damaged materials (moisture, fire, or other) resulting from noncompliant storage practices shall be removed and replaced at Contractor's expense.

D. Adhesives, flashing cements, and pail goods must be stored inside lockable trailers and in original containers with lids tightly in place.

1.08 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1. Do not apply roofing membrane during inclement weather.
2. Do not apply roofing membrane to damp or frozen substrates.
3. Observe wind chill and other cold weather conditions for proper application.
4. The Contractor shall have the final decision as to whether to chance roofing operations in the event wet conditions threaten.
5. The Contractor shall suspend Work, if in his/her opinion, wind speed will impede the proper installation of the roofing Work, or cause a danger to its personnel, or the Owner's property.

1.09 WARRANTY

A. Provide Contractor’s five (5) year warranty in accordance with the form at the end of this Section.

B. Manufacturer's Warranty:
   1. Manufacturer's twenty (20) year "non-prorated, no dollar limit" system warranty shall cover product quality, performance and workmanship, including roofing and membrane flashings. Warranty shall include insulation, coverboard, and roof membrane from roof surface up into parapet cap without exclusions. Warranty shall include full cost of repair and replacement of all damaged roof assembly components. The manufacturer’s warranty shall commence upon the project’s date of substantial completion.
   2. Wind Rider: Warranty shall provide coverage for wind gusts of up to 90 miles per hour. Warranty shall include inspections as required by the Manufacturer after wind events exceeding 55 mph or major storm events.
   3. Hail Rider: Warranty shall provide coverage for up to 2-inch diameter hail impacts.

C. Provide one (1) Roof Warranty Sign at the completion of the project. Sign shall be placed on roof at locations determined by the Owner.
   1. Warranty Signs: 24” x 24” x .080 aluminum with a baked enamel background and black lettering, in a non-penetrating manner, to read as follows:

WARNING:
ROOF AREA: (Roof designation)
THIS ROOF IS UNDER WARRANTY UNTIL
(Date), (MANUFACTURER)
(Warranty Number)
(Manufacturer’s Phone No.)
DO NOT MAKE ALTERATIONS OR REPAIRS
TO THIS ROOF WITHOUT APPROVAL FROM OWNER
CONTACT
OWNER CONTACT INFORMATION
(XXX) XXX-XXXX
FOR APPROVAL AND/OR TO REPORT DAMAGE REQUIRING REPAIRS

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
   1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
   2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Roof System Design: Provide a roofing system that meets or exceeds the more stringent of the following designations:
   a. Provide a roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist wind uplift pressures calculated according to ASCE 7, edition as adopted by the current Authority Having Jurisdiction.
   b. Wind Uplift Resistance Values: A minimum of two (2.0) times the wind uplift pressures. Contractor shall submit actual wind uplift calculations performed by the roof membrane manufacturer demonstrating the calculated resistance values for the roof system meet the design wind uplift calculation shown in the Drawings.

D. Approval Standards: Meet testing standards of FM 4450 and FM 4470.

E. Reflectance and Emittance Requirements: Minimum 3-year aged solar reflectance of 0.55 and 3-year aged thermal emittance of 0.75; or minimum 3-year aged solar reflectance index of 64.

F. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

G. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.02 ROOF MEMBRANE

A. PVC membrane:
   1. Sarnafil, 60 mil G410 PVC
   2. Siplast, 60 mil Parasolo PVC
   3. Carlisle-Syntec Inc., 60 mil Sureflex PVC
   4. Fibertite, 50 mil XT
   5. GAF, 60 mil PVC
   6. IB Roof Systems, IB PVC Single-Ply 60
   7. Substitutions: See Section01 6000-Product Requirements.

2.03 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Membrane Attachment Materials:
   1. Manufacturer's approved water-based, low VOC membrane bonding adhesive.
   2. Fasteners: Stainless steel and/or factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing to substrate, and acceptable to roofing system manufacturer.

C. Metal Termination Bars: Manufacturer's standard, pre-drilled stainless-steel or aluminum bars at 6-inches on center, approximately 1 by 1/8-inch thick; with anchors.

D. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

E. Water Cut-off Mastic: Manufacturer’s standard mastic for use behind fasteners, termination bars and at roof drain flashings.

F. Membrane Coated Metal: Manufacturer's standard 24 gauge, G-90 galvanized metal sheet, compatible for hot air welding.

G. Aluminum Foil Tape: 3M aluminum foil tape 425, or as recommended by the manufacturer.

H. Liquid PVC Flashing: Manufacturer's standard.

I. Flexible Walkways: Factory-formed, contrasting pads, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads, 36" x 36", provided by roofing system manufacturer. Pads shall be separated by 3" gaps to allow drainage of stormwater, and shall be heat welded to the membrane on all sides. Provide walk pads between all access points and around roof top equipment, regardless if shown in the Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Ensure that surfaces and site conditions are ready to receive Work and are acceptable to membrane manufacturer for required warranty.

B. Ensure existing roof surface is clean and smooth, free of depressions, waves or projections and is properly sloped to drains or eaves.

C. Ensure that roof surfaces are dry and free of snow or ice. Confirm dryness in the field by use of calibrated moisture meter, approved by the Engineer; maximum allowable: 12-percent and/or as approved by Engineer.

D. Ensure that roof openings, curbs, pipes, sleeves, ducts and vents through roof are solidly set, and any required wood nailing strips are in place.

E. All wood blocking, roof curbs, and penetrations shall be installed and secured prior to beginning with roof installation

F. Beginning of installation means installer accepts existing surfaces.

3.02 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Install insulation strips according to acoustical roof deck manufacturer's written instructions.

D. Unroll and position membrane without stretching. Allow membrane to relax 15 minutes if temperature is above 55 degrees Fahrenheit, allow to relax 30 minutes is temperature is below 55 degrees Fahrenheit.

3.03 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Install roofing and auxiliary materials to tie-in to existing roofing to maintain weathertightness of transition and to prevent voiding of manufacturer's warranty for existing roofing system.

3.04 ADHERED ROOFING INSTALLATION

A. Membrane Attachment:
   1. Adhesive Application:
      a. Apply bonding adhesive in accordance with the manufacturer's published instructions, to the exposed underside of the membrane and the corresponding substrate area.

b. Do not apply bonding adhesive along the splice edge of the membrane to be hot air welded over the adjoining sheet. Allow the adhesive to dry until it is tacky but will not string or stick to a dry finger touch.

2. Membrane Adhesion:
   a. Roll the membrane into the substrate while avoiding wrinkles. Roll the bonded section of the membrane sheet immediately after rolling the membrane into the adhesive with a 150 lb, 24” diameter roller to achieve maximum contact.
   b. Fold back the un-bonded half of the sheet lengthwise and repeat the bonding procedures.
3. Mechanical Fasteners: In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeter of roofing in accordance with manufacturer requirements.

B. Membrane Placement:
1. Apply roofing with side laps shingled with slope of roof deck where possible. Position adjoining sheets to allow a minimum overlap of 2 inches.
2. Continue to install adjoining membrane sheets in the same manner, overlapping edges a minimum of 2 inches and complete the bonding procedures as stated previously, in accordance with the manufacturer's specifications.

C. Apply roofing with side laps shingled with slope of roof deck where possible.

3.05 SEAMING

A. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings a minimum of 1-1/2 inches in accordance with the manufacturer's published written instructions, to ensure a watertight seam installation.
1. Equipment: Use an Automatic Hot Air Welding Machine for all field seams. Hot Air Hand Welders are acceptable at flashings only.
2. Quality Control:
   a. Probe all seams once the hot air welds have thoroughly cooled (approximately 30 minutes). Include name of person performing daily probing and evidence that probing was performed in Contractor’s Daily Report. Repair all seam deficiencies the same day they are discovered.
   b. Seam Testing: Verify strength of seams on sample material a minimum of twice daily, and provide samples or photographs of samples with Contractor’s Daily Report.
      1) NOTE: Failure to provide evidence of daily seam testing for both automatic and hand welding for review by A/E will result in seam testing performed on installed roofing at substantial completion.
      2) Contractor shall provide repairs at all samples removed for seam testing. If seams do not comply with the 1-1/2 inch minimum width specified and according to the manufacturer's published written instructions, Contractor shall provide repair patches along all seams at all roof areas within 10,000 square feet of the noncompliant seam.

B. Roof Drains (if applicable): Spread sealant/mastic bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

3.06 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate, anchor and seal top of sheet flashings per manufacturer requirements.

F. Install foil tape at all locations where PVC membrane is installed over asphaltic membranes with polyethylene surfaces.

G. Install liquid PVC flashings at all base flashing terminations and as identified in the Drawings.

3.07 WALKPAD INSTALLATION

A. Install walkpads between permanent roof access points, doors, and around all roof hatches, skylights, hose bibs, roof top mechanical units and kitchen exhaust fans, whether shown on the Drawings or not.

B. Heat weld all four sides of walkpads sized no larger than 3’-0” x 3’-0”, provide 3” minimum clearance between pads for drainage.

C. Do not install walkpads inside drain system sumps or over the membrane seams.

3.08 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation upon completion.
   1. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

B. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.09 DAILY CLEANING AND TEMPORARY SEALS

A. Daily Cleaning:
   1. Perform daily clean-up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.
   2. Inspect all roof drainage components for blockage, immediately remove blockages found.

B. Temporary Seals:
   1. Contractor shall provide a fully sealed system at the end of each workday.
      a. Insulation not covered by membrane the same day will be rejected.
      b. Water entering the new roof system as a result of missing flashings or inadequate temporary seals will be cause for rejection if the moisture remains in the roof system at Substantial Completion.
      c. Damage to interior surfaces and equipment that occurs due to leakage from daily seals will be repaired at Contractor’s expense.

3.10 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period.
   1. Substantial Completion:
      a. Prior to requesting that the Architect and Roof Consultant perform a substantial completion punchlist of the roof system, Contractor shall rinse ALL roof areas with water under low pressure (garden hose nozzle or similar) to remove surface debris and dirt.
      b. This cleaning is required to allow Contractor and Manufacturer to review the roof membrane for damage during the punchlist walk.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

ROOFING INSTALLER'S WARRANTY

A. WHEREAS of , herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
   1. Owner:
   2. Owner's Address:
   3. Building Name/Type:
   4. Building's Address:
   5. Area of Work:
   6. Acceptance Date:
   7. Warranty Period: FIVE YEARS.
   8. Expiration Date:

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:
   1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
      a. Lightning;
      b. Insert required wind speed in first subparagraph below.
      c. Peak gust wind speed exceeding 90 mph;
      d. Fire;
      e. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
      f. Faulty construction of parapet walls, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
      g. Vapor condensation on bottom of roofing; and
      h. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
   2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
   3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
   4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

IN WITNESS THEREOF, this instrument has been duly executed this ____ day of _____, 20___.

Authorized Signature:_____.

Name:_____.

Title:_____.

Company:_____.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood nailers for sheet metal work.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

E. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

F. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

G. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products; 2025.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Submit 12 inch long, completely finished units of specified factory-fabricated products exposed as finished work.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

1.08 WARRANTY

A. Manufacturer’s Warranty: Provide manufacturer’s 20-year, non-prorated warranty covering color fade, chalking and film integrity for all “Kynar 500”: pre-finished metal.

B. Contractor’s Warranty: Provide Owner a written warranty which shall warrant sheet metal work to be free of leaks and defects in materials and workmanship for five (5) years after date of final acceptance by Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Sheet Metal Manufacturers
   1. Metal Building Components, Inc.: www.mbci.com
   2. Petersen Aluminum Corporation: www.pac-clad.com
   3. Vincent Brass and Aluminum Company: vincentmetals.com
   4. Substitutions: See Section 01 6000 - Product Requirements

2.02 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239 inch) thick base metal.

B. Pre-Finished Galvanized Steel: ASTM A 653/A 653M, with G90/Z275 zinc coating; minimum 0.02 inch thick, 24 gauge base metal, shop pre-coated with PVDF coating.
   1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. "Kynar 500" or "Duranar 200"
   3. Color: As selected by Architect from manufacturer's full line of colors. Provide custom colors when needed to match other materials shown on the drawings or referenced in the Schedule of Materials and Colors.

C. Aluminum: ASTM B209 (ASTM B209M); 0.032 inch thick; anodized finish of color as selected.
   1. Clear Anodized Finish: AAMA 611 AA-M12C22A41 Class I clear anodic coating not less than 0.7 mils thick.
   2. Color Anodized Finish: AAMA 611 AA-M12C22A42/44 Class I integrally or electrolytically colored anodic coating not less than 0.7 mils thick.

D. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 0.032 inch thick; plain finish shop pre-coated with fluoropolymer coating.
   1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Architect from manufacturer's full line of colors. Provide custom colors when needed to match other materials shown on the drawings or referenced in the Schedule of Materials and Colors.

E. ~~Lead: ASTM B749, 2.5 lb/sq ft thick.~~

F. Stainless steel metal: 24 gauge, Type 304, 2b Finish, ASTM A240.

2.03 ACCESSORIES

A. Fasteners: Same material and finish as flashing metal , with soft neoprene washers.
   1. Mechanical Fasteners
      a. Nails: Compatible with material fastened, flathead, wire, barbed, slating type.
      b. Washers: Lead or neoprene.
      c. Screws: Self-tapping sheet metal type compatible with material fastened.
      d. Rivets: Stainless steel and cadmium plated material, closed end, type and size as recommended by sheet metal manufacturer.
      e. Concrete and Masonry Fasteners
         1) Round-head stainless steel screw and neoprene washer with lead expansion anchor, FS FF-S-325, Group IV, Type II.
         2) Acceptable Product: Rawl Plug, The Rawl Plug Company, Inc.

B. Flashing Underlayment

1. Grace Ultra, a self-adhering membrane composed of high density, cross-laminated polyethylene film coated on one side with butyl rubber adhesive, and covered with a disposable silicone-coated release sheet, and conforms to the following physical properties:
2. Color: Gray-Black
3. Thickness: Minimum 30 mil; ASTM D 3767 Method A
4. Self-Adhering underlayment membrane shall be rated for high temperature resistance up to 250 degrees F.

C. Mastic Sealant: One- or Two-Part Polyurethane; non-hardening, non-skinning, nondrying, non-migrating sealant.

D. Bituminous Coating: FS TT-C-494 or SSPC Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15 mil dry film thickness per coat.

E. Adhesives: Type recommended by flashing sheet manufacturer for waterproof and weather resistant seaming and adhesive application of flashing sheet.

F. Metal Accessories: Sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gauge required for performance.

G. Elastic Flashing Filler: Closed cell polyethylene or other soft closed cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.

H. Reglets: Metal or plastic units of type and profile indicated, compatible with flashing indicated, non-corrosive.

I. Flux: Phosphoric acid type, manufacturer's standard. For use with steel or copper: Rosin flux

2.04 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet, minimum four inches wide, interlocking with sheet.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside 1/2 inch; miter and seam corners.

E. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

F. Lap joints 1-inch minimum. Rivet and solder joints on parts that are to be permanently and rigidly assembled.

G. Expansion Provisions: Where lapped or bayonet type expansion provisions in work cannot be used or would not be sufficiently waterproof or weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant concealed within joints.

H. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance or work, form metal to provide for proper installation of Elastomeric sealant in compliance with SMACNA standards.

I. Tin edges of copper sheet to be soldered; solder shop formed metal joints, and after soldering, remove flux, wipe and wash solder joints clean; provide weathertight joints.

J. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

K. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

L. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.05 FABRICATED ITEMS

A. Coping Cap Flashings:
   1. Minimum 24 gauge Kynar 500 pre-finished galvanized steel formed in maximum 10 feet length sheets.
   2. Provide expansion slip joints at maximum 10 feet on center.

B. Flashings and Counterflashings:
   1. Minimum 24 gauge hot-dip galvanized steel formed in maximum 10 feet lengths.
   2. All flashings and counterflashings exposed to view shall be Kynar 500 pre-finished galvanized steel

C. Drip Flashing:
   1. Drip flashing shall be minimum 24 gauge Kynar 500 pre-finished galvanized steel formed in maximum 10 ft. lengths.

D. Roof Penetrations and Umbrella Counterflashing: Minimum 24 gauge hot-dip galvanized steel two piece construction, fabricated in accordance with approved shop drawings.

E. Metal Edge:
   1. Minimum 24 gauge Kynar 500 pre-finished galvanized steel formed in maximum 10 ft. lengths.
   2. Provide expansion slip joints at maximum 10 ft. on center.

F. Continuous Cleats: 22ga. continuous strips, hot dipped galvanized sheet metal.

G. Vent Pipe, Heat Vent Hoods, Sleeves, Pitch Pans, and Accessories: Minimum 24 gauge pre-finished, or hot-dip grip galvanized steel.

H. Gutters, Downspouts and Scupper Sleeves: Minimum 24 gauge Kynar 500 pre-finished galvanized steel. Lap joints minimum 3 inch. Seal laps with structural sealant and rivet. Coordinate downspouts with steel boots per drawings. Provide expansion joints in gutters per SMACNA guidelines, 50'-0" o.c. max. Gutters to be provided with gutter screens.

I. Downspout Boots shall be fabricated as specified in Section 05 5000 and as detailed on the drawings.

J. Expansion and Control Joints: 24 gauge hot-dip galvanized steel formed in 10 ft. maximum lengths where possible. Fabricate in accordance with SMACNA reference details, Ref. Plate 5-5a, 5-5b for field installations; Ref. Plates 5-6a & 5-6b for wall conditions.

K. Vent Stack, Soil Vent, Flashing: Single-component, poly-methyl-methacrylate (PMMA) resin with polyester reinforcing fleece fabric fully embedded into the resin to form roof system flashings, provided by primary roof membrane manufacturer. Fabricate and install in accordance with approved shop drawings.

L. Vent Pipe Flashing: 24 gauge hot-dip galvanized steel.

M. Roof Drain Flashing: Single-component, poly-methyl-methacrylate (PMMA) resin with polyester reinforcing fleece fabric fully embedded into the resin to form roof system flashings, provided by primary roof membrane manufacturer. Fabricate and install as shown in NRCA Roofing and Waterproofing Manual.

N. Membrane Coated Metal: 60 mil minimum, PVC or KEE membrane fully adhered to manufacturer's standard 24 gauge, G-90 galvanized metal sheet, compatible for hot air welding.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Install sheet metal with lines, arises, and angles sharp and true, and plane surfaces free from objectionable wave, warp, or buckle. Exposed edges of sheet metal shall be folded back to form ¼ inch hem on concealed side from view. Finished work shall be free from water retention and leakage under all weather conditions. Pre-fabricated corners or transitions are required at changes in direction, elevation, or plane and at intersections. Locate field joints not less than 12 inches, nor more than 3 feet from actual corner. Laps shall be 1 inch, riveted and soldered at following locations: Prefabricated corners; transitions; changes in direction, elevation, and plane; and at intersections.

B. Anchor units of work securely in place to prevent damage or distortion from wind or buckling. Provide for thermal expansion of metal units; conceal fasteners where possible; and set units true to line and level as indicated. Install work with laps, joints and seams which are permanently watertight and weather proof.

C. Install fabricated sheet metal items in accordance with manufacturer's installation instructions and recommendations and with SMACNA Architectural Sheet Metal Manual.

D. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces with zinc chromate, bituminous coating, or other permanent separation at locations or contact as recommended by manufacturer or fabricator. Do not use materials incompatible with roofing system.

E. Continuous Cleat: At exposed edges of gravel guards, fascias, coping cap and metal edge gravel guard and where required otherwise, attach galvanized continuous cleat nailed staggered at six (6) inches on center. Nails shall be annular threaded galvanized nails, with a minimum of 1.5 inches in length, and seated on the vertical flange of the cleat. Cleat shall be one gauge heavier than adjacent sheet metal item or a minimum of 22 gauge.

F. Flanges: Bed flanges of work in thick coat of bituminous roofing cement where required for waterproof performance.

G. Coping: Minimum 24 gauge pre-finished galvanized steel.

H. Coping Cap Flashings
   1. Install over underlayment and slip sheet.
   2. Lock bottom flanges to edge strips.
   3. Join sheets in accordance with SMACNA details.
   4. Fasten back of coping with fasteners and neoprene washers 8 inches on center through pre-drilled slotted holes.

I. Flashings and Counterflashings
   1. Extend flanges into reglet and securely fasten.
   2. Where nailing is required, nail at 6 inches on center.
   3. Overlap 4 inches on base flashing; lap ends at 3 inches.
   4. Or, depending on other construction, install counterflashing in reglets, either by snap in seal arrangement or by wedging in place with lead wedges at 8 inches on center for anchorage and filling reglet with elastomeric sealant as indicated and as required for specific exposure.
   5. All sheet metal counterflashing shall include a galvanized hook strip, placed a minimum of three feet on center or as required by local code or wind uplift requirement.

J. Metal Edge
   1. Install with allowance for movement between sections and seal with six (6) inch minimum cover plates.
   2. Extend flanges 4 inches onto roof surface.
   3. Install sealant between flange and substrate.
   4. Fasten 3 inches on center in two staggered rows.

K. Roof Penetration Hoods and Umbrella Counterflashings
   1. Install watertight hood or umbrella counterflashing at sleeves and penetration locations, such as pipes and conduit penetration roof, and at equipment supports and over pitch pans.
   2. Set umbrella counterflashing in sealant.
   3. Fully solder connections and seams and install in accordance with approved shop drawings.
   4. Tighten draw bands.
   5. Seal top of umbrella counterflashing with sealant.

L. Reglets
   1. Install reglets to receive counterflashing in manner and by methods indicated.
   2. Where shown in concrete, furnish reglets to trades of concrete work for installation as part of work in Division 3 Sections.
   3. Where shown in masonry, furnish reglets to trades of masonry work for installation as part of work in Division 4 Sections.

M. Expansion Joint Flanges
   1. Nail flanges of expansion joint units to curb nailers at maximum spacing of 6 inches.
   2. Fabricate seams at joints between units with minimum 3 inches overlap to form continuous waterproof system.

N. Drip Flashing
   1. Install over Rosin Paper.
   2. Furnish drip flashing to trades of masonry work for installation as part of work in specifications, Division 04 Sections.

O. Rooftop Unit Receiver Trim
   1. Install receiver flashing at rooftop units. Receiver clip shall allow RTU to be set on curb prior to roof membrane installation. Refer to drawings for detail.

3.04 CLEANING

A. Remove flux and residual acid immediately by neutralizing with baking soda and washing with clean water. Leave work clean and free of stains, scrap, and debris.

B. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.

C. Prime soldered area of phosphatized metal after cleaning to prevent rusting.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 08 3323
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior insulated coiling doors.

B. Interior non-fire-rated coiling doors.

C. Fire-rated coiling doors.

D. Electric operators and control stations.

E. Wiring from electric circuit disconnect to operators and control stations.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Division 26 - Electrical

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ICC (IECC) - International Energy Conservation Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. ITS (DIR) - Directory of Listed Products; current edition.

E. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

F. NEMA MG 00001 - Motors and Generators; 2024.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

I. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2019.

J. UL (DIR) - Online Certifications Directory; Current Edition.

K. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

L. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide general construction, electrical equipment, and component connections and details.

C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

D. Samples: Submit two slats, 3 by 6 inches in size illustrating shape, color and finish texture.

E. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience and approved by manufacturer.

C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace doors that fail in materials or workmanship within the specified warranty period.
   1. Warranty Period: One (1) year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Doors:
   1. C.H.I. Overhead Doors: www.chiohd.com/#sle.
   2. Clopay Building Products: www.clopaydoor.com/#sle.
   3. Cornell Iron Works, Inc: www.cornelliron.com/#sle.
   4. Raynor Garage Doors: www.raynor.com/#sle.
   5. The Cookson Company: www.cooksondoor.com/#sle.
   6. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com/#sle.
   7. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COILING DOORS

A. Exterior Insulated Coiling Doors: Steel slat curtain.
   1. Capable of withstanding positive and negative design wind loads of 20 psf, without undue deflection or damage to components.
   2. Sandwich slat construction with insulated core of foamed-in-place polyurethane insulation; minimum R-value of 8.0.
   3. Air Infiltration – Maximum air leakage of 1.00 cfm/ft^2 in accordance with the ICC (IECC) International Energy Conservation Code.
   4. Nominal Slat Size: 3 inches wide by required length.
   5. Finish: Factory powder coated, color as selected. See Section 01 6210-Schedule of Materials and Colors.
   6. Guide, Angles: Powder coated to match curtain.
   7. Hood Enclosure: Manufacturer's standard; Powder coated to match curtain.
      a. Provide mechanism cover for all exposed moving operator components.
   8. Electric operation.
   9. Mounting: Surface mounted.

B. Interior Non-Fire-Rated Coiling Doors: Steel slat curtain.
   1. Single thickness slats.
   2. Nominal Slat Size: 2-1/2 inches wide by required length.
   3. Finish: Factory powder coated, color as selected. See Section 01 6210-Schedule of Materials and Colors.
   4. Guides, Angles: Powder coated to match curtain.
   5. Hood Enclosure: Manufacturer's standard; Powder coated to match curtain.

a. Provide mechanism cover for all exposed moving operator components.
6. Electric operation.
7. Mounting: Within framed opening.

C. Fire-Rated Coiling Doors: Steel slat curtain; comply with NFPA 80.
1. Provide fire rating as indicated on the drawings.
a. Provide smoke and draft control door assemblies tested in accordance with UL 1784.
2. Provide products listed and labeled by ITS (DIR) or UL (DIR) as suitable for purpose specified and indicated on drawings.
3. Single thickness slats.
4. Nominal Slat Size: 2-1/2 inches wide by required length.
5. Finish: Factory powder coated, color as selected. See Section 01 6210-Schedule of Materials and Colors.
6. Guides, Angles: Powder coated to match curtain.
7. Hood Enclosure: Manufacturer's standard; Powder coated to match curtain.
a. Provide mechanism cover for all exposed moving operator components.
8. Fire Alarm Release Mechanism: Electric-motor operated from fire alarm system.
a. Provide a failsafe motor operated door assembly requiring no ancillary or externally mounted release devices, cables, chains, pulleys, reset handles or mechanisms
b. Provide an internal electrical failsafe release device that requires no additional wiring, external cables or mounting locations.
c. Maintain automatic closure speed at not more than 9” per second.
d. Ensure that manual resetting of spring tension, release devices, linkages or mechanical dropouts will not be required.
e. Provide 10 second time delay for activation upon loss of power.
9. Electric operation.
10. Mounting: Within framed opening.

2.03 MATERIALS AND COMPONENTS

A. Metal Curtain Construction: Interlocking slats.
1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
2. Curtain Bottom for Slat Curtains: Fitted with angles or aluminum extrusions to provide reinforcement and positive contact in closed position.
3. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and lintel brush seal where curtain enters hood enclosure of exterior doors.
4. Smoke Seals: Provide brush or gasket type weatherstripping seals to prevent passage of smoke and hot gases in compliance with UL 1784 testing requirements.
5. Steel Slats: Minimum thickness, 22 gauge, 0.03 inch; ASTM A653/A653M galvanized steel sheet. Provide 20 gauge slats where opening size dictates.
a. Galvanizing: Minimum G60 coating.

B. Guides - Angle: ASTM A36/A36M metal angles, size as required for door configuration.

C. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
1. Minimum thickness; 24 gauge, 0.024 inch.
2. Powder coated to match curtain.
3. Provide mechanism cover for all exposed moving operator components.

D. Lock Hardware:
1. For motor operated units, additional lock or latching mechanisms are not required.

E. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.04 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
   1. Provide tamperproof operation cycle counter.

B. Electric Operators:
   1. Mounting: Front of Coil.
   2. Motor Enclosure:
      a. Interior Coil: NEMA MG 00001, Type 1; totally enclosed fan cooled (TEFC).
   3. Motor Rating: Minimum 1/3 HP; industrial duty, or as required by the manufacturer.
   4. Motor Voltage: 120 volts, single phase, 60 Hz. minimum. Verify with electrical drawings.
   5. Controller Enclosure: NEMA EN 10250, Type 1.
   6. Opening Speed: 8-9 inches per second.
   7. Brake: Manufacturer's standard type, activated by motor controller.
   8. Manual override in case of power failure.
   9. See Division 26 - Electrical for electrical connections.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

D. Control Station: Provide standard “Open/Close” key-operated, 'Open-Close-Stop' momentary-contact control device with small format Best type 7-pin cylinder, NEMA 1B for each operator complying with UL 325.
   1. 24 volt circuit.
   2. Surface mounted, at interior door jamb at CMU walls.
   3. Recess mounted, at interior door jamb at gypsum walls.
   4. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide monitored sensing edge with wireless edge connection to motor control circuit for momentary contact open/close control.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install fire-rated doors in accordance with NFPA 80.

C. Install smoke door assemblies in accordance with NFPA 105.

D. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

E. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

F. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

G. Coordinate installation of electrical service with Division 26 Electrical.

H. Complete wiring from disconnect to unit components.

I. Complete wiring from fire alarm system.

J. Install enclosure and perimeter trim.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 3326
OVERHEAD COILING GRILLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead coiling metal grilles and operating hardware; electrically operated.

B. Wiring from electric circuit disconnect to operator and to control station.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware: Cylinder cores and keys.

B. Division 26 - Electrical

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ITS (DIR) - Directory of Listed Products; current edition.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA MG 00001 - Motors and Generators; 2024.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL (DIR) - Online Certifications Directory; Current Edition.

G. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide general construction component connections and details, and electrical equipment.

C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

D. Samples: Submit two grille members, 6 by 6 inch in size illustrating shape, color and finish texture.

E. Manufacturer's Installation Instructions: Indicate installation sequences and procedures, adjustment and alignment procedures.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience and approved by manufacturer.

C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Grilles:
   1. C.H.I. Overhead Doors: www.chiohd.com/#sle.
   2. Clopay Building Products: www.clopaydoor.com/#sle.
   3. Cornell Iron Works, Inc: www.cornelliron.com/#sle.
   4. The Cookson Company: www.cooksondoor.com/#sle.
   5. Raynor Garage Doors: www.raynor.com/#sle.
   6. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com/#sle.
   7. Substitutions: See Section 01 6000 - Product Requirements.

2.02 GRILLES AND COMPONENTS

A. Grille: Aluminum; horizontal bar curtain, coiling on overhead counterbalanced shaft.
   1. Finish: Anodized, Clear.
   2. Electric operation.
   3. Mounting: Within framed opening.

B. Curtain: Round horizontal bars connected with vertical links to form a brick pattern.
   1. Horizontal bars: 5/16 inch diameter.
   2. Bar spacing: 2 inch on center.
   3. Tube spacers: 1/2 inch diameter.
   4. Spacer spacing: 9 inch on center.
   5. Vertical links: Minimum 5/8 by 1/8 inch flat bar.
   6. Link spacing: 9 inch on center.
   7. Bar Ends: End links to be held in place by self-locking retaining rings.
   8. Bottom Bar: Extruded aluminum tubular section with sensing edge seal/cushion.
   9. Finish: Anodized, Clear.

C. Guides: Extruded aluminum section, of profile to retain grille in place with snap-on trim, polypropylene pile runners on both sides of curtain for quiet operation and wall mounting angles of same metal.
   1. Finish: Anodized, Clear.

D. Hood Enclosure and Trim (for exposed coil housing conditions): Sheet metal; completely covering operating mechanisms; internally reinforced to maintain rigidity and shape.
   1. Material: Aluminum.
   2. Sheet Metal Thickness: 0.040 inch.
   3. Finish: Anodized, Clear.

E. Lock Hardware:
   1. Center mounted on bottom bar, keyed locking with Best 7 pin cylinders with removable key core, operable from both sides of grille with lock bars into both jambs, with motor interlock cutout switches.

F. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.03 MATERIALS

A. Aluminum: ASTM B221 (ASTM B221M).

B. Galvanized Steel Bars: Galvanized to minimum coating thickness grade in accordance with ASTM A123/A123M.

2.04 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
   1. Provide tamperproof operation cycle counter.

B. Electric Operators:
   1. Mounting: Front of Coil.
   2. Motor Enclosure:
      a. Interior Coiling Grilles: NEMA MG 00001, Type 1; totally enclosed fan cooled (TEFC).
   3. Motor Rating: 1/3 hp; industrial duty, or as required by the manufacturer.
   4. Motor Voltage: 120 volts, single phase, 60 Hz. Verify with electrical drawings.
   5. Controller Enclosure: NEMA EN 10250 Type 1.
   6. Opening Speed: 8-9 inches per second.
   7. Brake: Manufacturer's standard type, activated by motor controller.
   8. Integral motor mounted interlock sensing to prevent damage to grille and operator when mechanical locking devices are engaged.
   9. Manual override in case of power failure.
   10. See Division 26 - Electrical for electrical connections.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

D. Control Station: Provide standard “Open/Close” key-operated "Open-Close-Stop" momentary-contact control device with small format Best type 7-pin cylinder, NEMA 1B for each operator complying with UL 325.
   1. 24 volt circuit.
   2. Surface mounted, at interior door jamb at CMU walls.
   3. Recess mounted, at interior door jamb at gypsum walls.
   4. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide monitored sensing edge with wireless edge connection to motor control circuit for momentary contact open/close control.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

A. Install grille unit assembly in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Division 26 Electrical.

F. Complete wiring from disconnect to unit components.

G. Install enclosure and perimeter trim.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.04 ADJUSTING

A. Adjust grille, hardware and operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean grille and components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Sun Shades

C. Aluminum doors and frames.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.

B. Section 08 8000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA 501 - North American Fenestration Standard/Specification for windows, doors, and skylights; Current Addition.

B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

C. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2012.

D. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

E. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

F. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

G. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

I. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

J. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

L. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

M. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

N. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

O. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

P. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

Q. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting two weeks before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
   1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

D. Shop drawing sheets that include engineering information designed by the Contractor’s Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor’s Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

E. Samples: Accompanying the Shop Drawings, submit:
   1. Sample of each exposed member.
   2. Samples of finish, showing complete range of color from darkest to lightest proposed for use on this Work.
   3. Samples, when approved by the Architect, will be used to verify that the installed finish is within the approved range.

F. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations stamped and signed by a Structural Engineer licensed in the State of Texas.

G. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Texas.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. Provide two year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide two year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING (EXTERIOR)

A. Center-Set Style, Thermally-Broken:
1. Basis of Design: Oldcastle BuildingEnvelope; Series 3000 Thermal MultiPlane.
2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
1. Arcadia, Inc.: www.arcadiainc.com
2. Atlas Architectural Metals, Inc.: www.atlasarchmetals.com.
3. Columbia Commercial Building Products: ccbpwin.com.
4. C.R. Laurence Company, Inc; U.S. Aluminum: www.crl-arch.com/sle.
5. EFCO, a Pella Company: www.efcocorp.com/sle.
6. Kawneer Company, Inc.: www.kawneer.com.
7. Manko Window Systems, Inc.: www.mankowindows.com.
8. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
9. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com.
10. Tubelite, Inc.: www.tubeliteinc.com
11. YKK AP America Inc: www.ykkap.com.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 BASIS OF DESIGN -- FRAMING FOR MONOLITHIC GLAZING (INTERIOR)

A. Center-Set Style:
1. Basis of Design: Oldcastle BuildingEnvelope; Series FG-3000.
2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
1. Arcadia, Inc.: www.arcadiainc.com
2. Atlas Architectural Metals, Inc.: www.atlasarchmetals.com.
3. Columbia Commercial Building Products: ccbpwin.com.
4. C.R. Laurence Company, Inc; U.S. Aluminum: www.crl-arch.com/sle.
5. EFCO, a Pella Company: www.efcocorp.com/sle.
6. Kawneer Company, Inc.: www.kawneer.com.
7. Manko Window Systems, Inc.: www.mankowindows.com.
8. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
9. Trulite Glass and Aluminum Solutions, LLC: www.trulite.com.
10. Tubelite, Inc.: www.tubeliteinc.com
11. YKK AP America Inc: www.ykkap.com.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.03 BASIS OF DESIGN -- SWINGING DOORS

A. Wide Stile, Insulating Glazing, Not Thermally-Broken:
1. Basis of Design: Oldcastle BuildingEnvelop; WS-500 Standard Wide Stile Entrance Door
2. Thickness: 2 inches.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. Arcadia, Inc.: www.arcadiainc.com
   2. Atlas Architectural Metals, Inc.: www.atlasarchmetals.com.
   3. Columbia Commercial Building Products: ccbpwin.com.
   4. C.R. Laurence Company, Inc; U.S. Aluminum: www.crl-arch.com/sle.
   5. EFCO, a Pella Company: www.efcocorp.com/sle.
   6. Kawneer Company, Inc.: www.kawneer.com.
   7. Manko Window Systems, Inc.: www.mankowindows.com.
   8. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
   9. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com.
   10. Tubelite, Inc.: www.tubeliteinc.com
   11. YKK AP America Inc: www.ykkap.com.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.04 STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Finish: Class I natural anodized.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
   2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   3. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   4. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   5. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   6. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   7. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   8. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.
   9. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.

B. Performance Requirements:
   1. General Requirements
      a. Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage or moisture disposal.
      b. Requirements shown by details are intended to establish basic dimension of units, sight lines and profiles of members.
      c. Provide concealed fastening.
      d. Provide entrance and storefront systems, including necessary modifications, to meet specified requirements and maintaining visual design concepts.

e. Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
f. Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied.
g. Provide for expansion and contraction without detriment to appearance or performance.
h. Assemblies shall be free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.
i. Not Permitted: Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system.
j. Coordinate all door hardware with Section 08 7100 – Door Hardware.

2. Frame calculations shall be designed by a registered engineer in the State of Texas. Manufacturer is responsible for system reinforcing.
3. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
   a. Design Wind Loads: Comply with requirements of ASCE 7.
   b. Member Deflection: Limit member deflection to 1/175 in any direction, with full recovery of glazing materials.
4. Interior Storefront, shall have adequate strength and stiffness to resist a minimum horizontal load of 5psf.
   a. Member Deflection: Limit member deflection to 1/175 in any direction, with full recovery of glazing materials.
5. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
6. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.
7. Thermal Requirements:
   a. Framing systems shall accommodate expansion and contraction movement due to surface temperature differentials of 180º F without causing buckling, stress on glass, failure of joint seals, excessive stress on structural elements, reduction of performance, or other detrimental effects.
   b. Ensure doors function normally within limits of specified temperature range.
   c. Thermal Break with a 1/4" separation consisting of a two part chemically curing, high density polyurethane which is mechanically and adhesively joined to aluminum storefront sections.
   d. Maximum U-factor: 0.45 (fixed), 0.60 (operable), 0.77 (entry doors).

2.05 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system. All exterior locations, and where otherwise required, units must be thermally broken, with integral internal drainage systems.
   1. Framing members for interior applications need not be thermally broken.
   2. Glazing Stops: Flush.
   3. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

B. Aluminum Subframing and Sill Receptors: Extruded aluminum, thermally broken to match framing members, at all exterior locations and where otherwise required, integrate with framing member drainage system.
   1. Finish: Same as storefront.

2. Subframing: At perimeter of units, where required.
3. Flat Fillers: Required at head and jamb exterior units wand where otherwise required.
4. Sill Receptors: At sills at exterior units.

C. Glazing: As specified in Section 08 8000.

D. Swing Doors: Glazed aluminum.
1. Thickness: 2 inches. with .188 inch wall thickness
2. Top Rail: 5 inches wide. Provide manufacturer’s closure plate as required to accept door closure.
3. Vertical Stiles: 5 inches wide.
4. Mid Rail: 8 1/4 inches wide.
5. Bottom Rail: 10 inches wide.
6. Glazing Stops: Square.
7. Finish: Same as storefront.

E. Sun Shades: Shop fabricated, shop finished, extruded aluminum outriggers, louvers, and fascia, free of defects impairing strength, durability or appearance.
1. Configuration: As indicated on drawings.
2. Louver Type: Circular face with Slat blades.
3. Sun Shade Angle: Confirm blade orientation with Architect prior to ordering.
4. Outrigger Shape: Bullnose. Confirm configuration with Architect prior to ordering.
5. Design Criteria: Design and fabricate to resist the same loads as storefront system without failure, damage, or permanent deflection:
6. Sizes: As indicated on drawings.
7. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.

2.06 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209 (ASTM B209M).

C. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.

D. Internal Reinforcing:
1. ASTM A36 for carbon steel; or ASTM B308 for structural aluminum.
2. Shapes and sizes to suit installation.
3. Shop coat steel components after fabrication with alkyd type zinc chromate primer complying with FS TT-P-645.

E. Anchorage Devices:
1. Manufacturer's standard formed or fabricated steel or aluminum assemblies of shapes, plates, bars or tubes.

F. Fasteners:
1. Aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with components being fastened.
2. Do not use exposed fasteners, except where unavoidable for application of hardware.
3. For exposed locations, provide countersunk Phillips head screws with finish matching items fastened.
4. For concealed locations, provide manufacturer's standard fasteners.
5. Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable.
6. Cap seal all fasteners with compatible sealant at exterior locations and where otherwise required.

G. Exposed Flashings: See drawing details and Sectoin 07 6200-Sheet Metal Flashing and Trim; finish to match framing members.

H. Glazing Reducer:
   1. 451-VG-029 Snap-in 1/4" infill adapter or equal by the frame manufacturer for storefront located at interior locations.

I. Glazing Gaskets:
   1. Compression type design, replaceable, molded or extruded, of neoprene, or ethylene propylene diene monomer (EPDM).
   2. Conform to ASTM C509 or C864.
   3. Profile and hardness as required to maintain uniform pressure for watertight seal.
   4. Provide in manufacturer's standard black color.

J. Weatherstripping:
   1. Wool pile conforming to AAMA 701.2; or extruded EPDM elastomeric conforming to ASTM C509 or C864.
   2. Provide EPDM or vinyl-blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

K. "Anti-Walk" Edge Blocking: "W" shaped EPDM blocks for use in keeping glazing material stationary under vibration or seismic loading.

L. Baffles (at weep holes): Type as recommended by system manufacturer and shown in published installation instructions.

M. Glazing Accessories: As specified in Section 08 8000.

N. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.07 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.08 FABRICATION

A. Coordination of Fabrication:
   1. Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
   2. Fabricate units to withstand loads which will be applied when system is in place.

B. General:
   1. Conceal fasteners wherever possible.
   2. Reinforce work as necessary for performance requirements and for support to structure.
   3. Comply with Section 08 8000 for glazing requirements.

C. Aluminum Framing:
   1. Provide members of size, shape and profile indicated, designed to provide for glazing from interior.
   2. Fabricate frame assemblies with joints straight and tight fitting.
   3. Maintain accurate relation of planes and angles, with hairline fit of contacting members.
   4. Seal horizontals and direct moisture accumulation to exterior.
   5. Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.
   6. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without being detrimental to appearance or performance.

7. Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer.
8. Provide tight fitting, injection molded, plastic water deflectors at all intermediate horizontals.
9. Provide thermally broken aluminum backer plate at perimeter of all windows and individual sealed aluminum caps at the top of all vertical window frame mullions.
10. Provide fully soldered/sealed end dams at ends of sill receptor system. ABS end dams are not allowed.

D. Entrance Doors:
1. Fabricate with mechanical joints using internal reinforcing plates and shear blocks attached with fasteners and by welding.
2. Provide extruded aluminum glazing stops of square design, permanently anchored on security side and removable on opposite side.

E. Welding:
1. Comply with recommendations of the American Welding Society.
2. Use recommended electrodes and methods to avoid distortion and discoloration.
3. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

F. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil-canning".

2.09 HARDWARE

A. Receive hardware supplied in accordance with Section 08 7100 – Door Hardware and install in accordance with requirements of this Section.

B. Cut, reinforce, drill and tap frames and doors as required to receive hardware.

C. Comply with hardware manufacturer's templates and instructions.

D. Use concealed fasteners wherever possible.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Verify exterior substrates and weather barriers have been completed to ensure proper air/water tight transition is maintained.

D. Provide alignment attachments and shims to permanently fasten system to building structure.

E. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

F. Provide thermal isolation where components penetrate or disrupt building insulation.

G. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

H. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

J. Install operating sash.

K. Set thresholds in bed of sealant and secure.

L. Install hardware using templates provided.

M. Install glass and infill panels in accordance with Section 08 8000, using glazing method required to achieve performance criteria.

N. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general testing and inspection requirements.

B. Air/Water Leakage Testing: Provide testing per AAMA 502 at 10% of glazing area per building, to be performed at mockup, 35%, 50% and 90% completion.
   1. Testing to be performed at 0.67 times the ASTM E331 rated pressure provided by the manufacturer for the system, not less than 5.6 psf.

C. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as directed by Architect.
   2. Conduct tests in each area prior to 10% of glazing area per building, to be performed at mockup, 35%, 50% and 90% completion.

D. The Contractor is responsible for providing the Field Quality Control and testing as specified, unless otherwise noted. Testing must be performed by a qualified testing and inspection agency and must not self-performed. The Contractor is solely responsible for the cost, schedule, and associated rework if the building enclosure systems are not constructed in accordance with the Contract Documents or do not pass testing.

E. Failed tests are not accepted and require retesting until successful tests are achieved. The Contractor must implement repair(s) that are acceptable to the Architect and the Owner and retest the location to ensure the repair(s) is effective. If remedial repair(s) are not effective, the contractor must provide repairs and retest until the test results are satisfactory.

3.05 ADJUSTING

A. Test door operating functions. Adjust closing and latching speeds and other hardware in accordance with manufacturer's instructions to ensure smooth operation.

B. Adjust operating hardware for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 4413
GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed curtain wall, with vision glazing and glass infill panels.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping: Firestop at system junction with structure.

B. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA 501 - North American Fenestration Standard/Specification for windows, doors, and skylights; Current Addition.

B. AAMA 501.1 - Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure; 2017.

C. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

D. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2012.

E. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

F. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

G. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

H. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

I. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

J. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

L. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

M. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).

N. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

O. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

P. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

Q. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

R. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, and infill.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Samples: Accompanying the Shop Drawings, submit:
   1. Sample of each exposed member.
   2. Samples of finish, showing complete range of color from darkest to lightest proposed for use on this Work.
   3. Samples, when approved by the Architect, will be used to verify that the installed finish is within the approved range.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.

G. Shop drawing sheets that include engineering information designed by the Contractor’s Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor’s Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

H. Test Reports: Submit results of full-size mock-up testing. Reports of tests previously performed on the same design are acceptable.

I. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

J. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design curtain wall and its structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at Texas.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than five years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 7700 - Closeout Procedures, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. Provide two year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide two year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN

A. Pressure Cap Four Sides; Not Unitized, Field Assembled:
   1. Basis of Design: Kawneer Company Inc; 1600 Curtain Wall System.

B. Other Manufacturers: Provide either product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below.
   1. Arcadia, Inc.: www.arcadiainc.com
   2. Atlas Architectural Metals, Inc.: www.atlasarchmetals.com.
   3. Columbia Commercial Building Products: ccbpwin.com
   4. C.R. Laurence Company, Inc; U.S. Aluminum: www.crl-arch.com.
   5. EFCO, a Pella Company: www.efcocorp.com/sle.
   6. Kawneer Company, Inc.: www.kawneer.com
   7. Manko Window Systems, Inc.: www.mankowindows.com
   8. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
   9. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com.
   10. Tubelite, Inc.: www.tubeliteinc.com
   11. YKK AP America Inc: www.ykkap.com.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 BASIS OF DESIGN - SWINGING DOORS

A. Wide Stile, Insulating Glazing, Not Thermally-Broken:
   1. Basis of Design: Kawneer Company Inc; 500 Heavy Wall Entrance Door.
   2. Thickness: 2 inches.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. Arcadia, Inc.: www.arcadiainc.com
   2. Atlas Architectural Metals, Inc.: www.atlasarchmetals.com.
   3. Columbia Commercial Building Products: ccbpwin.com
   4. C.R. Laurence Co., Inc; U.S. Aluminum: www.crl-arch.com.
   5. EFCO, a Pella Company: www.efcocorp.com.
   6. Kawneer Company, Inc.: www.kawneer.com
   7. Manko Window Systems, Inc.: www.mankowindows.com
   8. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
   9. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com.
   10. Tubelite, Inc.: www.tubeliteinc.com
   11. YKK AP America Inc.: www.ykkap.com.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.03 CURTAIN WALL

A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Fabrication Method: Either shop/factory or field fabricated system.
   2. Glazing Method: Either shop/factory or field glazed system.
   3. Mullion Dimensions: 2-1/2 inches by depth as required by engineered drawings for structural performance.
   4. Finish: Class I natural anodized.
      a. Factory finish surfaces that will be exposed in completed assemblies.
      b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   5. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   6. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   9. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.

B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set.
   1. Design Wind Loads: Comply with the requirements of ASCE 7.
      a. Measure performance by testing in accordance with ASTM E330/E330M, using test loads equal to 1.5 times the design wind loads and 10 second duration of maximum pressure.
      b. Interior Curtain Walls shall have adequate strength and stiffness to resist a minimum horizontal load of 5psf.
      c. Member Deflection: For spans less than 13 feet 6 inches, limit member deflection to flexure limit of glass in any direction, and maximum of 1/175 of span or 3/4 inch, whichever is less and with full recovery of glazing materials.
      d. Member Deflection: For spans over 13 feet 6 inches and less than 40 feet, limit member deflection to flexure limit of glass in any direction, and maximum of 1/240 of span plus 1/4 inch, with full recovery of glazing materials.
   2. Movement: Accommodate the following movement without damage to components or deterioration of seals:
      a. Expansion and contraction caused by 180 degrees F surface temperature.
      b. Expansion and contraction caused by cycling temperature range of 170 degrees F over a 12 hour period.
      c. Movement of curtain wall relative to perimeter framing.
      d. Deflection of structural support framing, under permanent and dynamic loads.

C. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on indoor face when tested as follows:
   1. Test Pressure Differential: 12 psf.
   2. Test Method: AAMA 501.1.

D. Air Leakage: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.24 psf pressure differential across assembly.

E. Thermal Performance Requirements:

1. Condensation Resistance Factor of Framing: 71, minimum, measured in accordance with AAMA 1503.
2. Overall U-value Including Glazing: 0.45 Btu/(hr sq ft deg F), maximum.

2.04 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.

B. Glazing: As specified in Section 08 8000.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.

C. Fasteners:
   1. Aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with components being fastened.
   2. Do not use exposed fasteners, except where unavoidable for application of hardware.
   3. For exposed locations, provide countersunk Phillips head screws with finish matching items fastened.
   4. For concealed locations, provide manufacturer's standard fasteners.
   5. Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable.
   6. Cap seal all fasteners with compatible sealant at exterior locations and where otherwise required.

D. Exposed Flashings: See drawing details and Sectoin 07 6200-Sheet Metal Flashing and Trim; finish to match framing members.

E. Firestopping: As specified in Section 07 8400.

F. Weatherseal Sealant: Silicone, with adhesion in compliance with ASTM C794; compatible with glazing accessories.

G. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, and compatible with flashing material.

H. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

I. Glazing Accessories: As specified in Section 08 8000.

J. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.

K. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.06 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.07 FABRICATION

A. Coordination of Fabrication:
   1. Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
   2. Fabricate units to withstand loads which will be applied when system is in place.

B. General:
   1. Conceal fasteners wherever possible.

2. Reinforce work as necessary for performance requirements and for support to structure.
3. Comply with Section 08 8000 for glazing requirements.

C. Aluminum Framing:
1. Provide members of size, shape and profile indicated, designed to provide for glazing from interior.
2. Fabricate frame assemblies with joints straight and tight fitting.
3. Maintain accurate relation of planes and angles, with hairline fit of contacting members.
4. Seal horizontals and direct moisture accumulation to exterior.
5. Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.
6. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without being detrimental to appearance or performance.
7. Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer.
8. Provide tight fitting, injection molded, plastic water deflectors at all intermediate horizontals.
9. Provide thermally broken aluminum backer plate at perimeter of all windows and individual aluminum caps at the top of all vertical window frame mullions.
10. Provide fully soldered end dams at ends of subsill system. ABS end dams are not allowed.

D. Entrance Doors:
1. Fabricate with mechanical joints using internal reinforcing plates and shear blocks attached with fasteners and by welding.
2. Provide extruded aluminum glazing stops of square design, permanently anchored on security side and removable on opposite side.

E. Welding:
1. Comply with recommendations of the American Welding Society.
2. Use recommended electrodes and methods to avoid distortion and discoloration.
3. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

F. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil-canning".

2.08 HARDWARE

A. Receive hardware supplied in accordance with Section 08 7100 – Door Hardware and install in accordance with requirements of this Section.

B. Cut, reinforce, drill and tap frames and doors as required to receive hardware.

C. Comply with hardware manufacturer's templates and instructions.

D. Use concealed fasteners wherever possible.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other related work.

B. Verify that curtain wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

A. Install curtain wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Install firestopping at each floor slab edge.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Pressure Plate Framing: Install glazing and infill panels in accordance with Section 08 8000, using glazing method required to achieve performance criteria.

J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. Provide services of curtain wall manufacturer's field representative to observe for proper installation of system and submit report.

B. See Section 01 4000 - Quality Requirements, for general testing and inspection requirements.

C. Air/Water Leakage Testing: Provide chamber test per AAMA 502 at 10% of glazing area per building, to be performed at mockup, 35%, 50% and 90% completion.
   1. Testing to be performed at 0.67 times the ASTM E331 rated pressure provided by the manufacturer for the system, not less than 8 psf.

D. Water-Spray Test: Provide water spray quality test of installed curtain wall components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as directed by Architect.

E. Conduct tests in each area prior to 10% of glazing area per building, to be performed at mockup, 35%, 50% and 90% completion.

F. The Contractor is responsible for providing the Field Quality Control and testing as specified, unless otherwise noted. Testing must be performed by a qualified testing and inspection agency and must not self-performed. The Contractor is solely responsible for the cost, schedule, and associated rework if the building enclosure systems are not constructed in accordance with the Contract Documents or do not pass testing.

G. Failed tests are not accepted and require retesting until successful tests are achieved. The Contractor must implement repair(s) that are acceptable to the Architect and the Owner and retest the location to ensure the repair(s) is effective. If remedial repair(s) are not effective, the contractor must provide repairs and retest until the test results are satisfactory.

3.05 ADJUSTING

A. Adjust operating sash for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, take care to remove dirt from corners, and wipe surfaces clean.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulated glass units.

B. Glazing units.

C. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

C. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.

D. Section 08 4313 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

E. Section 08 4413 - Glazed Aluminum Curtain Walls: Glazing provided as part of wall assembly.

F. Section 08 8300 - Mirrors.

G. Section 08 8723 - Security Films.

H. Section 08 8813 - Fire-Rated Glazing.

I. Section 08 8856-Security Glazing.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM C1036 - Standard Specification for Flat Glass; 2021.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.

G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.

I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

K. FTD-SA - Filti Testing and Development Shooter Attack Certification.; Current Edition.

L. GANA (GM) - GANA Glazing Manual; 2022.

M. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.

N. GANA (SM) - GANA Sealant Manual; 2008.

O. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2016).

P. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.

Q. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014, with Errata (2017).

R. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2017.

S. UL 972 - Standard for Burglary Resisting Glazing Material; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data on Insulating Glass Unit, Glazing Unit, and Plastic Film Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Delegated Design: Glass requires delegated design. Coordinate with delegated design efforts specified in fenestration sections.

E. Samples: Submit two samples 4 by 6 inch in size of glass units.

F. Certificate: Certify that products of this section meet or exceed specified requirements.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
   1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
      a. Insulating Glass Certification Council (IGCC).
      b. Safety Glazing Certification Council (SGCC).

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years documented experience and approved by manufacturer.

1.07 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Provide on-site glazing mock-up with the specified glazing components.

C. Locate where directed.

D. Mock-ups may remain as part of the Work.

1.08 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
   1. Oldcastle BuildingEnvelope: www.obe.com.
   2. Viracon, Inc: www.viracon.com/#sle.
   3. Other Fabricators as approved by the Float Glass Manufacturer.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Float Glass Manufacturers:
   1. AGC Glass North America, Inc: www.agcglass.com/#sle.
   2. Guardian Glass, LLC: www.guardianglass.com/#sle.
   3. Pilkington North America Inc: www.pilkington.com/na/#sle.
   4. Saint Gobain North America: www.saint-gobain.com/#sle.
   5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Design Pressure: Calculated in accordance with applicable codes.
   2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   4. Glass thicknesses listed are minimum. Deflection shall be no greater than the thickness of the glass. Final glazing thickness shall comply with all specification reference standards and glazing manufacturer recommendations for span width and height of each installation.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

D. Fully Tempered Safety Glass: Shall meet impact resistance per ANSI Z97.1 - Class A, or 16 CFR 1201 - Category II criteria for safety glazing used in hazardous locations.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
   2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
   3. Fully Tempered Safety Glass: Shall meet impact resistance per ANSI Z97.1 - Class A, or 16 CFR 1201 - Category II criteria for safety glazing used in hazardous locations.
   4. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality - Q3, with color and performance characteristics as indicated.
   5. Thicknesses: Glass thicknesses listed are minimum. Deflection shall be no greater than the thickness of the glass. Final glazing thickness shall comply with all specification reference standards and glazing manufacturer recommendations for span width and height of each installation.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class A or 16 CFR 1201 - Category II impact test requirements.
   2. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch thick, minimum.

2.04 INSULATED GLASS UNITS

A. Manufacturers:
   1. Glass: Any of the manufacturers specified for float glass, unless specifically required by manufacturer's tested assembly.

B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

C. Insulated Glass Unit Construction: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
      a. Spacer Color: Aluminum.
   4. Warm Edge or Thermoplastic Spacers may be used at contractor’s option.
      a. Spacer Color: Black or Gray.
   5. Spacer Color: Aluminum.
   6. Edge Seal:
      a. Dual-Sealed System: Provide polyisobutylene sealant (or thermoplastic in TPS system) as primary seal applied between spacer and glass panes, and silicone sealant as secondary seal applied around perimeter.
      b. Color: Black.
   7. Space between lites filled with air.
   8. Purge interpane space with dry air, hermetically sealed.
   9. Capillary Tubes: Provide tubes from air space for insulating glass units without inert type gas that have a change of altitude greater than 2500 feet between point of fabrication and point of installation to permit pressure equalization of air space.
      a. Capillary Tubes: Tubes to remain open and be of length and material type in accordance with insulating glass fabricator's requirements.

D. Type IGU - Insulated Glass Units:
   1. Applications: Exterior glazing unless otherwise indicated.
   2. Outboard Lite: Heat-strengthened unless fully tempered is required by code, 1/4 inch thick, minimum.
      a. Tint: Basis of Design, Atlantica by Vitro.

3. Inboard Lite: Heat-strengthened unless fully tempered is required by code float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
   b. Coating: Basis of Design, Solarban 70 by Vitro, on #3 surface.
4. Total Thickness: 1 inch.
5. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.28, maximum.
6. Visible Light Transmittance (VLT): 48 percent, minimum.
7. Solar Heat Gain Coefficient (SHGC): 0.28, maximum.
8. Visible Light Reflectance, Outside: 9 percent, maximum.
9. Glazing Method: Dry glazing method, gasket glazing.

E. Type IGSEF - Insulated Glass with applied SEcurity Film
1. Applications: Where indicated on the drawings.
2. Outboard Lite: Heat-strengthened unless fully tempered is required by code float glass, 1/4 inch thick, minimum.
   a. Tint: Basis of Design, Atlantica by Vitro.
3. Inboard Lite: Heat-strengthened unless fully tempered is required by code, 1/4 inch thick, minimum.
   a. Tint: Clear.
   b. Coating: Basis of Design, Solarban 70 by Vitro, on #3 surface.
   c. Provide Security Film as specified in 08 8723-Security Films.
   d. Apply Security Film on #4 surface.
4. Total Thickness: 1 inch.
5. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.28, maximum.
6. Visible Light Transmittance (VLT): 48 percent, minimum.
7. Solar Heat Gain Coefficient (SHGC): 0.28, maximum.
8. Visible Light Reflectance, Outside: 9 percent, maximum.
9. Forced Entry Resistance; Must comply with one of the following multiple impact test:
   a. FTD-SA - Filti Testing and Development Shooter Attack Certification Class 1.
   b. UL 972 tests in compliance with level of burglary and forced-entry resistance indicated; Multiple Impact.
10. Wet Glaze Anchoring System: Structural Silicone Sealant/Adhesive.
    a. Dow Chemical Company; Dowsil 995 Silicone Structural Sealant: www.dow.com.

F. Type IGS - Insulated Glass Spandrel:
1. Applications: Exterior spandrel glazing unless otherwise indicated.
2. Outboard Lite: Heat-strengthened unless fully tempered is required by code float glass, 1/4 inch thick, minimum.
   a. Tint: Same as Type IGU.
3. Inboard Lite: Heat-strengthened unless fully tempered is required by code float glass, 1/4 inch thick.
   a. Tint: Clear.
   b. Opacifier: Ceramic frit, on #4 surface.
   c. Opacifier Color: Match Type IGU.
   d. Coating: Same as Type IGU, on #3 surface.
4. Total Thickness: 1 inch.
5. Glazing Method: Dry glazing method, gasket glazing.

2.05 GLAZING UNITS

A. Type GTC - Glass Tempered Clear:
1. Applications: Interior glazing unless otherwise indicated.
2. Glass Type: Fully tempered float glass.
3. Tint: Clear.

4. Thickness: 1/4 inch, minimum.

B. Type GLSA - Glass Laminated SAfety:
   1. Applications: Locations as indicated on drawings.
   2. Tint: Clear.
   3. Thickness: 1/2 inch, nominal.
      a. Outer Lite: Fully Tempered glass.
      b. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
      c. Inside Lite: Tempered glass.

C. Type GSEF - Glass with applied SEcurity Film:
   1. Applications: Locations as indicated on drawings..
   2. Glass Type: Fully tempered float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, minimum.
   5. Provide Security Film as specified in 08 8723-Security Films.
   6. Apply Security Film to secure side of glass.
   7. Forced Entry Resistance; Must comply with one of the following multiple impact test:
      a. FTD-SA - Filti Testing and Development Shooter Attack Certification Class 1.
      b. UL 972 tests in compliance with level of burglary and forced-entry resistance indicated; Multiple Impact.
   8. Wet Glaze Anchoring System: Structural Silicone Sealant/Adhesive.
      a. Dow Chemical Company; Dowsil 995 Silicone Structural Sealant: www.dow.com.

2.06 GLAZING COMPOUNDS

A. Butyl Sealant: Single component; ASTM C920 Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

B. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

C. Silicone Structural Sealant: Single component; neutral curing; designed specifically for structural bonding applications of glass; color as selected.
   1. Basis of Design: Dow Chemical Company; Dowsil 995 Silicone Structural Sealant: www.dow.com.

2.07 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; color black.

E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 10 2600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

1.02 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2020.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

D. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2014.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Shop Drawings: Include plans, elevation, sections, and attachment details.

D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
   1. Submit two sections of corner guards, 6 inches long.

E. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Protect work from UV light damage.

D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards:
   1. Babcock-Davis: www.babcockdavis.com/#sle.
   2. Construction Specialties, Inc: www.c-sgroup.com/#sle.
   3. Inpro: www.inprocorp.com/#sle.
   4. Koroseal Interior Products: www.koroseal.com/#sle.
   5. Nystrom, Inc: www.nystrom.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance complying with applicable provisions of ASTM D543.

2.03 PRODUCT TYPES

A. Corner Guards - Flush Mounted:
   1. Material: Polyethylene terephthalate (PET or PETG); PVC-free with full height extruded aluminum retainer.
   2. Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.
   3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   4. Width of Wings: 2 inches.
   5. Corner: Radiused.
   6. Color: As selected from manufacturer's standard colors.
   7. Length: One piece.
   8. Preformed end caps.

B. Adhesives and Primers: As recommended by manufacturer.

C. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.

2.04 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

2.05 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that substrate surfaces for adhered items are clean and smooth.

C. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position corner guard 4 inches above finished floor to ceiling or height as indicated on drawings.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.04 CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 14 2400
HYDRAULIC ELEVATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Complete hydraulic elevator systems.
   1. Passenger type without machine room
B. Elevator Maintenance Contract.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Includes elevator pit.
B. Section 04 2000 - Unit Masonry: Masonry hoistway enclosure; building-in and grouting hoistway door frames.
C. Section 05 1200 - Structural Steel Framing: Includes hoistway framing and overhead hoist beams.
D. Section 05 5000 - Metal Fabrications: Includes sill supports, divider beams, and overhead hoist beams.
E. Section 05 5133-Metal Ladders: Includes elevator pit ladders.
F. Section 07 1300 - Sheet Waterproofing: Waterproofing of elevator pit walls and floor.
G. Section 07 8400 - Firestopping: Fire rated sealant in hoistway.
H. Section 08 7100 - Door Hardware: Product requirements for key cylinders and card readers for placement by this section.
I. Section 09 2116.23 - Gypsum Board Shaft Wall Assemblies.
J. Division 21 - Fire Suppression: Fire Sprinkler System in Hoistway
K. Division 22 - Plumbing: Motor for sump pump in pit.
L. Division 26 - Electrical: Conduit and wiring connections.
M. Division 28 - Electronic Safety and Security: Fire detection and alarm systems.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
C. AISC 360 - Specification for Structural Steel Buildings; 2016.
D. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
F. ASME A17.1 - Safety Code for Elevators and Escalators; 2016.
G. ASME A17.2 - Guide for Inspection of Elevators, Escalators, and Moving Walks; 2014.
H. ASME QEI-1 - Standard for the Qualification of Elevator Inspectors; 2024.
I. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
J. ASTM A139/A139M - Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over); 2016.
K. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.
L. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

M. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

N. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021.

O. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

P. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

Q. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

R. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

S. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

T. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.

U. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

V. ITS (DIR) - Directory of Listed Products; current edition.

W. NEMA MG 00001 - Motors and Generators; 2024.

X. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2015, with Errata (2017).

Y. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

Z. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

AA. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate work with other installers to provide conduits necessary for installation of wiring including but not limited to:
      a. Elevator equipment devices remote from elevator machine room or hoistway.
      b. Remote group automatic panel from controller cabinet.
      c. Elevator pit for lighting and sump pump.
      d. Automatic transfer switch from controller cabinet.
      e. Fire alarm panel from controller cabinet.
   2. Coordinate work with other installers for equipment provisions necessary for proper elevator operation, including but not limited to, the following:
      a. Automatic transfer switches with auxiliary contacts for emergency power transfer status indication.
      b. Shunt trip devices for automatic disconnection of elevator power prior to fire suppression system activation.
      c. Overcurrent protection devices selected to achieve required selective coordination.

B. Preinstallation Meeting: Convene manditory meeting at least one week prior to start of this work.
   1. Review schedule of installation submittals including product data and shop drawings which indicate pit dimensions and locations, proper procedures and conditions, and coordination with related work.
   2. Review use of elevator for construction purposes, hours of use, scheduling of use, cleanliness of car, employment of operator, and maintenance of system.

C. Construction Use of Elevator: Provide designated elevator for transport of construction personnel and materials in compliance with ASME A17.1.
   1. Owner to negotiate with manufacturer/installer for construction use of elevator in accordance with terms and conditions of manufacturer's temporary acceptance form.
   2. Make elevator available for construction use as early as possible.
   3. Enclose car with protective plywood on floor, walls, and ceiling.
   4. Provide temporary lighting.
   5. Provide control panel with manual and emergency operation.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on following items:
   1. Signal and operating fixtures, operating panels, and indicators.
   2. Car design, dimensions, layout, and components.
   3. Car and hoistway door and frame details.
   4. Electrical characteristics and connection requirements.

C. Shop Drawings: Include appropriate plans, elevations, sections, diagrams, and details on following items:
   1. Pit dimensions and location, including required clearances.
   2. Elevator Equipment and Machines: Size and location of driving machines, power units, controllers, governors, and other components.
   3. Hoistway Components: Size and location of car guide rails, buffers, jack unit and other components.
   4. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
   5. Clearances and over-travel of car.
   6. Locations in hoistway and machine room of traveling cables and connections for car lighting and telephone.
   7. Location and sizes of hoistway and car doors and frames.
   8. Interface with building security system.
   9. Electrical characteristics and connection requirements.
   10. Indicate arrangement of elevator equipment and allow for clear passage of equipment through access openings.
   11. Sump pit dimensions and location.
   12. Pit ladder and components, dimensions and location.

D. Samples: Submit samples illustrating car interior finishes, car and hoistway door and frame finishes, and handrail material and finish in the form of cut sheets or finish color selection brochures.

E. Testing Agency's Qualification Statement.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G. Operation and Maintenance Data:
   1. Parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
   2. Operation and maintenance manual.
   3. Schematic drawings of equipment and hydraulic piping, and wiring diagrams of installed electrical equipment with list of corresponding symbols to identify markings on machine room and hoistway apparatus.

1.06 QUALITY ASSURANCE

A. Maintain one copy of each quality standard document on site.

B. Designer Qualifications: Design guide rails, brackets, anchors, and machine anchors under direct supervision of a licensed Professional Structural Engineer experienced in design of this type of work and licensed in Texas.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.

D. Installer Qualifications: Trained personnel and supervisor on staff of elevator equipment manufacturer.

E. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

F. Products Requiring Fire Resistance Rating: Listed and classified by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.

G. Products Requiring Electrical Connection: Listed and classified by UL (DIR) or testing agency acceptable to authorities having jurisdiction as suitable for the purpose indicated in construction documents.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty for elevator operating equipment, devices, materials and labor for five years from Date of Final Acceptance.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design - Hydraulic Elevators: Otis Elevator Company, Hydrofit 3500; www.otis.com.

B. Other Acceptable Manufacturers - Hydraulic Elevators:
   1. Schindler Elevator Corporation: www.schindler.com.

C. Substitutions: See Section 01 6000 - Product Requirements.

D. Products other than Basis of Design are subject to compliance with specified requirements and prior approval of Architect. By using products other than Basis of Design, the Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

E. Contractor to coordinate clearances, layout, structural requirements, and infrastructural requirements with selected elevator(s). Dimensions and other information will vary and differ from each elevator product/ model/ manufacturer and may even change when using the basis-of-design product. Do not commence this work, related to foundation work, steel fabrication or other impacted activities until submittals and shop drawings have been produced, coordinated with the other work, and reviewed.

F. Source Limitations: Provide elevator and associated equipment and components produced by a single manufacturer and obtained from a single supplier .

2.02 HYDRAULIC ELEVATORS

A. Hydraulic Passenger Elevator:
   1. Hydraulic Elevator Equipment:
      a. Holeless hydraulic with cylinder mounted within hoistway.
   2. Operation Control Type:
      a. Selective Collective Automatic Operation Control.
   3. Service Control Types:
      a. Standard service control.
      b. Independent service control.
      c. Restricted Access service control.
   4. Interior Car Height: 96 inch. Confirm with elevator manufacturer.

5. Electrical Power: 480 volts; alternating current (AC); three phase; 60 Hz.
6. Freight Car Loading Classification: Class A - General Freight Loading in compliance with ASME A17.1.
7. Rated Net Capacity: 3500 pounds.
8. Rated Speed: 100 to 125 feet per minute.
9. Hoistway Size: As indicated on drawings. Confirm with elevator manufacturer.
10. Interior Car Platform Size: As indicated on drawings. Confirm with elevator manufacturer.
11. Travel Distance: As indicated on drawings.
12. Number of Stops: As indicated on drawings.
13. Hydraulic Equipment Locations:
    a. In Hoistway. No machine room provided.

2.03 COMPONENTS

A. Elevator Equipment:
   1. Motors, Hydraulic Equipment, Controllers, Controls, Buttons, Wiring, Devices, and Indicators: Comply with NFPA 70. Refer to Division 26 for additional information.
   2. Guide Rails, Cables, Buffers, Attachment Brackets and Anchors: Design criteria for components includes safety factors in accordance with applicable requirements of Elevator Code, ASME A17.1.
   3. Buffers:
      a. Spring type for elevators with speed less than or equal to 200 feet per minute.
   4. Lubrication Equipment:
      a. Provide grease fittings for periodic lubrication of bearings.
      b. Grease Cups: Automatic feed type.
      c. Lubrication Points: Visible and easily accessible.
   5. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit located in the elevator hoistway consisting of the following items:
      a. An oil hydraulic pump.
      b. An electric motor.
      c. Electronic oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.
      d. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.
      e. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating - motors shall be capable of 80 starts per hour with a 30% motor run time during each start.
      f. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
         1) Relief valve shall be adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
         2) Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
         3) Check valve shall be designed to close quietly without permitting any perceptible reverse flow.

4) Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
5) Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.

g. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
h. Oil Type: Readily biodegradable that is USDA certified biobased product, ultra low toxicity, readily biodegradable, energy efficient, high performing fluid made from canola oil with antioxidant, anticorrosive, antifoaming, and metal-passivating additives. Especially formulated for operating in environmentally sensitive areas. USDA certified biobased product, 95% bio-based content, per ASTM D6866.

6. A secondary hydraulic power source (powered by 110VAC single phase) must be provided. This is required to be able to raise (reposition) the elevator in the event of a system component failure (i.e. pump motor, starter, etc.)

B. Electrical Equipment:
1. Motors: NEMA MG 1.
2. Boxes, Conduit, Wiring, and Devices: As required by NFPA 70. Refer to Division 26 for additional information.
3. Sump Pump in Pit: Refer to Division 22 for additional information.
4. Spare Conductors: Provide ten percent in extra conductors and two pairs of shielded audio cables in traveling cables.

2.04 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).

B. Accessibility Requirements: Comply with ADA Standards.

C. Perform structural steel design, fabrication, and installation in accordance with AISC 360.

D. Comply with seismic design requirements in accordance with ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).
1. Complying with Elevator Safety Requirements for Seismic Risk Zone in accordance with ASME A17.1, ASCE 7 and other related requirements.
a. Project Seismic Risk: As indicated on drawings.
2. Provide earthquake emergency operations in accordance with ASME A17.1 requirements.

E. Perform welding of steel in accordance with AWS D1.1/D1.1M.

F. Fabricate and install door and frame assemblies in accordance with NFPA 80 and in compliance with requirements of authorities having jurisdiction.

G. Perform electrical work in accordance with NFPA 70.

H. Comply with fire protection sprinkler system of hoistway design in accordance with NFPA 13 requirements and authorities having jurisdiction (AHJ). Refer to Division 21 - Fire Suppression.

2.05 OPERATION CONTROLS

A. Elevator Controls: Provide vandal resistant landing operating panels and landing indicator panels.
1. Landing Operating Panels: Metallic type, one for originating "Up" and one for originating "Down" calls, one button only at terminating landings; with illuminating indicators.
2. Landing Indicator Panels: Illuminating.
3. Comply with ADA Standards for elevator controls.

B. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.

C. Hoistway Access key-switch at top floor in entrance jamb.

D. Hoistway Access key-switch at lowest floor in entrance jamb.

E. Interconnect elevator control system with building security, fire alarm, card access, and smoke alarm systems.

F. Door Operation Controls:
   1. Program door control to open doors automatically when car arrives at floor landing.
   2. Render "Door Close" button inoperative when car is standing at dispatch landing with doors open.
   3. Door Operation: Provide a direct current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. Door movements shall be electrically cushioned at both limits of travel and the door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. Closed-loop, microprocessor controlled motor-driven linear door operator, with adjustable torque limits, also acceptable. AC controlled units with oil checks or other deviations are not acceptable.
      a. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
      b. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
      c. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer will sound. When the obstruction is removed, the door will begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors will stop and resume closing only after the obstruction has been removed.
      d. Limited Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors will reverse and reopen partially. After the obstruction is cleared, the doors will begin to close.
      e. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors will recycle closed then attempt to open six times to try and correct the fault.
      f. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors will recycle open then attempt to close six times to try and correct the fault.
      g. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.
   4. Door Safety:

a. Primary door protection shall consist of a two-dimensional, multi-beam array projecting across the car door opening. Under normal operation and for any door position, the system shall detect as a blockage an opaque object that is equal to or greater than 1.3 inches in diameter when inserted between the car doors at vertical positions from within 1 inch above the sill to 71 inches above the sill. Under degraded conditions (one or more blocked or failed beams), the primary protection shall detect opaque objects that are equal to or greater than 4” in diameter for the same vertical coverage. If the system performance is degraded to the point that the 4” object cannot be detected, the system shall maintain the doors open or permit closing only under nudging force conditions.
b. The secondary protection shall have an anti-nuisance feature which will ignore detection in the secondary zone after continual detection occurs for a significant time period in the secondary zone without corresponding detection in the primary protection zone; i.e. a person/object is in the entryway but does not enter. Normal secondary protection shall be re-enabled whenever a detection occurs in the primary zone.
c. The reaction time of the door detector sub-system shall not exceed 60 milliseconds when both primary and secondary protection capabilities are active; nor 40 milliseconds when the secondary protection is disabled.
d. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

G. Provide microprocessor-based control system with utilizes on-board diagnostics for servicing, trouble-shooting, and adjusting without requiring the use of an outside service tool. If an on-board diagnostic system is not provided, a handheld service tool (or laptop), owner's license, operation manual, and tool instructions must be provided in addition to the control system. System shall be a non-proprietary control system/open protocol. Provide remote elevator monitoring capabilities
1. Locate controller in hoistway or machine room as indicated.

H. Hall Stations
1. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with applicable accessibility standards.
2. All fixtures shall be designed to be VANDAL RESISTANT.
3. Provide keyed operating switch for access at hall stations.

I. Signal Devices and Fixtures
1. Car-Operating Panel: A panel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. Raised markings Braille markings shall be provided for each push-button.
2. Car Fixture Finish:
a. Satin stainless steel
b. Applied car operating panel shall be furnished. It shall contain a bank of round metal mechanical illuminated buttons. Flush mounted to the panel and marked to correspond to the landings served, an emergency call button, door open and door close buttons, and switches for lights, inspection and the exhaust fan. The emergency call button shall be connected to a bell that serves as an emergency signal. All buttons to have raised numerals and Braille markings. Red LED halo illumination with Flat Flush Target finishes: satin stainless steel.
3. Car Position Indicator.
4. A compliant communication device shall be provided which has been designed in response to applicable accessibility requirements integral with the car operating panel.
a. ADA Phone – Code Compliant Cellular Connectivity: See paragraph 2.11.

5. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.
6. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Raised markings shall be provided for each push-button.
7. Fixture Finish: satin stainless steel.
8. Landing Passing Signal: A chime bell shall sound in the car to tell a passenger that the car is either stopping at or passing a floor served by the elevator.

J. Provide "Firefighter's Emergency Operation" in accordance with ASME A17.1, applicable building codes, and authorities having jurisdiction (AHJ).
1. Designated Landing: Main Lobby.

2.06 OPERATION CONTROL TYPE

A. Selective Collective Automatic Operation Control: Applies to car in single elevator shaft.
1. Refer to description provided in ASME A17.1.
2. Automatic operation by means of one button in the car for each landing served and by "UP" and "DOWN" buttons at the landings.
3. Stops are registered by momentary actuation of landing car buttons without consideration of the number of buttons actuated or the sequence buttons are actuated, but the stops are made in the order that landings are reached in each direction of travel.
4. All "UP" landing calls are made when car is traveling in the up direction.
5. All "DOWN" landing calls are made when car is traveling in the down direction.
6. Uppermost and lowermost calls are answered as soon as they are reached without consideration of the car travel direction.

2.07 SERVICE CONTROL TYPE

A. Independent Service Control:
1. Provide key operated "Independent Service" on car operating panel. Activation will remove that car from normal operation and cancel pre-registered car calls.
2. Car will respond to selected floor. Car will not respond to any calls from landing call buttons. Car will only respond to calls placed on the car operating panel. Doors will remain open at last landing requested. Doors will close with a constant pressure on "Door Close" button.
3. Key activation to normal operation will return car to normal operation.

B. Restricted Access Service Control:
1. Landing Call Lock-out: Provide card reader provisions or a key operated switch with spring return with key removable only in "Lock-Out" position in landing control station that performs the following when activated:
a. Restricts or permits landing call registration for that landing.
b. Causes the elevator to not respond to that landing.
2. Allow "Firefighter's Emergency Operation" to take control priority over "Restricted Access Service Control".

2.08 EMERGENCY POWER

A. Set-up elevator operation to run with elevator emergency power supply when the normal building power supply fails, and in compliance with ASME A17.1 requirements.

B. Elevator Emergency Power Supply: Supplied by battery backup; provide elevator system components as required for emergency power characteristics.

C. Emergency Lighting: As selected from manufacturers standard line.

D. Provide operational control circuitry for adapting the change from normal to emergency power.

E. Upon transfer to emergency power, advance one elevator at a time to a pre-selected landing, stop car, open doors, disable operating circuits, and hold in standby condition.

2.09 MATERIALS

A. Steel Cylinder Casing: ASTM A139/A139M, Grade A steel.

B. Rolled Steel Sections, Shapes, Rods: ASTM A36/A36M.

C. Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel), with matte finish.

D. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

E. Stainless Steel Sheet: ASTM A666/A666M, Type 441; No. 4 Brushed finish unless otherwise indicated.

F. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 441.

G. Extruded Aluminum: ASTM B221 (ASTM B221M), natural anodized finish unless otherwise indicated.

H. Aluminum Sheet: ASTM B209 (ASTM B209M), 3105 alloy, O temper.

I. Tempered Glass: 1/4 inch minimum thickness, fully tempered in compliance with ASME A17.1, 16 CFR 1201, ANSI Z97.1, and ASTM C1048 tempered glass requirements.

J. Laminated Glass: 3/8 inch minimum thickness, and in compliance with ASME A17.1, 16 CFR 1201, ANSI Z97.1, and ASTM C1172 laminated glass requirements.

2.10 CAR AND HOISTWAY ENTRANCES

A. Elevator, as indicated on drawings:
   1. Car and Hoistway Entrances, Each Elevator Floor Lobby:
      a. Hoistway Fire Rating: As indicated on drawings.
      b. Elevator Door Fire Rating: As indicated on drawings.
      c. Framed Opening Finish and Material: Brushed stainless steel.
      d. Car Door Material: Stainless steel, with rigid sandwich panel construction.
      e. Hoistway Door Material: Stainless steel, with rigid sandwich panel construction.
      f. Door Operation: As indicated on the drawings.
      g. Door Width: As indicated on drawings.
      h. Door Height: As indicated on drawings.
      i. Sills: Extruded aluminum.

B. Sills/Thresholds: Configure to align with frame return and coordinate with floor finish.

C. Gasketing: Provide acoustic type gasketing at hoistway doors and frames to minimize audible noise due to car activities in the hoistway, and air pressure differential between hoistway and landing floors.

2.11 CAR EQUIPMENT AND MATERIALS

A. Elevator Car:
   1. Car Operating Panel: Provide main; flush-mounted applied face plate, with vandal resistant illuminated call buttons corresponding to floors served with hoistway access, "Door Open/Door Close" buttons, "Door Open" button, "Door Close" button, alarm button, and top of car inspection.
      a. Panel Material: Integral with front return; one per car.
      b. Car Floor Position Indicator: Above door with illuminating position indicators.
      c. Locate alarm button where it is unlikely to be accidentally actuated; not more than 54 inch above car finished floor.

d. Emergency Communications System: Integral phone system provided. ADA Phone – Code Compliant Cellular Connectivity: Contractor shall provide a phone service through a self-contained cellular based VoIP system. This system shall meet code, include a backup battery capable of powering the emergency communication equipment for 4+ hours in the event of a power outage. The solution shall have remote monitoring capability to ensure continuous connectivity with a means of remote troubleshooting. Remote monitoring capability shall include, at a minimum, the ability to monitor connectivity and power supply. Remote monitoring shall be capable of providing local alerts to response personnel when on-site intervention is required.

2. Ventilation: Two speed fan with ventilation per manufacturer standard operation.
3. Subfloor: Underlayment grade, exterior plywood, 5/8" nominal thickness.
4. Flooring: See Schedule of Materials and Colors for required flooring. Adjust recess for flooring material as well as load capacity of car. The flooring contractor must be an approved TDLR Vendor or you must subcontract the flooring through the elevator company. This is required for final elevator inspection with TDLR.
5. Wall Base: Recessed stainless steel, 4 inch high.
6. Front Return Panel: Stainless steel.
7. Side Walls: Stainless steel.
8. Rear Wall: Stainless steel.
9. Hand Rail: Stainless steel, at rear wall. Provide open clearance space 1-1/2 inch (38 mm) wide to face of wall.
   a. Round, Metal Tube: 1-1/2 inch diameter.
   b. Stainless Steel Finish: No. 4 Brushed.
10. Ceiling: Downlight type, metal pans with suspended LED downlights.
    a. Canopy Ceiling: Stainless steel.
11. Provide emergency access panel for egress from car at ceiling.
12. On/Off Light Switch located in car operating panel.

B. Car Accessories:
   1. Certificate Frame: Stainless steel frame glazed with tempered glass, and attached with tamper-proof screws.
   2. Protective Pads: Canvas cover, padded with impact-resistant fill material, sewn with piping edges; fire resistant in compliance with ASME A17.1, covering side and rear walls and front return; provide one set for each elevator.
      a. Color: As selected by Architect.
      b. Provide at least 4 inch clearance from bottom of pad to finished floor.
      c. Pad Supports: Stainless steel studs, and mounted from ceiling frame.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting this work.

B. Verify that hoistway, pit, and machine room are ready for work of this section.

C. Verify hoistway shaft and openings are of correct size and within tolerance.

D. Verify location and size of machine foundation and position of machine foundation bolts.

E. Verify that electrical power is available and of correct characteristics.

F. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Arrange for temporary electrical power for installation work and testing of elevator components, and comply with requirements of Section 01 5000 - Temporary Facilities and Controls.

B. Maintain elevator pit excavation free of water.

3.03 INSTALLATION

A. Proceeding with work associated with the elevator pit, elevator hoistway, and or elevator equipment without appropriately reviewed submittals is at Contractor's own risk.

B. Proceeding with work associated with the elevator pit, elevator hoistway, and or elevator equipment without pre-installation meeting is at Contractor's own risk.

C. Proceeding with work associated with the elevator pit, elevator hoistway, and or elevator equipment without properly notifying Owner and Architect or their representatives with 72 hour minimum notice that work will commence on X date is at Contractor's own risk.

D. Coordinate this work with installation of hoistway wall construction.

E. Install system components, and connect equipment to building utilities.

F. Provide conduit, electrical boxes, wiring, and accessories. Refer to Division 26 for additional information.

G. Install hydraulic piping between cylinder and pump unit.

H. Mount machines, motors, and pumps on vibration and acoustic isolators.
   1. Place on structural supports and bearing plates.
   2. Securely fasten to building supports.
   3. Prevent lateral displacement.

I. Install hoistway, elevator equipment, and components in accordance with approved shop drawings.

J. Install guide rails to allow for thermal expansion and contraction movement of guide rails.

K. Accurately machine and align guide rails, forming smooth joints with machined splice plates.

L. Bolt brackets to self drilling expansion shell anchors.

M. Field Welds: Chip and clean away oxidation and residue with wire brush; spot prime surface with two coats.

N. Install hoistway door sills, frames, and headers in hoistway walls; grout sills in place, set hoistway floor entrances in alignment with car openings, and align plumb with hoistway.

O. Fill hoistway door frames solid with grout in accordance with Section 04 2000.

P. Structural Metal Surfaces: Clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.

Q. Machine Room Components: Clean and degrease; prime one coat, finish with one coat of enamel.

R. Wood Surfaces not Exposed to Public View: Finish with one coat primer; one coat enamel.

S. Adjust equipment for smooth and quiet operation.

3.04 TOLERANCES

A. Guide Rail Alignment: Plumb and parallel to each other in accordance with ASME A17.1 and ASME A17.2.

B. Car Movement on Aligned Guide Rails: Smooth movement, without any objectionable lateral or oscillating movement or vibration.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Testing and inspection by regulatory agencies will be performed at their discretion.
   1. Schedule tests with agencies and notify Owner and Architect.
   2. Obtain permits as required to perform tests.

3. Document regulatory agency tests and inspections in accordance with requirements.
4. Perform tests required by regulatory agencies.
5. Furnish test and approval certificates issued by authorities having jurisdiction.

C. Perform testing and inspection in accordance with requirements.
1. Inspectors shall be certified in accordance with ASME QEI-1.
2. Perform tests as required by ASME A17.2.
3. Provide at least two weeks written notice of date and time of tests and inspections.
4. Supply instruments and execute specific tests.

D. Perform tests in the presence of Owner and Architect.

E. Operational Tests:
1. Perform operational tests in the presence of Owner and Architect.
2. At an agreed time, and the building occupied with normal building traffic, conduct tests to verify performance.
a. Furnish event recording of each landing call registrations, time initiated, and response time throughout entire working day.

3.06 ADJUSTING

A. Adjust for smooth acceleration and deceleration of car to minimize passenger discomfort.

B. Adjust with automatic floor leveling feature at each floor landing to reach 1/4 inch maximum from flush with sill.

3.07 CLEANING

A. Remove protective coverings from finished surfaces.

B. Clean surfaces and components in accordance with manufacturers written instructions.

3.08 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

C. Demonstrate proper operation of equipment to Owner's designated representative.

D. Demonstration: Demonstrate operation of system to Owner's personnel.
1. Use operation and maintenance data as reference during demonstration.
2. Conduct walking tour of project.
3. Briefly describe function, operation, cleaning and maintenance of each component.

E. Training: Train Owner's personnel on cleaning and operation and maintenance of system.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.
3. Instructor: Manufacturer's training personnel.
4. Location: At project site, unless noted otherwise.

3.09 PROTECTION

A. Do not permit construction traffic within car after cleaning.

B. Protect installed products until Date of Substantial Completion.

C. Touch-up, repair, or replace damaged products and materials prior to Date of Substantial Completion.

3.10 MAINTENANCE

A. Refer to Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to initial maintenance service.

B. Provide Initial Maintenance Contract of elevator system and components in accordance with ASME A17.1 and requirements as indicated for 12 months from Date of Substantial Completion.

C. Perform maintenance contract services using competent and qualified personnel under the supervision and direct employ of the elevator manufacturer or original installer.

D. Maintenance contract services shall not be assigned or transferred to any agent or other entity without prior written consent of Owner.

E. Examine system components periodically.

F. Include systematic examination, adjustment, and lubrication of elevator equipment.

G. Maintain and repair or replace parts, whenever required, using parts produced by original equipment manufacturer.

H. Perform work without removing cars from use during peak traffic periods.

I. Provide emergency call back service during regular working hours throughout period of this maintenance contract.

J. Maintain an adequate stock of parts for replacement or emergency purposes, and have personnel available to ensure the fulfillment of this maintenance contract without unreasonable loss of time.

END OF SECTION

SECTION 11 6162

THEATRICAL LIGHTING SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Provision of the Theatrical Lighting Systems at the Tomball ISD Tomball Intermediate School

1.02 RELATED DOCUMENTS

A. Theatre Lighting Systems Drawings (“TL” Series) and general provisions of the contract including general and supplementary conditions and Division 1 Specification sections apply to this section.

B. Section 11 6133: Theatrical Rigging Systems, drawings, and documentation.

C. Section 27 4116: Audio Video Systems and Equipment, drawings, and documentation.

D. Division 26: Electrical Work drawings and documentation.

1.03 SECTION INCLUDES

A. Project instructions for the Contractor and System description details.

B. System product descriptions.

C. Project completion instructions for the Contractor.

1.04 RESPONSIBILITY AND RELATED WORK

A. Coordination, supply, installation, shipping, storage, inspection, commissioning, testing, instruction and warranties of the Theatrical Lighting Systems.

B. Plant, materials, equipment, transport and labor necessary to accomplish this and have a complete and fully functioning System.

C. Also includes:

1. Required licenses and permits including payment of charges and fees.
2. Verification of dimensions and conditions at the job site.
3. Provision of submissions.
4. Installation in accordance with the Contract Documents, Manufacturer's recommendation, and in conformity with applicable codes and authority having jurisdiction.
5. Extension of electrical service, including ground, to equipment locations.

D. The drawings included with this specification convey general system concepts. Where the plans do not show complete and accurate building details, the Contractor is responsible for making field measurements necessary to establish exact locations, relationships, and load capacities necessary for the installation of these systems.

E. Coordinate the work with the related documents and the scheduled work of other trades.

F. Conduit infrastructure system, including wire for AC Power and grounding for the Theatrical Lighting Systems, are provided as part of the Contract. Coordination between different disciplines is required to achieve a proper conduit system installation and power provisions for Theatrical Lighting Systems. All electrical installation shall be in accordance with Division 26.

G. Supply accessories and minor equipment items needed for a complete and fully operational system, even if not specifically mentioned in these Specifications or on the associated Drawings, without claim for additional payment.

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H. Notify the Architect of any discrepancies in part numbers or quantities before bid. Failing to provide such notification requires the Contractor to supply items and quantities according to the intent of the Specifications and associated Drawings without claim for additional payment.

I. Specifications and drawings are complementary. Work called for by one is binding as if called for by both. Any discrepancies between specifications and drawings shall be brought to the attention of the Architect for clarification during the bidding period. No allowance shall subsequently be made to the Contractor by reason of their failure to have brought said discrepancies to the attention of the Architect.

J. Execute all work in accordance with the NEC and all applicable State and Local codes, ordinances, and regulations.

K. If a conflict develops between the Contract Documents and the appropriate codes and is reported to the Architect prior to bid opening, the Architect will prepare the necessary clarification. Where a conflict is reported after contract award, propose a resolution of the conflict and, upon approval, perform work.

1.05 REFERENCES

A. Published specification standards, tests or recommended methods of trade, industry or governmental organizations apply to Work in this section where cited below:

1. American National Standards Institute (ANSI)
2. American Society of Testing and Materials (ASTM)
3. Electronics Industries Association (EIA)
4. Institute of Electrical and Electronic Engineers (IEEE)
5. National Electrical Manufacturer’s Association (NEMA)
6. National Electrical Code (NEC)
7. National Fire Protection Association (NFPA)
8. Underwriters Laboratories (UL)
9. Occupational Safety and Health Administration (OSHA)
10. Entertainment Services and Technology Association (ESTA)
11. United States Institute of Theater Technology (USITT)
12. Illuminating Engineering Society (IES)

1.06 DEFINITIONS

A. In addition to Division 1 definitions, the following list of terms as used in this Section shall be defined as:

1. Owner – Tomball ISD
2. Project – Intermediate School Replacement
3. Consultant(s) – The Owner’s Technical Representative(s) for this Section
4. Architect – Huckabee
5. Contractor – The provider of all material, labor, and equipment necessary for the systems described in this Section
6. Furnish/Supply – To purchase, procure, acquire, and deliver complete with all necessary accessories (CWANA)
7. Install – To set in place, join, attach, link, set up or otherwise connect together and test until complete before turning over to the Owner, all parts, item, or equipment supplied by the contractor.
8. Provide – To furnish and install

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1.07 DESCRIPTIONS AND REQUIREMENTS

A. Lighting and Control System – Platform

1. The new Platform lighting system shall be comprised of a DMX/eDMX control system communicating with the distributed power system and DMX/eDMX devices to control all lighting elements within the performance space.
2. The lighting control console shall be located at the back-of-house or at the platform. Console shall operate directly over the lighting control network.
3. The relay panel and the control distribution panel (CDP) shall be in a nearby electrical room. The control distribution panel will contain all network and DMX interface control components.
4. Switched power shall be distributed throughout the Platform and Dining Area in recessed wall mounted, pipe mounted, batten mounted, and structure mounted devices.
5. Network and DMX control shall be distributed throughout the Platform and Dining Area through a series of plug in ports.
6. Architectural Lighting system shall be capable of supporting the same DMX values as the control console so that looks may be snapshotted then recalled through architectural station presets. This will include control of switched theatrical lighting circuits and DMX-controlled performance fixtures.
7. Architectural lighting control touch panel shall be located on stage left.
8. Provide theatrical lighting fixtures and required accessories. Installation is required under this base specification and shall include:
9. Hang and rough focus to the Owner’s selected hanging plot.
10. Set-up, addressing and patch.
11. Verification of proper operation and associated training.

B. Focus

1. Contractor will hang, focus, and program lights to a Consultant-directed plot
2. The Owner may elect to generate their own plot. If not, the Consultant will provide this documentation.
3. If the Contractor finds any needed updates or changes before hang begins the Consultant or Owner will update the documents as needed.
4. The Contractor is responsible for tracking and updating all changes to the plot after it has been turned over for installation. These updates and changes may be provided to the Consultant as necessary. However, the Contractor is responsible for these updates and may be provided the plot in an editable format to make the updates.
5. The Consultant produced plot will provide the following information if applicable for each fixture:
    a. Location
    b. Unit number for that location
    c. Type
    d. Area/purpose
    e. Mode
    f. Fixture universe/address
6. As part of turnover documents, the Contractor will be required to ensure the following are provided:

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a. An electronic version of the plot. Provided on a flash drive and preserved by the Contractor for at least the length of the warranty.
b. A B-sized version of the plot mounted to foamcore-like material.
c. All of the information listed above in number 5 and additionally all circuiting of fixtures.

7. As part of the final observation and testing (3.5) Consultant will verify the focus. The Contractor may elect to complete the focus before the final observation and make any changes noted by the Consultant at this time. If the Contractor elects to have the Consultant direct focus as part of final observation the following shall be provided:
   a. At least (10) days notice
   b. A board operator
   c. At least (2) people to perform the focus
   d. All required lifts and safety equipment
   e. A focus target. Person or figure
   f. Person or system to document any changes that arise as part of the focus

C. Console Programming
1. The Contractor shall create a starting show file for the project. The file will be loaded onto the console, provided to the Owner on a flash drive, and preserved by the Contractor for at least the length of the warranty. The Contractor will provide the starting show file to the Owner, if requested, following the requirements laid out in the warranty portion (1.14) of this specification and shall be considered a service call.
2. Owner may select to add, update, or change any of the information below. These changes may be directed before, during, or after initial training. The Contractor will make any requested changes provided any amount of training time is left in the project as outlined in the instruction of Owner personnel of this specification (3.6).
3. At the Owner's request program any fixture, color, or controllable attribute to provided faders.
4. Ensure all areas outlined in the console programming portion of this specification are covered as part of the instruction of Owner personnel of this specification (3.6).
5. Using the provided plot, the Contractor shall create the following console programming at a minimum, if applicable:
   a. Patching
   b. Patch all fixtures to channel numbers outlined in the plot.
6. Groups
   a. (1) group for every area of the plot.
   b. (1) group for every "row" of front lights
   c. (1) group for every "row" of front lights from the left
   d. (1) group for every "row" of front lights from the right
   e. (1) group for every "row" of top lights
   f. (1) group for every "row" of backlights
7. Palettes
   a. Intensity
      1) Provide a 70% intensity for use in creating cues
   b. Color

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1) Provide warm (R02) and cool (R3202 or R60) for ease of selection.
2) Provide a red (R27), green (R90), and blue (R80) for use on cyclorama fixtures
3) A warm white. Roughly 3200K

8. Interactive Control Display (Magic Sheet)
   a. Provide an interactive control display to aid in programming and console use
   b. The interactive display shall utilize a combination of standard and user-defined symbols to generate a fixture layout which copies the light plot as closely as reasonably possible.
   c. Selectable fixtures will, at a minimum, indicate the following parameters or palettes and their current states:
      1) Fixture type
      2) Channel
      3) Intensity
      4) Color
      5) Focus
   d. Provide controls for all groups as described above

1.08 QUALITY ASSURANCE

A. Contractor’s Qualifications: Firm experienced in the provision of systems similar in complexity to those required for this project; and meet the following:
   1. No less than five (5) years of experience with equipment and systems of the specified types.
   2. Experience with at least five (5) comparable scale projects within the last two (2) years.
   3. Engage the services of a Manufacturer certified technician.
   4. Be a franchised dealer and service facility for the manufacturer’s products furnished.
   5. Maintain a fully staffed and equipped service facility.
   6. At the request of the Architect, demonstrate that:
      a. Adequate plant and equipment are available to complete the work.
      b. Adequate staff with commensurate technical experience is available.

B. Manufacturer's Qualifications:
   1. No less than five (5) years continuous experience in the production of specified type of product.
   2. Production shall meet applicable NEMA standards.

1.09 SUBMITTALS:

A. Provide submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures section unless otherwise indicated.

B. The submittal information required by the specification is to be presented complete and as submissions noted below. Submittals are a crucial and integral part of the construction process; as such the Owner's consultant will not recommend payment to the Contractor above 25% of the scheduled value of this work until all submittal information has been approved.

C. Submittals must be original work produced by the firm responsible for performing the work defined in this specification. Scanning, photographic copying, materially copying, or any other reproducing the contents of the drawings or specifications contained within the Contract Documents will be marked as unacceptable and not reviewed for any content. No claim shall

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be made for delay, undue burden, or additional costs for the effort to produce shop drawings, schedules, and equipment lists addressing this specification or the overall project manual.

D. Project Submittal Part 1:
   1. Provide for approval not later than thirty (30) days after issuance of Notice to Proceed and prior to commencement of Work:
      a. Section 1: A complete schedule of submittals.
      b. Section 2: A chronological schedule of Work in bar chart form. Revise and resubmit schedule as required to reflect construction progress.

E. Project Submittal Part 2:
   1. Provide for approval no later than sixty (60) days after issuance of Notice to Proceed and in accordance with previously submitted submittal schedule.
   2. Products:
      a. Section 1: Complete list of products to be incorporated within the Work (Bill of Materials).
      b. Section 2: Manufacturer's data sheets for each product.
         1) Provide original manufacturer's data sheets in order as they appear in the specification.
         2) Data sheets are required for each product in sufficient detail to evaluate product suitability for incorporation within the Work.
         3) Product literature shall include documentation of UL Listing or approved recognition by a Nationally Recognized Testing Laboratory (NRTL).
      c. Section 3: Provide Architect and/or Architect's Consultant with samples of wall plate materials and colors as specified in this section.
      d. Section 4: Submit Safety Data Sheets (SDS) for each potentially hazardous material prior to use. Include information pertaining to the hazardous material with the SDS.
   3. Drawings:
      a. Provide computer software generated drawings using standard industry graphic standards. Hand or poorly drawn documents will not be accepted. All drawings shall be created on a computer aided drafting (CAD) system. Electronic files of theatrical lighting contract documents shall not be distributed for use in generating submittal documents with the exception of Architectural backgrounds.
      b. Schematic Drawings.
         1) Provide drawings detailing cabling-riser intent.
         2) Give each component a unique designator and use this designator consistently throughout the project.
         3) Include inter- and intra-component connections and cabling diagram depicting cable types, designators, and color codes.
      c. Installation Drawings.
         1) Provide drawings showing the coordinated locations of all installed equipment. Drawings shall include floorplans and other views as necessary to fully describe the intended finished conditions.
         2) Provide Conduit and Electrical Drawings indicating:
            a) Conduit sizing/routing for each system component,
            b) Locations where power is required along with the location of all junction boxes.

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3) Detail Drawings: Provide drawings showing special details depicting methods and means specific to each product, assembly and each product Manufacturer's recommended installation methods and means.

d. Equipment Drawings:

1) Rack and Panel Elevations: Provide a front elevation of all racks and/or panels.

2) Rack and Panel Assembly Details: Provide drawings showing location of equipment in racks with dimensions; wire routing and cabling within housings; AC power outlet and terminal strip locations.

3) Custom Enclosures and Millwork Drawings: Provide full fabrication detail drawings indicating size, material, finish, and openings for equipment.

4) Fabricated Plates and Panels Drawings: Provide complete drawings of custom fabricated plates or panels. Drawings to include dimensioned locations of components, component types, engraving information, plate material and color, and bill of material.

e. Schedule Drawings: Provide load schedules noting source and destination of wiring and associated connected load.

f. Labeling Drawing: Provide representative equipment and cabling labeling scheme. Include font sizes and styles, explanation of scheme, and descriptor and designator schedule.

g. General Detail Drawings: Provide detail drawings depicting any unique installation methods specific to each product.

h. Control Screen Templates: Provide layout drawings and/or screenshots for master house lighting stations and similar electronic control surfaces.

4. Any other pertinent data generated which is necessary to provide the Work.

F. Submittal Format:

1. Electronic (PDF) submittal documents are required for review.
2. Provide each submittal with a unique number and each shall be numbered in consecutive order.
3. Submittals shall not be issued with other disciplines.
4. Provide each submittal with a complete table of contents with the following information:

a. Project Name

b. Submittal number. In the case of a resubmittal, use the original submittal number immediately followed by the suffix "R" immediately followed by a unique number and shall be numbered in consecutive order.

c. Date of submission.

d. Referenced specification Section, Part, Article, Paragraph, and page number or drawing reference as applicable.

5. Follow list by Manufacturer's data sheets, arranged as in Part 2 of this specification. If a data sheet shows more than one product, indicate the model being proposed with an arrow or other appropriate symbol.
6. Drawings executed at an appropriate scale, but not smaller than 1/8" = 1'-0".

G. Resubmission Requirements:

1. Make any requested corrections or change in submittals required. Resubmit for review as directed.
2. Indicate any changes that have been made other than those requested.

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3. Approval of Submittals: Each submittal package will be returned with one of the following stamps:
    a. “No Exceptions Taken” proceed with construction; all job site coordination will be at the direction of the General Contractor.
    b. “Make Corrections Noted: No Resubmission Required” submittals have been returned with conditional approval. Corrections, as indicated on the returned drawings and/or specifications, must be made before construction can begin.
    c. “Make Corrections Noted: Submit Only Corrected Pages/Items” submittals have been returned with conditional approval. Corrections, as indicated on the returned drawings and/or specifications, must be made in writing and returned to the consultant before construction can begin.
    d. “REJECTED, Submit Specified Item” a specified item in the submittal has been rejected for the reasons noted. Re-submit in compliance with the specifications.
    e. “REJECTED, Revise and Re-submit” submittal has been rejected for the reasons noted. Re-submit in compliance with the specifications.
    f. “No Review Action Required” all information provided was for information or coordination purposes only. Review is not required.
4. Any of the above stamps may also carry a “PARTIAL” stamp. This indicates that required information noted in the section above was not provided. Omitted items may be noted as part of the reviewed submittal, but it is the Contractor’s responsibility to verify all required submittal documentation.

1.10 PROJECT RECORD MANUAL

A. Provide electronic copies of the project record documents or as required per the General Conditions of the Project.

B. The Project Record Manual shall be segregated into three separate bindings as follows:
1. As-Built Record Documents:
    a. Product Data:
        1) List of all products incorporated in the Project inclusive of all substitutions, field changes, or revisions The list shall include Manufacturer’s serial numbers.
        2) Manufacturer's data for each type of product conforming to the scheme above.
        3) Organize and bind the above in specification order.
    b. Record drawings: Final rendition of project drawings enumerated in the Submittal section above. Provide editable computer software generated drawings using standard industry graphic standards. Hand or poorly drawn documents will not be accepted. All drawings shall be created on a computer aided drafting (CAD) system, in both a DWG and PDF file format.
    c. Test Reports: Record findings of systems testing described in Part 3 below.
2. Operations Manual
    a. System Operation and Instructions: Prepare a complete and typical procedure for the operation of the equipment as a system, organized by subsystem or activity.
        1) This procedure should describe the operation of all system capabilities.
        2) Assume the intended reader of the manual to be technically experienced but unfamiliar with the components and the facility.
3. Service & Maintenance Manual:

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a. Provide an original copy of the service manual on every piece of equipment for which the Manufacturer offers a service manual. Arrange manuals in the same order as the operations manual.

b. Manufacturer’s maintenance and care instructions.

c. Maintenance Instructions: include maintenance phone number(s) and hours, maintenance schedule, description of products recommended or provided for maintenance purposes, and instructions for the proper use of these products.

4. Warranty Manual:

a. Manufacturer's warranty statements on each product.

b. Date of substantial completion and ending dates for warranties for each group of products.

c. Software registration and licenses.

5. Include any other pertinent data generated during the Project or required for future service.

6. Appropriately duplicate data within the separate bindings when it will reasonably clarify procedures, e.g., operational data in maintenance binding.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Products shall ship and be stored in their original container to prevent damaging or entrance of foreign matter.

B. Provide protective covering during construction to prevent damaging or entrance of foreign matter.

C. Replace, at no expense to Owner, product damaged during storage, handling, or the course of construction.

1.12 PROJECT CONDITIONS

A. Verify conditions on the job site applicable to this work. Notify Architect in writing of discrepancies, conflicts, or omissions promptly upon discovery.

B. The Drawings diagrammatically show cabling and arrangements of equipment fitting the space available without interference. If conditions exist which make it impossible to install work as shown, recommend solutions and/or submit drawings to the Architect for approval, showing how the work may be installed.

1.13 FINAL TESTING AND OBSERVATION

A. Upon completion of installation and initial tests and adjustments specified in Part 3, acceptance testing shall be performed by the Consultant.

B. The process of acceptance testing the System may necessitate moving and adjusting certain component parts; perform such adjustments without claim for additional payment.

1.14 WARRANTY

A. Warrant labor and product for two (2) years following the date of substantial completion to be free of defects and deficiencies and to conform to the drawings and specifications as to kind, quality, function, and characteristics. Repair or replace defects occurring in labor or product within the Warranty period without charge. Any cost associated with this warranty repair is the responsibility of the Contractor.

B. This warranty is in addition to any specific warranties issued by Manufacturers for greater periods of time.

C. Within the warranty period, answer service calls within twenty-four (24) hours during normal working hours and correct the deficiency within forty-eight (48) hours.

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D. During the warranty period, the Manufacturer shall provide a toll-free 24-hour-per-day number for telephone technical support and service request. If callback is required, calls shall be answered within thirty (30) minutes.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Model numbers and manufacturers included in this specification are listed to establish a standard of product function, performance, and quality. Products or manufacturers listed herein are listed in no particular order or preference.

B. Refer to General and Supplementary Conditions and Division 1 Specification Sections for equipment substitution procedure. Substitution of any equipment within this specification shall require review and approval by WJHW.

C. Substitution of specified products with other qualified manufacturers and products will be considered providing:

1. A request for substitution of each specific product must be made in writing by a bidding Contractor not less than ten (10) business days prior to bid for written approval of the Architect.
2. Sufficient data of the products is presented for prior approval including technical data, manufacturer's specifications, samples, and, if requested, results of independent testing laboratory tests.
3. Written permission is obtained for the substitution from the Owner or Owner's Representative.

D. Providing product not specifically specified without prior written approval by the Owner, Architect, and/or Architect's Consultant shall not be accepted.

2.02 GENERAL

A. Products shall be new, free from defects and listed by an NRTL when an applicable NRTL Standard exists. Provide product of a given type from one manufacturer.

B. Provide product of a given type from one manufacturer.

C. Regardless of the length or completeness of the descriptive paragraph herein, provide product complying with the specified manufacturers' published specifications.

2.03 CABLING AND ACCESSORIES

A. All cable shall be compliant with NEC and NRTL listed. Any NRTL listing must be available at the time of bid.

B. All electrical conductors installed under this contract, except where otherwise specified, shall be soft drawn annealed stranded copper having a conductivity of not less than 98% of pure copper, and meet appropriate ratings (e.g., CMR, CMP, etc.)

C. Cable shall carry appropriate fire rating (e.g., CMR, CMP, OFNR, OFNP, etc.) on jacket of cable.

D. Where cables are routed through cable tray, provide tray rated cable of equal specification.

E. Where cables are run exposed through a return air plenum, provide plenum rated cable of equal specification.

F. Shielded cables located in raceways shall have aluminum foil shield with drain wire.

G. The Belden cables listed below are approved for use on this project and are listed to set the acceptable standard of performance. If field conditions or actual cable pathway requires tray or plenum cable, provide version of cable that meets required rating. Cables from Carol,

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Liberty, and West Penn are also acceptable provided they meet the performance specifications of the approved listed cables.

H. DMX512 (E-DMX) distribution cable:
   1. Provide 24 AWG four twisted pair data cable.
   2. Pair Color Code Chart:
      a. 1 – White/Blue Stripe and Blue
      b. 2 – White/Orange Stripe and Orange
      c. 3 – White/Green Stripe and Green
      d. 4 – White/Brown Stripe and Brown
   3. Insulation: Polyolefin
   4. Inner/Outer Jacket Material: PVC – Polyvinyl Chloride
   5. Nominal Impedance: 100 ohms.
   6. Nominal Velocity of Prop.: 72%
   7. Capacitance between conductors: 15.0 pF/ft.
   8. Acceptable product:
      a. Belden 1583A (Category 5E).

I. DMX512 (E-DMX) distribution cable – Stage Electric Drops:
   1. Provide extra rugged, flexible control cable (Ethernet) for connection of NET outlets on grid to electric batten distribution.
   2. Cable to be four-pair, double shielded, low-capacitance.
   3. Conductors: 26 AWG tinned, annealed copper stranded 7 x 0.16.
   4. Connector: Provide with EtherCon connector by Neutrik®.
   5. Assembly: pairs cabled with Kevlar strength member.
   6. Shield: (inner) aluminum/Mylar, 100% coverage (outer) tinned copper braid, 80% coverage.
   7. Conductivity: 15ohms per 100 meters @ 20C.
   8. Impedance: 100 ± 15 ohms 1-100MHz.
   9. Acceptable product:
      a. TMB & Associates ProPlex or equivalent.

J. DMX512 Backup Control Signal Distribution Cable:
   1. Provide 24 AWG two twisted pair cable.
   2. Insulation: Foam polyethylene.
   3. Shield: aluminum foil/polyester tape.
   4. Capacitance between conductors: 12.5 pF/ft.
   5. Acceptable product:
      a. Belden 9729

K. Architectural Lighting DMX Cable:
   1. Provide 24 AWG two twisted pair cable.
   2. Insulation: Foam polyethylene.
   3. Shield: aluminum foil/polyester tape.
   4. Capacitance between conductors: 12.5 pF/ft.

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5. Acceptable product:
    a. Belden 9842

L. Preset Station Signal Distribution Cable:
1. Provide 16 AWG single twisted pair cable.
2. Insulation: PVC-polyvinyl chloride.
3. Shield: unshielded.
4. Capacitance between conductors: 33 pF/ft.
5. Acceptable product:
    a. Belden 8471

M. Multi-Conductor SO Type Cable:
1. Provide multi-conductor cable with black neoprene jacket.
2. Conductivity: not less than 98%.
3. Conductor: soft drawn annealed stranded copper.
4. Minimum Conductor Temperature: 90° C.
5. Size: No. 12 AWG minimum.
6. No. of Conductors: As required by circuits shown.
7. Acceptable product:
    a. Cole Wire & Cable
    b. Carol
    c. Rome

2.04 POWER DISTRIBUTION

A. Mini Relay Panel (RP)
1. Provide a small-format DMX controlled relay panel for load circuit distribution as described on the drawings.
2. Mechanical
    a. Panel shall be constructed of 16AWG steel and finished in a black fine-texture powder paint.
    b. Panel shall support wall and ceiling mounting, including installation in plenum air return spaces.
    c. A removable dead front cover shall be mechanically fastened using four screws.
    d. An internal safety cover made of 16AWG steel shall prevent access to all line voltage (Class 1) wiring and components without limiting access to low voltage terminations, changing settings during commissioning, or manual control of relays.
3. Functionality
    a. Panel shall be available in both (4) and (8) zone configurations with a 20A, fully–rated, relay output and 0-10V dimming output per zone.
    b. Panel shall be UL924 LISTED for emergency lighting circuits and shall activate only the selected outputs. Excluded loads shall be shed and not output during emergency conditions
    c. Panel shall support onboard configuration without the use of software.
    d. Panel shall support a contact input for use in UL 924 Emergency Systems
    e. A dry contact input shall provide triggering of an emergency condition

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f. A three-position switch shall set the input as Normally Open (NO) Normally Closed (NC), or Off.

g. Panels shall be configurable via ANSI E1.20 Remote Device Management (RDM). RDM parameters shall include: Panels that are not configurable over RDM shall not be acceptable.

4. Electrical

a. Power Input shall support 120-277 Volts AC 47-63Hz for control electronics and for each independent zone.

b. Panel shall provide a 20A, fully rated, normally open relay for each output rated for lighting and plug load use.

c. A 0-10V dimming output per zone shall support 0-10V sink control rated for 100mA per output.

d. 0-10V wiring shall be fully isolated from ground within the Panel.

e. Panel shall support Class 2, ANSI E1.11-2008, USITT DMX512A control communications

f. Panel shall provide a DMX512A wiring connection using terminal blocks for #24 AWG wire

g. Panel shall be designed and tested to withstand discharges up to 15,000 volts (IEC 801-2) without impairment of performance.

h. Panel shall provide a three-position terminal for power input to the control electronics. The control power input shall accept 6-14AWG wire and be clearly marked Line, Neutral and Earth Ground

i. Each relay shall provide three screw terminals for line voltage power connection. Each terminal shall accept 6-14awg wire and be clearly labeled Input, Output and Thru.

j. Panel shall support 0-10V dimming control via two 16-26AWG terminals for 0-10V+ and 0-10V common wiring connections.

5. Quantity: As shown in drawings.

6. Acceptable product:

a. ETC Foundry Mini Panel: UFMP4

B. Distribution Wiring Devices

1. General

a. All power distribution devices overall assembly shall be listed by a nationally recognized test lab.

b. All dimmed circuit connectors shall be 20A grounded stage pin type. All switched circuits connectors shall be 20A NEMA L5-20 twist-lock type. All connector types provided shall be of a single manufacture.

c. All pigtails shall be three-wire type “SOW” rubber jackets cable. All pigtails to be provided with proper strain relief.

d. All power distribution devices shall be fabricated from minimum 18-gauge galvanized steel and finished in black fine-textured powder coat paint unless noted otherwise. Boxes shall be free from burrs, sharp corner, and overhanging edges.

e. Circuits for Raceways and Plugging Boxes shall be labelled with 2” yellow on black Brady numbers. Numbers shall be located so that they are not obscured by cabling. Circuits shall be assigned and labelled per schedules on drawings

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f. Circuits for Wall Boxes and Floor Pockets shall be labelled with 1” yellow on black Brady numbers. Numbers shall be located so that they are not obscured by cabling. Circuits shall be assigned and labelled per schedules on drawings. As a rule, circuits shall number Stage Left to Stage Right, Down stage to Upstage.

g. All power distribution devices shall be provided with appropriate mounting hardware.

h. All multi-conductor cable is to be provided with Kellems-type strain relief grips at each end of the cables with intermediate strain relief as required.

i. Provide connector strips, gridiron junction boxes (GIJB), and associated hardware for over the stage lighting. Coordinate connector strip lengths for electrics with the theatrical rigging equipment. Provide all multi-conductor cables allowing the devices to fly to a low trim as indicated on the TR sheets. The cable is to be provided with necessary cable strain relief grips as part of the cable management system. Provide rugged network control cables to parallel the multi-conductor cable runs. Verify all electrical circuits and label all circuit numbers as specified.

2. Pipe Mounted Boxes (PB)

a. Provide a plug box designed for pipe mounting.

b. Construction: code gauge steel.

c. Provide in white finish if located downstage of main drape.

d. Provide in black finish if located upstage of the main drape.

e. Connectors: female 20A NEMA L5-20 twist-lock connectors on the end of each of the pigtails and flush mounted 20A NEMA 5-15 Parallel Blade Edison receptacles for convenience circuits.

f. Circuits: number of circuits as specified on drawings.

g. Labeling: circuits are labeled with yellow letters on black background.

h. Overall assembly UL listed.

i. Quantity: As shown in drawings.

j. Acceptable product:

1) Altman 450 series

2) ETC 9300 series

3) SSRC PM series

2.05 CONTROL EQUIPMENT

A. Control Distribution Panel (CDP)

1. Provide wall-mounted unit to house components within as described on the drawings

2. Provide a low profile, wall mounted NEMA 1 enclosure constructed of 16 gauge steel.

3. Enclosure shall have a hinged, locking door of same construction.

4. Enclosure shall be properly vented to maintain acceptable equipment operating temperature.

5. Enclosure shall be sized to house all necessary components for the lighting control network.

6. Provide an integrated rack rail system to accommodate adjustable and easy mounting of network components.

7. Rails shall be constructed of 11 gauge steel with tapped 10-32 mounting holes in universal EIA spacing.

8. Enclosure shall have cable management features including pass-through on back pan, sufficient cable tie points and knockouts on top, bottom and sides.

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9. Enclosure shall have a powder coat finish. Color per Manufacturer's standard.
10. Enclosure shall be UL listed.
11. Quantity and details: As shown on drawings
12. Acceptable product:
    a. ETC DIN14 or DIN28 Enclosure

B. UPS Backup Power / Surge Protection
1. Provide a DIN rail mountable UPS backup to support equipment located in the control distribution panel (provide with one (1) spare battery).
2. Output Power Capacity: 500VA/120V
3. Input 120V/ Output 120V
4. Interface Port: DB-9 RS-232
5. Extended runtime model
6. Rack Height: 2 Units
7. Filtering: Full time multi-pole noise - filtering: 0.3% IEEE surge let-through: zero clamping response time: meets UL 1449
8. The UPS shall be provided by the lighting control system manufacturer.
9. Quantity: As shown in drawings.
10. Acceptable product:
    a. APC
    b. Tripp Lite
    c. Middle Atlantic
    d. Eaton

C. Control Components
1. Ethernet Switches (ESW)
    a. Provide business grade Gigabit PoE+, Layer 2 managed Ethernet switches in the CDR as shown in the TL series documents.
    b. Switch shall include 24 POE+ ports meeting IEEE802.3at standard
    c. Switch shall include port routing via separate VLAN subnets
    d. Switch shall be equipped with LED indicators for power status, port status, bandwidth utilization, collision detection and speed indication.
    e. Switch shall have a built-in web-based management interface to provide easy to use management through a standard browser. Provide with all required software management tools.
    f. Provide DIN rail mount kit and required hardware and cables for stacking.
    g. Each network location shall have a dedicated input point on the network switch. Dedicated input points shall be clearly labeled to identify connected network device at the patch panel. Patching shall not be required.
    h. Ethernet switch shall be tested and approved by Lighting Control System Manufacturer for compatibility with all connected devices.
    i. Quantity: As required by design
2. Network Node/Gateway (GTWY)
    a. Provide DIN rail-mounted DMX Ethernet node/Gateway to generate DMX to devices located at theatrical and house architectural lighting positions

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b. Nodes shall have (4) screw terminal or 5-pin DMX connectors for a total of 4 DMX universes for distribution over the Ethernet system.
c. DMX Node shall have LEDs for indication of power, network activity, and DMX port configuration.
d. Each input shall route directly to the Ethernet Switch located in the sound room CDP without the need for patching.
e. Quantity: As required by design.
f. Acceptable product:
1) Pathway rack or DIN rail mounted gateway
2) ETC rack or DIN rail mounted gateway

D. Plates and Devices
1. Network Receptacle Station/Gateway (NET)
a. Provide a remote plug-in station for connection of control console and portable DMX Gateways at the platform and other locations as noted in the drawings.
b. Station shall be provided with a Neutrik RJ45 jack. Each jack shall be rated for use in harsh commercial conditions.
c. Station will contain the following components:
1) RJ 45 jack with punch down block, provide Neutrik EtherCon type receptacle as indicated on drawings.
2) Station faceplates shall be .80” aluminum, finished in fine texture, scratch-resistant black powder coat.
3) Station back box will be a minimum of 2.5 inches.
4) Station shall have silk screened graphics white in color.
5) Provide a Lamacoid label that de-notes, using an alpha-numeric labeling convention, the switch location and network port number.
d. These network connections shall also be configured with a back box and mounting hardware for mounting on the FOH lighting galleries or backstage.
e. Each Network jack will route directly to the Ethernet Switch located in the assigned Dimmer Rooms without the need for patching.
f. No daisy chaining between jacks or splicing of Category 5e and above cable is allowed.
g. Quantity: As shown in drawings.
h. Acceptable product:
1) Pathway Network station
2) SSRC station
3) ETC Network station
2. DMX512 Distribution (DMX):
a. Provide DMX512 distribution for connection to wiring devices in the platform.
b. Modules shall provide one optically isolated DMX512 signal output capable of driving thirty-two (32) receiving devices on a single DMX line.
c. Provide a wall plugging box designed for surface mounting.
d. Provide in white finish if located downstage of main drape.
e. Provide in black finish if located upstage of the main drape.

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f. Construction: code gauge steel.
g. Connectors: Neutrik 5 conductor XLR, flush mounted.
h. Circuits: located as shown on the drawings.
i. Labeling: labeled with yellow letters on black background.
j. Quantity: As shown in drawings.
k. Acceptable product:
    1) Pathway Connectivity station
    2) SSRC station
    3) ETC station

2.06 CONTROL CONSOLE AND ACCESSORIES

A. Overview
1. Provide a control console for direct operation of theatrical fixtures and development of user-presets to be stored for recall via the Architectural Control Sub-system specified in this section.
2. Provide initial setup as directed as part of the system commissioning process.

B. Control Console
1. The lighting control console shall be a microprocessor-based system specifically designed to provide complete control of stage, studio, and entertainment lighting systems.
2. The system shall also be able to control third party ACN devices directly. The system shall provide control of 2,560 networked addresses or 1,024 local DMX addresses on a maximum of 80 control channels.
3. Two independent channels shall be provided with on/off functionality. Independents shall be patched in a location separate from patch.
4. A maximum of 999 cues may be contained in non-volatile electronic memory and stored to an onboard hard disk or to any USB storage device.
5. Twenty or forty faders shall provide access to individual intensity channels, intensity for devices as well as playbacks.
6. Four (4) configurable faders shall provide functionality for controlling audio volume, output of bump buttons, output from the cue list, output from playbacks, or crossfade control.
7. The console shall have one (1) built-in 7” color multi-touch touchscreen. The touchscreen shall provide the primary interface for system configuration, programming show data and multi-parameter control.
8. Six (6) softkey buttons shall be provided, five (5) of which may be configured by the user.
9. The console shall not require the use of an external monitor for normal use. Optional displays shall be accessible via connection to an external HDMI compatible monitor.
10. Console software upgrades shall be made by the user via a USB port; changing internal components shall not be required.
11. The console shall provide a USB port allowing show data to be saved for archival or transfer to other consoles or a personal computer.
12. The console shall be supplied with an onboard 25GB SSD.
13. It shall be possible to import sound clips and files to be stored on the console’s internal drive. Sound files shall be played back from cues, playback faders as well as selecting the file and playing from the audio tab.

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14. The console shall have the ability to analyze sound wave and trigger playbacks 1 through 5 based on base through treble. Playback 6 shall act as a background state.
15. It shall be possible to import image files to be stored on the console's internal drive. Image files shall be played back from cues, playback faders as well as selecting the file and playing from the image tab.
16. Console shall have a series of predefined video effects that shall be triggered or manipulated through x/y positioning of the user's fingers on the on-board multi-touch screen. The video toy engine shall have the ability to be set to automatically trigger the effects based on a set of predefined parameters
17. Console shall provide a locally hosted web-based control interface accessible by a web browser from a device connected to the same network as the console.
18. Web based interface shall allow for color control, playback control, recording of playbacks and cues.
19. Console power shall be 12V AC or DC via an external power unit. The power unit shall operate with 90-265VAC line voltage, 50 or 60Hz. Console shall be provided with a universal power supply.
20. Accessories:
21. Provide with dust cover
22. Provide (1) USB jump drive, minimum 8gb
23. Quantity: (1)
24. Acceptable product:
    a. Electronic Theater Controls ColorSource AV 20

2.07 ARCHITECTURAL CONTROL SYSTEM – PLATFORM

A. Processing – Provide either a rack mounted control processor located in the control distribution rack or provide distributed processing at each control station.
   1. The processing rack shall receive output data from a lighting control console and/or architectural control stations, process the information it receives and distribute the information to DMX-controlled panels and devices.
   2. Processing Racks shall be designed to support the following wire terminations:
      a. AC (single phase)
      b. Echelon link power
      c. 24Vdc
      d. DMX512 In
      e. DMX512 Out
      f. RS232 Serial In/Out
      g. Net3 Unshielded Twisted Pair (UTP) or ST fiber optic
   3. Coordinate integration of audio-visual system with contractor and program system as directed by the End User.

B. Configuration – Configure architectural control system screens in conjunction with User prior to commissioning. Base configuration shall accommodate the following basic layouts:
   1. Main Navigation
   2. User configurable named presets (2 pages to be programmed at training)
   3. House light individual control
   4. House light presets

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5. Work light individual control
6. Work light presets

C. Stations - General
1. Master stations shall be located in backstage as noted on the contract documents.
2. Provide preset stations as described below and shown in drawings.
3. All audience exposed switches shall be provided with locking covers and shall be painted a custom color as determined by the architect.

D. Acceptable product:
1. Electronic Theatre Controls Echo with DMX Scene Controller

E. DMX Control Interface
1. Provide a DIN-rail mounted DMX interface to allow snapshot capture of lighting presets via the DMX input stream.
2. The control interface shall support:
a. Recall of prerecorded scenes for playback using DMX.
b. Preset playback as activated by any connected control station.
c. DMX pass-through for real-time output of incoming DMX levels.
d. Live control and recording for multiple DMX fixture profiles.
3. Provide control network interface, power supply, and cabling as required.
4. Station shall be compatible with associated time clock and master station controls.
5. Quantity: As required for design.
6. Acceptable Product:
a. ETC Echo DMX Scene Controller

F. Control Stations
1. Wall Mount Console - HLM
a. The Touchscreen protocols station shall provide control of up to 512 local or networked DMX addresses. Addresses may be distributed using DMX512-A, via sACN, or Art-Net.
b. Touchscreen stations shall consist of a seven-inch, backlit LCD with capacitive multi-touch interface
c. Flush-mount to industry standard 3-gang back box
d. The Touchscreen shall have an RJ45 Ethernet port for connection to a lighting system and for Power over Ethernet (PoE)
e. The Touchscreen shall provide a USB port allowing show data to be saved for archival or transfer to other consoles or a personal computer
f. The Touchscreen shall support patching, address setting, and mode changes using Remote Device Management (RDM) on the local DMX/RDM port
g. Touchscreen playback control shall be capable of:
1) Seven user customizable interactive pages
2) Interactive color picker
3) Virtual level wheel
4) Rearranging and re-programming preset tiles
h. Screen backlight shall dim or turnoff when not in use

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i. Quantity: (1) Within SMP.
j. Acceptable product:
1) ETC EchoTouch

2. SMP Rack Panel (SMP)
a. Provide standard 19” panel to be mounted in SMP rack provided under 27 41 16
b. Panel shall contain the following:
1) House Light Master touchscreen station (HLM)
2) (1) Neutrik RJ-45 network receptacle (NET)
3) Network labels as required
c. Coordinate panel size and material type to match AV components in the SMP rack.

2.08 PORTABLE LIGHTING FIXTURES AND ACCESSORIES

A. Provide and integrate the following equipment into the project.
1. Theatrical Lighting Fixtures
a. The portable lighting fixtures shall connect and be controlled by the new theatrical lighting control system.
b. All fixtures shall be listed by UL or an OSHA approved NRTL.
c. Fixtures shall be constructed of rugged die cast aluminum with high impact knobs and handles unless otherwise noted.
d. Fixtures shall be provided with a black finish unless otherwise noted.
e. Fixtures shall have a rugged steel yoke with a positive locking clutch which will allow for a 300º body rotation.
f. All fixtures shall be provided with color frame, power lead with mating grounded connector, safety cable, and C-clamp equipped with a lockable pan-bolt.
g. Fixtures shall be:
1) Labeled with the Owner’s mark and select numbering/labelling inventory scheme.
2) Bench-focused, if necessary.
3) Hung in the Owner’s selected stock plot.
4) Patched at the console.

B. LED-type fixtures
1. All LED-type fixtures shall support ANSI E1.11 DMX512-A and ANSI E1.20 RDM standards.
2. All LEDs used in the product shall be high brightness and proven quality from established and reputable LED manufacturers.
3. Manufacturer of LED emitters shall utilize an advanced production LED binning process to maintain color consistency.

C. Fixtures – Type and Quantity
1. Color-changing LED Profile
a. Provide an RGBL color mixing high-intensity LED illuminator with DMX controlled intensity and color;
b. Provide unit and any/all accessories including cables in white finish
c. Unit shall have a shutter assembly with (4) blades mounted in two or more planes. Shutter blades shall be warp and burnout resistant;

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d. Unit shall have two accessory slots, a top-mounted quick release gel frame retainer, and a slot with sliding cover for motorized pattern devices or optional iris.
e. Unit shall have projector-like quality pattern imaging, sharp shutter cuts without halation, and allow for both hard and soft beam edges;
f. Unit shall operate at 100V to 240V 50/60 Hz and utilize an internal power supply;
g. Provide power lead with NEMA L5-20 connector;
h. Unit shall support power and DMX in and thru connections.
i. Provide the following quantity of high definition lens tubes:
    1) (4) 26° in White Finish
    2) (4) 36º in Black Finish
j. Acceptable Quantity and Product:
    1) (4) ETC ColorSource Spot V in White Finish
    2) (4) ETC ColorSource Spot V in Black Finish

2. Color-changing LED Wash
    a. Provide an RGBL color mixing high-intensity LED illuminator with DMX controlled intensity and color;
    b. Provide unit and any/all accessories, including cables in black finish
    c. Unit shall have an accessory slot with a top-mounted quick release gel frame retainer.
    d. Unit shall operate at 100V to 240V 50/60 Hz and utilize an internal power supply.
    e. Provide power lead with NEMA L5-20 connector;
    f. Unit shall support power and DMX in and thru connections.
    g. The unit shall have a motorized zoom
    h. Provide each with a barn door assembly
    i. Quantity (10)
    j. Acceptable product:
        1) ETC ColorSource Fresnel V in Black Finish
3. LED Follow Spots – Medium Long Throw
    a. Provide a 5800K cool white high-intensity LED illuminator with DMX-controlled intensity.
    b. Construction: sheet metal or aluminum housing with black finish; corrosion-resistant materials.
    c. 440 watt long-life LED source
    d. High-performance optical system designed for medium throw applications with a zoom minimum of 5.5° or less
    e. 100% closing manually operated iris
    f. Built-in flicker-free power supply suitable for broadcast and live performance.
    g. Gobo slot capable of accepting standard “A” size gobos.
    h. External color changer with (6) total color slots
        1) Provide color media as selected by Owner; gels to be provided separately unless otherwise noted.
    i. Compact adjustable yoke suitable for stand or pipe mounting.

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j. Portable floor stand or yoke-mount compatibility.
k. Integrated handles and balance adjustments for smooth manual operation.
l. Set of tools and initial spare parts.
m. Quantity: (1)
n. Acceptable Products:
1) Ushio SAI 500
2) Or approved equal

D. Cables and Accessories
1. 2-in-1 DMX/TRUE1 Power & Data Pass-Through Cable
a. Provide a hybrid cable assembly.
b. Each cable shall incorporate DMX512 signal and Neutrik TRUE1 power conductors within a single jacket and provide pass-through capability for both power and DMX signal.
c. Quantity:
1) (3) @ 15 ft. White Jacket/ Finish
2) (12) @ 10 ft, Black Jacket/ Finish
d. Acceptable Products:
1) TMB & Associates ProPower
2) Lex Products PowerFLEX
3) Or approved equal
2. Extension Cables:
a. Provide extension cables for extending pigtail or wall box circuits to lighting instrument.
b. Provide cable and connectors which meet or exceed the quality of cables and connectors set forth in this specification.
c. Provide each cable with Velcro cable tie.
d. Provide extension cable assemblies consisting of 12-gauge, 3 conductor flexible cable and 20A rated male and female grounded NEMA L5-20 connectors.
e. Quantity:
1) (4) @ 5 ft.
2) (2) @ 10 ft.
f. Acceptable Products:
1) TMB & Associates ProPower
2) Lex Products PowerFLEX
3) Or approved equal
3. Adapter Cables
a. Provide adapter cables for extending pigtail or wall box circuits to lighting instrument.
b. Provide cable and connectors which meet or exceed the quality of cables and connectors set forth in this specification.
c. Provide each cable with Velcro cable tie.

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d. Provide extension cable assemblies consisting of 12-gauge, 3 conductor flexible cable and 20A rated male NEMA 5-15 Parallel Blade connectors and female grounded NEMA L5-20 twist-lock connectors.
e. Quantity:
    1) (1) @ 1ft. with Male NEMA 5-15 and female NEMA L5-20 connectors
    2) (1) @ 1ft. with Male NEMA L5-20 and female NEMA 5-15 connectors
f. Acceptable Products:
    1) TMB & Associates ProPower
    2) Lex Products PowerFLEX
    3) Or approved equal

4. DMX-512 cable
    a. Provide DMX-512 cables for connecting lighting consoles, moving lights, or other DMX controlled accessories to the Network Nodes.
    b. Connectors shall be Neutrik 5-pin.
    c. Provide 24AWG two twisted pair data cable.
    d. Insulation: polyethylene.
    e. Nominal Impedance: 100 ohms.
    f. Nominal Velocity of Prop.: 78%.
    g. Capacitance between conductors: 12.5 pF/ft.
    h. Quantity:
        1) (4) 5’ DMX Cable
        2) (2) 10’ DMX Cable
    i. Acceptable Products:
        1) TMB & Associates ProPlex
        2) Lex Products PowerFLEX
        3) Or approved equal
5. Flexible Category 5e Cable/NET Cable:
    a. Provide extra rugged, flexible control cable (Ethernet) for connection of NET stations to portable Network Nodes.
    b. Cable to be 4-pair, double shielded, low-capacitance.
    c. Conductors: 24 AWG tinned, annealed copper stranded 7 x 0.16.
    d. Connector: Provide with EtherCon connector by Neutrik
    e. Assembly: pairs cabled with Kevlar strength member.
    f. Shield: (inner) aluminum/Mylar, 100% coverage (outer) tinned copper braid, 80% coverage.
    g. Conductivity: 15ohms per 100 meters @ 20C.
    h. Impedance: 100 ±15 ohms 1-100 MHz
    i. Quantity:
        1) (1) 50’ Ethernet Cable
        2) (1) 25’ Ethernet Cable
    j. Acceptable Products:

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1) TMB & Associates ProPlex
2) Lex Products PowerFLEX
3) Or approved equal

6. XLR DMX Terminator
   a. Provide XLR DMX male terminator
   b. Connector shall be Neutrik 5-pin.
   c. Termination resistance: 120 ohms +/- 10% between pins 2 and 3
   d. Termination power capacity: 2 watts
   e. Quantity: (3)
   f. Acceptable Product
      1) ETC SGE 1507
      2) Lex Products DMX5P-TERM
7. Hook-and-Loop Cable Ties
   a. Product shall be reusable hook-and-loop cable ties suitable for dressing and bundling entertainment lighting, control, and power cabling.
   b. Product shall be provided in colors matching the associated cable jacket and supporting pipe, batten, or structure as required.
   c. Product shall be constructed of woven nylon hook-and-loop material.
   d. Product shall provide a secure, non-abrasive method of cable management and shall be reusable without degradation under normal use.
   e. Product shall be nominally 3/4-inch wide by 4-inch, 6-inch, or 8-inch lengths, as required for cable looms and for securing cables to battens, hanging positions, and supporting structures.
   f. Product shall include a slot or attachment feature allowing the tie to remain captive to the cable bundle when released.
   g. Furnish any unused cable ties to Owner at project closeout.
   h. Quantity: (100) ties
   i. Acceptable products:
      1) VELCRO Brand ONE-WRAP Reusable Ties
      2) Monoprice Hook-and-Loop Cable Ties
      3) Cable Matters Reusable Hook-and-Loop Cable Ties
      4) Or approved equal

2.09 GENERAL

A. Coordinate incorporation of the Work specified herein with other project work so as to facilitate a cohesive final product.

B. The installation recommendations contained within the Telecommunications Distribution Methods Manual are mandatory minimum standards and requirements.

C. Mount equipment and enclosures plumb and level.

D. Permanently installed equipment to be firmly and safely held in place.

E. Verify all locations of equipment in all rooms with Owner’s Representative, Owner, and Consultant.

2.10 INSTALLATION OF CABLE AND WIRING

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A. Verify installation of electrical work for this scope and all associated equipment with the overall Electrical installation. Provide all necessary equipment, including mounting hardware, for complete connection of power system wiring.

B. Verify installation of power and ground wiring to equipment. Power and ground wiring will terminate inside of equipment and/or junction boxes and be hardwired to ground buss and circuit breaker to ensure uninterrupted operation.

C. All control wiring will be executed in adherence to ANSI standards including the following:

1. Isolate cables carrying signals at different levels and separate to restrict interaction.
2. Keep wiring separated into three groups of conduit provided for control circuits, power circuits (up to 50 Amps), and feeder circuits (above 50 Amps).
3. Isolate all wiring, except for safety ground wiring, from conduit ground.
4. Take such precautions as are necessary to prevent and guard against electromagnetic and electrostatic interference in other technical systems (such as sound and communications systems) in the facility. Where possible all devices and wiring will be enclosed in a shielded environment. Take care not to use shields (conduits) and grounds as current carrying return paths for lamp and relay coil commons. All ground references are to be made to the building electrical system ground.
5. Label unused wiring provided for spares or future systems and terminate at screw terminal strips.
6. All joints and connections will be made with resin-core solder or with ratchet jaw crimp type mechanical connectors. Connect all circuits electrically in phase using same wire color code for similar circuits throughout the project.
7. Install cable in a manner to adhere to manufacturer’s specifications for maximum cable pulling tension, minimum bend radius, and restrictions.
8. Provide appropriate support at all horizontal-to-vertical transitions in order to keep the weight of the cable from degrading at the point of transition.
9. If a J-hook or trapeze system is used to support cable bundles, all horizontal cables shall be supported at a maximum of 48-inch (1.2 meter) intervals. At no point shall the cables rest on light fixtures, acoustic ceiling grids, panels, conduits, sprinkler pipe, water pipe and/or HVAC system ducting.
10. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices
11. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, install appropriate carriers to support the cabling.
12. Cables shall be identified by a self-adhesive machine label in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606-A. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.
13. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.
14. Provide splice free wiring and cabling from origination to destination. Cables shall be installed in continuous lengths from origin to destination (no splices). Properly designed transition points, or consolidation points are not considered ‘splice’ points.
15. Cover edges of cable and wire pass-through holes in chassis, housings, boxes, etc., with rubber grommets or Brady GRNY nylon grommetting.

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16. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced prior to final acceptance at no cost to the Owner.

2.11 INSTALLATION OF EQUIPMENT

A. Take appropriate precautions against electrostatic discharge (ESD) when installing electronic equipment.

B. Equipment to be installed in new condition, free of damages, scratches, dents, etc.

C. Provide adequate ventilation in cabinet mounted equipment to maintain operating temperatures within range recommended by Manufacturer.

D. All equipment will be installed in compliance with applicable Local and National Codes and Regulations.

E. Equipment shall be installed in accordance with Manufacturer's requirements.

F. Install lighting fixtures using standard industry practices. All lamps, lenses, and reflectors will be installed free of dirt, dust, and finger smudges. Do not use bare hands when handling conventional tungsten lamps. Ensure that a safety cable is properly applied with each fixture.

G. Install lighting instruments to the standard house hang or repertory plot as directed by Consultant. Contractor shall document location of each type of distribution device and circuiting as part of as-built documents on plot. Provide pdf copy of plot to Consultant and Owner. Provide (2) full size printed copies of plot to Owner.

2.12 CONTRACTOR COMMISSIONING

A. Prior to energizing or testing the System ensure the following:

1. Physical installation is complete.
2. Products are installed in proper and safe manner according to Manufacturer's requirements.
3. Dust, debris, solder splatter, etc. is removed.
4. Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.
5. Temporary facilities and utilities have been properly disconnected and removed.
6. Broken work, including glass, raised flooring and supports, ceiling tiles and supports, walls, doors, etc. have been replaced or properly repaired, and debris cleaned up and discarded. The jobsite shall be broom clean.

B. Contractor shall:

1. Retain the services of a Manufacturer certified technician to check the installation and ensure its proper operation. No part of the Theatrical Lighting System may be energized before this technician has checked and approved the System installation.
2. Test all lighting load circuits for the following:
   a. Continuity
   b. Nominal voltage
   c. Polarity
   d. Accuracy to the Distribution Schedule as enumerated in the drawings.
3. Test controls wiring for the following:
   a. Appropriate wire types and quantities
   b. Control wire distance from source
   c. Terminations meet Manufacturer requirements

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C. The following identifies some, but not all, of the commissioning tasks of the commissioning team. This list is not intended to be comprehensive and should be considered a general guideline for the Contractor without a defined commissioning process statement:
   1. Program all power distribution panels
   2. Setup and program all network control devices
   3. Setup and initial programming of control console
   4. Setup and initial programming for all architectural control devices
   5. Program all emergency lighting control devices

2.13 FINAL OBSERVATION & TESTING

A. Upon completion of installation, initial adjustments, tests and measurements specified in Part 3, and submission and review of the results, a final inspection and test will be observed by the Consultant.

B. Testing will include operation of each major system and any other components deemed necessary. Contractor will assist in this testing and provide all test equipment noted below. Contractor shall provide at least two (2) technicians available for the entire testing period (day and night), to assist in tests, adjustments, and final modifications. Testing process is estimated to take a minimum of one (1) day.

C. Provide the following test gear:
   1. Circuit Tester with adapters for all connectors present in the system.
   2. Multimeter capable of measurements up to 600V AC/DC, 10A DC, and 2MOhms
   3. DMX Tester
   4. Industrial Ethernet Tool capable of testing signal continuity and distance from source

D. The following procedures will be performed on each System:
   1. Observation of the physical installation including labeling, mounting, and finish of all equipment and components which are a part of the System.
   2. Functional testing of all control devices and devices under control within the System.
   3. Review of programming and standard settings for all control interface devices.
   4. Load circuit verification.
   5. Control circuit verification.
   6. Other tests on equipment or systems deemed appropriate.

E. The Consultant will provide the Owner with a listing describing any incomplete or otherwise deficient items determined as part of the testing process. Where further adjustment or work becomes evident during testing, the Contractor is to continue work until the System is complete.

2.14 INSTRUCTION OF OWNER PERSONNEL

A. Provide operations and service training on all equipment incorporated in the System.

B. Training shall not be conducted until final observation and testing is completed by the Consultant, unless otherwise directed by the Owner.

C. Provide (4) hours of training. Training time shall be conducted in multiple sessions, with each session not to exceed four hours. Training shall be conducted in accordance with Owner's schedule.
   1. Six months after completion of initial training, schedule an additional (4) hours with Owner for review of systems and equipment operation.

D. The major equipment components and subject matter are as follows (advisory percentage of overall time allocated):

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1. Power Distribution System (20%)
    a. Basic testing and control
    b. Normal and emergency operations
    c. Programming memory
    d. Software configurations and upgrades
    e. Troubleshooting.
2. Control Console (40%)
    a. Operational training, including offline or remote-access software
    b. Patching and programming
    c. Fixture integration
    d. Peripheral hardware
    e. Applications interface for retrieving information from the control console
    f. Troubleshooting
    g. Upgrades
3. Architectural Controls (20%)
    a. Part of training will be to establish programmed looks for the performance areas with the end-user. The Contractor shall provide all equipment to establish DMX values for preset looks.
    b. Snapshotting preset onto DMX controller
    c. Preset recall operation
    d. Normal operations (e.g., console arbitration, time-clock controlled events, etc.)
    e. Troubleshooting.
4. Theatrical Lighting Fixtures and Accessories (20%)
    a. Hang and focus
    b. Cabling and circuiting
    c. Setup and DMX addressing
    d. Troubleshooting

E. Training Schedules
    1. Training should be assumed to take place on the project site.
    2. Training should be scheduled to be non-overlapping.
    3. Actual training schedule shall be by agreement with Owner.
    4. In the event that a portion of the training time is occupied in troubleshooting the equipment installation, then the training time shall be extended an equal amount of time.

F. Submit an outline of the course with sample instructional aides for approval thirty (30) days prior to scheduled instruction sessions to architect and architect's consultant.

G. Following discussions with Owner, provide a Training submittal 2-4 weeks prior to first training. Submittal shall:
    1. Include a separate page/entry for every training session.
    2. Indicate date, time, and approximate length of training session.
    3. Indicate person(s) conducting training.
    4. Indicate whether training will be video recorded.

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5. Intended curriculum and most appropriate attendees (e.g., technician, operations, IT, etc.)
6. Include signature and title lines for:
    a. Owner acknowledging and accepting training schedule. Include both an Accepted and Rejected box. An alternate schedule time should be suggested by the Owner in the event the schedule is rejected.
    b. Countersigning by trainer indicating that training actually occurred.
    c. All persons attending training. Where attendees do not stay for the entire session, this should be noted on the form and initialed by Owner's representative attending training.
    d. Owner's representative attending training at the end of the session shall initial that:
        1) Training Occurred.
        2) Training Materials were provided and left with Owner
        3) Training was not interrupted or shortened by equipment or system troubleshooting. If it is, then there should be a line where Owner and Contractor can indicate when make-up training will be provided and how long it should be.
        4) Training was generally sufficient for the proposed curriculum.
7. Include Notes section for Owner and Contractor to note any issues during training (areas requiring further development, etc.)

H. Following training occurrence, submit completed training records no later than 5 days following end of training. When training is conducted over a period of weeks, completed training submittals shall be consolidated into a single submittal and submitted every 2 weeks.

END OF SECTION 11 6162

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SECTION 27 4116

INTEGRATED AUDIO/VIDEO SYSTEMS AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Integrated Audio-Video Systems and Equipment as part of the Work.

1.02 RELATED DOCUMENTS

A. General provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this section.

B. Reference the Project Manual for related specification sections.

C. Reference the Project Drawings for additional information.

1.03 SECTION INCLUDES

A. Project instructions for the Contractor and System description details

B. System product description

C. Project completion instructions for the Contractor

1.04 RESPONSIBILITY

A. Responsibilities include, but are not limited to, the following items:

1. Provide materials, equipment, transportation, and labor necessary for a fully working, tested, and calibrated system. Supply accessories and minor equipment items (such as, but not limited to, power strips, adapters, connectors, mounting hardware, etc.) needed for a complete system, even if not specifically mentioned in these Specifications. Notify the Architect of any discrepancies in part numbers or quantities before bid. Failing to provide such notification, supply items and quantities according to the intent of the Specification and Drawings, without claim for additional payment.
2. Specifications and drawings are complementary. Work called for by one is binding as if called for by both. Any discrepancies between specifications and drawings shall be brought to the attention of the Architect for clarification during the bidding period. No allowance shall subsequently be made to the Contractor by reason of their failure to have brought said discrepancies to the attention of the Architect.
3. Execute work in accordance with the National Electrical Code (NEC), the National Electrical Safety Code, the Occupational Safety and Health Act (OSHA), applicable State and Local codes, ordinances, regulations, authority having jurisdiction (AHJ), and manufacturer’s recommendations. If a conflict develops between the contract documents and the appropriate codes and is reported to the Architect prior to bid opening, the Architect will prepare the necessary clarification. Where a conflict is reported after contract award, propose a resolution of the conflict and, upon approval, perform Work.
4. Required licenses, insurance and permits including payment of charges and fees
5. Verification of dimensions and conditions at the job site.
6. Coordinate location and installation of equipment with other building elements.
7. Preparation of submittal information
8. Pick-up of Owner Furnished Equipment (OFE) and incorporation into project if applicable.
9. Development and implementation of control system software code and control panel layouts, which will become the property of the Owner
10. Final tests and adjustments, written report, and documentation

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11. Instruction of operating personnel
12. Provision of manuals
13. Maintenance services and warranty.

1.05 REFERENCES

A. Published specification standards, tests or recommended methods of trade, industry or governmental organizations apply to Work in this section where cited below:
   1. American National Safety Institute (ANSI)
   2. American Society of Testing and Materials (ASTM)
   3. Electronics Industries Association (EIA)
   4. Federal Communications Commission (FCC)
   5. National Electrical Manufacturer's Association (NEMA)
   6. National Electrical Code (NEC)
   7. Underwriters Laboratories (UL)
   8. Occupational Safety and Health Administration (OSHA)
   9. Society of Motion Picture and Television Engineers (SMPTE)
   10. Building Industry Consulting Service International (BICSI)
   11. Davis and Davis, Sound System Engineering (3rd Edition) (SSE), Howard W. Sams, 2006
   12. Giddings, Audio System Design and Installation (ASDI), Howard W. Sams, 2013
   13. AV Installation Handbook Second Edition: The Best Practices for Quality Audiovisual Systems, Infocomm (AVIH), 2009

1.06 DEFINITIONS

A. In addition to those Definitions of Division1, the following list of terms as used in this specification shall be defined as follows:
   1. Furnish - To purchase, procure, acquire, and deliver complete with related accessories.
   2. Install – To set in place, join, attach, link, set up or otherwise connect together and test until complete before turning over to the Owner, all parts, items, or equipment supplied by Contractor.
   3. Provide – To furnish and install.

1.07 DESCRIPTIONS & REQUIREMENTS

A. The following is intended to further describe the Work and clarify design intent and is not an exhaustive description of the systems.

B. Cafetorium
   1. AV Presentation System
      a. A single projection screen presentation system shall be provided. The system will utilize a projection screen mounted to the proscenium wall. The screen will be motorized so that it can be raised out of sight when not in use. The screen should be a 16:9 aspect ratio for high-definition programming.
      b. The main projector shall be approximately 13,000 ANSI lumens, bright enough to illuminate the screen without dimming house lighting completely. The main projector shall have a minimum native resolution of 1920 x 1080.
      c. An AV-over-IP network shall distribute the video sources to the projector. Sources listed below shall be encoded to the network and decoded at the projector.
   2. Audio Sources

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a. Provide an assortment of dynamic and condenser microphones.
b. Provide wired microphone inputs around.
c. Provide ceiling mounted microphones over the stage for choral performances.
d. Provide a wireless microphone system with remote mounted antennas including handheld and body-worn transmitters.
e. Provide a rack mounted multi-media player for music playback at the main portable and stage control positions.
f. Provide a rack mounted multi-media recorder for music recording at the main portable and stage control positions.
g. Provide wired and wireless media connectivity.
h. Provide cabling and equipment accessories.

3. Video Sources
   a. Provide a wireless presentation system, connected to school WiFi network
   b. Provide an HDMI input at Stage Management Rack
   c. Provide an HDMI input in the Stage Right Technical Facility Panel
4. Mixing System
   a. Provide a rack mounted digital mixing system in the main portable rack.
   b. Provide a rack mounted mixer at the stage control position for simple operation.
5. Processing and Amplification
   a. Provide a dedicated audio DSP for signal routing and processing.
   b. Provide DSP amplification for loudspeakers.
   c. Provide audio system control via networked control system.
6. Loudspeakers
   a. Provide ceiling mounted loudspeakers distributed throughout the cafeteria space.
   b. Provide loose loudspeakers for on-stage monitoring.
7. Equipment Housing
   a. Provide a portable equipment rack for the main control position.
   b. Provide permanent wall-mounted rack in a dedicated room to house amplifiers and processing equipment.
   c. Provide permanent wall-mounted racks on stage for the stage manager’s control position.
8. Hearing Assist
   a. Provide a wireless, single channel radio frequency hearing assist system.
   b. Provide a remote mounted antenna to provide coverage of the audience area.
   c. System must operate on approved FCC frequencies.
   d. Provide enough portable receivers to meet current ADA standards including:
      1) C
      2) Headsets
      3) Inductive coil loops
9. Life Safety
   a. Provide a contact closure from the life safety system.

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b. System to mute upon contact closure and remain muted during the alarm.
c. System to continue previous operation when alarm has ended.

C. Band/Orchestra
1. Audio Sources
a. Provide microphones for recording.
b. Provide a rack mounted multi-media player for music playback.
c. Provide a rack mounted multi-media recorder for music recording.
d. Provide wired and wireless media connectivity.
e. Provide a line input connection at the front of the room for Owner provided metronome.
f. Provide cabling and equipment accessories.
2. Mixing System
a. Provide a rack mounted mixer for control and routing of audio sources.
3. Processing and Amplification
a. Provide DSP amplification for room loudspeakers.
4. Loudspeakers
a. Provide wall mounted speakers at the front of the room for music playback.
b. Provide wall mounted speakers at the back of the room for metronome playback for percussion instruments.
5. Equipment Housing
a. Provide a permanent wall mounted equipment rack for housing of rack mounted equipment.
b. Equipment rack to be located near the director for quick access to operable equipment.
6. Life Safety
a. Provide a contact closure from the life safety system.
b. System to mute upon contact closure and remain muted during the alarm.
c. System to continue previous operation when alarm has ended.

D. Choir
1. Audio Sources
a. Provide microphones for recording.
b. Provide a rack mounted multi-media player for music playback.
c. Provide a rack mounted multi-media recorder for music recording.
d. Provide wired and wireless media connectivity.
e. Provide cabling and equipment accessories.
2. Mixing System
a. Provide a rack mounted mixer for control and routing of audio sources.
3. Processing and Amplification
a. Provide DSP amplification for room loudspeakers.
4. Loudspeakers
a. Provide wall mounted speakers at the front of the room for music playback.

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5. Equipment Housing
    a. Provide a permanent wall mounted equipment rack for housing of rack mounted equipment.
    b. Equipment rack to be located near the director for quick access to operable equipment.
6. Life Safety
    a. Provide a contact closure from the life safety system.
    b. System to mute upon contact closure and remain muted during the alarm.
    c. System to continue previous operation when alarm has ended.

E. Gymnasium
1. Audio Sources
    a. Provide wired microphone connections at either end of the court.
    b. Provide wireless microphone system.
    c. Provide dynamic microphones.
    d. Provide wired and wireless media connectivity.
    e. Provide cabling and equipment accessories.
2. Processing and Amplification
    a. Provide a dedicated DSP to the space.
    b. Provide DSP amplification for room loudspeakers.
3. Loudspeakers
    a. Provide surface mounted loudspeakers distributed over the court for audio coverage of the court.
4. Equipment Housing
    a. Provide a permanent wall mounted equipment rack for housing of rack mounted equipment.
    b. Equipment rack to be located in adjacent storage room.
5. Control
    a. Provide a touch panel control system for system operation.
    b. Touch panel to be located behind a protective hinged door.
6. Hearing Assist
    a. Provide a wireless, single channel radio frequency hearing assist system. System must operate on approved FCC frequencies.
    b. Provide a remote mounted antenna to provide coverage of the audience area.
    c. System must operate on approved FCC frequencies.
    d. Provide enough portable receivers to meet current ADA standards including:
        1) Ear speakers
        2) Headsets
        3) Inductive coil loops
7. Life Safety
    a. Provide a contact closure from the life safety system.
    b. System to mute upon contact closure and remain muted during the alarm.

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c. System to continue previous operation when alarm has ended.

F. Meeting Rooms

1. AV Presentation System

~~**a. Provide a wall mounted display**~~

b. Provide an floorbox HDMI connection to the **owner-provided owner installed** display

c. ~~Operation of the display will be by handheld remote control~~.

1.08 SUBMITTALS

A. Provide submittals in accordance with Conditions of the Contract and Division 1, Submittal Procedures section unless otherwise indicated.

B. Submittals shall contain sufficient information to describe the Work to be performed. Reviewed shop drawings are to be used for final coordination and construction.

C. Shop drawings must be original work produced by the Contractor responsible for performing the work defined in this specification. Scanning, photographic copying, materially copying, or any other reproducing the contents of the drawings or specifications contained within the Contract Documents will be marked as unacceptable and not reviewed for any content. No claim shall be made for delay, undue burden, or additional costs for the effort to produce shop drawings, schedules, and equipment lists addressing this specification or the overall project manual.

D. Supplementary submittal requirements:

1. Provide each of the following in one electronic submission for review within thirty days of issuance of Notice to Proceed (NTP) and prior to commencement of Work:

a. Complete schedule of submittals.

b. Chronological schedule of Work in bar chart form.

c. Product Data Sheets:

1) Provide a complete table of contents with the following information:

2) Project title.

3) Submittal number. In the case of a resubmittal, use the original submittal number immediately followed by the suffix “R” immediately followed by a unique number and be numbered in consecutive order.

4) Date of submission.

5) Provide a list of and Manufacturer's data sheets on products to be incorporated with the Work. Arrange data sheets in the same order they appear in this specification. Where a data sheet shows more than one product, indicate the model being proposed with an arrow or other appropriate symbol.

6) For each product submitted, indicate which item in the specification it is submitted for.

7) Submit manufacturer’s product literature for each type of firestop material to be used. Literature shall include documentation of UL classifications or approved third party testing. Manufacturer’s name and number for each part shall be included. Submit drawings of through penetrations, which include the system to be utilized for the firestopping application. Drawing shall indicate construction of wall or floor assembly; size, number and material of penetrating items; firestop system designation; required F-rating, T-rating and remarks.

8) Upon Owners and/or Consultant’s request provide (3) three copies of the submittals. Bind submittal in titled three ring D style binders sized for 150 per

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cent of the material. Maximum size: three-inch spine. Use multiple volumes as required. Separate major grouping with labeled binder tabs.

9) Submissions that do not follow the format and configuration described above will be returned without review.

d. Shop Drawings:

1) Functional Diagrams/Schematics:

a) Detailed wiring diagrams showing interconnection of components and products, wiring and cabling diagrams depicting cable types and designators, and device designators for each system. Provide connector designations and terminal strip identification, along with color codes for cables connecting to these devices. Give each component a unique designator and use this designator consistently throughout the project.

2) Coordination Drawings:

a) Prepare and submit a set of coordination drawings showing major elements, components, and devices of the audio and video system in relationship with other building components. Prepare drawings to an accurate scale of 1/8”=1’-0” or larger on suitable sized media.

b) Prepare floor plans, reflected ceiling plans, elevations, sections, and details to conclusively coordinate and integrate all equipment. Indicate locations where space is limited, and where sequencing and coordination of installations is of importance to the efficient flow of the Work including but not necessarily limited to the following:

(1) Equipment housings

(2) Ceiling and wall mounted devices

(3) Raceways

(4) Cabling

3) Equipment: Location of equipment within racks, consoles, or on tables, with dimensions; wire routing and cabling within housings; AC power outlet and terminal strip locations.

4) Patch panel(s): Layouts and designation (labeling) strips, including color schemes.

5) Full fabrication details of any custom enclosures and millwork indicating size, material, finish and openings for equipment.

6) Structural rigging and mounting details:

a) Loudspeaker rigging, suspension, and mounting detail drawings shall be signed and sealed by a professional engineer licensed to practice in the state in which the project is located. The signed and sealed drawings noted above to include the following:

(1) Analysis of all components in the load path and attachment method to building structure for suspended loudspeakers.

(2) Attachment method for mounting brackets at ceilings, walls, or other building features.

(3) Detail the product manufacturer, part numbers, and load capacity of the hardware fittings and materials selected for suspended or mounted loudspeakers.

(4) A copy of the design calculations.

(5) Secondary steel required for attachment to the building structure.

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(6) Custom brackets, mounts, suspension grids or trusses, loudspeaker cabinet frames, or loudspeaker brackets.

(7) Loudspeaker brackets or mounts provided by the specific loudspeaker manufacturer being installed that do not include traceability data.

7) Traceability data and/or ANSI standard compliance data for loudspeaker mounting brackets or rigging provided by the loudspeaker manufacturer.

8) Risk analysis data as referenced in Part 3.2, F

9) Stamping Engineer post-installation sign-off as described in Part 3.2, F

10) Proof of ETCP certification for on-site rigging crew.

11) Projector, loudspeaker, camera mounting details, include hardware types and load capacity.

12) Fabricated Plates and Panels

a) Provide complete drawings on custom fabricated plates or panels. Drawings shall include dimensioned locations of components, component types, engraving information, plate material and color, and bill of material.

13) Labeling

a) Equipment and cabling labeling scheme. Include font sizes and styles, explanation of scheme, and designator schedule.

14) Schedules

a) Wiring schedule showing source and destination of wiring and indicating which wiring is in conduit. Junction box schedule showing type of box, size, mounting and location. Include this information with remainder of wiring diagrams.

15) Control System Software

a) Provide electronic copies of proposed control system user interfaces within sixty (60) days of issuance of Notice to Proceed (NTP).

16) IP Addresses

a) Coordinated with the venue IT Administrator, provide a list of IP addresses, by device, used in the project.

e. Consultant's project documents in electronic format will not be supplied to the Contractor for their use as part of submittals.

f. Detail drawings executed at an appropriate scale, but not smaller than 1/8 inch = 1'–0".

g. Submissions that do not follow the format and configuration described above will be returned without review.

h. Any other pertinent data which is necessary to provide the Work.

2. Control System Software:

a. Provide electronic copies of proposed control system user interfaces within sixty (60) days of issuance of Notice to Proceed (NTP).

E. Resubmission requirements:

1. Make all requested corrections or change in submittals required. Resubmit for review until no exceptions are taken.

2. Indicate all changes that have been made other than those requested.

1.09 CONTRACT CLOSE-OUT DOCUMENTS:

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A. Provide submittals in accordance with Conditions of the Contract and Division 1, Submittal Procedures section unless otherwise indicated, after substantial completion but prior to final observation:

B. Supplementary submittal requirements:

1. Provide the following in one electronic submission for review.
    a. Equipment Manuals:
        1) Manufacturer's owner/instruction manual for each type of Product by manufacturer and model or part number unless specified otherwise herein
        2) Supply manufacturer’s serial numbers for each Product
        3) For custom circuits or modifications, a description of the purpose, capabilities, and operation of each item
        4) Separately bind list by manufacturer and model or part number of Products incorporated within the Work, arranged in alpha numeric order. When applicable, bind Manufacturer's warranty statements separately.
    b. Test Reports: Recorded findings of Commissioning.
    c. Signed copy of turn over equipment to Owner including quantity, make and model.
    d. Copy of any program or hardware setup files.
    e. System Operation and Instructions: Prepare a complete and typical procedure for the operation of the equipment as a system, organized by subsystem or activity.
        1) This procedure should describe the operation of system capabilities.
        2) Assume the intended reader of the manual to be technically inexperienced but unfamiliar with the components and the facility.
    f. Provide Consultant with copy of Owner training video.
    g. Service Information, including service phone number(s) and hours; service schedule; description of products recommended or provided for maintenance purposes, and instructions for the proper use of these products.
    h. Any other pertinent data generated during the Project or required for future service.
    i. Within three (3) weeks of final observation, submit the following in one electronic submission for review. Upon Owners and/or Consultant’s request provide (3) three copies of the following:
        1) Record drawings: Final rendition of Shop Drawings depicting what is actually incorporated within the Work.
        2) Hardcopy full size set of Record drawings.
        3) Three (3) compact disc or DVD’s containing Record drawings in AutoCAD editable DWG format and Adobe PDF format. Resolution to be sufficient to permit Owner’s technicians to be able to clearly read all notes and text on screen.
        4) One set of signed proof-of-training documents.
2. Submittal Format:
    a. Record Drawings: Drawings executed at an appropriate scale, but not smaller than 1/8 inch = 1’–0”.
    b. Segregate documents into separate binders containing data relevant to operational, maintenance, and warranty issues. Appropriately duplicate data within the separate bindings when it will reasonably clarify procedures, e.g., operational data in maintenance binding.

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c. Bind Project Record Manual in titled three ring D style binders sized for 150 per cent of the material. Maximum size: three inch spine. Use multiple volumes as required. Separate major grouping with labeled binder tabs.

C. Resubmission requirements:

1. Make all requested corrections or change in submittals required. Resubmit for review until no exceptions are taken.
2. Indicate all changes that have been made other than those requested.

1.10 CUSTOM SOFTWARE

A. Introduction:

1. Proprietary software provided for the Technical Systems shall be subject to this software license between the Contractor and the Owner as an essential element of the system as defined in the system specification and associated documents, drawings and agreement.
2. Contractor shall agree that 3rd party proprietary software provided with the system shall be subject to this agreement.
3. Contractor and Owner agree that this software license is deemed to be part of, and subject to, the terms of the Agreement applicable to both parties; and shall supersede any standard manufacturer or Contractor's standard license agreement.
4. Proprietary software shall be defined to include, but not be limited to, device and system specific software and firmware designed to run on conventional computer based operating platforms as well as all micro-processor based hardware used to program, setup, or operate the system or its components.
5. For sake of this agreement, MS Windows® shall not be considered "proprietary" software, unless a non-public version of Windows® or any of its components are critical to the operation of the system in which case it shall be deemed proprietary.

B. License Grant and Ownership:

1. Contractor hereby grants to Owner a perpetual, non-exclusive, site license to all software for Customer's use in connection with the establishment, use, maintenance and modification of the system implemented by Contractor. Software shall mean executable object code of software programs and the patches, scripts, modifications, enhancements, designs, concepts or other materials that constitute the software programs necessary for the proper function and operation of the system as delivered by the Contractor and accepted by the Owner.
2. Except as expressly set forth in this agreement, Contractor shall at all times own all intellectual property rights in the software. Any and all licenses, product warranties or service contracts provided by third parties in connection with any software, hardware or other software or services provided in the system shall be delivered to Owner for the sole benefit of Owner.
3. Owner may supply to Contractor or allow the Contractor to use certain proprietary information, including service marks, logos, graphics, software, documents and business information and plans that have been authored or pre-owned by Contractor. All such intellectual property shall remain the exclusive property of Owner and shall not be used by Contractor for any purposes other than those associated with delivery of the system.

C. Copies, Modifications, and Use:

1. Source code shall be available to Owner for a period of not less than 10 years.
2. Owner may make copies of the software for archival purposes and as required for modifications to the system. All copies and distribution of the software shall remain within the direct control of Owner and its representatives.

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3. Owner may make modifications to the source code version of the software, if and only if the results of all such modifications are applied solely to the system. In no way does this Software License confer any right for Owner to license, sublicense, sell, or otherwise authorize the use of the software, whether in executable form, source code or otherwise, by any third parties.
4. All express or implied warranties relating to the software shall be deemed null and void in case of any modification to the software made by any party other than Contractor.

D. Warranties and Representations:

1. Contractor represents and warrants to Owner that:
   a. It has all necessary rights and authority to execute and deliver this Software License and perform its obligations hereunder and to grant the rights granted under this Software License to Owner;
   b. The goods and services provided by contractor under this Software License, including the software and all intellectual property provided hereunder, are original to Contractor or its subcontractors or partners; and
   c. The software, as delivered as part of the system, will not infringe or otherwise violate the rights of any third party, or violate any applicable law, rule or regulation.
2. Contractor further represents and warrants that, throughout the System Warranty Period, the executable object code of software and the system will perform substantially in accordance with the System Specifications and Agreement. If the software fails to perform as specified and accepted all remedies are pursuant to the policies set forth in the Specification and in the Agreement. No warranty of any type or nature is provided for the source code version of the software which is delivered as is.
3. Except as expressly stated in this Agreement, there are no warranties, express or implied, including, but not limited to, the implied warranties of fitness for a particular purpose, of merchantability, or warranty of no infringement of third party intellectual property rights.

1.11 QUALITY ASSURANCE

A. Qualifications: Contractor to be experienced in the provision of systems similar in complexity to those required for this project, and meet the requirements listed below. Provide documentation at the time of bid to support these qualifications:

1. Form of corporation.
2. No less than three years' experience with equipment and systems of the specified types.
3. Experience with at least three comparable scale projects within the last three years.
4. Be a franchised dealer and service facility for the manufacturer's products furnished.
5. Maintain a fully staffed and equipped service facility with full-time field technicians.
6. Have at least one supervisory on-site employee who has completed and has been certified CTS-I by Infocomm.
7. Supervision of all rigging by an ETCP certified rigger for all work associated with suspension or mounting of overhead equipment.
8. Adequate plant capacity and equipment to complete the Work.
9. Adequate staff with commensurate technical experience.
10. Suitable financial status (i.e., bonding and materials purchase capacity) to meet the obligations of the Work.
11. Adequate regional service organization to meet warranty response requirements of the Project.

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12. Provide listing with appropriate explanation regarding the status of Contractor's resolved or unresolved legal disputes within the last six calendar years.
13. Provide listing with appropriate explanation regarding any projects within the last 3 years where the Contractor has failed to meet construction schedules due to Contractor's cause.
14. Completed current version of the AIA Contractor's Qualification Form.

B. Subcontractors: at the time of bid, the Contractor shall provide a list of structural, electrical, sound, or any other subcontractors intended to do the Work, or are being retained as local service providers throughout the warranty period. Subcontractors shall be appropriately state licensed in their specialty and must provide the same qualification documents as the Contractor.

C. Work: Perform Work in compliance with the applicable standards listed herein and governing codes and regulations of the authorities having jurisdiction and the Contract Documents.
1. Drawings and specification requirements govern where they exceed Code and Regulation requirements.
2. Where requirements between governing Codes and Regulations vary, the more restrictive provision applies.
3. Nothing in the Contract Documents grants authority or permission to disregard or violate any legal requirements.

D. Coordinate exact location and installation of equipment, power, grounding, and raceway requirements with the Architect.

1.12 DELIVERY, STORAGE & HANDLING

A. Ship Products in its original container, to prevent damaging or entrance of foreign matter.

B. Handling and shipping in accordance with Manufacturer's recommendation.

C. Provide protective covering during construction of all installed devices, to prevent damaging or entrance of foreign matter.

D. Replace at no expense to Owner, Products damaged during storage, handling or the course of construction.

1.13 PROJECT CONDITIONS

A. Verify conditions on the job site applicable to this work. Notify Architect in writing of discrepancies, conflicts, or omissions promptly upon discovery.

B. The Drawings diagrammatically show cabling and arrangements of equipment fitting the space available without interference. If conditions exist which make it impossible to install work as shown, recommend solutions and/or submit drawings to Architect for approval, showing how the work may be installed.

1.14 WARRANTY

A. Warrant labor and equipment for one year following the date of substantial completion to be free of defects and deficiencies, and to conform to the drawings and specifications as to kind, quality, function, and characteristics. Repair or replace defects occurring in labor or equipment within the Warranty period without charge.

B. This warranty is in addition to any specific warranties issued by manufacturers for greater periods of time.

C. Within the warranty period, answer service calls within twenty four (24) hours during normal working hours and correct the deficiency within forty eight (48) hours.

D. Provide Owner with the name and telephone number of the person to call for service. This information to be part of Project Closeout Documents.

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E. Thirty days prior to the end of the warranty period provide a complete checkout of all system components. Repair or replace any defective equipment discovered during the testing. Correct any defects in wiring or other functional problems reported by Owner. Warranty replacement and service of equipment shall not apply to Owner furnished equipment (OFE). Coordinate observation visit with the Owner.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products quantity is as required. If a quantity is given, provide at least the given amount. Some product listed may not be required to fulfill the obligations of the Work.

B. Equipment and materials shall be new and conform to applicable UL or ANSI provisions.

C. Regardless of the length or completeness of the descriptive paragraph herein, provide Products complying with the specified manufacturer's published specifications.

D. Remove or blank out all manufacturers’ names, logos, or other symbols from loudspeakers or other objects placed in view of the public. If logos are removable, remove and repaint to the color of the adjacent surface and reattach.

E. Take care during installation to prevent scratches, dents, chips, etc.

2.02 ACCEPTABLE MANUFACTURERS

A. Model numbers and manufacturers included in this specification are listed as a standard of function, performance, and quality.

B. Refer to General and Supplementary Conditions and Division 1 Specification Sections for equipment substitution procedure.

C. If a specified product has been discontinued by a manufacturer, provide the replacement model (as certified by the manufacturer) at no additional cost.

D. Where required provide manufacturer’s rack mount adapter or one manufactured by Middle Atlantic or Winstead unless specified elsewhere.

2.03 MICROPHONES AND ACCESSORIES

A. Single Wireless Microphone System (WRLS, Type 1):

   a. Not Specified.

B. Dual Wireless Microphone System (WRLS, Type 2):

   1. Receiver Type: Digital Wireless System with automatic switching diversity reception with XLR type audio output connectors.
   2. Indicators: LED signal strength meters for battery, RF and audio levels.
   3. Frequency: Coordinate with FCC and local requirements.
   4. Antennas: Rear mount passive antennas for the frequency spectrum chosen.
   5. 1-RU Rack mountable.
   6. Acceptable Product:

      a. Shure SLXD4D Diversity Receiver

C. Triple Wireless Microphone System (WRLS, Type 3)

   1. Not specified

D. Quad Wireless Microphone System (WRLS, Type 4):

   1. Receiver Type: Digital Wireless System with automatic switching diversity reception with XLR type audio output connectors.
   2. Indicators: LED signal strength meters for battery, RF and audio levels.

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3. Frequency: Coordinate with FCC and local requirements.
4. Antennas: Rear mount passive antennas for the frequency spectrum chosen.
5. 1-RU Rack mountable.
6. Acceptable Product:
    a. Shure ULXD4Q Diversity Receiver

E. Bodypack Wireless Microphone (Type 1)
1. Theatrical/presentation headset/lapel mic
2. Acceptable Product:
    a. Shure SLXD1 Bodypack Transmitter
        1) Shure SB903 Lithium Ion Battery
        2) Shure UL4#-MTQG Headset Microphone (coordinate color with Owner)
        3) Shure MX153#/O-TQG (coordinate color with Owner)

F. Bodypack Wireless Microphone (Type 2)
1. Athletic headset/lapel mic
2. Acceptable Product:
    a. Shure SLXD1 Bodypack Transmitter
        1) Shure SB903 Lithium Ion Battery
        2) Shure UL4#-MTQG Headset Microphone (coordinate color with Owner)
        3) Shure SM31FH

G. Handheld Wireless Microphone (Type 1)
1. Beta 87A capsule
2. Acceptable Product:
    a. Shure SLXD2/B87A Handheld Transmitter
        1) Shure SB903 Lithium Ion Battery

H. Wireless Microphone Charge Base (Type 1)
1. 2 Port Wireless Microphone Charging Dock
2. Acceptable Product
    a. Shure SBC10-903-US Battery Charger Base

I. Wireless Microphone Charge Base (Type 2)
1. 8 Port Wireless Microphone Charging Dock
2. Acceptable Product:
    a. Shure SBC80-903-US Battery Charger Base

J. Vocal Microphone: (Type 1)
1. Handheld dynamic cardioid pattern
2. Acceptable Product:
    a. Audix OM6
    b. Shure Beta58a
    c. Approved Equivalent

K. Instrument Microphone: (Type 1)
1. Dynamic cardioid pattern

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2. Acceptable Product:
    a. Audix D4
    b. Shure Beta57a
    c. Approved Equivalent

L. Instrument Microphone: (Type 2)
1. Condenser cardioid pickup pattern
2. Acceptable Product:
    a. Audix f9
    b. Shure SM81
    c. Approved Equivalent

M. Instrument Microphone: (Type 3)
1. Boundary style condenser
2. Acceptable Product:
    a. Audix ADX60
    b. Shure Beta91a
    c. Approved Equivalent

N. Choir Microphone: (Type 1)
1. Hanging condenser
2. HyperCardioid pattern
3. Acceptable Product:
    a. Audix ADX40HC
    b. Shure MX202B/S

O. Podium Microphone (Type 1)
1. Goose neck condenser microphone
2. Cardioid pattern
3. Acceptable Product:
    a. Shure MX412/C

P. Drum Microphone Package: (Type 1)
1. 7-piece kit to include:
2. Large diaphragm kick drum mic
3. Snare drum mic
4. Rack & Floor tom mics
5. Overhead mics
6. Mounts for all mics
7. Acceptable Product:
    a. Audix DP7
    b. Shure DMK57-52
    c. Shure KSM 137 Stereo Pair
    d. Approved Equivalent

Q. Piano Microphone Package: (Type 1)

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1. **Dual element condenser microphone**
2. **Stereo pair**
3. **Acceptable Product:**
    a. **Audix SCX25APS**
    b. **Shure Beta 181/C (Quantity: 2)**
    c. **Approved Equivalent**

R. Switched Vocal Microphone: (Type 1)

1. **Handheld dynamic cardioid pattern**
2. **ON/Off Switch integrated**
3. **Acceptable Product:**
4. **Shure SM58S**
    a. **Approved Equivalent**

S. General Purpose Microphone: (Type 1)
    1. Handheld dynamic cardioid pattern
    2. Acceptable Product:
        a. Shure SM58
        b. Approved Equivalent

T. Suspended Microphone: (Type 1)
    1. Phantom powered
    2. Acceptable Product:
        a. Audix ADX40 with CPSADXC cardioid capsule
        b. Shure MX202B/C
        c. Approved Equivalent

U. Microphone Stands and Mounting Hardware:
    1. Acceptable Product:
        a. TYPE 1: Round-base floor stands, Black
            1) Atlas MS-10CE w / PB11XEB
            2) Approved Equivalent
        b. TYPE 2: Heavy Duty floor stand, Black
            1) Atlas SB11WE
            2) Approved Equivalent
        c. TYPE 3: Boom Arm Short, Black
            1) Atlas PB11XEB
            2) Approved Equivalent
        d. TYPE 4: Boom Arm Long, Black
            1) AtlasPB21XEB
            2) Approved Equivalent
        e. TYPE 5: Tabletop stand, Black
            1) Atlas SMS2B
            2) Approved Equivalent

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2.04 INPUT SOURCES

A. Media Player (MDP, Type 1):
   1. Analog and outputs: RCA unbalanced.
   2. 1-U Rack Mountable.
   3. Bluetooth Receiver
   4. USB & Aux input
   5. Wireless Remote Control.
   6. Acceptable Product:
      a. Tascam CD-400U

B. Media Recorder (MDR, Type 1):
   1. Analog inputs and outputs: RCA unbalanced.
   2. Digital input and output: S/PDIF, AES/EBU
   3. 1-U Rack Mountable.
   4. Bluetooth Receiver
   5. USB & Aux input
   6. RS-232 Control
   7. Wired remote control
   8. Acceptable Product:
      a. Tascam SS-R250N

C. Mono DI Box (Type 1):
   1. Inputs for unbalanced line sources
   2. Inputs shall be via ¼" receptacles
   3. Line and mic level outputs
   4. Ground lift switch
   5. Acceptable Product:
      a. Whirlwind DIRECTOR
      b. Radial ProDI
      c. Approved Equivalent

D. Stereo DI Box (Type 1):
   1. Inputs for stereo/dual mono unbalanced line sources
   2. Inputs shall be via ¼", RCA, 3.5mm receptacles
   3. Line and mic level outputs
   4. Ground lift switch
   5. Acceptable Product:
      a. Whirlwind DIRECT2
      b. Radial ProAV2
      c. Approved Equivalent

E. Stereo Computer DI Box (Type 1):
   1. Inputs for stereo/dual mono unbalanced line sources
   2. Inputs shall be via ¼", RCA, 3.5mm receptacles

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3. Line and mic level outputs
4. Ground lift switch
5. Acceptable Product:
    a. Whirlwind PC-DI
        1) ProCo BPMBMB-3 3.5mm TRS Cable
    b. Radial JPC
        1) ProCo BPMBMB-3 3.5mm TRS Cable
    c. Approved Equivalent

F. Stereo Computer USB DI Box (Type 1)
1. Inputs shall be via USB receptacle
2. Mic level outputs
3. Acceptable Product:
    a. Whirlwind PC-USB
    b. Radial USB-Pro
    c. Approved Equivalent

G. Line Input (LI, Type 1)
1. Decora mounted
2. Stereo RCA jacks
3. Stereo 3.5mm jack
4. Balanced stereo outputs
5. Coordinate finish with Architect
6. Acceptable Product:
    a. RDL D#-CIJ3D

H. Bluetooth Receiver (BTRX, BTIO, Type 1)
1. Input: Bluetooth
2. Output: balanced analog audio.
3. Provides long distance distribution of Bluetooth audio using Cat6 cable.
4. Powered from receiver in rack.
5. Does not support automatically pairing.
6. Customizable Bluetooth name.
7. Coordinate finish with Architect
8. Acceptable Product to Include:
    a. RDL BT1A (BTRX)
    b. RDL TX-TPR2A (BTIO)

I. Analog Stereo to AES Converter (AES, Type 1)
1. Inputs: 2x balanced analog, 2x unbalanced analog
2. Outputs: 1x AE3
3. Acceptable Product:
a. RDL HR-ADC1
b. Approved Equivalent

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2.05 MIXERS

A. I/O Expander (MIX IO, Type 1)
    a. Portable digital audio expander.
    b. 16 balanced inputs
    c. 8 balanced outputs
    d. Acceptable Product:
        1) Allen & Heath AB168

B. Mixer (MIXER, Type 1):
    1. 6 input rack mount mixer
    2. 6 mono mic/line inputs
    3. 3 stereo line inputs
    4. Stereo line output
    5. 2 mono line outputs
    6. Acceptable Product:
        a. TOA M-633D

C. Mixer (MIXER, Type 2):
    1. 16 input digital rackmount mixer
    2. 8 outputs
    3. 48 channels
    4. 36 mix busses
    5. USB audio input/output.
    6. Rack Mountable.
    7. Acceptable Product:
        a. Allen & Heath SQ-5
            1) SKB 1SKB-RE-SQ5

D. Mixer (MIXER, Type 3)
    1. 2 mic/5 stereo line inputs.
    2. 3 stereo zone outputs
    3. Rack Mountable.
    4. Acceptable product:
        a. Tascam MZ-223

2.06 DIGITAL SIGNAL PROCESSORS

A. Digital Signal Processing System (DSP)
    1. Provide independent DSP processing for each system as detailed on the AV drawings.
    2. The DSP system and control software shall be operational 30 days prior to the first use of the installed system.
    3. Function: Provide all signal processing and control required for the system(s). Devices required include, but are not limited to; mixer, matrix router, crossover, high and low pass filters, delay, compression, 6-band parametric equalizer, limiter, ducker, signal delay, and external control.

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4. Unit to be configured with a minimum quantity of inputs and outputs as shown within the AV drawings, including control port requirements.
5. Signal flow and routing to be fully user configurable.
6. Unit to permit hardwire connection of external switches for recalling presets.
7. Unit to permit remote networked control via dedicated devices.
8. Access to external user-adjustable controls shall be restricted.
9. Manufacturer Software:
    a. Provide 12 months of on-site software upgrades from date of final acceptance.
10. DSP Software Setup:
    a. Provide site specific configuration and programming for the DSP software.
    b. Coordinate user interface, software functionality, and menu screens with Architect's Consultant. Reference submittal requirements.
    c. Provide ongoing software upgrades and maintenance for 12 months from date of final acceptance.
    d. Reference Part 3.4 System Programing in this specification for additional programming details.
11. Where DSP and Amplifiers are used in the same system, use processing and amplification products of the same platform.

B. Digital Signal Processor (DSP, Type 1)
1. Acceptable Product:
    a. QSC Q-Sys Core 24f

C. Digital Signal Processor Input/Output Expander (DSP IO, Type 1)
1. Acceptable Product:
    a. QSC QIO-ML4i
    b. QSC QIO ML2x2
    c. QSC QIO L4o

2.07 POWER AMPLIFIERS

A. General:
1. Two, Four, or Eight channel power amplifier with the EIA standard RS-490 power rating at 1% THD into 70-volt constant voltage load or 8-ohm load as applicable.
2. Provide protection of circuit components in the event of input over-drive, output overload, or short circuits.
3. Frequency response: ±1 dB, 20 Hz to 20 kHz with less than 1 per cent THD at rated output.
4. Input impedance: 10k ohm balanced.
5. Output regulation: 2 dB from no load to full load conditions.
6. Noise generation: at least 85 dB below rated output with input shorted.

B. Acceptable products:
1. Type 1:
    a. QSC CX-Q 2K4
    b. LEA CONNECT 35xD
2. Type 2

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a. LEA CONNECT 35x

2.08 LOUDSPEAKERS

A. General
1. Coordinate loudspeaker/grille and hardware colors with Architect
2. Provide all necessary mounting hardware, brackets, supports and any secondary steel required to attach loudspeaker to building structure.

B. Speaker (Type 1 – 9)
1. Not Specified

C. Speaker (Type 10)
1. Type: Compact surface mount two-way, full-range loudspeaker
2. Configuration: 12-inch woofer, 90° x 50° horn
3. Frequency Response: 62Hz – 19kHz
4. Power: 600W program @ 8Ω
5. Sensitivity: 95dB (1W/1m)
6. Acceptable Product:
a. JBL PRX412M
1) JBL PRX412M-CVR

D. Speaker (Type 11)
1. Type: Pendant loudspeaker
2. Configuration: 6.5-inch driver and a 1-inch dome tweeter
3. Frequency Response: 68 Hz – 17 kHz
4. Power: 150W @ 8 ohms
5. Taps: 60W / 30W / 15W / 7.5W @ 70V
6. Coverage: 120-degree conical
7. Acceptable Product:
a. JBL Control 67P/T
b. QSC AD-P6T

E. Speaker (Type 12 – 20)
1. Not Specified

F. Speaker (Type 21)
1. Type: Surface mounted loudspeaker
2. Configuration: 12-inch coaxial two-way loudspeaker
3. Frequency Range: 55 Hz – 20 kHz
4. Power: 600W @ 8 ohms
5. Coverage: 90-degree conical
6. Acceptable Product:
a. Tannoy VX12
1) Tannoy VMB
2) Tannoy VXY12
b. Renkus-Heinz CX121M

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1) Renkus-Heinz UBKT/CT121M

G. Speaker (Type 22 – 30)
1. Not Specified

H. Speaker (Type 31)
1. Type: Surface mounted loudspeaker
2. Configuration: 8-inch two-way loudspeaker
3. Frequency Range: 37 Hz – 18 kHz
4. Taps: 110W / 55W / 28W / 14W @ 70V
5. Coverage: 110 x 85 degree
6. Acceptable Product:
a. JBL Control 29AV-1
1) JBL MTC-29UB

2.09 LOUDSPEAKER HARDWARE AND SUPPORT STRUCTURE

A. All rigging truss modules, slings and hardware to meet a minimum of one of the following standards.
1. ASME B30.26
2. ASME B30.9
3. OSHA 1910.184
4. OSHA 1926.251
5. UL 1480 31.3

B. Shoulder Type Machinery Eye Bolts:
1. Forged Steel - Quenched and Tempered.
2. Fatigue rated at 1-1/2 times the Working Load Limit at 20,000 cycles.
3. Product to meet or exceed all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements.
4. Select size of product based working load limits required.
5. Acceptable Product:
a. Crosby Group S-279 / M-279 Series

C. Forged Eye Nuts:
1. Forged Steel - Quenched and Tempered.
2. Tapped with standard UNC class 2 threads after galvanizing.
3. Product to meet or exceed all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements.
4. Select size of product based working load limits required.
5. Acceptable Product:
a. Crosby Group G-400 Series

D. Anchor Shackles:
1. Forged - Quenched and Tempered, with alloy pin.
2. Working Load Limit permanently shown on every shackle.
3. Hot Dip galvanized or Self-Colored.

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4. Product to meet the performance requirements of Federal Specification RR-C-271D Type IVA, Grade A, Class1.
5. Select size of product based working load limits required.
6. Provide all screw pin type shackles with mouse wire.
7. Acceptable Product:
    a. Crosby Group G-213 / S-213 Series Round Pin
    b. Crosby Group G-209 / S-209 Series Screw Pin

E. Turnbuckles:
1. Acceptable turnbuckle assembly combinations include: Eye and Eye, Jaw and Jaw, Jaw and Eye.
2. End fittings are Quenched and Tempered, bodies heat treated by normalizing.
3. Hot Dip galvanized.
4. Product to meet or exceed all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements.
5. Product to meet the performance requirements of Federal Specifications FF-T-791b, Type 1 Form 1 - CLASS 4, and ASTM F-1145.
6. Select size of product based working load limits required.
7. All end fittings to be moused to the body with mousing cable.
8. Acceptable Product:
    a. Crosby Group HG-226 Series, Eye and Eye
    b. Crosby Group HG-227 Series, Jaw and Eye
    c. Crosby Group HG-228 Series, Jaw and Jaw

F. Wire Rope:
1. Strands: 7 x 19 Utility Cable.
2. Type: Galvanized.
3. Select size of product based working load limits required.
4. Acceptable Manufacturer:
    a. Wire Rope Corporation of America (WRCA)

G. Wire Rope Thimble:
1. Product to meet the performance requirements of Federal Specification FF-T-276b Type II.
2. Hot Dip galvanized.
3. Select size of product based wire rope size required for suspended load.
4. Acceptable Product:
    a. Crosby Group G-411 Series

H. Wire Rope Sleeves:
1. Type: Copper Duplex.
2. Select size of product based wire rope size required for suspended load.
3. Acceptable Product:
    a. Wire Rope Corporation of America (WRCA) SW-740 Series

2.10 ASSISTIVE LISTENING

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A. ALS Transmitter (ALT, Type 1):
   1. Configuration: Single-channel.
   2. Frequency: 216 MHz.
   3. Audio Input: Balanced, mic or line level, 3-pin XLR.
   4. Provide power supply.
   5. Provide 1-RU rack mount bracket.
   6. Remote mounted antenna (ANT-HA)
   7. Acceptable Product:
      a. Listen Technologies LS-71-216
         1) Listen Technologies LA-124 for device/panel mounted antennas
      b. William Sound FM-558 Pro
         1) William Sound ANT 034 for device/panel mounted antennas

B. ALS Receiver (Type 1):
   1. Configuration: Single channel.
   2. Frequency: 216 MHz.
   3. Frequency agile to adjust various systems.
   4. Receivers to be frequency adjustable for use in all venues.
   5. Include an individual price for owner to purchase additional receivers.
   6. Acceptable Product:
      a. Listen LR-5200-216 Receiver
         1) Listen LA-401 Ear Speaker
         2) Listen LA-402 Headset
         3) Listen LA-430 Neck Loop
      b. William Sound FM-R38
         1) William Sound EAR 022
         2) William Sound HED 024
         3) William Sound NKL 001

2.11 PROJECTION SCREENS

A. Electric Projection Screen (PS, Type 1)
   1. General: Provide manufacturer's standard units consisting of screen and other components as required for a complete installation.
   2. Provide rigging and mounting hardware as required.
   3. Comply with the following requirements for the viewing surface:
      a. Tab tensioned screen
      b. Low Voltage Controller
      c. Slot Closure
      d. 16:9 aspect ratio
      e. HD Progressive 1.1 Contrast screen material
   4. Provide custom black drop as required to locate bottom of image as shown in elevation details
   5. Screen Size: Reference projection screen schedule

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6. Acceptable Product:
    a. Da-Lite Tensioned Advantage Custom

2.12 VIDEO PROJECTORS

A. Video Projector (PROJ, Type 1)
1. Laser WUXGA 3LCD Projector
2. Native Resolution WUXGA (1920 x 1200) with 4K Enhancement Technology
3. Brightness 13,000 lumens
4. Control Communication RS-232C
5. Field verify throw distance to determine appropriate lens
6. Provide required lens
7. Acceptable Product:
    a. Epson EB-PU2213B

2.13 AV SOURCES

A. Wi-Fi Presentation Gateway (WPS Type 1):
1. Allows simultaneous display of up to four presentation sources
2. Remote View: Up to 40 remote users can connect via a Web browser
3. Output Signal Types: HDMI, RGB
4. Output Resolution: 1920x1080@60Hz
5. Acceptable Product:
    a. Crestron Air Media AM-3200-WF
    b. Pre-approved equal

2.14 ENCODERS/DECODERS

A. AV over IP Encoder (ENC, Type 1)
1. 4K60 4:4:4 Video Support
2. One Gigabit LAN Port for 4K60 4:4:4 Video, Dante®/AES67, and Control
3. HDMI 2.0 and HDCP 2.2, 2.3 Compliant
4. Fits 2-gang back box
5. Coordinate color with Architect
6. POE
7. Acceptable Product:
    a. Visionary DuetE5-WP-H

B. AV Over IP Encoder (ENC, Type 2)
1. 4K60 4:4:4 Video Support
2. One Gigabit LAN Port for 4K60 4:4:4 Video, Dante®/AES67, and Control
3. HDMI 2.0 and HDCP 2.2, 2.3 Compliant
4. Surface Mount Encoder
5. POE+
6. Acceptable Product:
    a. Visionary DuetE-5 Encoder

C. AV Over IP Decoder (DEC, Type 1)

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1. 4K60 4:4:4 Video Support
2. One Gigabit LAN Port for 4K60 4:4:4 Video, Dante®/AES67, and Control
3. HDMI 2.0 and HDCP 2.2, 2.3 Compliant
4. Surface Mount Encoder
5. POE
6. Acceptable Product:
    a. Visionary D5100 Decoder

2.15 AV NETWORK HARDWARE

A. AV Network Switch (AV SWITCH, Type 1)
1. 1RU Rackmount
2. 10/100/1000 BASE-T RJ45 ports
3. 10000BASE-X SFP ports
4. Switching Fabric: 240 Gbps
5. Acceptable Product:
    a. Netgear M4250 Series

2.16 CONTROL SYSTEMS

A. Room Control Relay Unit (RMC, Type 1)
1. Native network low-voltage relay connectivity solution for Q-SYS
2. Four (4) dry contact closure relay circuits with Normally Open (NO), Common (C), and Normally Closed (NC) connections
3. Power-over-Ethernet (PoE) capable
4. Surface- or rack-mountable (1RU, quarter-width)
5. Includes surface mounting hardware
6. Acceptable product to include
    a. Q-SYS QIO-LVR4
    b. Q-SYS QIO-RMK rack mounting kit

2.17 USER INTERFACES

A. Touch Panel (TP, Type 1)
1. Projective capacitive (PCAP) multi-touch, Power over Ethernet, 24-bit color display.
2. Viewable Screen Dimensions (diagonal) 10 inch
3. Resolution 1920 x 1200
4. POE+ Class 5
5. Acceptable Product:
    a. QSC TSC-101-G3

2.18 POWER SYSTEMS

A. Power Sequencing
1. Power Sequencing system to be operated via low voltage button contact closures from either push buttons located on panels local to the event space or via a contact closure from a relative control system (DSP, Control Processor, etc.)
2. Devices to be sequenced “ON” in order of audio signal flow. Devices and equipment to be shut down in reverse order from “ON” sequence. Example “ON” order starting with:

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a. Source devices. (Media Players, Pre-amplifiers, etc.)
b. Processing devices (DSP, Mixers, Video Switchers, etc.)
c. Output devices (Amplifiers, Powered Speakers, etc.)

3. Devices not to be sequenced and to remain on for status and monitoring purposes to include but not limited to:
   a. Network switches and components.
   b. Equipment housing ventilation systems.
   c. Control system equipment responsible for providing control of Remote Power Sequencing system.
4. Coordinate wiring of high voltage components.

B. Power Sequencer (SEQ, Type 1)
1. 6 step sequencing
2. Low voltage contact closure
3. Configurable step delay
4. Acceptable Product:
   a. Middle Atlantic USC-6R

C. Power Sequencer (SEQ, Type 2)
1. Network controlled power sequencer
2. Rack mounted
3. 8 controlled outlets
4. 1 unswitched outlet
5. 20A capacity
6. Acceptable Product:
   a. Middle Atlantic RLNK-P920R

D. Rack Power Distribution (RPD, Type 1)
1. Modular raceway power system.
2. Rack mountable vertical distribution.
3. Low voltage contact closures.
4. Coordinate wiring of high voltage components with electrical contractor.
5. Provide additional raceways if circuit count exceeds maximum raceway length
6. Acceptable Product to Include:
   a. Middle Atlantic MPR-xA
   b. Middle Atlantic RLM-20A (Switched Module, as needed)
   c. Middle Atlantic RLM-30A (Switched Module, as needed)
   d. Middle Atlantic M-20A (Un-switched Module, as needed)

E. Rack Power Distribution (RPD, Type 2)
1. Rack mountable vertical distribution.
2. Used for additional outlets where needed.
3. Size strip to number of required outlets.
4. Acceptable Product:
   a. Middle Atlantic PDT Series

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b. Middle Atlantic PD Slim Series

F. Switched Power Distribution (SW POWER, Type 1)
1. Low voltage-controlled power distribution
2. Rack mounted
3. 3 controlled duplexes
4. 1 unswitched duplex
5. Acceptable Product:
a. Middle Atlantic PDC-915R-6

G. Power Protection with Lights (POWER/LIGHT):
1. 20 Amp power system.
2. Eight switched AC outlets.
3. Remote power turn on.
4. Acceptable product:
a. Furman Sound PL-PRO C
b. Approved Equivalent

H. Power Protection with Lights (POWER/LIGHT):
1. For small or portable rack applications
2. 15 Amp power system.
3. Eight switched AC outlets.
4. Acceptable product:
a. Furman Sound PL-8C
b. Approved Equivalent

I. Rackmount Uninterruptible Power Supply (UPS)
1. Provide UPS systems to maintain power to all networking and processing equipment, including digital audio mixer systems and recording equipment
2. UPS's shall be on-line style with sufficient battery reserve to operate for 15 minutes. Size each UPS unit for 25% additional capacity.
3. Rack mountable.
4. Acceptable product:
a. Middle Atlantic Select Series UPS
b. APC Easy UPS Series

2.19 EQUIPMENT HOUSING AND ACCESSORIES

A. General
1. Refer to drawings for equipment rack sizes and additional notes.

B. Wall Mounted Equipment Rack (Type 1)
1. Finish: Textured black powder coat
2. Tapped 10-32 rack rails
3. Acceptable Product:
a. Middle Atlantic DWR series
1) ~~Middle Atlantic FAN2-DC-FC~~
2) Middle Atlantic DWRSR-138FT-K-EU

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3) Middle Atlantic LVFD series

C. Floor-Supported Wall Rack (Type 1)
   1. Finish: Black powder coat
   2. Tapped 10-32 rack rails
   3. Acceptable Product:
      a. Middle Atlantic SR series
         1) Middle Atlantic LVFD series
         2) Middle Atlantic DWRSR-6-FK series

D. Portable Equipment Rack (Type 1)
   1. Size: 8RU front with 12RU Top
   2. Tapped 10-32 rack rails
   3. Acceptable Product:
      a. SKB 1SKB19-R1208

E. Rack Blanks (BLANK)
   1. Flanged, aluminum panel.
   2. Anodized finish.
   3. Acceptable product:
      a. Middle Atlantic BL series

F. Rack Vents (VENT)
   1. Flanged, aluminum panel.
   2. Anodized finish.
   3. Acceptable product:
      a. Middle Atlantic VTP series

G. Cable Management
   1. Brush grommet panel
   2. Acceptable Product:
      a. Middle Atlantic BR series

H. Rack Drawers (DRAWER)
   1. Blank anodized finish
   2. Acceptable product:
      a. Middle Atlantic D series

I. Rack Mounted Sliding Shelf (SLIDE OUT SHELF)
   1. Finish: Black
   2. 1-RU rack mountable sizes.
   3. Acceptable product to include:
      a. Middle Atlantic SS

J. Equipment Rack Screws:
   1. Install rack mounted equipment with black 10-32 star post security screws with flat nylon washers.
   2. Quantity as required.

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3. Provide one spare bit located in a clear plastic bag attached to the inside of each equipment rack in plain view.
4. Acceptable Product:
    a. Middle Atlantic HTX

2.20 PLATES AND PANELS

A. General
1. Provide plates and panels and as described in Drawings. Engrave as shown on Drawings. Other Plates and Panels may be required to satisfy the requirements of the Work.
2. Custom panels shall be 1/8-inch thick aluminum, standard EIA sizes, brushed, anodized finish unless otherwise noted. Brush in direction of aluminum grain only.
3. Plate finish shall be coordinated with the Architect. Plastic plates are not acceptable.
4. Panel, plate and label engraving shall be 1/8-inch block sans serif characters unless noted otherwise. On dark panels or pushbuttons, letters shall be white; on stainless steel or brushed natural aluminum pushbuttons, letters shall be black.

B. Custom and/or Engraved Panels:
1. Acceptable Manufacturers:
    a. EMG
    b. RCI Custom
    c. ProCo
    d. Radial Engineering

2.21 CONNECTORS

A. XLR Panel Mount Connectors
1. Provide panel mount XLR connectors with unified metal shell.
2. RF-Protector connectors.
3. Shell Color: Black.
4. Contacts: Silver.
5. Terminations: Solder.
6. Acceptable Product:
    a. Male Connectors: Neutrik NC*MD-L-1-BAG Series
    b. Female Connectors: Neutrik NC*FD-L-1-BAG Series

B. XLR Cable Connectors
1. Provide XLR cable connectors with die cast shell.
2. No-screw type assembly.
3. Chuck-type strain relief.
4. Shell Color: Black.
5. Contacts: Silver.
6. Terminations: Solder.
7. Acceptable Product:
    a. Male Connectors: Neutrik NC*MX-BAG Series
    b. Female Connectors: Neutrik NC*FX-BAG Series

C. 3.5mm Stereo Panel Mount Connectors

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1. Provide panel mount 3.5mm connectors with unified metal shell.
2. RF-Protector connectors.
3. Shell Color: Black.
4. Terminations: Solder.
5. Acceptable Product:
    a. Switchcraft EH35MMMSCB

D. Speaker Connectors
1. Provide 4 or 8 conductor connector
2. Shell Color: Black
3. Terminations: Solder or tab
4. Acceptable Product:
    a. Neutrik NL4MPXX
    b. Neutrik NL8MPRXX

E. HDMI Connectors
1. Provide panel mount HDMI feedthrough connectors
2. HDMI 2.0 compliant
3. Acceptable Product:
    a. Neutrik NAHDMI-W

F. Ethercon Panel Connectors
1. Provide panel mount Ethercon CAT6 connectors
2. Metal housing
3. Shielded
4. Acceptable Product:
    a. Neutrik NE8FDP-B

2.22 LOOSE CABLES

A. Microphone/Instrument Cables:
1. Cable properties:
    a. Quad 24 gauge stranded with braided shield, flexible hard service jacket.
    b. Color: Black
    c. Each cable to be provided with a Velcro style tie wrap.
        1) Minimum 5/8” width
        2) Length appropriate to wrap minimum 1.5 times around a cable loop of 14-inch diameter.
        3) Standard of performance:
            a) Rip-Tie CABLEWRAP
2. Microphone Cable:
    a. Type 06 – 6 foot, with Gray collar on connector
    b. Type 25 – 25 foot, with Blue collar on connector
    c. Type 50 – 50 foot, with Green collar on connector
    d. Type 100 – 100 foot, with Red collar on connector

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3. Instrument Cable
    a. Type 06 - 6 foot, 1/4-1/4
    b. Type 10 – 10 foot, 1/4-1/4
4. Acceptable cable:
    a. Whirlwind MKQ series
    b. Canare StarQuad
    c. ProCo AmeriQuad

B. Speaker Cables:
1. Cable properties:
    a. Color: Black,
    b. Connector: NL4 to NL4 or NL8 to NL8
    c. Wire: 12 gauge stranded, SJ jacket.
    d. Each cable to be provided with a Velcro style tie wrap.
        1) Minimum 1” width
        2) Length appropriate to wrap minimum 1.5 times around a cable loop of 14-18 inch diameter.
        3) Standard of performance:
            a) Rip-Tie CABLEWRAP
2. Speaker Cable:
    a. Type 06 – 6 foot, with Gray collar on connector
    b. Type 25 – 25 foot, with Blue collar on connector
    c. Type 50 – 50 foot, with Green collar on connector
    d. Type 100 – 100 foot, with Red collar on connector
3. Acceptable cable:
    a. Whirlwind NL series
    b. Approved Equivalent

C. Ethernet Audio Cables:
1. Cable properties:
    a. Color: Black
    b. Neutrik Ethercon Connector
    c. Rugged Tactical Jacket
    d. Each cable to be provided with a Velcro style tie wrap.
        1) Minimum 5/8” width
        2) Length appropriate to wrap minimum 1.5 times around a cable loop of 14-inch diameter.
        3) Standard of performance:
            a) Rip-Tie CABLEWRAP
2. Ethernet Audio Cable:
    a. Type 06 – 6 foot, with Gray collar on connector
    b. Type 25 – 25 foot, with Blue collar on connector
    c. Type 50 – 55 foot, with Green collar on connector

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d. Type 100 – 100 foot, with Red collar on connector

3. Acceptable cable:
   a. ProCo DuraCat
   b. Approved Equivalent

D. Power Extension Cables:
1. Cable properties:
   a. Color: Black
   b. 12-gauge, 3 conductor, stranded, flexible hard service jacket.
   c. Each cable to be provided with a Velcro style tie wrap.
      1) Minimum 1” width
      2) Length appropriate to wrap minimum 1.5 times around a cable loop of 14-18 inch diameter.
      3) Standard of performance:
         a) Rip-Tie CABLEWRAP
2. Power Extension Cable:
   a. Type 12 – 12 foot,
   b. Type 25 – 25 foot,
   c. Type 50 – 50 foot,
   d. Type 100 – 100 foot
3. Acceptable cable:
   a. ProCo E-Cords series
   b. Approved Equivalent

2.23 INSTALLED CABLES & WIRING

A. General
1. All electrical conductors installed under this contract, except where otherwise specified, shall be soft drawn annealed stranded copper having a conductivity of not less than 98% of pure copper, and meet appropriate ratings (e.g. CMR, CMP, etc.)
2. Cable shall carry appropriate fire rating (e.g. CMR, CMP, OFNR, OFNP, etc.) on jacket of cable.
3. Where cables are routed through cable tray, provide tray rated cable of equal specification.
4. Where speaker cables are run exposed through a return air plenum, provide plenum rated cable of equal specification.
5. Shielded cables located in raceways shall have aluminum foil shield with drain wire.
6. The Belden cables listed below are approved for use on this project and are listed to set the acceptable standard of performance. If field conditions or actual cable pathway requires tray or plenum cable, provide version of cable that meets required rating. Cables from West Penn, Windy City Wire, Liberty, Commscope and Gepco are also acceptable provided they meet the performance specifications of the approved listed cables.

B. Microphone/Line Level Wire
1. Provide shielded 22 AWG cable.
2. Cable to be PVC jacketed.

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3. Jacket color: black.
4. Acceptable Product:
    a. Belden 9451

C. Speaker Level Wire
1. For applications less than 300W and/or 300 feet
2. Provide 16 AWG cable.
3. Cable to be CL3R or CL2P rated.
4. Jacket color: gray.
5. Acceptable Product:
    a. Belden 5200UE

D. Speaker Level Wire
1. For applications less than 600W and/or 600 feet
2. Provide 14 AWG cable.
3. Cable to be CL3R or CL2P rated.
4. Jacket color: gray.
5. Acceptable Product:
    a. Belden 5100UE

E. Speaker Level Wire
1. For applications less than 2400W and/or 1000 feet
2. Provide 12 AWG cable.
3. Cable to be CL3R or CL2P rated.
4. Jacket color: gray.
5. Acceptable Product:
    a. Belden 5000UE

F. Category Cable
1. 23-gauge solid cable
2. Category 6+ Enhanced
3. 4 pair, UTP
4. Acceptable Product
    a. Belden 2412F

G. Wireless /Assisted Listening Antenna Cable
1. For applications less than 100 feet
2. 16-gauge, stranded center conductor
3. RG8/X
4. 95% braided shield
5. Acceptable Product:
    a. Belden 9258

H. Wireless /Assisted Listening Antenna Cable
1. For applications between 100 and 400 feet
2. 10-gauge, stranded center conductor

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3. RG8/U
4. 90% braided shield
5. Acceptable Product:
    a. Belden 9913

I. HDMI Cable Shorter Than 50’
1. Provide pre-molded cables in lengths as required
2. Acceptable Product:
    a. Crestron® Certified HDMI® Interface Cable
    b. Extron Ultra Series HDMI Cable
    c. Comprehensive Microflex Pro AV/IT 18Gbps

J. HDMI Hybrid Fiber Optic Cable
1. Provide pre-molded cables in lengths as required
2. Acceptable Product:
    a. Extron HD Pro P/50 (26-726-50)
    b. Extron HD Pro P/75 (26-726-75)
    c. Extron HD Pro P/100 (26-726-100)
    d. Extron HD Pro P/125 (26-726-125)
    e. Extron HD Pro P/150 (26-726-150)

2.24 MISCELLANEOUS

A. Headphones (Type 1):
1. Acceptable Product:
    a. Sony MDR-7506
    b. Shure SRH440
    c. Approved Equivalent

B. Mobile Cabinet: (Type 1) – Microphones / Accessories
1. Lockable
2. Steel construction
3. 4 Drawers
4. Large 6” casters
5. Acceptable Product:
    a. Westward 3401NVS-5PU-95W
    b. Approved Equivalent

C. Mobile Cabinet: (Type 2) - Speakers / Cables
1. Lockable
2. Steel mesh construction
3. Large 6” casters
4. Double doors
5. Acceptable Product:
    a. Grainger 9WMJ8
    b. Approved Equivalent

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PART 3 - EXECUTION

3.01 GENERAL

A. Coordinate incorporation of the Work specified herein with other project work so as to facilitate a cohesive final Products.

B. The installation recommendations contained within ASDI and Telecommunications Distribution Methods Manual are mandatory minimum standards and requirements.

C. Mount equipment and enclosures plumb and level.

D. Permanently installed equipment to be firmly and safely held in place. Design equipment supports to support loads imposed with a safety factor of at least five. Seismic bracing shall be installed on appropriate equipment where local codes require such installation.

E. Verify all locations of equipment in all rooms with Owner's Representative, Owner, and Consultant.

3.02 INSTALLATION

A. Installation of cable and wiring

1. Cabling and Wiring:

a. Install cable in a manner to adhere to manufacturer's specifications for maximum cable pulling tension, minimum bend radius, and restrictions.

b. Provide appropriate support at all horizontal-to-vertical transitions in order to keep the weight of the cable from degrading at the point of transition.

c. If a J-hook or trapeze system is used to support cable bundles, all horizontal cables shall be supported at a maximum of 48-inch (1.2 meter) intervals. At no point shall the cables rest on light fixtures, acoustic ceiling grids, panels, conduits, sprinkler pipe, water pipe and/or HVAC system ducting.

d. Horizontal distribution cables shall be bundled in groups of no more than 50 cables when being supported by J-Hook or trapeze systems. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance. An exception to this rule is when cable is installed in cable tray systems.

e. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices

f. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, install appropriate carriers to support the cabling.

g. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced prior to final acceptance at no cost to the Owner.

h. Cables shall be identified by a self-adhesive machine label in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606-A. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.

i. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.

j. Provide splice free wiring and cabling from origination to destination. Cables shall be installed in continuous lengths from origin to destination (no splices). Properly designed transition points, or consolidation points are not considered 'splice' points.

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k. Make joints and connections with rosin-core 60/40 solder or with mechanical connectors specifically intended for the type and class of cable being used. Where spade lugs are used, crimp properly with ratchet type tool.

l. Take precaution to prevent and guard against electromagnetic and electrostatic hum. For line-level audio signal, float cable shield at one end. Shield not connected to be folded back over cable jacket and covered with heat-shrink tubing. Do not cut off unused shield.

m. Isolate cables and wires of different signals or different levels; and separate, organize, and route to restrict channel crosstalk or feedback oscillation in any amplifier section. Keep wiring separated into groups for microphone level circuits, line level circuits, loudspeaker circuits, and power circuits.

n. Connect cable to active components through XLR connections whenever multiple formats are available. Make connections to speaker transformers with properly sized closed end connectors crimped with factory approved ratchet type tool. Wire nut or "Scotchlock" connectors are not acceptable. Do not wrap audio cable splices or connections with adhesive backed tape.

o. Cover edges of cable and wire pass-through holes in chassis, housings, boxes, etc., with rubber grommets or Brady GRNY nylon grommetting.

p. Execute wiring in strict adherence to:

1) Phillip Giddings. Audio System Design and Installation. Indianapolis: Howard W. Sams & Co., 1990.

2) Don Davis and Carolyn Davis. Appendix II, Recommended Wiring Practices. Sound System Engineering, 2nd Edition. Indianapolis: Howard W. Sams & Co., 1989.

3) AV Installation Handbook Second Edition: The Best Practices for Quality Audiovisual Systems, Infocomm, 2009

2. Equipment Housing Cabling and Wiring:

a. Lace, tie, or harness wire or cable as required herein, and in accordance with accepted professional practice. Dress, lace or harness all wire or cable to prevent mechanical stress on electrical connections; no wire or cable shall be supported by a connection point. Install cable and wire neatly tied in manageable bundles with cable lengths cut to minimize excess cable slack but still allow for service and testing. Provide horizontal support bars if cable bundles sag. Reference photos below for standard of quality.

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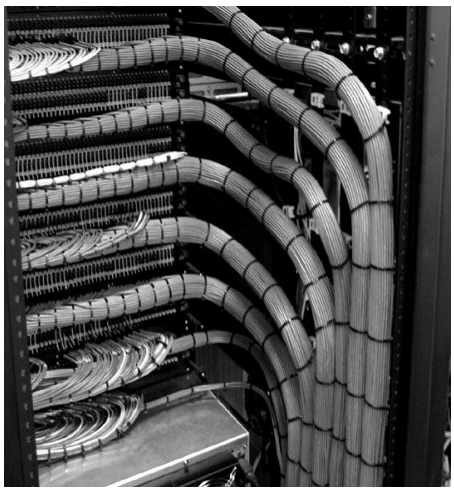

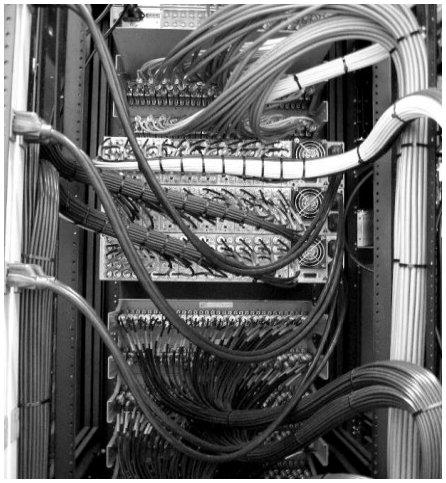

b. Provide adequate service loops so that equipment mounted on rack slides may be pulled fully out, to their locked position without straining cable.

c. Neatly bundle excess AC power cable from housing mounted equipment with plastic cable ties.

d. Provide plastic cable ties or Velcro straps to bundle cabling and wiring. Electrical tape and adhesive backed cable tie anchors are not acceptable.

e. Install with connections completely visible and labeled.

f. Provide termination resistors, if required, of 5 per cent tolerance; fully visible and not concealed.

B. Installation of connectors, plates & panels:

1. Install panel mounted connectors rigidly attached to panels, plumb and level.
2. Custom rack panels shall be 1/8 inch thick aluminum, standard EIA sizes, brushed black anodized finish (brushed in direction of aluminum grain only), unless otherwise noted.
3. Custom connector plates (speaker, microphone, etc.) are typically stainless steel, unless otherwise noted or specified. However, verify plate finish with Architect.
4. Install XLR type connectors in accordance with IEC-268 standard, with a wiring scheme of pin 2 hot (high), pin 3 (low), and pin 1 screen (shield).
5. Other Plates and Panels may be required to satisfy the requirements of the Work.

C. Installation power and grounding:

1. Coordinate final connection of power and ground wiring to housings.
2. Hardwire power wiring directly to internal AC receptacles to ensure uninterrupted operation.
3. Provide 3-conductor, isolated ground, 120 VAC outlets as required within each housing. Provide a minimum of two spare outlets in each rack.
4. Provide a copper ground buss top to bottom in each housing, insulated from the housing. Ground equipment chassis not having a three wire power cord to these busses using 6/32 nuts, bolts and lock-washers with No. 12 wire. Connect green ground wire from each AC outlet in housing to this buss bar.
5. Replace manufacturers supplied 18 gauge IEC power cords with UL listed 18 gauge pre-molded 6”, 12”, 18”, or 24”. Use minimum length required. No looped or cable tied IEC power cords will be permitted within the equipment rack.

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6. Replace manufacturers supplied 14 gauge IEC power cords with UL listed 14 gauge pre-molded 18” or 36” for all equipment IEC capable. Use minimum length required and minimize looped or cable tied IEC power cords present in the equipment rack.

D. Installation of electronic equipment:

1. Take appropriate precautions against electrostatic discharge (ESD). Establish a personal ground before handling electronic equipment through the use of a grounded wrist wrap and/or an anti-static floor pad.
2. Take appropriate precautions to protect the equipment from damage during installation. Equipment to be installed free of damages, scratches, dents, etc.
3. Mount trim potentiometers, custom circuit cards, relays, and transformers (except large 70V units) in shielded enclosures, and mark their function and connections with engraved lamicoid labels.
4. Mount equipment plumb and level, firmly and safely held in place.

E. Installation of equipment housing:

1. Mount equipment in racks and consoles and fully wire and test before delivery to job site. If field conditions prevent prior assembly of racks, notify Owner in writing that racks will be fabricated on site and the reasons for the change.
2. Secure rack mounted devices utilizing all available fastener mounting positions on device.
3. Provide rear support for housing mounted equipment greater than 15 inches deep.
4. Provide blank panels to fill unused panel space within the equipment housing.
5. If Key door locks are required, key each housing type alike.
6. Looking at the rack from the rear, locate AC power and speaker wiring on the left; line level audio, video, and RF wiring on the right.
7. Provide shaft locks or security covers on non-user operated equipment having front panel controls. These panels are to be installed at the conclusion of testing.
8. If forced air active thermal management is used, provide ventilation blocking material on the front, sides, and rear of the equipment rack as needed. Reference Middle Atlantic Products “Controlling the Temperature Inside Equipment Racks”.
9. Panels or equipment mounted on the rear rack rails shall not block access to any front mounted components.
10. If equipment rack is not equipped with casters, provide two inch high wood base to isolate equipment rack from floor. Wood base should be capable of supporting the load.

F. Installation of loudspeakers:

1. The Contractor is responsible for final design and engineering of loudspeaker rigging, attachments, brackets, and hoisting.
2. Loudspeakers shall be mounted at the operating position in a safe, secure, and permanent manner.
3. Provide custom rigging as needed. In addition to the ANSI standards below, custom rigging shall be built to include compliance with the following American Welding Society standards:
    a. AWS-D1.1/D1.1M:2020
    b. AWS-D1.2/D1.2M:2014
4. Loudspeaker manufacturer supplied mounting brackets or rigging shall be built to the applicable ANSI standards listed below, with testing and/or traceability data provided as part of shop drawings submittal.

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5. Suspension and Mounting:
    a. Static and dynamic equipment loads shall be suspended or mounted in compliance with the following ANSI/ESTA standards, using the latest available versions of the standards:
        1) ANSI E1.4-2-2021 Statically Suspended Rigging Systems
        2) ANSI E1.56-2018 Rigging Support Points
        3) ANSI E1.6-1-2021 Powered Hoist Systems
        4) ANSI E1.8-2012 Loudspeaker Enclosures Intended for Overhead Suspension
    b. Rigging, mounting, and support systems for overhead suspended loudspeakers shall be reviewed and certified by a registered Professional Engineer (PE), in the employ of the Contractor, licensed to practice in the State in which the project is located. Documentation shall be included as a submittal item. Once the systems are installed, the PE shall physically inspect, at the Contractor's cost, the methods and means used to verify compliance with the original design.
6. General Guidelines:
    a. Reference Project structural documents.
    b. Site and/or special inspections may be required if requested by the Owner.
    c. Paint loudspeakers, supports, and related hardware color as directed by the Owner.
    d. The aiming direction of all loudspeakers shall be adjustable by no less than ±5 degrees horizontally and vertically.
    e. Loudspeakers are to be oriented parallel to their mounting surface unless otherwise noted.
    f. Provide a safety cable connected to a secondary location for each loudspeaker.
    g. All loudspeakers located in ceiling tiles shall be located in the center of the tile unless noted otherwise.
    h. Paint loudspeakers to match surroundings. Confirm color selection with the Architect during the submittal phase.
    i. Exterior loudspeaker cabinets shall be constructed of materials designed for permanent outdoor exposure conditions with a minimum IP 54 rating, and a minimum expected 10-year life span. Exterior and interior surfaces of the cabinets shall be protected from the effects of water, moisture, and humidity. The exterior surface shall also be protected from the effects of ultraviolet radiation to prevent fading and color change. The cabinets shall be shaped and oriented in a manner that minimizes the possibility of water pooling on any cabinet surface. Associated hardware shall be inherently non-corrosive, performing to the standards of 304 Stainless Steel or higher.

G. Installation of projectors:
1. Confirm distance of specified projection lens before mounting projector.
2. Projectors shall be mounted plumb and level at the operating position in a safe, secure and permanent manner.
3. All hardware required to locate the mount and projector at the required location shall be provided.
4. Projectors shall be mounted using tamper proof secure hardware.
5. Contractor may be required to adjust projection screen and lift upper and lower limit switches for projection screens and lifts specified elsewhere and not installed as part of this Contract.

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H. Installation of flat panel monitors:
   1. Confirm location before mounting.
   2. Monitors shall be mounted plumb and level at the operating position in a safe, secure and permanent manner.
   3. All hardware required to locate the mount and monitor at the required position shall be provided.
   4. Locate monitor on the center line of the room unless noted otherwise.

I. Loose Equipment
   1. Provide loose equipment as indicated on drawings.
   2. Unpackage and assemble items.
   3. Place items in designated storage or refer to Owner for direction on final location and storage of loose equipment.

3.03 FIRESTOP

A. A fire-stop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Fire-stop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.

B. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate fire-stop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly fire-stopped.

C. Fire-stop systems shall be reviewed by a Professional Engineer (PE) licensed to practice in the State in which the project is located. Stamped drawings showing the fire stop systems shall be included as a submittal item. Once the systems are installed, the engineer of record for the firestop system shall physically inspect the methods and means used to verify compliance with the original design.

D. A drawing showing the proposed fire-stop system, stamped/embossed by the PE shall be provided to the Owner's Technical Representative prior to installing the fire-stop system(s).

E. All fire-stop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for observation by the local authorities prior to cable system acceptance.

3.04 CONTROL SYSTEM PROGRAMMING

A. General
   1. Audio level controls
      a. Audio level controls to use UP/DOWN buttons to change audio levels in 2 dB increments (or closest translation by control system).
      b. Microphone and line level controls to have a fixed range between 0 and -24 dB.
      c. Audio outputs/zone output level controls to have a fixed range between 0 and -6 dB.
      d. Provide visual feedback of current level setting.
      e. Provide additional level control upstream of user-level control to set the overall level for each zone.
   2. Audio System with power sequencing definitions:
      a. STANDBY: System is powered on with all outputs muted in processing.

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b. MODE: See individual systems for exact routing in each mode. System is on and outputs are unmuted in processing.

c. OFF: System is powered down with all outputs muted in processing.

B. Cafetorium

1. DSP functions triggered by AV Control System touch panel.

a. System modes/presets:

1) STANDBY: Audio DSP preset to mute all output capability of the system. AV Control System to un-route all video signals, power off all displays and projector(s), and retract projection screen(s.)

2) EVENT: This preset to change Audio DSP Source Matrix to route the outputs of the portable digital mixing system to the main loudspeakers. All outputs of the DSP to be unmuted.

3) PRESENTATION: This preset to change Source Matrix to route the outputs of the presentation system to the main loudspeakers as shown in functional diagrams.

a) Volume controls: Provide volume controls for sources shown in DSP diagram.

b) Mute controls: Provide mute buttons for sources shown in DSP diagram.

2. Low voltage controls for DSP

a. PAGE/FIREALARM: Triggered by the paging and/or fire alarm system, this trigger to display a lockout notification due to fire alarm/paging event. This notification should temporarily halt all controls from the touch panel until the trigger is released.

3. The Stage Managers Touch Panel and Control Position touch panel video controls shall mirror one another. Any button presses on either panel shall show on both panels

C. Gymnasium

1. DSP functions triggered by AV Control System touch panel.

a. Volume controls: Provide volume controls for sources shown in DSP diagram.

b. Mute controls: Provide mute buttons for sources shown in DSP diagram.

2. Low voltage controls for DSP

a. PAGE/FIREALARM: Triggered by the paging and/or fire alarm system, this trigger to display a lockout notification due to fire alarm/paging event. This notification should temporarily halt all controls from the touch panel until the trigger is released.

D. Transport Control

1. Provide standard Stop, Play, Pause, Fast Forward and Rewind for each playback device and menu control for DVD players. Buttons should be arranged in a conventional fashion that will be familiar to the normal user.

2. The selected control function should be displayed by showing the appropriate button “pressed”. It should remain this way until another function is selected.

3. For devices that will go into a standby mode after a period of time, the control system shall sense this mode and restore normal operating mode once a transport function has been selected. This may require the use of current sensors to determine the state of the unit. No direct user action should be required at the playback device to restore the normal operating mode.

E. Screen/Shade Control

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1. In addition to up-down functions, provide a Stop function to allow the movement to be halted. Once movement has been stopped, the up or down buttons should resume travel in the selected direction.
2. Control system shall not prevent screen/shade wall controls from being used as well.
3. Touch panel controls should be readily accessible to the user to permit direct control of shades or screen with having to navigate through multiple control pages.

F. Room Combining
1. Combining of adjacent areas shall be done through a graphical representation of the physical areas to be combined. Use of a floor plan metaphor is recommended with the graphic oriented correctly with respect to control panel location.
2. Use buttons or other appropriate objects placed along the common wall to enable the combining function.
3. When spaces are combined, the graphic appearance of those areas shall change to reflect this configuration. Once an area is separated from a combination, the color of its area should revert to the normal room color.
4. Common control functions between combined rooms shall be linked, allowing control of the combined area from any one of the touch panels. Examples of common functions include:
    a. Background music selection,
    b. Background music volume
    c. Background music muting
    d. Lighting preset recall
    e. Master volume (not individual channel volume)
5. When combining adjacent rooms, the control system shall force the common functions to a predetermined default configuration so all rooms have the same configuration.
6. To avoid unintentional changes, a control panel will not be able to operate a function in a remote location without also operating that same function in the room where the panel is located.

G. Level Control
1. Objects requiring level adjustment such as volume or tone controls shall be through Up/Down buttons with a graphical representation of the actual level.
2. Increment of level change to be adjusted for reasonable range without the need to push the Up or Down buttons needlessly.

H. Volume Mute
1. Where the ability to mute the sound is needed, the button shall use the label “Vol On” and “VOL OFF” instead of Mute and Unmute. When in a “VOL OFF” mode, pushing the “VOL UP” button shall restore the sound and bring the system out of the muted mode.
2. VOL ON/OFF buttons shall change color to indicate the status of the button.

I. Standard Colors
1. Control functions shall be color coded to add clarity and show relationships between different groups of controls.
2. The color Red shall be reserved to indicate a fault or abnormal condition.
3. Green may be used to indicate normal operation, but may be used for standard control colors as well.
4. Similar controls should maintain the same color scheme across all control pages.

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5. When a function is selected, the graphical depiction of that button should appear to be pressed and its color change to a darker shade of the regular button color.
6. Color schemes used for background and foreground objects should be selected to be complimentary and provide a consistent theme throughout the control pages.

J. Minimum Button Size and Placement
1. Minimum visual size of a button is 3/8” wide by 1/4” high.
2. Spacing between buttons should be no less than 1/16”.
3. Where buttons are immediately adjacent, the active selection area of the button should be reduced to 80% of the visual area of the button.

K. Button Actions
1. When a function on a control page is selected, that button or visual object associated with that function should change to reflect what has been chosen.
2. For functions that are momentary selections (i.e., VOL UP), the change of state is visible for as long as the button is being pressed.
3. For function that are maintained selections (i.e., PLAY), the change of state remains visible until another function is selected and resets the previous function.
4. The state change of a button or visible object should depict real-world objects as much as possible including the appearance of the button be pressed inward, change in shade of the original color, but not a change in hue.

L. Labels
1. Use of simple words or titles are preferred to indicate functionality, navigation and system status.
2. Use of stylish symbols should be avoided unless their identity is commonly recognized by the general public. Standard symbols for transport functions are acceptable.
3. Labels should be presented in a clear, sans serif type face that will remain legible on lower resolution touch panels.
4. Where physical buttons are present along the side of a touch panel, these buttons should be engraved and filled with a contrasting color.

M. Power On/Off
1. For panels requiring an ON/OFF control, these functions should be linked through current sensors or other methods for the control system to detect the power on condition of the component being controlled.
2. Powering off a system should not interfere with the ability of a projector to complete its cool down cycle.

N. Look & Feel
1. Control pages should utilize a clean, elegant but stylish appearance.
2. Use a common graphical template across all control pages for a consistent look.
3. The touch screen layout should utilize graphical elements such as drop shadows, gradient fills and transparency to provide a pleasing overall appearance.
4. Utilize graphical representations of floor plans to convey location information.
5. Include company logos, icons or watermarks to portray the corporate identity.
6. Provide clear navigation tools for moving between control pages.
7. Each sub-page should have a “BACK” button to return to the previous page. This button should appear in the same location on each page.

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1. Provide a “HELP” button or icon on each user page to provide clear, non-technical instructions on how to use the functions available to regular users.

O. Security
   1. Provide password access to control pages not intended to be accessed by the general public.
   2. Unless otherwise noted, provide a minimum of three levels of access
      a. General User
      b. Non-Technical Employee
      c. AV Technician
   3. Segregate the control functions to only allow authorized individuals access to more sophisticated control pages.
   4. Provide a timeout feature to automatically return the control panel back to the default opening screen after 30 seconds of inactivity. After this reset, passwords must be reentered to return to a previous control page.

P. Presets
   1. For systems that have different operating modes or configurations, provide the ability to store and recall preset combinations of system settings.
   2. Provide a “Preset” page that permits a minimum of five presets to be recalled. Each button to include a label describing the function or configuration associated with that button.
   3. Provide the ability for new presets to be stored over previous settings. New preset to be able to change the label to reflect the new or revised configuration.
   4. When a preset has been recalled, the control page should indicate the active configuration.

3.05 LABELING OF EQUIPMENT

A. Provide each terminal strip with a unique descriptor and a numerical designator for each terminal. Show terminal strip descriptor and designator on system schematic drawing.

B. Provide logical and legible cable and wiring label permanently affixed for easy identification.
   1. Labels on cables to be adhesive strip type covered with clear heat-shrink tubing. Factory stamped heat shrink tubing may be used in lieu of the adhesive strip style.
   2. Wiring designator to be an alpha-numeric code unique for each cable. Actual cable designation assignments to be determined by Contractor. Add cable designation codes to system schematic drawings.
   3. Locate the cable designator at the origination and destination of each circuit within 3 inches of the point of termination or connection. Provide cable designator on circuits with intermediate splice points with an additional suffix to indicate each segment.

3.06 ENGRAVING

A. Text font: 1/8 inch block sans serif characters unless noted otherwise.

B. On dark materials, provide white characters; on stainless steel or brushed natural aluminum plates, or light-colored materials, provide black characters.

C. Provide at least two lines of text with first line listing the general device name, e.g., amplifier. Second line to include schematic reference of the device, e.g., AMP-1.

D. Equipment label: black with white characters except where indicated.

3.07 COMMISSIONING

A. Prior to energizing or testing the system, ensure the following:

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1. All products are installed in proper and safe manner according to manufacturer's instructions.
2. Insulation and shrink tubing are present were required.
3. Dust, debris, solder splatter, etc. is removed.
4. Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.
5. Labeling has been provided.
6. Temporary facilities and utilities have been properly disconnected, removed and disposed of off-site.
7. Products are neat, clean and unmarred and parts securely attached.
8. Broken work, including glass, raised flooring and supports, ceiling tiles and supports, walls, doors, etc. have been replaced or properly repaired, and debris cleaned up and discarded.

B. Prior to energizing the System verify and perform the following tests and adjustments in compliance with applicable EIA standards.
1. Electronic devices are properly grounded.
2. Test each AC power receptacle with a circuit checker for proper hot, neutral and ground connections.
3. Verify each individual component is operating properly.
4. Verify each individual component's performance meets the manufacturer's published performance for this unit.
5. Measure and record the DC resistance between the technical ground in any equipment rack or console and the main building ground. Resistance should be 0.15 ohms or less.

C. Speaker Circuit Verification Test
1. Measure the impedance of each speaker line leaving the equipment racks.
2. For constant voltage systems measure the impedance at 100 (or 250) Hz, 1 KHz and 8 (or 10) KHz of each line leaving the equipment rack with the line disconnected from the driving source. For band limited devices, use a frequency appropriate for the operating range of the transducer.
3. When documenting the results of these tests, include the calculated impedance based on number of units on a line and the size and distance of the run. Correct any field readings that differ more than 20% from the calculated impedance.
4. Include the results of the tests in the Project Record Manual.

D. Speaker Polarity Verification Test
1. Use an electronic polarity checker, TEF-20, SYSID, SIM II, Smaart, or other similar device to test each loudspeaker. All speakers should have the same relative polarity.
2. Follow manufacturer's recommendations in conducting the tests.
3. Include the results of the tests in the Project Record Manual.

E. Audio Signal Paths
1. Verify operation from each source device through all switching, amplification and distribution devices.

F. System Gain Adjustment
1. Adjust each active device to have proper gain structure from the mixer output to the input of the amplifier.
2. With all amplifiers turned off, connect a sine wave or pink noise generator to the input of the mixer. Using an RMS AC voltmeter with a dB scale, adjust the mixer to an output

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between -10 and 0 dBu. Once the level has been established, it should remain unchanged throughout the test. All equalizers should be set flat for this test.

3. Follow the signal flow from the mixer to each subsequent component. Measure the input level and output level of each device at the point of connection to the device. The input level reading should differ no more than 0.25 dB from the level recorded for the preceding device. Diagnose and correct the wiring or equipment when any readings exceed this range.
4. Adjust the output of each component to achieve the proper output level.
5. Record the output levels of each device in the Project Record Manual.

G. Signal Delay Adjustment

1. Adjust the delay to each subsystem to ensure proper synchronization between the main speakers and delayed speakers.
2. Using a TEF 20, SYSID, Smaart, SIM II, or other acceptable time based measurement system, measure the arrival time of the distant signal and then measure the arrival of the local signal.
3. Based on the arrival times measured, adjust the delay applied to the local speakers to synchronize them with the distant speakers. Repeat the test to verify the delay has been set to within 1 ms of the arrival of the distant signal. Once the precise delay time has been determined, provide an additional 10 ms of Haas effect delay to maintain directional orientation toward the original sound source.
4. Continue to test and adjust each separate subsystem with a dedicated delay channel.
5. Provide hard-copy printout of each delay adjustment showing first the arrival times with no delay set and then the result after the delay has been adjusted. Record the settings of each delay in the Project Record Manual.

H. Remote Input Verification Test

1. Using a microphone or portable signal generator, connect to each microphone/line level receptacle throughout the facility.
2. Verify that the receptacle under test appears at the correct input and is operating properly.
3. In a similar manner, check all remote tielines and media related lines for correct wiring and labeling.

I. System Equalization

1. Using a RTA, TEF 20, SYSID, or SMAART, equalize all loudspeaker systems to provide a suitable frequency response as follows:
   a. Speech Reinforcement Systems: flat response from 125 Hz to 2.5 KHz, with 2 dB roll off above.
   b. Program Reproduction Systems: flat response from 65 Hz to 8 KHz, with 2 dB roll off above.
2. Verify system gain and amplifier levels.
3. Provide program levels of at least 85 dB and speech reinforcement levels of at least 70 dB in the seating area without objectionable distortion, buzzes, or rattles.
4. Provide hard copy printouts of the spectral response with the test data.

J. RFI and Parasitic Oscillation

1. With systems operating check to ensure that all systems are free from spurious oscillation and radio frequency interference in the absence of audio signal.

K. Buzzes, Rattles and other Distortions

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1. Adjust the system for normal operating level in the space. Apply a slow sine wave sweep from 60 Hz to 3 KHz and listen carefully for buzzes, rattles and other objectionable distortions.
2. Correct the cause of the defect. If the cause is not from the system. Bring the cause to the attention of the GC, indicating cause and suggestive corrective actions.

L. Video Systems Test
1. Projected images and screen must be plumb with respect to ceiling line.

M. Video System Tests. Verify performance of all video equipment, components and systems, as specified herein.
1. Video (signal):
a. S/N (peak to RMS), unweighted DC to 4.2 MHz: 55 dB minimum.
b. Crosstalk, unweighted DC to 4.2 MHz: 45 dB minimum.
c. Frequency Response: Within plus to minus 0.5 dB to 4.2 MHz.
d. Line and Field Tilt: 2% maximum.
e. Differential Gain: 2% maximum.
f. Differential Phase: 2 degrees maximum.
g. Frequency Response: DC to 4.2 MHz within plus or minus 0.5 dB.

N. Video Signal Paths
1. Verify operation from each source device through all switching, amplification and distribution devices.

O. Video Test Report shall include the following:
1. Test Failures and Notices
a. Sink Device EDID Test – Open items or failures shall not be accepted.
b. Cable Length Test – Open items or failures shall not be accepted.
c. HDCP KSV Limitations – Limitations shall not be accepted.
d. Cable Limitations - Limitations shall not be accepted.
e. EDID Limitations - Limitations shall not be accepted.
f. Cable Length Limits exceeded – Failing cables shall not be accepted.
2. Device Model Number, Serial Number, and Firmware Version for main chassis and each input and output card.
3. Device Model Number, Serial Number, and Firmware Version for connected transmitter and receiver devices.
4. EDID – Input Resolution and 3D support status for each input.
5. EDID – Supported Output Resolution and 3D support status for devices connected to each output.
6. EDID – Supported Audio formats for each input.
7. EDID – Supported Audio formats for devices connected to each output.

P. Control Systems
1. Verify operational functions of the control system and all interfaced devices.
2. Verify operational functionality of any wireless user devices.

3.08 CAT5E/CAT6 CABLE CERTIFICATION

A. General Field Test Requirements

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1. All CAT5E/CAT6 cabling links installed as part of this scope shall be tested for the following, in accordance with the field test specifications defines in ANSI/TIA-568-C.2 “Commercial Balanced Twisted-Pair Telecommunications Cabling and Components Standard.” This document will be referred to as the “Category 5e Standard”:
    a. Wire Map
    b. Length
    c. Insertion Loss
    d. NEXT loss
    e. PS NEXT Loss
    f. ACR-F Loss
    g. PS ACR-F Loss
    h. Return Loss
    i. Propagation Loss
    j. Delay Skew
2. The installed twisted-pair horizontal links shall be tested from terminated end point to terminated end point for compliance with the “Permanent Link” performance specification as defined in the Category 5e Standard.
3. One hundred percent of the installed cabling links must pass the requirements of the Category 5e standard mentioned above and as further detailed in Section B below. Any failing link must be diagnosed and corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the test results documentation in accordance with Section C below.
4. The test equipment (tester) shall comply with the accuracy requirements for level IIe field testers as defined in ANSI/TIA-1152. The tester including the appropriate interface adapter must meet the specified accuracy requirements. The accuracy requirements for the permanent link test configuration (baseline accuracy plus adapter contribution) are specified in Table 2 of ANSI/TIA-1152 (Table 2 in this TIA document also specifies the accuracy requirements for the channel configuration).
5. The RJ45 test plug shall fall within the values specified in ANSI/TIA-568-C Annex C for NEXT, FEXT and Return Loss.
6. The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy.
7. The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. In order to deliver optimum accuracy, preference is given to a permanent link interface adapter for the tester that can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. To ensure that normal handling on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction.
8. The Pass or Fail condition of the link-under-test is determined by the results of the required individual tests (detailed in Section 4.2.2 of ANSI/TIA-1152). Any Fail result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass.
9. A Pass or Fail result for each parameter is determined by comparing the measured values with the specifies test limits for that parameter.

B. Performance Test Parameters

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1. The test parameters are defined by the Category 5e Standard. The test of each link shall contain all of the following parameters as detailed below. In order to pass the test, all measurements (at each frequency in the range from 1 MHz through 100 MHz) must meet or exceed the limit value determined in the above mentioned standard.
2. Wire Map - Shall report Pass if the wiring of each wire-pair from end to end is determined to be correct.
3. Length – The field tester shall be capable of measuring length of all pairs of a basic link or channel based on the propagation delay measurement and the average value for NVP. The physical length of the link shall be calculated using the pair with the shortest electrical delay. This length figure shall be reported and shall be used for making the Pass/Fail decision. The Pass/Fail criteria are based on the maximum length allowed for the Permanent Link configuration (90 meters – 295 feet) plus 10% to allow for the variation and uncertainty of NVP.
4. Insertion Loss (Attenuation) – Insertion Loss is a measure of signal loss in the permanent link or channel. The term “Attenuation” has been used to designate “Insertion Loss.” Insertion Loss shall be tested from 1 MHz through 100 MHz in maximum step size of 1 MHz. It is preferred to measure insertion loss at the same frequency intervals as NEXT loss in order to provide a more accurate calculation of the Attenuation-to-Crosstalk Ratio (ACR) parameter. Minimum test results documentation (summary results): Identify the worst wire pair (1 of 4 possible). The test results of the worst wire pair must show the highest attenuation value measured (worst case), the frequency at which the worst case value occurs, and the test limit value at this frequency.
5. NEXT Loss – Pair-to-pair near end crosstalk loss (abbreviated as NEXT loss) shall be tested for each wire pair combination from each end of the link (a total of 12 pair combinations).This parameter is to be measured from 1 through 100 MHz. NEXT Loss measures the crosstalk disturbance on a wire pair at the end from which the disturbance signal is transmitted (near-end) on the disturbing pair. The maximum step size for NEXT loss measurements shall not exceed the maximum step size defined in the Category 5e Standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair combination that exhibits the worst value of NEXT (worst case). NEXT is to be measured from each end of the link-under-test. These wire pair combinations must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.

   Table 1 – Maximum frequency step size as defined in ANSI/TIA-1152

Frequency Range (MHz)	Maximum Step size (MHz)
1 - 31.25	0.15
31.26 - 100	0.25

6. PS NEXT Loss – Power Sum NEXT Loss shall be evaluated and reported for each wire pair from both ends of the link under-test (a total of eight results). PS NEXT Loss captures the combined near-end crosstalk effect (statistical) on a wire pair when all other pairs actively transmit signals. Like NEXT this test parameter must be evaluated from 1 through 100 MHz and the step size may not exceed the maximum step size defined in the Category 5e Standard as shown in Table 1. Maximum test results documentation (summary results): Identify the wire pair that exhibits the worst-case margin and the wire pair that exhibits the worst value for PS next. These wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.

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7. ACR-F Loss, pair to pair – Attenuation Crosstalk Ratio Far-end is calculated from the pair-to-pair FEXT Loss. It shall be measured for each wire-pair combination from both ends of the link under-test. FEXT Loss measures the crosstalk disturbance on a wire pair at the opposite end (far-end) from which the transmitter emits the disturbing signal on the disturbing pair. FEXT is measured to compute ACR-F Loss that must be evaluated and reported in the test results. ACR-F measures the relative strength of the far-end crosstalk disturbance relative to the attenuated signal that arrives at the end of the link. This test yields 24 wire pair combinations. ACR-F is to be measured 1 through 100 MHz and the maximum step size for FEXT loss measurements shall not exceed the maximum step size defined as the standard as in Table 1. Minimum test results documentation (summary results): Identify the wire pair combination that exhibits the worst value for ACR-F. There wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
8. PS ACR-F Loss – Power Sum Attenuation Crosstalk Ratio Far-end is a calculated parameter that combines the effect of the FEXT disturbance from three wire pairs of the fourth one. This test yields eight wire-pair combinations. Each wire-pair is evaluated from 1 through 100 MHz in frequency increments that do not exceed the maximum step size defined in the standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst pair combinations must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
9. Return Loss – Return Loss (RL) measures the total energy reflected on each wire pair. Return Loss is to be measured from both ends of the link-under-test for each wire pair. This parameter is also to be measured from 1 through 100 MHz in frequency increments that do not exceed the maximum step size defined in the Category 5e Standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst value of Return Loss. These wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
10. Propagation Delay – Propagation delay is the time required for the signal to travel from one of the links to the other. This measurement is to be performed for each of the four wire pairs. Minimum test results documentation (summary results): Identify the wire pair with the worst propagation delay. The report shall include the propagation delay value measured as well as the test limit value.
11. Delay Skew – [as defined in the Category 5e Standard; Section 6.2.19] This parameter shows the difference in propagation delay between the four wire pairs. The pair with the shortest propagation delay between the four wire pairs. The pair with the shortest propagation delay is the reference pair with a delay skew value of zero. Minimum test results documentation (summary results): Identify the wire pair with the worst-case propagation delay (the longest propagation delay). The report shall include the delay skew value measured as well as the test limit value.

C. Test Result Documentation

1. The test results/measurements shall be transferred into a Windows based database utility that allows for the maintenance, inspection, and archiving of these test records. A guarantee must be made that the measurement results are transferred to the PC unaltered, i.e., “as saved in the tester” at the end of each test and that these results cannot be modified at a later time.
2. The database for the completed job shall be stored and delivered on CD-ROM or DVD including the software tools required to view, inspect, and print any selection of test reports.

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3. A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information:
    a. The identification of the link in accordance with the naming convention defined in the overall system documentation.
    b. The overall Pass/Fail evaluation of the link-under-test including the NEXT Headroom (overall worst case) number.
    c. The date and time the test results were saved in the memory of the tester.
4. General information to be provided in the electronic data base with the test results information for each link:
    a. The identification of the customer site as specified by the end-user.
    b. The identification of the link in accordance with the naming convention defined in the overall system documentation.
    c. The overall Pass/Fail evaluation of the link-under-test
    d. The name of the test limit selected to execute the stored test results
    e. The cable type and value of NVP used for length calculations
    f. The date and time the test results were saved in the memory of the tester
    g. The brand name, model, and serial number of the tester.
    h. The identification of the tester interface
    i. The revision of the tester software and the revision of the test limits database in the tester
    j. The test results information must contain information on each of the required test parameters that are listed in Section B and as further detailed below under paragraph C5.
5. For each of the frequency-dependent test parameters, the value measured at every frequency during the test is stored. The PC-resident database program must be able to process the stored results to display and print a color graph of the measured parameters. The PC-resident software must also provide a summary numeric format in which some critical information is provided numerically as defined by the summary results (minimum numeric test results documentation) as outlined above for each of the test parameters.
6. The detailed test results data to be provided in the electronic database must contain the following information:
    a. Length: Identify the wire-pair with the shortest electrical length, the value of the length rounded to the nearest 0.1 m330 and test limit value.
    b. Propagation delay: Identify the pair with the shortest propagation delay, the value measured in nanoseconds (ns) and the test limit value.
    c. Delay Skew: Identify the pair with the largest value for delay skew, the value measured in nanoseconds (ns) and the test limit value.
    d. Insertion Loss (Attenuation): Minimum test results documentation as explained in Section B for the worst pair.
    e. Return Loss: Minimum test results documentation as explained in Section B for the worst pair as measured from each end of the link.
    f. NEXT, ACR-F: Minimum test results documentation as explained in Section B for the worst pair combination as measured from each end of the link.
    g. PS NEXT and PS ACR-F: Minimum test results documentation as explained in Section B for the worst pair combination as measured from each end of the link.

3.09 FINAL OBSERVATION & TESTING

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A. Upon completion of installation, initial adjustments, tests and measurements specified in Part 3, and submission and review of the results, a final observation and test will be performed by the Owner or Owner's representative no earlier than two weeks after receipt of the written results.

B. Provide a minimum of one (1) person for observation and testing familiar with aspects of the System to assist the Owner.

C. The process of testing the System may necessitate moving and adjusting certain components.

D. Testing includes operation of each major system and any other components deemed necessary. Perform tests and provide required test equipment, tools and material required to make any necessary repairs, corrections, or adjustments.

E. The following procedures will be performed on each System:

1. Observation of the methods and means employed to incorporate the System within the facility.
2. Verification of proper operation, from controlling devices to controlled devices.
3. Verification of proper adjustment, balance, and alignment of equipment for optimum quality and to meet the manufacturer's published specifications. Establish and mark normal settings for each level control, and appropriately record these settings within the Record Documents.
4. Other tests on equipment or systems deemed appropriate.

F. In the event the need for further adjustment or work becomes evident during testing, the Contractor is to continue their work until the System is acceptable at no addition to the contract price. If approval is delayed because of defective equipment, or failure of equipment or installation to meet the requirements of these specifications and any extension of the observation and testing period is required, the Contractor shall pay for additional time and expenses of the Owner at the standard rate in effect at that time.

3.10 TEST EQUIPMENT

A. Thirty days prior to start of testing, provide a list to the Owner of test equipment make, model numbers and calibration dates that will be used.

B. The following equipment shall be available on site for the entire test period through final system testing.

1. Sound Level Meter : ANSI S1.4-1971 Type S1A with digital or analog display. Meter to provide ranges of 40 to 120 dBA.
2. Pink Noise Source - Equal energy per octave bandwidth 20 Hz to 20,000 Hz, ±1 dB (long-term average) at 0 dBm output. Stability: ±2 dB per day.
3. Dual-trace oscilloscope - 100 MHz bandwidth, 1 mV/cm sensitivity.
4. Impedance Meter - Capable of testing audio lines at three frequencies, minimum, between 250 Hz and 5k Hz. Measurement Range: 1 ohm to 100 kohms.
5. Audio Oscillator: bandwidth 20 Hz to 20k Hz ±.5 dB at 0 dBm output. Output to be balanced. Oscillator to include adjustable output level over the range from –30 dBu to +10 dBu.
6. Multimeter - Measurement range, DC to 20k Hz, 100 mV to 300 V, 10 ma to 10 A, dB.
7. NTSC Test generator
8. Real time analyzer with LED or CRT display. The unit shall meet the filter requirements of ANSI S1.11 Class III for one third octave filters.
9. Video (analog) test generator capable of generating signal up to 1920 x 1200 with audio.
10. Video (digital) test generator capable of generating signal up to 1920 x 1200 with audio.

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11. Ladders and scaffolding necessary to inspect elevated equipment, junction boxes, etc.

C. Provide three portable VHF or UHF business band radios for use during acceptance testing with transmission range sufficient to cover entire project. Include rechargeable batteries and recharger along with holster for wearing on belt. Radios to be available for duration of testing process, including any follow-up visits required prior to final acceptance.

3.11 INSTRUCTION OF OWNER PERSONNEL

A. Provide instruction to Owner designated personnel focusing on the use, operation and maintenance of the systems, scheduled as a minimum of two separate sessions, by an instructor fully knowledgeable and qualified in system operation. The System Reference Manuals should be complete and on site at the time of this instruction. Coordinate schedule of demonstration with Owner's Representative.

1. Cafetorium
    a. 4 hours of instruction
2. Music Rooms
    a. 2 hours of instruction
3. Gymnasium
    a. 2 hours of instruction

B. Video record all training sessions and compile a training video to be provided to the Owner on DVD.

C. Provide sign in sheet to document the attendee's presence.

D. If Contractor is not properly equipped to conduct Owner training on particular equipment, arrange for factory representatives of the equipment to be present to provide training at no additional cost to the Owner.

3.12 CLEANUP AND REPAIR

A. Upon completion of the work, remove refuse and rubbish from and about the premises. Leave areas and equipment clean and in an operational state. Repair any damage caused to the premises by the installation of systems at no cost to the Owner.

END OF SECTION 27 4116

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SECTION 22 1005
PLUMBING PIPING

THE SEAL APPEARING ON THIS DOCUMENT
WAS AUTHORIZED BY
BRANDON K. ADAMS, PE #142295 ON 08/06/2026

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Subsoil drain piping
B. Sanitary waste piping, buried within 5 feet of building.
C. Sanitary waste piping, above grade.
D. Grease waste piping, buried.
E. Grease waste piping, above grade.
F. Domestic water piping, buried within 5 feet of building.
G. Domestic water piping, above grade.
H. Storm drainage piping, buried within 5 feet of building.
I. Storm drainage piping, above grade.
J. Natural gas piping, buried.
K. Natural gas piping, above grade.
L. Condensate and Forced Main piping
M. Pipe flanges, unions, and couplings.

1.02 RELATED REQUIREMENTS

A. Section 33 0110.58 - Disinfection of Water Utility Piping Systems.

1.03 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
D. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV; 2021.
E. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings—DWV; 2022.
F. ASME B31.1 - Power Piping; 2024.
G. ASME B31.9 - Building Services Piping; 2025.
H. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2025, with Errata.
I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
J. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2025.
K. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2025.
L. ASTM B32 - Standard Specification for Solder Metal; 2020.
M. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
N. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
O. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2020.

P. ASTM B813 - Standard Specification for Water Flushable Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2024.

Q. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2023.

R. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.

S. ASTM C1540 - Standard Specification for Heavy-Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.

T. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings; 2026.

U. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020 (Reapproved 2024).

V. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2025.

W. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2020.

X. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2021.

Y. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2024, with Editorial Revision (2025).

Z. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

AA. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2025.

BB. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems; 2025.

CC. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-Linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing; 2024.

DD. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.

EE. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.

FF. FM 1680 - Examination Standard for Couplings Used in Hubless Cast Iron Systems for Drain, Waste or Vent, Sewer, Rainwater or Storm Drain Systems Above and Below Ground, Industrial/ Commercial and Residential; 2025.

GG. NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum

HH. NSF 372 - Drinking Water System Components - Lead Content; 2024.

II. PPI TR-4 - PPI HSB Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe; 2024.

JJ. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Welders' Certificates: Submit certification of welders' compliance with ASME BPVC-IX.

D. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

E. Project Record Documents: Record actual locations of valves.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements for additional provisions.
   2. Valve Repacking Kits: One for each type and size of valve.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

2.02 SUBSOIL DRAIN PIPING

A. PVC Pipe: ASTM D2729
   1. Fittings: PVC
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement and ASTM F656 primer.

2.04 SANITARY WASTE PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.

1. Fittings: Cast iron.
2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
1. Fittings: Cast iron.
2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. Copper Tube: ASTM B306, DWV.
1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, sovent.
2. Joints: ASTM B32, alloy Sn50 solder.

2.05 GREASE WASTE PIPING, BURIED

A. Cast Iron Pipe: CISPI 301, hubless.
1. Fittings: Cast iron.
2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

2.06 GREASE WASTE PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.
1. Fittings: Cast iron.
2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
1. Fittings: Cast iron.
2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.07 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.

2.08 DOMESTIC WATER PIPING, ABOVE GRADE

A. BASE BID - Copper Pipe: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.
3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

B. ALTERNATE 4 - Cross-Linked Polyethylene (PEX-a) Pipe: ASTM F876 and ASTM F877. (ONLY FOR USE FOR DOMESTIC WATER PIPING LESS THAN 2-INCH).
1. Manufacturers:
a. Uponor, Inc
2. PPI TR-4 Pressure Design Basis:
a. 160 psig at maximum 73 degrees F.
b. 100 psig at maximum 180 degrees F.
c. 80 psig at maximum 200 degrees F.
3. Pipe: Provide in straight lengths for all pipes route above ceiling / overhead. Coiled pipe is only acceptable for pipes sizes 3/4" and smaller and installed within walls. All horizontal pipe to be provided with horizontal support channel.
4. Fittings: Brass and engineered polymer (EP) ASTM F1960.
5. Joints: ASTM F1960 cold-expansion fittings.

2.09 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. PVC Pipe: ASTM D2665 or ASTM D3034.
1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement and ASTM F656 primer.

2.10 STORM DRAINAGE PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74 service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.11 NATURAL GAS PIPING, BURIED

A. Polyethylene Pipe: ASTM D2513, SDR 11.
   1. Fittings: ASTM D2683 or ASTM D2513 socket type.
   2. Joints: Fusion welded.

2.12 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASTM A234/A234M, wrought steel welding type.
   2. Joints: Welded to ASME B31.1.

2.13 CONDENSATE, DRAIN, AND FORCE MAIN PIPING

A. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, sovent.
   2. Joints: ASTM B32, alloy Sn50 solder.

2.14 PIPE FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 inch and Under:
   1. Ferrous Pipe: Class 150 malleable iron threaded unions.
   2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Sizes Over 1 inch:
   1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
   2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Shielded, Heavy Duty No-Hub Couplings:
   1. Testing: In accordance with ASTM C1540 and FM 1680.
   2. Gasket Material: Neoprene complying with ASTM C564.
   3. Band Material: Stainless steel.
   4. Eyelet Material: Stainless steel.

2.15 LINE PRESSURE REGULATORS AND APPLIANCE REGULATORS INDICATORS

A. Compliance Requirements:
   1. Appliance Regulator: ANSI Z21.18/CSA 6.3.
   2. Line Pressure Regulator: ANSI Z21.80/CSA 6.22.

B. Materials in Contact With Gas:
   1. Housing: Aluminum, steel (free of non-ferrous metals).
   2. Seals and Diaphragms: NBR-based rubber.

C. Maximum Inlet Operating Pressure: Refer to contract drawings.

D. Output Pressure Range:
   1. Line Pressure Regulator: Refer to contract drawings.
   2. Appliance Regulator: Refer to manufacturer's IOM.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Provide access where valves and fittings are not exposed.

H. Install water piping to ASME B31.9.

I. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

J. Sleeve pipes passing through partitions, walls, and floors.

K. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

L. Install unions downstream of valves and at equipment or apparatus connections.

M. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

3.04 INSTALLATION REQUIRMENTS FOR CROSS-LINKED POLYETHYLENE (PEX-A) PIPE:

A. Piping Installation:
   1. Install PEX piping system in compliance with the Uponor PEX Piping Systems Design and Installation Manual (PDIM), current edition, and the Uponor PEX Piping Systems Installation Guide, current edition.
   2. PEX shall not be installed in areas within 5feet of UV light.
   3. PEX shall not be installed within 12” of any gas appliance vents.
   4. PEX shall not be installed within 12” of any light fixture.
   5. PEX shall not be installed at connections to or within 24” of domestic water heating equipment. Provide type L copper water tube for these applications. This shall include, but not necessarily be limited to, the following:
      a. gas and electric storage type and tankless water heaters
      b. hot water storage and thermal expansion tanks
      c. hot water circulating pumps
      d. thermostatic mixing valves

6. All final stub-outs to plumbing fixtures and equipment shall be Type L copper with solder joint or mechanical pressfittings.
7. Only approved and appropriate firestop materials shall be used with PEX piping.
8. When transitioning from PEX to other piping materials, follow the appropriate installation instructions for that product.
9. Install piping in full compliance with manufacturer`s Plumbing Installation Guide.

B. Hangers and Supports Installation:
1. Install supports suitable for PEX-a piping in compliance with local codes and the Uponor Piping Systems Installation Guide, current edition.

C. Pipe Joint Construction:
1. PEX-a Connections: Install per manufacturer's recommendations. Use manufacturer-recommended cold-expansion tool for ASTM F1960 connections.

D. Field Quality Control:
1. Do not expose PEX piping to direct sunlight for more than 30 days. If construction delays are encountered, provide cover to portions of piping exposed to direct sunlight.

E. Insulation:
1. All PEX-a piping is to be insulated. Refer to piping insulation spec section for additional information.

3.05 FIELD TESTS AND INSPECTIONS

A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.

B. Domestic Water Systems:
1. Perform hydrostatic testing for leakage prior to system disinfection.
2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
3. Hydrostatic pressure testing shall be completed in accordance with local codes and the Uponor PEX Piping Systems Design and Installation Manual (PDIM), current edition.

C. Gas Distribution Systems:
1. Test Preparation: Close each appliance valve or disconnect and cap each connected appliance.
2. General Systems:
   a. Inject a minimum of 10 psi of compressed air into the piping system for a duration of 15 minutes and verify with a gauge that no perceptible pressure drop is measured.
   b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound.
3. Welded Pipes or Systems with Service Pressures Above 14 in-wc:
   a. Inject a minimum of 60 psi of compressed air into the piping system for a duration of 30 minutes and verify with a gauge that no perceptible pressure drop is measured.
   b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound with 1 psi increments.

D. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with local code requirements and the Uponor PEX Piping Systems Design and Installation Manual (PDIM), current edition.

B. Prior to starting work, verify system is complete, flushed, and clean with potable water.

3.07 SERVICE CONNECTIONS

A. Provide new sanitary and storm sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.

END OF SECTION

SECTION 23 0913
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

THE SEAL APPEARING ON THIS DOCUMENT
WAS AUTHORIZED BY
GABRIEL R. GARCIA, PE #125068 ON 08/07/2026

1.01 SECTION INCLUDES

A. Control panels.

B. Control Valves:
   1. Ball valves with factory-mounted actuators.
   2. Butterfly valves with factory-mounted actuators.
   3. Electronic valve operators.

C. Pressure independent valves and actuators.

D. Dampers.

E. Damper Operators:
   1. Electric operators.
   2. Inlet vane operators.

F. Wall-, Surface-, and Duct-Mounted Sensors:
   1. Temperature sensors.
   2. Humidity sensors.
   3. IAQ (indoor air quality) sensors.
   4. Building static pressure transmitters.
   5. Static air pressure sensors.
   6. Air pressure transmitters.
   7. Damper position indicators.
   8. Carbon monoxide sensors.
   9. Carbon dioxide sensors.

G. Thermostats:
   1. Freezestats.

H. Time switches.

I. Fan and pump motor run-status monitoring.

J. Pipe-Mounted Sensors and Transmitters:
   1. Temperature sensors.
   2. Differential pressure transmitters.
   3. Flow switches.
   4. Turbine/impeller flow meters.

K. Energy Metering:
   1. Hydronic energy meters.

1.02 RELATED REQUIREMENTS

A. Section 25 3513 - Integrated Automation Actuators and Operators.

B. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

C. Section 26 2726 - Wiring Devices: Elevation of exposed components.

1.03 REFERENCE STANDARDS

A. ANSI/FCI 70-2 - Control Valve Seat Leakage; 2021.

B. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2024, with Errata (2025).

C. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.

F. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 CONTROL PANELS

A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.

B. Provide common keying for all panels.

2.03 CONTROL VALVES

A. Ball Valves with Factory-Mounted Actuators:
   1. Service: Use for chilled water or hot water.
   2. Flow Characteristic: Include 2-way and 3-way diverting operation configured to fail as indicated on drawings.
   3. Replacements in Kind: Provide pressure-independent type.
   4. Rangeability: 500 to 1.
   5. ANSI Rating: Class 150.
   6. Leakage: Class IV (0.1 percent of rated capacity) per ANSI/FCI 70-2.
   7. Body Size:
      a. Under 2-1/2 inches:
         1) Connection: NPT.
         2) Materials:
            (a) Body: Brass.
            (b) Flanges: Ductile iron.
            (c) Ball: 300 series stainless steel.
            (d) Stem: 300 series stainless steel.
            (e) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.
            (f) Stem Seal: EPDM O-Rings.
            (g) Flow Control Disk: Thermoplastic synthetic-resin.
      b. 2-1/2 inches and Above:
         1) Connection Type: Flanged.
         2) Materials:
            (a) Body: Brass.

(b) Flanges: Ductile iron.
(c) Ball: 300 series stainless steel.
(d) Stem: 300 series stainless steel.
(e) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.
(f) Stem Seal: EPDM O-Rings.
(g) Flow Control Disk: Thermoplastic synthetic-resin.

c. Service Temperature:
1) Fluid Side: 0 to 284 degrees F liquid or 25 psig steam.
2) Ambient Side: From minus 4 to 122 degrees F.

8. Actuator Requirements:
a. Assembly: Field-mounted.
b. Input: 0 to 10 VDC configured as indicated on drawings.
c. Accessories: Provide with valve position indicator and manual override.

B. Butterfly Valves with Factory-Mount Actuators:
1. Iron body, stainless steel disc, resilient replaceable seat for service to 250 degrees F wafer or lug ends, extended neck.
2. Hydronic Systems:
a. Rate for service pressure of 125 psig at 250 degrees F.
b. Size for 1 psig maximum pressure drop at design flow rate.

C. Electronic Valve Actuators:
1. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.

2.04 PRESSURE INDEPENDENT VALVES AND ACTUATORS

A. Size 2 inch and Smaller:
1. Provide ball style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and NPT threaded or soldered connections.
2. Metal construction materials consist of bronze or brass.
3. Nonmetal construction materials consist of Teflon, EPDM, or engineered resin.

B. Size 2.5 inch and Larger:
1. Provide ball, globe, or butterfly style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and flanged, grooved, or weld end connections.
2. Valve body construction materials consist of cast iron, carbon steel, or ductile iron.
3. Internal components construction materials consist of brass, aluminum bronze, bronze, Teflon, EPDM, NORYL, or engineered resin.

C. Actuator Requirements:
1. Assembly: Field-mounted.
2. Input: 0 to 10 VDC configured as indicated on drawings.
3. Accessories: Provide with manual override and valve position indicator.

2.05 DAMPERS

A. See Section 23 3300 for dampers and this section for actuators and operators.

2.06 DAMPER OPERATORS

A. General:
1. Provide actuators with torque capacity sized for minimum of 20 percent greater than maximum design stream velocity and hold tight seal against maximum system pressures.
2. Provide spring return for two position control and for fail safe operation.

3. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
4. Provide one operator for maximum 36 sq ft damper section.
5. See Section 25 3513 for field-mount damper actuators and operators.

B. Electric Operators:
1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

C. Inlet Vane Operators:
1. High pressure with pilot positioners and sufficient force to move vanes when fan is started with vanes in closed position. Return vane operator to closed position on fan shutdown.

2.07 WALL-, SURFACE-, AND DUCT-MOUNT SENSORS

A. Temperature Sensors:
1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
2. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F.
3. 100 ohm platinum RTD is acceptable if used with project DDC controllers.
4. Temperature Sensing Device: Compatible with project DDC controllers.
5. Performance Characteristics:
a. RTD:
1) Room Sensor Accuracy: Plus/minus 0.50 degrees F minimum.
2) Duct Averaging Accuracy: Plus/minus 0.50 degrees F minimum.
3) Chilled Water Accuracy: Plus/minus 0.50 degrees F minimum.
4) All Other Accuracy: Plus/minus 0.75 degrees F minimum.
5) Range: Minus 40 degrees F through 220 degrees F minimum.
b. Thermistor:
1) Accuracy (All): Plus/minus 0.36 degrees F minimum.
2) Range: Minus 25 degrees F through 122 degrees F minimum.
3) Heat Dissipation Constant: 2.7 mW per degree C.
c. Sensing Range:
1) Provide limited range sensors if required to sense the range expected for a respective point.
2) Use RTD type sensors for extended ranges beyond minus 30 to 230 degrees F.
3) Use temperature transmitters in conjunction with RTDs when RTDs are incompatible with DDC controller direct temperature input.
d. Outside Air Sensors: Watertight inlet fitting shielded from direct rays of the sun.
e. Immersion Temperature Sensors: A sensor encased in a corrosion-resistant probe with an indoor junction box service entry body.
f. Room Temperature Sensors:
1) Construct for wall box mounting.
2) Room sensor shall be blank plate with no digital display, setpoint adjustment or override.
g. Temperature Averaging Elements:
1) Use on duct sensors for ductwork 10 sq ft or larger.
2) Use averaging elements where prone to stratification with sensor length 8 ft or 16 ft.
3) Provide for all mixed air and heating coil discharge sensors regardless of duct size.
h. Insertion Elements:

1) Use in ducts not affected by temperature stratification or smaller than 11 sq inches.
2) Provide dry type, insertion elements for liquids, installed in immersion wells, with minimum insertion length of 2.5 inches.

B. Humidity Sensors, Duct-Mounted:
1. Replaceable digitally profiled thin-film capacitive sensor probe extended from die-cast metal, weather-proof plastic or metal housing designed for duct mounting.
2. Measuring Scale: 0 to 100 percent RH, noncondensing, temperature compensated.
3. Hardwired Output: Two-wire, 4 to 20 mA, loop powered.
4. Accuracy: Plus/minus 1 percent between 20 to 40 percent RH linear range, NIST traceable with multi-point calibration.

C. Humidity Transmitters, Surface-Mounted:
1. Plastic housing encased, wall-mounted, humidity indicatingsensor.
2. Humidity Sensor Type: Replaceable thin-film capacitive.
3. Accuracy: 1 percent at rated measuring scale and capable of withstanding 95 percent relative humidity without loss of calibration.
4. Output: Two-wire, 4 to 20 mA, 0 to 5 VDC or 0 to 10 VDC, non-loop powered, selectable.

D. IAQ (Indoor Air Quality) Sensors:
1. Form Factor: Surface mounted, desk mounted, or single-gang electrical-box-mounted module made of high-impact plastic or other resilient material.
2. CO2 (Carbon Dioxide) Monitoring Sensor:
a. Non-dispersive infrared (NDIR) type, 0 to 100 %RH range.
b. Accuracy: Plus/minus 30 ppm within three percent of measured value.
3. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.

E. Building Static Pressure Transmitters:
1. Single port for direct or tubing connection into wall or ceiling static pressure tip, direct acting, double bell, scale range 0.01 to 6.0 in-wc positive or negative, and sensitivity of 0.0005 in-wc. Transmit electronic signal to receiver with matching scale range.

F. Static-Air Pressure Sensors:
1. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
2. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F.
3. Accuracy: One percent of full scale with repeatability 0.3 percent.
4. Output: 0 to 5 vdc with power at 12 to 28 vdc.

G. Air Pressure Transmitters:
1. General: Provide dry air media, differential pressure transducers to monitor duct pressure.
2. Accuracy: Plus/minus 2 percent full scale of range with combined linearity and hysteresis.
3. Zero Adjust: Pushbutton auto-zero and digital input using 2-position terminal block.
4. Measuring Range: 1 to 10 in-wc, unidirectional or bidirectional.
5. Hardwired Output: 2-wire, loop-powered 4 to 20 mA, field selectable.
6. Proof and Burst Pressure (pressure differential): 3 and 5 psid.

H. Damper Position Indicators: Potentiometer mounted in enclosure with adjustable crank arm assembly connected to damper to transmit 0 to 100 percent damper travel.

I. Carbon Monoxide Sensors:
1. Gas sensing module that holds fixed or replaceable carbon monoxide gas-sensor cartridge.
2. Form Factor: IEC 60529, IP20 enclosure, single-gang electrical box mounted.

3. Electromechanical sensor with 0 to 500 ppm measurement range.
4. Accuracy: Plus/minus Five percent of range with 1 ppm resolution.
5. Hardwired Output: Three-wire, 4 to 20 mA, loop powered.
6. Alarm: Auxiliary dry contact relay driven by setpoint adjustable between 25 to 180 ppm.

J. Carbon Dioxide Sensors, Duct and Wall:
1. General: Provide nondispersive infrared (NDIR), diffusion sampling CO2 sensors with integral transducers and linear output.
2. Air Temperature: Range of 32 to 122 degrees F.
3. Relative Humidity: Range of 0 to 95 percent (noncondensing).
4. Calibration Characteristics:
   a. Automatically compensating algorithm for sensor drift due to sensor degradation.
   b. Maximum Drift: 2 percent.
   c. User calibratable with a minimum calibration interval of 5 years.
5. Construction:
   a. Sensor Chamber: Noncorrosive material for neutral effect on carbon dioxide sample.
   b. Provide duct mounted sensors with duct probe designed to protect sensing element from dust accumulation and mechanical damage.
   c. Housing: High impact plastic.

2.08 THERMOSTATS

A. Low-Limit Temperature Cutout Switch:
1. Configuration: Vapor-filled capillary.
2. Probe Sensing Length: 20 feet.
3. Setpoint Adjust Control: Screw, concealed with manual reset switch.
4. Switch Type: SPDT, snap-action, form C in dust-protected enclosure.
5. Sensing Range: 15 to 55 degrees F.
6. Mounting: Locate on cooling coil intake side.
7. Field Interface: Connect load line-voltage to starter.
8. Electrical Rating: As indicated on drawings.

2.09 TIME SWITCHES

A. Digital Electronic Time Switches:
1. Description: Factory-assembled, solid-state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
2. Program Capability:
   a. Astronomic Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
3. Schedule Capacity: Not less than 16 programmable on/off operations.
4. Provide automatic daylight savings time and leap year compensation.
5. Provide power outage backup to retain programming and maintain clock.
6. Manual Override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
7. Input Supply Voltage: 120 VAC unless otherwise indicated.
8. Provide lockable enclosure; environmental type complying with NEMA EN 10250 as specified for the following installation locations:

2.10 FAN AND PUMP MOTOR RUN-STATUS MONITORING

A. Current Switches:

1. Mini Solid-Core: 2-State, On/Off digital output of motor status with adjustable trip point to detect belt loss or mechanical failure.
2. Mini Split-Core: 2-state, On/Off digital output of inverter-duty motor status with adjustable trip point to detect belt loss or mechanical failure.
3. Solid Core: 2-state, On/Off digital output of motor status with adjustable trip point to detect belt loss or mechanical failure and built-in pilot duty relay.
4. Split Core: 2-state, On/Off digital output of inverter-duty motor status with adjustable trip point to detect belt loss or mechanical failure and built-in pilot duty relay.
5. Maximum AC Current Monitoring Value: As indicated on drawings.

B. Differential Pressure Switches:
1. Fan Status: Select for adjustable range between 0 to 5 in-wc across fan discharge and external or fan inlet. Include static pressure tips.
2. Pump Status: Select for adjustable range between 8 to 60 psi across pump discharge and suction sides. Include static pressure tips and 3-way valve manifold.

2.11 PIPE-MOUNTED SENSORS AND TRANSMITTERS

A. Temperature Sensors:
1. Pipe-mounted temperature probe tied to weather-resistant enclosure for direct insertion into compatible liquids or gases or inserted into intermediary thermal grease-filled pipe-well compatible with interfaced fluid.
2. Sensor Type: 1,000 ohm Platinum RTD.
3. Transmitter: Fitted within probe-interface enclosure, calibrated.
   a. Monitoring Range: 32 to 122 degrees F, adjustable.
   b. Hardwired Output: Two-wire, 4 to 20 mA, loop powered.
   c. Accuracy: Plus/minus three percent. adjustable on the transmitter end.
4. Accessories: Provide downstream PT test plug and brass pipe-well.

B. Differential Pressure Transmitters:
1. General: Provide wet media differential pressure transducers with 6 ft (1.83 m) armored cable, to allow local or remote pressure sensing capability using existing plumbing runs.
   a. Input Power: Class 2; 15 to 30 VDC, 24VAC nominal, 50/60 Hz.
   b. Output: 3-wire transmitter; 4 to 20 mA, 0 to 5V, or 0 to 10V, selectable,
   c. Sensor:
      1) Media Compatibility: 17 to 4 PH stainless steel.
      2) Status Indication: Dual color LED.
      3) Proof Pressure: 2x max. F.S. range.
      4) Burst Pressure: 5x max. F.S. range.
      5) Accuracy at 77 degrees F for less than or equal 20 ft:
         (a) Ranges A and B: Plus/minus 1 percent F.S. typical.
         (b) Range C: Plus/minus 1.5 percent F.S. typical.
         (c) Range D: Plus/minus 2 percent F.S. typical.
      6) Surge Damping: Electronic; 1 second averaging.
      7) Long Term Stability: Plus/minus 0.25 percent.
   d. Pressure Ranges:
      1) 0 psi to 50 psi (Gauge): 5 psid/10 psid/25 psid/50 psid (pressure differential).
      2) 0 psi to 100 psi (Gauge): 10 psid/20 psid/50 psid/100 psid (pressure differential).
      3) 0 psi to 250 psi (Gauge): 25 psid/50 psid/125 psid/250 psid (pressure differential).
   e. Enclosure: NEMA EN 10250, Type 4.

C. Flow Switches:

1. Repetitive Accuracy: Plus/minus 10 percent of actual flow setting.
2. Switch Actuation: Adjustable over the operating range and sized for the application, such that the setpoint is between 25 and 75 percent of the full range.
3. Provide Form C snap-action contacts, rated for the application.
4. Furnish nonflexible paddle with magnetically actuated contacts, rated for service at a pressure greater than the installed conditions.

D. Turbine Flow Meters:
1. Insertion Type: Provide for 4 inch pipe with ball valve and threadolet.
2. Flow Capacity Range: As indicated on drawings.
3. Coated ductile iron case, polymer-based cap, test port, and hermetically sealed register with low flow indicator.
4. Pressure and Temperature: Up to 175 psi and 120 degrees F.
5. Accessories: Provide downstream PT test plug and sight flow indicator.

2.12 ENERGY METERING

A. Hydronic Energy Meters:
1. LCD-indicating Btu/h energy meter with wall-mounted hardware capable of being installed remotely for direct connection into field-mounted compatible flow meter and temperature sensors or probes for supply and return sides.
2. Factory configured to dynamically monitor, calculate, and output energy demand based on user configured field setting via the front panel keypad or computer interface.
3. Integral transmitter to provide a linear analog or configurable pulse output signal representing the energy rate.
4. Software Outputs: Energy demand, energy consumption, flow rate, supply temperature, return temperature, and temperature difference.
5. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats with plans and room details before installation. Locate 48 inches above floor. Align with lighting switches and humidistats; see Section 26 2726.

C. Mount freeze protection thermostats using flanges and element holders.

D. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

E. Provide separable sockets for liquids and flanges for air bulb elements.

F. Provide thermostats in aspirating boxes in front entrances, gymnasiums, high security areas, and where indicated.

G. Provide valves with position indicators and with pilot positioners where sequenced with other controls.

H. Provide mixing dampers of opposed blade construction arranged to mix streams. Provide pilot positioners on mixed air damper motors.

I. Provide isolation (two-position) dampers of parallel blade construction.

J. Mount control panels adjacent to associated equipment on vibration free walls or free-standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

K. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

END OF SECTION

SECTION 23 0923
DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY GABRIEL R. GARCIA, PE #125068 ON 08/07/2026

1.01 SECTION INCLUDES

A. System description.
B. Operator interface.
C. Controllers.
D. Power supplies and line filtering.
E. Controller software.
F. HVAC control programs.

1.02 RELATED REQUIREMENTS

A. Section 23 0913 - Instrumentation and Control Devices for HVAC.
B. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2024, with Errata (2025).
B. MIL-STD-810 - Environmental Engineering Considerations and Laboratory Tests; 2019h, with Editorial Revision (2022).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide data for each system component and software module.
C. Shop Drawings:
   1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
   2. List connected data points, including connected control unit and input device.
   3. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration digital media containing graphics.
   4. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
   5. Indicate description and sequence of operation of operating, user, and application software.
D. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.
   2. Include submittals data in final "Record Documents" form.
E. Operation and Maintenance Data:
   1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
   2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
   3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Substantial Completion.

C. Provide five year manufacturer's warranty for field programmable micro-processor based units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Owner will select one alternate from Alternates 3A-3B to be included with the Base Proposal. Do not include DDC for HVAC in the Base Proposal.
   1. Alternate 3A: Automated Logic.
   2. Alternate 3B: Unify

2.02 SYSTEM DESCRIPTION

A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units with communications to Building Management System specified in Section 23 09 23.

B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.

C. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.

D. Controls for variable air volume terminals, radiation, reheat coils, unit heaters, fan coils, and the like when directly connected to the control units. Individual terminal unit control is specified in Section 23 0913.

E. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

F. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

2.03 OPERATOR INTERFACE

A. PC Based Work Station:
   1. Resides on high speed network with building controllers.
   2. Connected to server for full access to all system information.

B. Workstation, controllers, and control backbone to communicate using BACnet protocol and addressing.

C. BACnet protocol to comply with ASHRAE Std 135.

2.04 CONTROLLERS

A. Building Controllers:
   1. General:

a. Manage global strategies by one or more, independent, standalone, microprocessor based controllers.
b. Provide sufficient memory to support controller's operating system, database, and programming requirements.
c. Share data between networked controllers.
d. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
e. Utilize real-time clock for scheduling.
f. Continuously check processor status and memory circuits for abnormal operation.
g. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
h. Communication with other network devices to be based on assigned protocol.

2. Communication:
   a. Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.
   b. Perform routing when connected to a network of custom application and application specific controllers.
   c. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
4. Provisions for Serviceability:
   a. Diagnostic LEDs for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

B. Custom Application Controller:
1. General:
   a. Provide sufficient memory to support controller's operating system, database, and programming requirements.
   b. Share data between networked, microprocessor based controllers.
   c. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
   d. Utilize real-time clock for scheduling.
   e. Continuously check processor status and memory circuits for abnormal operation.
   f. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
   g. Communication with other network devices to be based on assigned protocol.
2. Communication:

a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.

3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
4. Provisions for Serviceability:
   a. Diagnostic LED's for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

C. Application Specific Controllers:
1. General:
   a. Not fully user programmable, microprocessor based controllers dedicated to control specific equipment.
   b. Customized for operation within the confines of equipment served.
   c. Communication with other network devices to be based on assigned protocol.
2. Communication:
   a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
   b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
4. Provisions for Serviceability:
   a. Diagnostic LEDs for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3 feet.

D. Input/Output Interface:
1. Hardwired inputs and outputs tie into the DDC system through building, custom application, or application specific controllers.

2. All Input/Output Points:
   a. Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration.
   b. Provide universal type for building and custom application controllers where input or output is software designated as either binary or analog type with appropriate properties.
3. Binary Inputs:
   a. Allow monitoring of On/Off signals from remote devices.
   b. Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise.
   c. Sense dry contact closure with power provided only by the controller.
4. Pulse Accumulation Input Objects: Comply with all requirements of binary input objects and accept up to 10 pulses per second.
5. Analog Inputs:
   a. Allow for monitoring of low voltage 0 to 10 VDC, 4 to 20 mA current, or resistance signals (thermistor, RTD).
   b. Compatible with and field configurable to commonly available sensing devices.
6. Binary Outputs:
   a. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
   b. Outputs provided with three position (On/Off/Auto) override switches.
   c. Status lights for building and custom application controllers to be selectable for normally open or normally closed operation.
7. Analog Outputs:
   a. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.
   b. Provide status lights and two position (AUTO/MANUAL) switch for building and custom application controllers with manually adjustable potentiometer for manual override on building and custom application controllers.
   c. Drift to not exceed 0.4 percent of range per year.
8. Tri State Outputs:
   a. Coordinate two binary outputs to control three point, floating type, electronic actuators without feedback.
   b. Limit the use of three point, floating devices to the following zone and terminal unit control applications:
      1) VAV terminal units.
   c. Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.
9. System Object Capacity:
   a. System size to be expandable to twice the number of input output objects required by providing additional controllers, including associated devices and wiring.
   b. Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions.

2.05 POWER SUPPLIES AND LINE FILTERING

A. Power Supplies:
   1. Provide UL listed control transformers with Class 2 current limiting type or over-current protection in both primary and secondary circuits for Class 2 service as required by the NEC.
   2. Limit connected loads to 80 percent of rated capacity.
   3. Match DC power supply to current output and voltage requirements.

4. Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.
5. Regulation to be 1 percent combined line and load with 100 microsecond response time for 50 percent load changes.
6. Provide over-voltage and over-current protection to withstand a 150 percent current overload for 3 seconds minimum without trip-out or failure.
7. Operational Ambient Conditions: 32 to 120 degrees F.
8. EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD-810 for shock and vibration.
9. Line voltage units UL recognized and CSA approved.

B. Power Line Filtering:
   1. Provide external or internal transient voltage and surge suppression component for all workstations and controllers.
   2. Minimum surge protection attributes:
      a. Dielectric strength of 1000 volts minimum.
      b. Response time of 10 nanoseconds or less.
      c. Transverse mode noise attenuation of 65 dB or greater.
      d. Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.

2.06 CONTROLLER SOFTWARE

A. All applications reside and operate in the system controllers and editing of all applications occurs at the operator workstation.

B. System Security:
   1. User access secured via user passwords and user names.
   2. Passwords restrict user to the objects, applications, and system functions as assigned by the system manager.
   3. User Log On/Log Off attempts are recorded.
   4. Automatic Log Off occurs following the last keystroke after a user defined delay time.

C. Object or Object Group Scheduling:
   1. Weekly Schedules Based on Separate, Daily Schedules:
      a. Include start, stop, optimal stop, and night economizer.
      b. 10 events maximum per schedule.
      c. Start/stop times adjustable for each group object.

D. Provide standard application for equipment coordination and grouping based on function and location to be used for scheduling and other applications.

E. Alarms:
   1. Binary object is set to alarm based on the operator specified state.
   2. Analog object to have high/low alarm limits.
   3. All alarming is capable of being automatically and manually disabled.
   4. Alarm Reporting:
      a. Operator determines action to be taken for alarm event.
      b. Alarms to be routed to appropriate workstation.
      c. Reporting Options:

F. Maintenance Management: System monitors equipment status and generates maintenance messages based upon user-designated run-time limits.

G. Sequencing: Application software based upon specified sequences of operation in Contract Drawings

H. PID Control Characteristics:
   1. Direct or reverse action.

2. Anti-windup.
3. Calculated, time-varying, analog value, positions an output or stages a series of outputs.
4. User selectable controlled variable, set-point, and PED gains.

I. Staggered Start Application:
1. Prevents all controlled equipment from simultaneously restarting after power outage.
2. Order of equipment startup is user selectable.

J. Energy Calculations:
1. Accumulated instantaneous power or flow rates are converted to energy use data.
2. Algorithm calculates a rolling average and allows window of time to be user specified in minute intervals.
3. Algorithm calculates a fixed window average with a digital input signal from a utility meter defining the start of the window period that in turn synchronizes the fixed-window average with that used by the power company.

K. Anti-Short Cycling:
1. All binary output objects protected from short-cycling.
2. Allows minimum on-time and off-time to be selected.

L. On-Off Control with Differential:
1. Algorithm allows binary output to be cycled based on a controlled variable and set-point.
2. Algorithm to be direct-acting or reverse-acting incorporating an adjustable differential.

M. Run-Time Totalization:
1. Totalize run-times for all binary input objects.
2. Provides operator with capability to assign high run-time alarm.

2.07 HVAC CONTROL PROGRAMS

A. General:
1. Support Inch-pounds and SI (metric) units of measurement.
2. Identify each HVAC Control system.

B. Optimal Run Time:
1. Control start-up and shutdown times of HVAC equipment for both heating and cooling.
2. Base on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature.
3. Start-up systems by using outside air temperature, room mass temperatures, and adaptive model prediction for how long building takes to warm up or cool down under different conditions.
4. Use outside air temperature to determine early shut down with ventilation override.
5. Analyze multiple building mass sensors to determine seasonal mode and worse case condition for each day.

C. Supply Air Reset:
1. Monitor heating and cooling loads in building spaces, terminal reheat systems, both hot deck and cold deck temperatures on dual duct and multizone systems, single zone unit discharge temperatures.
2. Adjust discharge temperatures to most energy efficient levels satisfying measured load by:
   a. Raising cooling temperatures to highest possible value.
   b. Reducing heating temperatures to lowest possible level.

D. Enthalpy Switchover:
1. Calculate outside and return air enthalpy using measured temperature and relative humidity; determine energy expended and control outside and return air dampers.

2.08 CHILLER CONTROL PROGRAMS

A. Control function of condenser water reset, chilled water reset, and chiller sequencing. Support inch-pounds and SI (metric) units of measurement.

B. Condenser Water Reset: Automatically reset controlled condenser water temperature using measured outside wet bulb temperature and load being handled.

C. Chilled Water Reset: Automatically reset controlled chilled water temperature satisfying cooling coil requiring greatest cooling.

D. Chiller Sequencing: Determine which combination of chillers will most efficiently satisfy chilled water load, by cycling chillers, based on comparing load to switchover limits defined for each chiller.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

3.02 INSTALLATION

A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.

B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation.

C. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

3.03 MANUFACTURER'S FIELD SERVICES

A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

B. Provide service engineer to instruct Owner's representative in operation of systems plant and equipment for 3 day period.

3.04 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate complete and operating system to Owner.

END OF SECTION

SECTION 23 2123
HYDRONIC PUMPS

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY GABRIEL R. GARCIA, PE #125068 ON 08/07/2026

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Circulators.

B. In-line pumps.

C. End-suction pumps.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 23 0513 - Common Motor Requirements for HVAC Equipment.

C. Section 23 0923 - Direct-Digital Control System for HVAC.

D. Section 23 0934 - Variable-Frequency Motor Controllers for HVAC.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2024, with Errata (2025).

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Pump Seals: One for each type and size of pump.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture, assembly, and field performance of pumps, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Armstrong Fluid Technology, Inc

B. Bell & Gossett, a Xylem Inc. brand

C. Grundfos Pumps Corporation

D. Taco

2.02 GENERAL

A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

B. Electrical Requirements:
   1. Listed and classified by UL or testing agency acceptable to authority having jurisdiction as suitable for the purpose specified and indicated.
   2. Variable Frequency Drives (VFDs): Provide in accordance with Section 23 0934, except for integral-VFDs.
   3. Enclosures: Provide unspecified product(s) required to fit motor:

2.03 CIRCULATORS

A. Horizontal shaft, single-stage pump with direct connected, resilient-mount, oil lubricated motor for discharge pressures of up to 125 psi.

B. Casing: Cast iron, with flanged pump connections.

C. Impeller: Non-ferrous keyed to shaft.

D. Bearings: Oil-lubricated bronze sleeve.

E. Shaft: Alloy steel with bronze sleeve, integral thrust collar.

F. Seal: Mechanical seal, 225 degrees F maximum continuous duty temperature.

G. Drive: Flexible coupling.

H. Electrical:
   1. Motor: 1,750 rpm unless indicated otherwise; see Section 23 0513.
   2. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

2.04 IN-LINE PUMPS

A. Closed-Coupled, Single-Stage Pump: Vertical pump with radially- or horizontally-split casing and integral controls; rated for discharge pressures up to 175 psi.

B. Casing: Cast iron with seal flush connection, threaded suction, and discharge ports with gauge port and drain plug.

C. Impeller: Bronze, fully enclosed, keyed directly to motor shaft or extension.

D. Shaft: Stainless steel with stainless steel impeller cap screw or nut and stainless steel sleeve.

E. Seal: Mechanical seal, 225 degrees F maximum continuous duty temperature.

F. Electrical:
   1. Motor: 1,750 rpm, open drip-proof (ODP); see Section 23 0513.
   2. Integral Controls:
      a. Variable Frequency Drive (VFD): Factory-fitted and tested with dedicated terminal box for power, instrumentation and related control wiring.
      b. DDC Controller: VFD-integrated or external controller module with visual-tactile interface and minimum of 2 analog inputs, 2 digital inputs, and real-time clock. Provide differential pressure sensor and temperature sensor with thermowell and thermal grease.
      c. BAS, SCADA, or Other Integrated Automation Link: BACnet MS/TP in accordance with ASHRAE Std 135.

2.05 END-SUCTION PUMPS

A. Split-Coupled Pump: Base-mounted, single-stage pump with horizontal shaft and radially- or horizontally-split casing rated for discharge pressures up to 175 psi.

B. Casing: Cast iron or ductile iron with renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction, and discharge flanged connections with gauge ports.

C. Impeller: Stainless steel, balanced, fully enclosed, keyed to shaft.

D. Bearings: Oil lubricated roller or ball bearings.

E. Shaft: Alloy steel with copper, bronze, or stainless steel shaft sleeve.

F. Seal: Mechanical, 225 degrees F maximum continuous duty temperature.

G. Drive: Flexible coupling with coupling guard.

H. Baseplate: Cast iron or fabricated steel with integral drain rim.

I. Electrical:
   1. Motor: 1,750 rpm, total-enclosed, fan-cooled (TEFC); see Section 23 0513.
   2. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For close-coupled or base-mounted pumps, provide supports under elbows on pump suction and discharge line sizes 4 inches and over.

D. Provide line sized shut-off valve and pump suction fitting on pump suction, and line sized combination pump discharge valve on pump discharge.

E. Provide air cock and drain connection on horizontal pump casings.

F. Provide drains for bases and seals, piped to and discharging into floor drains.

G. Check, align, and certify alignment of base-mounted pumps prior to start-up.

H. Install close-coupled and base-mounted pumps on concrete housekeeping base, with anchor bolts, set and level, and grout in place. See Section 03 3000.

I. Lubricate pumps before start-up.

J. Controls: Interface each pump starter or VFD with HVAC controller; see Section 23 0923.

END OF SECTION

SECTION 23 3600
AIR TERMINAL UNITS

PART 1 GENERAL

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY GABRIEL R. GARCIA, PE #125068 ON 08/07/2026

1.01 SECTION INCLUDES

A. Single-duct terminal units.
   1. Variable-volume units.
B. Hose kits and valves.

1.02 RELATED REQUIREMENTS

A. Section 23 0548 - Vibration and Seismic Controls for HVAC.
B. Section 23 3100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

A. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils; 2001, with Addenda (2011).
B. AHRI 880 (I-P) - Performance Rating of Air Terminals; 2017 (Reaffirmed 2023).
C. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
D. ASTM A492 - Standard Specification for Stainless Steel Rope Wire; 1995 (Reapproved 2019).
E. ASTM A603 - Standard Specification for Metallic-Coated Steel Structural Wire Rope; 2019.
F. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2025.
G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
I. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
J. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2024.
K. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate airflow, static pressure, and NC designation. Include electrical characteristics and connection requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 SINGLE-DUCT, VARIABLE-VOLUME UNITS

A. Manufacturers:
   1. Krueger-HVAC
   2. Metalaire, a brand of Metal Industries Inc
   3. Price Industries, Inc
   4. Trane, a brand of Ingersoll Rand

B. General:
   1. Factory-assembled, AHRI 880 (I-P) rated and bearing the AHRI seal, air volume control terminal with damper assembly, flow sensor, externally mounted volume controller, duct collars, and all required features.
   2. Control box bearing identification, including but not necessarily limited to nominal cfm, maximum and minimum factory-set airflow limits, coil type and coil (right or left hand) connection, where applicable.

C. Unit Casing:
   1. Minimum 22 gauge, 0.0299 inch galvanized steel.
   2. Air Inlet Collar: Provide round, suitable for standard flexible duct sizes.
   3. Unit Discharge: Rectangular, with slip-and-drive connections.
   4. Acceptable Liners:
      a. 1/2 inch thick, coated, fibrous-glass complying with ASTM C1071.
         1) Secure with adhesive.
         2) Coat edges exposed to airstream with NFPA 90A approved sealant.
         3) Cover liner with non-porous foil.
      b. 3/4 inch thick polyurethane foam adhesive complying with UL 181 erosion requirements in accordance with ASHRAE Std 62.1, and having a maximum smoke developed index of 50 for both insulation and adhesive, when tested in accordance with ASTM E84.
      c. Liner not to contain pentabrominated diphenyl ether (CAS #32534-81-9) or octabrominated diphenyl ether.

D. Damper Assembly:
   1. Heavy-gauge, galvanized steel, or extruded aluminum construction with solid steel, nickel-plated shaft pivoting on HDPE, self-lubricating bearings.
   2. Provide integral position indicator or alternative method for indicating damper position over full range of 90 degrees.
   3. Incorporate low leak damper blades for tight airflow shutoff.

E. Hot Water Heating Coil:
   1. Coil Casing: Minimum 22 gauge, 0.0299 inch galvanized steel, factory-installed on terminal discharge with rectangular outlet, duct connection type.
   2. Coil Fins: Aluminum or aluminum plated fins, mechanically-bonded to seamless copper tubes.
   3. Coil leak tested to minimum 350 psig.
   4. Base performance data on tests run in accordance with AHRI 410 and units to bear AHRI 410 label.

F. Electrical Requirements:
   1. Single-point power connection.
   2. Equipment wiring to comply with requirements of NFPA 70.

G. Control Transformers: Factory supplied and mounted for electric and electronic control applications.

H. Controls:
   1. DDC (Direct-Digital Controls):
      a. Bi-directional Damper Actuator: 24 volt, powered closed, spring return open.
      b. Microprocessor-Based Controller: Air volume controller, pressure-independent with electronic airflow transducers, factory-calibrated maximum and minimum CFMs.
         1) Occupied and unoccupied operating mode.
         2) Remote reset of temperature or CFM set points.
         3) Proportional, plus integral control of room temperature.

4) Monitoring and adjusting with portable terminal.

c. Room Sensor:

1) Compatible with temperature controls specified.

2) Wall-mounted, system powered, with temperature set-point adjustment including connection access for portable operator terminal.

2. Airflow Sensor: Differential pressure airflow device measuring total, static, and wake pressures.

a. Signal accuracy: Plus/minus five percent throughout terminal operating range.

2.02 HOSE KITS AND VALVES

A. Hoses:

1. Provide hoses for all units for connection to main water supply and return headers.
2. Length: 2 feet.
3. Material: Braided stainless steel rated to minimum 400 psi at 265 degrees F.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are suitable for installation.

B. Verify that field measurements are as indicated on drawings.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install the inlets of air terminal units and air flow sensors a minimum of four duct diameters from elbows, transitions, and duct takeoffs.

C. Provide ceiling access doors or locate units above easily removable ceiling components.

D. Support units individually from structure with wire rope complying with ASTM A492 and ASTM A603 in accordance with SMACNA (SRM). See Section 23 0548.

E. Do not support from ductwork.

F. Connect to ductwork in accordance with Section 23 3100.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Provide manufacturer's field representative to test, inspect, instruct, and observe field-assembled components and equipment installation, including connections and to assist in field testing. Report results in writing.

1. Leak Test:
   a. After installation, fill water coils and test for leaks.
   b. Repair leaks and retest until no leaks exist.
2. Operational Test:
   a. After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   b. Test and adjust controls and safeties.
   c. Replace damaged and malfunctioning controls and other equipment.
   d. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 23 6426
ROTARY-SCREW WATER CHILLERS

THE SEAL APPEARING ON THIS DOCUMENT
WAS AUTHORIZED BY
GABRIEL R. GARCIA, PE #125068 ON 08/07/2026

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air-cooled rotary-screw chiller.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete housekeeping pads.

B. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

C. Section 23 0800 - Commissioning of HVAC.

D. Section 23 0923 - Direct-Digital Control System for HVAC.

E. Section 23 0993 - Sequence of Operations for HVAC Controls.

F. Section 23 2113 - Hydronic Piping.

G. Section 23 2114 - Hydronic Specialties.

H. Section 25 1500 - Integrated Automation Software.

I. Section 25 3519 - Integrated Automation Control Valves.

J. Section 26 0583 - Wiring Connections.

1.03 REFERENCE STANDARDS

A. AHRI 550/590 (I-P) - Standard for Performance Rating of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle; 2023.

B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2026).

C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2024, with Errata (2025).

E. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2025, with Errata .

F. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2026.

G. UL 984 - Hermetic Refrigerant Motor-Compressors; Current Edition, Including All Revisions.

H. UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide rated capacities, weights, specialties and accessories, electrical requirements and wiring diagrams.

C. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate equipment, piping and connections, valves, strainers, and thermostatic valves required for complete system.

D. Manufacturer's Performance Data: Indicate energy input versus cooling load output from 0 to 100 percent of full load at specified and minimum condenser water temperature for water-cooled chillers and at specified and minimum outdoor air temperature for air-cooled chillers.

E. Operation and Maintenance Data: Include start-up instructions, maintenance data, parts lists, controls, and accessories; include trouble-shooting guide.

F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's written installation instructions for rigging, unloading, and transporting units.

B. Deliver units to the job site completely assembled and charged with refrigerant and oil by manufacturer.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer's Warranty: Provide minimum five year warranty to include coverage for materials only for compressor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Owner will select one alternate from Alternates 1A-1C to be included with the Base Proposal. Do not include Rotary-Screw Water Chillers in the Base Proposal.
   1. Alternate 1A: Carrier.
   2. Alternate 1B: Trane
   3. Alternate 1C: JCI/York

2.02 AIR-COOLED, ROTARY-SCREW, WATER CHILLER CONSTRUCTION REQUIREMENTS

A. Factory assembled and tested chiller consisting of compressor(s), compressor motor(s), motor starter(s) or variable frequency drives as indicated, evaporator, condenser, enclosure, refrigeration circuits(s) and specialties, interconnecting piping, microprocessor-based controls, readouts, and diagnostics.
   1. Rating: AHRI 550/590 (I-P).
   2. Safety: ASHRAE Std 15 and UL 1995.
   3. Construction and Testing: ASME BPVC-VIII-1.
   4. Energy Efficiency: ASHRAE Std 90.1.
   5. Enclosures:
      a. Structural Framing: Mount structural steel on welded steel base with hot-dip galvanized finish.
      b. Steel Cabinet:
         1) Factory apply baked on powder paint or corrosion resistant paint prior to assembly.
         2) Provide gasketing and weatherproofing to panels with fully opening doors containing starters or variable frequency drives, terminal blocks, through-the-door type disconnects and circuit breaker with lockable handles indicating "power-on" or "power-off".
         3) Provide door stays.
      c. Perform 500-hour salt spray test in accordance with ASTM B117 for outdoor applications.

B. Rotary-Screw Compressors:
   1. Unit: Semi-hermetic type with two, variable speed drive compressors with multiple independent refrigeration circuit(s), internal muffler, discharge, check, and suction service valves.

2. Oil Lubrication System: Positive pressure system, oil heater, oil separator, check valves, solenoid valves, and filtration devices.
3. Valves: Check valves in compressor discharge.
4. Capacity Reduction System: Load/unload valve control down to 20 percent of full load without the activation of hot gas bypass.
5. Motors: UL 984, 3,600 rpm, suction gas-cooled, hermetically sealed, squirrel cage induction with starter.

C. Evaporator, Shell and Tube Type:
1. ASME BPVC-VIII-1, two pass type, with two independent refrigeration circuits.
2. Shell, Removable Heads and Tube Support Sheets: Carbon steel.
3. Tubes: Mechanically treated copper tubes fixed and aligned into intermediate tube support sheets across the shell to maintain consistent spacing between tubes with the capability of being cleanable.
4. Working Pressure Rating, Refrigerant-Side: 200 psi.
5. Working Pressure Rating, Water-Side: 150 psi.
6. Cold Surface Insulation:
   a. Factory install on shell and all other cold surfaces.
   b. 0.75-inch minimum thickness, closed cell, expanded polyvinyl chloride flexible foam insulation with a maximum K factor of 0.28.

D. Provide vents and water drain connections.

E. Provide fittings for temperature control sensors.

F. Freeze Protection: Provide evaporator heater with thermostat to protect from freezing at ambient temperatures down to minus 20 degrees F.

G. Air-Cooled Condenser:
1. Heat Exchanger:
   a. Arrangement: Two pass, round tubes.
   b. Mechanically bond aluminum fins to internally enhanced, seamless copper tubing and protect with corrosion resistant materials or coatings.
   c. Clean, dehydrate and test.
   d. Leak Test: 506 psi.
   e. Seal: Nitrogen holding charge.
2. Coil Guards: Provide expanded metal with lint screens. Protect condenser coil by enclosing with heavy plastic to prevent damage during shipping or rigging.
3. Fans and Motors:
   a. Dynamically balanced propeller type, direct drive fans of reinforced polymer corrosion resistant construction and equip with sealed, permanently lubricated ball bearings.
   b. Discharge Fan Guards: Coated steel wire.
   c. Discharge Direction: Vertical.
   d. Motors: Totally enclosed, high efficiency, suitable for outdoor use, three phase, permanent split capacitor, single speed with internal overload protection.

H. Refrigeration Circuits:
1. Provide two independent refrigeration circuit(s) with two compressor(s) per circuit.
2. Minimum Refrigerant Specialties per Circuit:
   a. Isolation and service valves for refrigerant removal and charging.
   b. Removable-core filter driers.
   c. ASHRAE Std 15 compliant relief valves.
   d. Liquid line sight glass with moisture indicator.
   e. Refrigerant expansion valves or metering devices.
   f. Complete operating charge of both refrigerant and oil.

I. Controls Package:
   1. Unit Controls: Factory-supplied DDC:
      a. Control-panel mounted with required input-output expansions, power supply, fused disconnect, hand switches, knobs, and accessories required to control chiller unit to manufacturer required sequences to meet intended use with listed performance.
      b. Factory configured to interface prewired sensors, switches, and safeties with allowance to add up to four chiller valves and flow sensors.
      c. Graphic-based touchscreen to include unit operation controls and user filter based interface for faults, alarms, performance, unit diagnostics, and data recording up to 12 months.
      d. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.
      e. External Point Mapping: Provide mapping table for each parameter included in the local visual interface with software-toggle flag to allow reduced mapping of available points.
      f. Isolation Valves: Field-installed, 2-position, butterfly type with position tracking; see Section 25 3519.
   2. Control Components for Preventing Shutdown:
      a. Provide high pressure limit with indicating light for each compressor, set lower than factory pressure switch to automatically unload compressor and prevent nuisance high pressure condenser control trip.
      b. Provide one protector with indicating light for each compressor, with current limit setpoint of 120 percent of compressor running load amperage to automatically unload compressor preventing over-current trip.
      c. Provide low refrigerant limit to automatically unload each compressor preventing a low evaporator temperature trip.
   3. Chiller Operation in Abnormal Operating Conditions:
      a. Unloaded Running: Adequate chilled water production.
      b. Trip-out Limit Reached: Chiller goes off-line and manual reset is required for continued operation.
   4. Control Panel Display:
      a. Evaporator pressure.
      b. Condenser refrigerant pressure.
      c. Entering and leaving evaporator water temperature.
   5. Points for Remote Monitoring and Control:
      a. Entering and leaving condenser water temperature as applicable.
      b. Chilled water setpoint.
      c. Electrical 3 phase current limit and percent RLA setpoint.
      d. Electrical 3 phase amp draw.
      e. Chiller operating mode.
      f. Condenser refrigerant temperature.
      g. Elapsed time and number of starts counter.
      h. Chiller compressor run status relay.
      i. Minimum of 20 diagnostics with time and date stamp.
      j. Identification of the fault, date, time and operating mode at time of occurrence, type of reset required, and help message.
      k. Relay output energized upon detecting a fault requiring manual reset.
      l. Relay output energized whenever unit is operating in a limit mode for an extended period of time.
      m. Analog input to control leaving chilled water temperature setpoint based upon a 4-20ma or 0-10 VDC signal from the building automation system.

n. Programmable soft during pull-down period via ramped current limit or fully adjustable, temperature pull-down rate.
o. Leaving chilled water reset based upon return water temperature.
p. Provide RS-232 for printer interface.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Align chiller package on steel or concrete foundations.

C. Install units on vibration isolators.

D. Connect to electrical service.

E. Connect to chilled water piping.

F. Arrange piping for easy dismantling to permit tube cleaning and removal.

G. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface; see Section 25 1500.

3.02 MANUFACTURER'S FIELD SERVICES

A. Perform factory startup of the chiller by factory trained and authorized servicing technicians confirming equipment has been correctly installed prior to equipment becoming operational and covered under the manufacturer's warranty.

B. Supply initial charge of refrigerant and oil if not completely factory charged.

C. Demonstrate system operations and verify specified performance.

3.03 CLOSEOUT ACTIVITIES

A. Demonstrate proper operation of equipment to Owner's designated representative.

END OF SECTION

SECTION 23 7313
MODULAR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

THE SEAL APPEARING ON THIS DOCUMENT
WAS AUTHORIZED BY
GABRIEL R. GARCIA, PE #125068 ON 08/07/2026

1.01 SECTION INCLUDES

A. Casing construction.
B. Fan section.
C. Coil section.
D. Filter and air cleaner section.
E. Damper section.
F. Access section.
G. Controls.

1.02 RELATED REQUIREMENTS

A. Section 23 0548 - Vibration and Seismic Controls for HVAC.
B. Section 23 3413 - Axial HVAC Fans.
C. Section 25 1500 - Integrated Automation Software.

1.03 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015 (Reaffirmed 2026).
B. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils; 2001, with Addenda (2011).
C. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
D. AMCA 99 - Standards Handbook; 2025.
E. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2025.
F. AMCA 300 - Reverberation Room Methods of Sound Testing of Fans; 2024.
G. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.
H. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.
I. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.
J. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2025.
K. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
L. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
M. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2024, with Errata (2025).
N. ASTM B177/B177M - Standard Guide for Engineering Chromium Electroplating; 2011 (Reapproved 2021).
O. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
P. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
Q. UL 508 - Industrial Control Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Published Literature: Indicate dimensions, weights, capacities, ratings, gauges and finishes of materials, and electrical characteristics and connection requirements.
   2. Filters: Data for filter media, filter performance data, filter assembly, and filter frames.
   3. Fans: Performance and fan curves with specified operating point clearly plotted, power, RPM.
   4. Sound Power Level Data: Fan outlet and casing radiation at rated capacity.
   5. Electrical Requirements: Power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

C. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.

D. Manufacturer's Instructions: Include installation instructions.

E. Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.

B. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

C. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Owner will select one alternate from Alternates 2A-2C to be included with the Base Proposal. Do not include Modular Central-Station Air-Handling Units in the Base Proposal.
   1. Alternate 2A: Carrier.
   2. Alternate 2B: Trane
   3. Alternate 2C: JCI/York

2.02 CASING CONSTRUCTION

A. Full Perimeter Base Rail:
   1. Construct of galvanized steel.
   2. Provide base rail of sufficient height to raise unit for external trapping of condensate drain pans.

B. Casing:
   1. Construct of one piece, insulated, double wall panels.
   2. Provide mid-span, no through metal, internal thermal break.
   3. Construct outer panels of galvanized steel and inner panels of galvanized steel.
   4. Casing Air Pressure Performance Requirements:
      a. Able to withstand up to 8 in-wc positive or negative static pressure.

b. Not to exceed 0.0042 inches per inch deflection at 1.5 times design static pressure up to a maximum of plus 8 in-wc in positive pressure sections and minus 8 in-wc in negative pressure sections.

C. Access Doors:
1. Construction, thermal and air pressure performance same as casing.
2. Provide surface mounted handles on hinged, swing doors.

D. Outside Air and Exhaust Air Weather Hood:
1. Fabricate from same material as casing outer panel.
2. Extend hood past perimeter of unit casing opening so as not to instruct airflow path.
3. Paint hoods with same finish as external surface of outdoor units.
4. Provide inlet hood for each fresh air damper with a sine wave moisture eliminator to prevent entrainment of water into the unit from outside air.
5. Provide exhaust hoods for each exhaust air opening.
6. Size each hood for 100 percent of nominal fresh air damper capacities.
7. Protect each hood with bird screen to prevent nesting at intake or exhaust airflow paths.

E. Unit Flooring: Construct with sufficient strength to support expected people and equipment loads associated with maintenance activities.

F. Casing Leakage: Seal joints and provide airtight access doors so that air leakage does not exceed one percent of design flow at the specified casing pressure.

G. Insulation:
1. Provide minimum thermal thickness of 12 R throughout.
2. Completely fill panel cavities in each direction to prevent voids and settling.
3. Comply with NFPA 90A.

H. Drain Pan Construction:
1. Provide cooling coil and humidifier sections with an insulated, double wall, galvanized steel drain pan complying with ASHRAE Std 62.1 for indoor air quality and sufficiently sized to collect all condensate.
2. Slope in two planes to promote positive drainage and eliminate stagnate water conditions.
3. Locate outlet of sufficient diameter at lowest point of pan to prevent overflow at normal operating conditions.
4. Provide threaded drain connections constructed of drain pan material, extended sufficient distance beyond the base to accommodate field installed, condensate drain trapping.

I. Louvers: Stationary, of galvanized steel, 4 inches deep with plenum, nylon bearings, 1/2-inch mesh, 0.04-inch galvanized wire bird screen in aluminum frame, and bearing AMCA Certified Ratings Seal in accordance with AMCA 500-L. Furnish adjustable louvers with hollow vinyl bulb edging on blades and foam side stops to limit leakage to maximum 2 percent at 4 in-wc differential pressure when sized for 2000 fpm face velocity.

J. Finish:
1. Outdoor Units:
a. Coat external surface of unit casing with primer and minimum 1.5 mil, enamel paint finish.
b. Comply with salt spray test in accordance with ASTM B177/B177M.
c. Color: Manufacturer's standard color.
2. Indoor Units:
a. Provide exterior, galvanized steel panels with painted surface complying with ASTM B177/B177M.
b. Color: Manufacturer's standard color.

2.03 FAN SECTION

A. Type: Forward curved, single width, single inlet, centrifugal plug fan, in accordance with AMCA 99. See Section 23 3413

B. Performance Ratings: Determined in accordance with AMCA 210 and labeled with AMCA Certified Rating Seal.

C. Sound Ratings: AMCA 301; tested to AMCA 300 and label with AMCA Certified Sound Rating Seal.

D. Bearings: Self-aligning, grease lubricated, with lubrication fittings extended to exterior of casing with plastic tube and grease fitting rigidly attached to casing.

E. Mounting:
   1. Locate fan and motor internally on welded steel base coated with corrosion resistant paint.
   2. Factory mount motor on slide rails.
   3. Provide access to motor, drive, and bearings through removable casing panels or hinged access doors.
   4. See Section 23 0548.

F. External Motor Junction Box: Factory mount NEMA 4 external junction box and connect to extended motor leads from internally mounted motors.

G. Motor Wiring Conduit: Factory wire fan motor wiring to the unit mounted starter-disconnect, variable frequency drive, and external motor junction box.

H. Flexible Duct Connections:
   1. For separating fan, coil, and adjacent sections.

I. Drives:
   1. Comply with AMCA 99.
   2. Bearings: Heavy duty pillow block type, ball bearings, with ABMA STD 9 L-10 life at 50,000 hours.
   3. Shafts: Solid, hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.
   4. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, bored to fit shafts, and keyed. Variable and adjustable pitch sheaves for motors 15 hp and under selected so required rpm is obtained with sheaves set at mid-position; fixed sheave for 20 hp and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.
   5. Belt Guard: Fabricate to SMACNA (DCS); 0.106 inch thick, 3/4 inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

2.04 COIL SECTION

A. Casing: Provide access to both sides of coils. Enclose coils with headers and return bends exposed outside casing. Slide coils into casing through removable end panel with blank off sheets and sealing collars at connection penetrations.

B. Drain Pans: 24 inch downstream of coil and down spouts for cooling coil banks more than one coil high.

C. Eliminators: Three break of galvanized steel, mounted over drain pan.

D. Air Coils:
   1. Certify capacities, pressure drops, and selection procedures in accordance with AHRI 410.

E. Fabrication:

1. Tubes: 5/8 inch OD seamless copper expanded into fins, brazed joints.
2. Fins: Aluminum.
3. Casing: Die formed channel frame of galvanized steel.

F. Water Heating Coils:
1. Headers: Cast iron, seamless copper tube, or prime coated steel pipe with brazed joints.
2. Configuration: Drainable, with threaded plugs for drain and vent; serpentine type with return bends on smaller sizes and return headers on larger sizes.

G. Water Cooling Coils:
1. Headers: Cast iron, seamless copper tube, or prime coated steel pipe with brazed joints.
2. Configuration: Drainable, with threaded plugs for drain and vent; threaded plugs in return bends and in headers opposite each tube.

2.05 HOSE KITS AND VALVES

A. Hoses:
1. Provide hoses for all units for connection to main water supply and return headers.
2. Length: 2 feet.
3. Material: Braided stainless steel rated to minimum 400 psi at 265 degrees F.

2.06 FILTER AND AIR CLEANER SECTION

A. General: Provide filter sections with filter racks, minimum of one access door for filter removal, and filter block-offs to prevent air bypass.

B. Pleated Media Filters:
1. Media: 2 inch, 100 percent synthetic fibers, continuously laminated to a grid with water repellent adhesive, and capable of operating up to a maximum of 625 fpm without loss of efficiency and holding capacity.
2. Frame: Steel wire grid.
3. Minimum Efficiency Reporting Value: MERV 8 when tested in accordance with ASHRAE Std 52.2.

C. Differential Pressure Gauge:
1. Provide factory installed dial type differential pressure gauge, flush mounted with casing outer wall, and fully piped to both sides of each filter to indicate status.
2. Maintain plus/minus 5 percent accuracy within operating limits of 20 degrees F to 120 degrees F.

2.07 DAMPER SECTION

A. Mixing Section: Provide a functional section to support the damper assembly for modulating the volume of outdoor and return air.

B. Damper Blades:
1. Double-skin airfoil design with metal, compressible jamb seals and extruded-vinyl blade-edge seals on each blade.
2. Self-lubricating stainless steel or synthetic sleeve bearings.
3. Comply with ASHRAE Std 90.1 I-P for rated maximum leakage rate.
4. Provide leakage testing and pressure ratings in compliance with AMCA 500-D test methods.
5. Arrange in parallel or opposed-blade configuration.

C. Barometric Relief Dampers:
1. Frame: Roll formed galvanized steel.
2. Blades: Roll formed galvanized steel.
3. Blade Seals: Extruded vinyl, mechanically attached to the blade edge.

2.08 ACCESS SECTION

A. Provide where indicated on drawings to allow for inspection, cleaning, and maintenance of field-installed components.

B. Construct access doors same as previously specified within this Section.

2.09 CONTROLS

A. Combination VFD - Disconnects:
   1. Provide factory mounted, combination VFD - disconnect for each fan motor.
   2. Factory mount in full metal enclosure and wire to fan motor.
   3. Mount VFD-disconnect on fan section externally in a NEMA 1 enclosure within a dedicated controls section or housed fan section.
      a. Internal Enclosure Construction Characteristics:
         1) Integral part of unit casing to allow for thermal venting to casing interior.
         2) Accessible from unit exterior via access door.
         3) Construction of access doors same throughout unit.
   4. Include control transformer with sufficient capacity to support the following items:
      a. VFD and controls.
      b. Binary output on-off wiring.
      c. Analog output speed-signal wiring.
      d. Wires that interface between VFD and direct digital controller.

B. DDC Contractor Installed Direct Digital Control (DDC) System:
   1. Mixing Section Dampers:
      a. Outdoor Air Damper: Fail closed using spring-return actuator.
      b. Return Air Damper: Fail open using spring-return actuator.
   2. Temperature Sensors: Provide for fan discharge, supply, return, mixed air, and coil section. Use averaging type for coil sections.
   3. Low Limit Switches:
      a. Factory wire to momentary push-button reset circuit.
      b. Provide separate low limit for each coil in a coil stack.
   4. Fan Status: Provide pressure switch to determine running status.
   5. Loaded Filter Section: Tube to filter section to indicate sectional filter status.
   6. Condensate Overflow Switches:
      a. Comply with UL 508; shut down unit in the event of primary drain blockage.
      b. Factory install float switch in drain pan to detect high water condensate level.
      c. Locate float switch above primary drain line connection and below drain pan rim.
   7. Relays, Unit-Mounted, Output-Linked: Provide for external loads including motor starters, relief dampers, pumps, condensing units, and other equipment as specified in the drawings.

C. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.

D. External Point Mapping: Provide mapping table for each parameter included in the local visual interface with software-toggle flag to allow reduced mapping of available points.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Bolt sections together with gaskets.

C. Isolate fan section with flexible duct connections.

D. Install flexible duct connections between fan inlet and discharge ductwork and air handling unit sections. Ensure that metal bands of connectors are parallel with minimum 1 inch flex between ductwork and fan while running.

E. Provide fixed sheaves required for final air balance.

F. Make connections to coils with unions or flanges.

G. Hydronic Coils:
   1. Hydronic Coils: Connect water supply to leaving air side of coil (counterflow arrangement).
   2. Provide shut-off valve on supply line and lockshield balancing valve with memory stop on return line.
   3. Locate water supply at bottom of supply header and return water connection at top.
   4. Provide manual air vents at high points complete with stop valve.
   5. Ensure water coils are drainable and provide drain connection at low points.

H. Cooling Coils:
   1. Pipe drain and overflow to nearest floor drain.

I. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface; see Section 25 1500.

3.02 SYSTEM STARTUP

A. Provide manufacturer's field representative to perform systems startup.

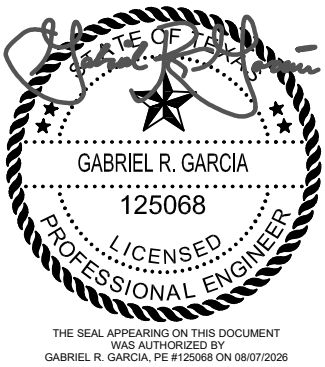
B. Prepare and start equipment and systems in accordance with manufacturers' instructions and recommendations.

3.03 CLOSEOUT ACTIVITIES

A. Demonstrate proper operation of equipment to Owner's designated representative.

END OF SECTION

SECTION 23 8126.13
SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS



THE SEAL APPEARING ON THIS DOCUMENT
WAS AUTHORIZED BY
GABRIEL R. GARCIA, PE #125068 ON 08/07/2026

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air-source heat pumps.

B. Air cooled condensing units.

C. Indoor air handling (fan and coil) units for ductless systems.

D. Controls.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2026.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2026).

D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.

E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2027.

G. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carrier Corporation

B. Trane Inc

C. Mitsubishi.

D. Lennox

E. Samsung

2.02 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.

1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator.
2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Drawings for additional requirements.

C. Certifications:
1. UL 1995 or UL/CSA 60335-2-40
2. UL 207

2.03 INDOOR AIR HANDLING UNITS FOR DUCTLESS SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.

B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
2. Manufacturer: System manufacturer.

2.04 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
1. Comply with AHRI 210/240.
2. Refrigerant: R-32 or R-454B.
3. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
4. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.

B. Compressor: Hermetic, two speed 1800 and 3600 rpm, AHRI 520 resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high-pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.

C. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

D. Coil: Air-cooled, aluminum fins bonded to copper tubes.
1. Provide with hail guards to protect coil.

E. Operating Controls:
1. Control by room thermostat to maintain room temperature setting.

2.05 ACCESSORY EQUIPMENT

A. Room Thermostat: Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
1. System selector switch (heat-off-cool) and fan control switch (auto-on).
2. Automatic switching from heating to cooling.
3. Preferential rate control to minimize overshoot and deviation from setpoint.
4. Programming based on weekdays, Saturday and Sunday.
5. Thermostat Display:
a. Actual room temperature.
b. Programmed temperature.
c. System Mode Indication: Heating, Cooling, Fan Auto, Off, and On, Auto or On, Off.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. Install refrigeration systems in accordance with ASHRAE Std 15.

D. Pipe drain from cooling coils to nearest floor drain.

END OF SECTION

SECTION 23 8200
CONVECTION HEATING AND COOLING UNITS

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY GABRIEL R. GARCIA, PE #125068 ON 08/07/2026

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fan-coil units.

B. Electric unit heaters.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. AHRI 440 - Performance Rating of Room Fan-Coils; 2008.

B. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); Current Edition.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide typical catalog of information including arrangements.

C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 FAN-COIL UNITS

A. Manufacturers:
   1. Trane
   2. Carrier
   3. Enviro-tec
   4. Price

B. Performance Data and Safety Requirements:
   1. Unit capacities certified in accordance with AHRI 440.
   2. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to authority having jurisdiction as suitable for purpose indicated.
   3. Insulation to comply with NFPA 90A requirements for flame spread and smoke generation.
   4. Equipment wiring to comply with requirements of NFPA 70.

C. Required Directory Listings: AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI).

D. Coils:
   1. Evenly spaced aluminum fins mechanically bonded to copper tubes.
   2. Water Coil: Suitable for working temperatures not less than 200 degrees F.
   3. Provide drain pan under cooling coil easily removable for cleaning.

E. Coil Piping Packages:

1. Hoses:
    a. Provide hoses for all units for connection to main water supply and return headers.
    b. Length: 2 feet.
    c. Material: Braided stainless steel rated to minimum 400 psi at 265 degrees F.

F. Finish: Factory applied baked primer coat on visible surfaces of enclosure or cabinet.

G. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

H. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

I. Controls:
1. Provide units with control valves furnished by the automatic temperature controls manufacturer.
2. Controls Interface:
    a. Relay board.
    b. 24-volt transformer.

J. Filter: Easily removed 1 inch thick glass fiber throw-away type, located to filter air before coil.

2.02 ELECTRIC UNIT HEATERS

A. Manufacturers:
1. INDEECO (Industrial Engineering and Equipment Company)
2. Qmark
3. Marley

B. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to authority having jurisdiction as suitable for purpose indicated.

C. Heating Element Assembly:
1. Thermal safety cut-out within electric terminal box with automatically reset switch located near electric terminal box.
2. Horizontal Projection Units:
    a. Nickel chromium resistance wire surrounded with magnesium oxide and sheathed in steel, spiral-finned tubes.

D. Housing:
1. Suitable for ceiling or high altitude mount using provided hardware appendages.
2. Horizontal Projection Units:
    a. Construction materials to consist of heavy gauge steel with galvanized, polyester powder coat, or high gloss baked enamel finish.
    b. Provide with threaded holes for threaded rod suspension.
    c. Provisions for access to internal components for maintenance, adjustments, and repair.

E. Air Inlets and Outlets:
1. Inlets: Provide stamped louvers or protective grilles with fan blade guard.
2. Outlets: Provide diffuser cones, directional louvers, or radial diffusers.

F. Fan: Factory balanced, direct drive, axial type with fan guard.

G. Motor: Totally enclosed, thermally protected, and provided with permanently lubricated bearings.

H. Controls:
1. Built-in line-voltage thermostat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are suitable for installation.

B. Verify that field measurements are as indicated on drawings.

3.02 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Do not damage equipment or finishes.

C. Unit Heaters:
   1. Hang from building structure, with pipe hangers anchored to building, not from piping or electrical conduit.
   2. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

D. Fan-Coil Units:
   1. Install as indicated.

E. Units with Hydronic Coils:
   1. Provide with shut-off valve on supply piping and tamper-proof, balancing valve with memory stop on return piping.
   2. If not easily accessible, extend air vent to exterior surface of cabinet for ease of servicing.
   3. Provide float operated automatic air vents with stop valve for fan coil units and unit heaters.

F. Units with Cooling Coils: Connect drain pan to condensate drain.

END OF SECTION

SECTION 26 3213
ENGINE GENERATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged engine generator system and associated components and accessories:
   1. Engine and engine accessory equipment.
   2. Alternator (generator).
   3. Generator set control system.
   4. Generator set enclosure.

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY B. KYLE HASKOVEC, PE #143448 ON 08/06/2026

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.

E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 3600 - Transfer Switches.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA/EGSA 404 - Standard for Installing Generator Sets; 2014.

C. NEMA MG 00001 - Motors and Generators; 2024.

D. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines; 2024, with Amendment.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 99 - Health Care Facilities Code; 2024, with Errata.

G. NFPA 110 - Standard for Emergency and Standby Power Systems; 2025.

H. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries; Current Edition, Including All Revisions.

I. UL 2200 - Stationary Engine Generator Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.
      a. Transfer Switches: See Section 26 3600.
   2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.
   3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.
   1. Include generator set sound level test data.
   2. Include characteristic trip curves for overcurrent protective devices upon request.
   3. Include alternator thermal damage curve upon request.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

D. Derating Calculations: Indicate ratings adjusted for applicable service conditions.

E. Fuel Storage Tank Calculations: Indicate maximum running time for generator set configuration provided.

F. Specimen Warranty: Submit sample of manufacturer's warranty.

G. Evidence of qualifications for installer.

H. Evidence of qualifications for maintenance contractor (if different entity from installer).

I. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

J. Manufacturer's factory emissions certification.

K. Manufacturer's certification that products meet or exceed specified requirements.

L. Source quality control test reports.

M. Provide NFPA 110 required documentation from manufacturer where requested by authorities having jurisdiction, including but not limited to:
   1. Certified prototype tests.
   2. Torsional vibration compatibility certification.
   3. NFPA 110 compliance certification.
   4. Certified rated load test at rated power factor.

N. Manufacturer’s detailed field testing procedures.

O. Field quality control test reports.

P. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
   1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

Q. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

R. Maintenance contracts.

S. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

T. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Filter Elements: One of each type, including fuel, oil and air.

1.06 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70 (National Electrical Code).
   2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for Level 1 system.
   3. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
   1. Authorized service facilities located within 200 miles of project site.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with engine generator systems of similar size, type, and complexity; manufacturer's authorized installer.

E. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.
   1. Contract maintenance office located within 200 miles of project site.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Packaged Engine Generator Set - Basis of Design: Cummins.

B. Packaged Engine Generator Set - Other Acceptable Manufacturers:
   1. Caterpillar Inc: www.cat.com/#sle.
   2. Cummins Power Generation Inc: www.cumminspower.com/#sle.
   3. Kohler Co: www.kohlerpower.com/#sle.

C. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

D. Source Limitations: Furnish engine generator sets and associated components and accessories produced by a single manufacturer and obtained from a single supplier.

2.02 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. System Description:
   1. Application: Emergency/standby.
   2. Configuration: Single packaged engine generator set operated independently (not in parallel).

D. Packaged Engine Generator Set:
   1. Type: Gaseous (spark ignition).
   2. Power Rating: As indicated on drawings, standby.
   3. Voltage: As indicated on drawings.
   4. Main Line Circuit Breaker:
      a. Type: Thermal magnetic.
      b. Trip Rating: Select according to generator set rating.

E. Generator Set General Requirements:
   1. Prototype tested in accordance with NFPA 110 for Level 1 systems.
   2. Factory-assembled, with components mounted on suitable base.
   3. List and label engine generator assembly as complying with UL 2200.
   4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
   5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
   6. Main Line Circuit Breakers: Provide factory-installed line side connections with suitable lugs for load side connections.

F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.

G. Starting and Load Acceptance Requirements:
   1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.
   2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
   3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
   4. Maximum Load Step: Supports 100 percent of rated load in one step.

H. Exhaust Emissions Requirements:
   1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.

2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

2.03 ENGINE AND ENGINE ACCESSORY EQUIPMENT

A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.

B. Engine Fuel System - Gaseous (Spark Ignition):
   1. Fuel Source: Natural gas.
   2. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
   3. Provide components/features indicated and as necessary for operation and/or required by applicable codes, including but not limited to:
      a. Carburetor.
      b. Gas pressure regulators.
      c. Fuel shutoff control valves.
      d. Low gas pressure switches.

C. Engine Starting System:
   1. System Type: Electric, with DC solenoid-activated starting motor(s).
   2. Battery(s):
      a. Battery Type: Lead-acid.
      b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
      c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.
   3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.
   4. Battery Charger:
      a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.
      b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.
      c. Recognized as complying with UL 1236.
      d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.
      e. Provide integral DC output ammeter and voltmeter with five percent accuracy.
      f. Provide alarm output contacts as necessary for alarm indications.

D. Engine Speed Control System (Governor):
   1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.
   2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.

E. Engine Lubrication System:
   1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.

F. Engine Cooling System:
   1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
   2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.
   3. Coolant Heater: Provide thermostatically controlled coolant heater to improve starting under cold ambient conditions; size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature.

G. Engine Air Intake and Exhaust System:
   1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.
   2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.
   3. Exhaust Silencer: Provide critical grade or better exhaust silencer with sound attenuation not less than basis of design; select according to manufacturer's recommendations to meet sound performance requirements, where specified.

2.04 ALTERNATOR (GENERATOR)

A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 00001; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.

B. Exciter:
   1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
   2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.
   3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.

C. Temperature Rise: Comply with UL 2200.

D. Insulation System: NEMA MG 00001, Class H; suitable for alternator temperature rise.

E. Enclosure: NEMA MG 00001, drip-proof.

F. Total Harmonic Distortion: Not greater than five percent.

G. Alternator Heater: Provide strip heater to prevent moisture condensation on alternator windings.

2.05 GENERATOR SET CONTROL SYSTEM

A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.

B. Control Panel:
   1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.
   2. Generator Set Control Functions:
      a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).
      b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
      c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.
      d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.
      e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.

f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.

3. Generator Set Status Indications:
   a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
   b. Current (Amps): For each phase.
   c. Frequency (Hz).
   d. Real power (W/kW).
   e. Reactive power (VAR/kVAR).
   f. Apparent power (VA/kVA).
   g. Power factor.
   h. Duty Level: Actual load as percentage of rated power.
   i. Engine speed (RPM).
   j. Battery voltage (Volts DC).
   k. Engine oil pressure.
   l. Engine coolant temperature.
   m. Engine run time.
   n. Generator powering load (position signal from transfer switch).
4. Generator Set Protection and Warning/Shutdown Indications:
   a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:
      1) Overcrank (shutdown).
      2) Low coolant temperature (warning).
      3) High coolant temperature (warning).
      4) High coolant temperature (shutdown).
      5) Low oil pressure (shutdown).
      6) Overspeed (shutdown).
      7) Low fuel level (warning).
      8) Low coolant level (warning/shutdown).
      9) Generator control not in automatic mode (warning).
      10) High battery voltage (warning).
      11) Low cranking voltage (warning).
      12) Low battery voltage (warning).
      13) Battery charger failure (warning).
   b. In addition to NFPA 110 requirements, provide the following protections/indications:
      1) High AC voltage (shutdown).
      2) Low AC voltage (shutdown).
      3) High frequency (shutdown).
      4) Low frequency (shutdown).
      5) Overcurrent (shutdown).
   c. Provide contacts for local and remote common alarm.
   d. Provide lamp test function that illuminates all indicator lamps.
5. Other Control Panel Features:
   a. Event log.
   b. Communications Capability: Compatible with system indicated. Provide all accessories necessary for proper interface.
   c. Remote monitoring capability via PC.

C. Remote Annunciator:

1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.
2. Generator Set Status Indications:
   a. Generator powering load (via position signal from transfer switch).
   b. Communication functional.
3. Generator Set Warning/Shutdown Indications:
   a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following indications:
      1) Overcrank (shutdown).
      2) Low coolant temperature (warning).
      3) High coolant temperature (warning).
      4) High coolant temperature (shutdown).
      5) Low oil pressure (shutdown).
      6) Overspeed (shutdown).
      7) Low fuel level (warning).
      8) Low coolant level (warning/shutdown).
      9) Generator control not in automatic mode (warning).
      10) High battery voltage (warning).
      11) Low cranking voltage (warning).
      12) Low battery voltage (warning).
      13) Battery charger failure (warning).
   b. Provide audible alarm with silence function.
   c. Provide lamp test function that illuminates all indicator lamps.

D. Remote Emergency Stop: Provide approved red, mushroom style remote emergency stop button where indicated or required by authorities having jurisdiction.

2.06 GENERATOR SET ENCLOSURE

A. Enclosure Type: Sound attenuating, weather protective.

B. Enclosure Material: Steel or aluminum.

C. Hardware Material: Stainless steel.

D. Color: Manufacturer's standard.

E. Access Doors: Lockable, with all locks keyed alike.

F. Openings: Designed to prevent bird/rodent entry.

G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.

H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.

I. Utilize an upward discharging radiator hood.

J. Exhaust Silencers: Where exhaust silencers are mounted within enclosure in main engine compartment, insulate silencer to minimize heat dissipation as necessary for operation at rated load under worst case ambient temperature.

2.07 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Perform production tests on generator sets at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

C. Generator Set production testing to include, at a minimum:

1. Operation at rated load and rated power factor.
2. Single step load pick-up.
3. Transient and steady state voltage and frequency performance.
4. Operation of safety shutdowns.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive equipment.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.

D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Unless otherwise indicated, mount generator set on properly sized, minimum 6 inch high concrete pad constructed in accordance with Section 03 3000.

F. Provide required support and attachment in accordance with Section 26 0529.

G. Provide required vibration isolation and/or seismic controls in accordance with Section 26 0548.

H. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.

I. Provide grounding and bonding in accordance with Section 26 0526.

J. Identify system wiring and components in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to prepare and start systems and perform inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

C. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.

D. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

E. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.

F. Preliminary inspection and testing to include, at a minimum:
   1. Inspect each system component for damage and defects.
   2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
   3. Check for proper oil and coolant levels.

G. Prepare and start system in accordance with manufacturer's instructions.

H. Perform acceptance test in accordance with NFPA 110.

I. Inspection and testing to include, at a minimum:
   1. Verify compliance with starting and load acceptance requirements.
   2. Verify voltage and frequency; make required adjustments as necessary.
   3. Verify phase sequence.
   4. Verify control system operation, including safety shutdowns.
   5. Verify operation of auxiliary equipment and accessories (e.g. battery charger, heaters, etc.).
   6. Perform load tests in accordance with NFPA 110 (1.5 hour building load test followed by 2 hour full load test).

J. Provide field emissions testing where necessary for certification.

K. Sound Level Tests: Measure sound levels for compliance with specified requirements. Identify and report ambient noise conditions.

L. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

M. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 7900 - Demonstration and Training, for additional requirements.

B. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

C. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of four hours of training.
   3. Instructor: Manufacturer's authorized representative.
   4. Location: At project site.

D. After successful acceptance test and just prior to Substantial Completion, replace air, oil, and fuel filters and fill fuel storage tank.

3.06 PROTECTION

A. Protect installed engine generator system from subsequent construction operations.

3.07 MAINTENANCE

A. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of engine generator system for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

B. Conduct site visit at least once every three months to perform inspection, testing, and preventive maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.

C. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 4 hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.

3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

D. Maintain an on-site log listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced.

END OF SECTION

SECTION 31 23 00
EXCAVATION, FILLING AND BACKFILLING FOR SITE UTILITIES

PART 1 GENERAL

1.01 SUMMARY

A. Provide all equipment, materials and labor for excavation, trenching and backfilling for storm sewers, water distribution mains, sanitary sewers and other utility systems and appurtenances.

1.02 RELATED WORK

A. Earthwork. Division 31.

B. Manholes. Section 33 05 13.

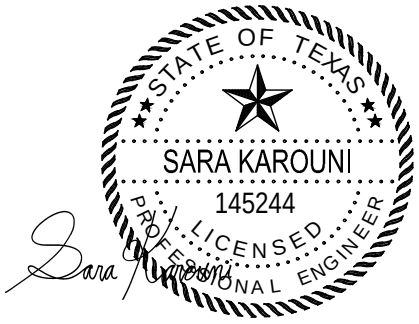
C. Water Distribution Mains. Section 33 11 00.

D. Sanitary Sewers. Section 33 31 00.

E. Storm Sewers. Section 33 40 00.

1.03 REFERENCE SPECIFICATION

A. Except as otherwise specified herein or indicated on drawings, workmanship, methods of installation, construction procedures and materials furnished shall be in strict accordance with latest edition of “Specifications for Sewer Construction,” the Department of Public Works, City of Houston, Texas, and all applicable amendments. In using aforementioned specifications, it shall be understood that wherever the terms “City of Houston” and “Director of Public Works” are used, the interpretation shall be “Owner” and “Engineer,” respectively.



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PART 2 PRODUCTS

2.01 EARTH BACKFILL

A. Earth backfill shall be free of lumps, stones, trash and spongy or otherwise objectionable material and approved by the Architect/Engineer. Approved backfill material may be from the excavation or borrowed.

2.02 CEMENT-SAND BACKFILL

A. Prepare cement-sand backfill as specified in the section on Cement-Sand Backfill, Section 31 23 23.15.

2.03 BANK SAND

A. Use sand that is free from clay lumps, organic and other deleterious material, and having a plasticity index of 12 or less.

B. Site material may be used in place of bank sand if after first being tested and meeting requirements set for bank sand.

2.04 GRAVEL

A. Provide gravel with no particles larger than 1 inch, free of clay lumps and organic or other deleterious material.

PART 3 EXECUTION

3.01 EXCAVATION

A. Procedure. Excavate to indicated or specified line and grade.
   1. Excavate by open cut with trenching machine or backhoe. Do not use excavated material composed of large chunks or clods for backfill, but dispose of such material and provide other suitable material for backfill without additional expense.
   2. During excavation, pile material suitable for backfilling in an orderly manner far enough from the bank of the trench to avoid overloading, slides or cave-ins.
   3. Remove from site or waste as indicated all excavated materials not required or suitable for backfill. Loading and transportation of waste material shall be included in bid price and no additional payment will be made.
   4. Grade as necessary to prevent surface water from flowing into trenches or other excavations.

B. Trench Excavation.
   1. Cut banks of pipe trench as nearly vertical as practical in the pipe zone without violating the provisions of Section 31 23 43, Trench Safety Systems. Remove stones as necessary to avoid point-bearing. Overexcavate wet or unstable soil from the trench bottom to permit construction of a more stable bed for pipe.
   2. Dig the trench the proper width as shown. If the trench width below the top of pipe is wider than specified in this section or shown on the plans, then the Contractor shall install higher class of pipe and/or improved bedding as determined by the Architect/Engineer. No additional payment will be made.
   3. Accurately grade the trench bottom to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along its entire length, except where necessary to excavate for bell holes and for proper sealing of pipe joints. Dig bell holes and depressions for joints after the trench bottom has been graded. Make bell holes and depressions for joints no deeper, longer or wider than needed to make the joint properly.
   4. If any excavation is carried beyond the lines and grades required or authorized, the Contractor shall, at his own expense, fill such space with concrete or other suitable material as directed by the Architect/Engineer. No additional payment will be made.
   5. The excavation of trench shall not advance more than 100 feet ahead of the completed pipe work except where specifically authorized by the Architect/Engineer.

C. Sheeting and Bracing.
   1. Install, in sewer trenches and other excavations with vertical sides, sheeting and bracing necessary to support the sides. Sheeting and bracing shall be so installed as to place no undue or damaging strain on uncompleted work. Any damage resulting from settlement or lack of bracing shall be repaired by the Contractor at his own expense.
   2. The sides of all trenches shall be securely held by bracing and sheeting which may be removed in units when the level of backfilling has reached the elevation necessary to properly protect the work and adjacent property.
   3. When sheeting or shoring cannot be safely removed, it shall be left in place. Timber left in place shall be cut off at least 2 feet below the surface.
   4. Payment for sheeting and bracing trenches shall be included in the trenching, laying and backfilling item. No additional payment shall be made.
   5. The Contractor shall comply with the provisions of Section 31 23 43, Trench Safety Systems.

D. Pipe Zone. The pipe zone is defined as including the pipe bedding, backfill to one-half the pipe diameter (to the springline) and the initial backfill to 12 inches above the top of the pipe.

E. Pipe Bedding.

1. Class AA Bedding. Accurately grade the bottom of the trench 3 inches below the bottom of the pipe and to limit clear space on either side of the pipe to 9 inches at and below the top of the pipe. Place a minimum of 5 inches of cement-sand backfill up to the flow line of the pipe or above before pipe is laid. Install the pipe and place additional cement-sand backfill. Compact the cement-sand to a minimum density of 95 percent, according to AASHTO Standard Method T-99, around the pipe and to a height of 6 inches above the top of the pipe.
2. Class A Bedding. Accurately grade the bottom of the trench 3 inches below the bottom of the pipe and limit clear space on either side of the pipe to 9 inches at and below the top of the pipe. Place a minimum of 5 inches of cement-sand backfill up to the flow line of the pipe or above before pipe is laid. Install pipe and place additional cement-sand backfill. Compact the cement-sand to a minimum density of 95 percent, according to AASHTO Standard Method T-99, around the pipe and to the springline of the pipe.
3. Class B Bedding. Accurately grade and round the bottom of the trench to support the bottom quadrant of the pipe uniformly on undisturbed soil at every point along its entire length. Dig bell holes and depressions for joints after the trench bottom has been graded so the pipe will rest on the prepared bottom for nearly its full length as practical. Cut bell holes and depressions only as long, deep and wide as required for properly making the particular type of joint.
4. Class C Bedding. Accurately grade the bottom of the trench 6 inches below the elevation of the normal pipe installation and limit clear space on either side of the pipe to 6 inches at and below the top of the pipe. Place and compact 6 inches of bank sand in the trench before the pipe is laid. Install the pipe and place additional bank sand. Compact around the pipe to a height 6 inches above the top of pipe. Compact to a minimum density of 95 percent using AASHTO Standard Method T-99.

F. Water in Excavation. The Contractor shall, at all times, take such precautions as are necessary to keep the work free from ground or surface water. Pumps of adequate capacity or other approved method shall be provided to remove water from the excavation in such a manner that it will not interfere with the progress of the work or the proper placing of other work. Water shall be discharged to a stream or storm sewer as designated by the Architect/Engineer. Ground or surface water will not be allowed to drain into or be pumped into an existing sanitary sewer system. If the work includes connection to an existing sanitary sewer, a temporary watertight plug must be installed and maintained within the pipe for the duration of the contract and bedding material interrupted in a manner approved by the Architect/Engineer to isolate new construction from the existing system. All costs of handling the water shall be included in the bid item and no additional payment shall be made.

3.02 UTILITY INSTALLATION

A. Storm and Sanitary Sewers. Limit clear space on either side of the pipe to 9 inches at and below the top of the pipe. Above the pipe, cut as wide as necessary to sheet and brace and properly perform the work. Provide class of bedding as shown on drawing or specified in another section.

B. Water Supply and Distribution Lines. Grade trenches to avoid high points requiring vacuum and relief valves in water lines. Provide a minimum cover over the top of the pipe of 4 feet (5 feet for lines larger than 12 inches) from the existing ground surface or the indicated finished grade, whichever is lower. Avoid interference of water lines with other utilities. Provide Class C bedding.

C. Excavation of Appurtenances. Excavate sufficiently for manholes and similar structures to leave at least 2 feet clear between the outer surfaces and the embankment or timber that may be used to hold and protect the banks. Any over-depth excavation below such appurtenances not directed will be considered unauthorized and will be refilled with sand, gravel, cement-sand or concrete, as directed, at no additional cost.

3.03 PROTECTION OR REMOVAL OF UTILITY LINES

A. The Contractor shall anticipate all underground obstructions such as, but not limited to, water mains, gas lines, storm and sanitary sewers, telephone or electric light or power ducts, concrete, and debris. Any such lines or obstructions indicated on the drawings show only the approximate locations and must be verified in the field by the Contractor. The Owner and Architect/Engineer will endeavor to familiarize the Contractor with all known utilities and obstructions, but this will not relieve the Contractor from full responsibility in anticipating all underground obstructions whether or not shown on the drawings.

B. Maintain in proper working order and without interruption of service all existing utilities and services which may be encountered in the work, except that with the consent of the Architect/Engineer such service connections may be temporarily interrupted to permit the Contractor to remove designated lines or to make temporary changes in the location thereof as will aid in the completion of the work and at the same time maintain service to the property so originally benefitted. The cost of making any temporary changes shall be at the Contractor's expense as no additional payment will be made.

C. Before starting construction, the Contractor shall obtain all necessary permits and notify all utility companies involved to have their utilities located and marked in the field. All underground utilities shall then be uncovered to verify location and elevation before construction begins.

3.04 BACKFILLING

A. Criteria. Do not backfill trenches to a point greater than 2 feet above top of pipe until all required pressure tests are performed and utility systems as installed conform to specified requirements of appropriate sections. Backfill trenches to ground surface with selected material as specified for embankments under Earthwork sections. Reopen trenches improperly backfilled to depth required for proper compaction. Refill and recompact as specified, or otherwise correct the condition in an approved manner.

B. Open Areas.
   1. In the pipe zone, place backfill evenly and carefully around and over pipe in layers no thicker than 6 inches. Compact with mechanical hand tampers to 95 percent AASHTO Density, Test Method T-99, until there is a cover of not less than 1 foot over utility lines. Use selected backfill material of optimum moisture content. Take special care not to damage pipe wrapping or coating.
   2. Above the pipe zone, deposit backfill in 12-inch layers. Compact each layer to 90 percent AASHTO Density, Test Method T-99.
   3. All forms, lumber, trash and debris shall be removed from manholes and other structures. Backfill shall be placed symmetrically on all sides in layers no thicker than 8 inches. Each layer shall be compacted to 90 percent AASHTO Density, Test Method T-99.

C. Pavement Sections.
   1. In the pipe zone, deposit backfill material in layers 6 inches or thinner. Compact each layer to 95 percent of AASHTO Density, Test Method T-99.
   2. Above the pipe zone, backfill soil material to be deposited in 12-inch layers, each layer compacted to 95 percent AASHTO Density, Test Method T-99. Place compacted soil material to within 0.5 feet of finished pavement surface.
   3. Use cement-sand backfill above the pipe zone only when directed or as shown on plans. Deposit cement-sand in 12-inch layer and compact to 95 percent AASHTO Density, Test Method T-99. Cure cement-sand layer at least 3 days before placing pavement on top of it.

3.05 TEST FOR DISPLACEMENT OF SEWERS

A. After the trench has been backfilled to 2 feet above the pipe and tamped as specified, check the alignment as follows. Flash a light through the sewer between manholes. Use a flashlight

or reflect sunlight with a mirror. If the illuminated interior of the pipeline shows poor alignment, pipe displacement or other defects, correct to the satisfaction of the Architect/Engineer.

B. All plastic pipe shall be tested for deflection by hand-pulling a mandrel with an outside diameter equal to 95 percent of the original inside diameter of the pipe through the pipe after backfilling is complete. Mandrel is to be pulled by hand line. Should the mandrel meet any resistance, the Contractor may clean the line, or correct the resistance, and repeat the test. Any pipe not meeting this test shall be removed and replaced at the Contractor's expense.

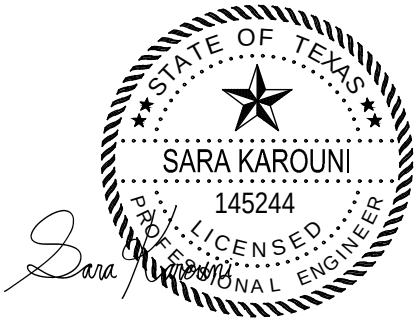
END OF SECTION

SECTION 31 23 13
SUBGRADE PREPARATION

PART 1 GENERAL

1.01 SUMMARY

A. Provide earthwork for the excavation of materials on site; excavation of borrow material from designated areas; compaction of natural subgrades; placement and compaction of embankments to grade; finish grading; stripping and stockpile and placement of topsoil; disposal of excess or unsuitable materials; and other required operations. Where this section and the project Geotechnical report differ, the Geotechnical Report's recommendations shall be used.



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1.02 RELATED WORK

A. Testing Laboratory Services. Section 01 45 29.

B. Waste Material Disposal. Section 01 74 19.

C. Clearing and Grubbing. Section 31 11 00.

D. Earthwork for Site Utilities. Section 31 23 00.

E. Trench Safety Systems. Section 31 23 43.

1.03 CLASSIFICATIONS

A. The following are brief definitions of classifications of earthwork.

B. Topsoil. Top 6 inches of natural surface soil possessing the characteristics of representative on-site soils which produce and sustain grass and other vegetative growth.

C. Stripping of Ground Surface. Stripping consists of removing all vegetation, decayed vegetable matter, rubbish and other unsuitable materials located within the areas designated for grading operations. Unless otherwise designated to remain, all areas shall be stripped to ground level prior to beginning earthwork.

D. Excavation. Consists of the required below-grade removal and proper utilization or disposal of every description and of whatever substances encountered within the grading limits of the project. Excavation shall be performed to the lines and grades indicated on the drawings.

E. Borrow. Material taken from designated areas to make up any deficit of excavated material.

F. Waste. Excavated material which is unsuitable for reuse on site or which is in excess of the materials needed for embankment operations.

G. Subgrade. Consists of that portion of the surface on which a compacted embankment or pavement is constructed.

H. Compaction. Compaction of soil materials consists of rolling, sprinkling, tamping and otherwise working the soil to achieve a percent of Standard Proctor density as determined by the AASHTO Standard T-99 procedure.

I. Embankment. Earth fill placed and compacted in successive layers to the line and grade defined by the construction plans.

J. Finish Grading. Operations required for smoothing disturbed areas that are not overlaid with pavement or other structures. Finish grading consists of the final operations for bringing site grade to lines and grades shown on drawings.

PART 2 PRODUCTS

2.01 MATERIALS

A. Embankment Fill.
   1. Obtain suitable fill material from site excavation operations or from borrow areas approved by the Architect/Engineer.
   2. Suitable fill material shall meet these specifications and be sand, gravel, earth or a combination of these materials, free from excessive silts. Fill shall be well broken up and be free of clods of hard earth, rocks and stones greater than 2-inch dimension and shall be free of trash. vegetation, organic matter and corrosive or perishable material.
   3. Embankment fill must have a liquid limit of 45 maximum, ASTM D 4318.
   4. Embankment fill must have a plasticity index between 7 and 40, inclusive, ASTM D 4318. Not more than 40 percent of the material shall pass a No. 200 sieve, ASTM D 1140.

B. Topsoil.
   1. Obtain topsoil from site or provide natural fertile, friable loam suitable for growths of grass and plants.
   2. Topsoil shall contain decomposed vegetable matter, finely divided and minimum 4 percent by weight.
   3. Topsoil shall be free from subsoil, clay, brush, weeds, rocks and dirt clods larger than 1 inch in diameter, stalks, roots and materials which would be toxic or harmful to growth.

2.02 EQUIPMENT

A. Contractor shall furnish, operate and maintain appropriate equipment necessary to achieve uniform layers, sections and smoothness in grade and to meet specified compaction densities. Obtain approval for equipment and materials before commencing embankment work.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Contractor shall inform and satisfy himself as to the character, quantity and distribution of material to be excavated. A project soils report is available from the Owner. Soil borings have been provided with the project soils report.

3.02 TOPSOIL REMOVAL

A. Prior to excavation or embankment activities, topsoil located within clearing limits shall be stripped to depths encountered but no less than 3 inches in depth.

B. Stripped topsoil shall be transported to and deposited in stockpile locations indicated on the plans.

C. Topsoil shall be kept separate from other excavated materials, brush, litter, weeds, stones larger than 2 inches in diameter and other materials that would interfere with planting and maintenance operations.

D. Protect stockpiled topsoil from dumping of unwanted material and dumping by the public.

E. The topsoil source and stockpile areas shall be graded to drain as far as practical during the periods of removal and storage.

3.03 EXCAVATION

A. Construction Methods.
   1. Perform excavation of all types of materials encountered within limits of project to the lines, grades and elevations indicated in the plans.
   2. All excavated materials shall be unclassified and no extra compensation shall be made based on types of materials encountered.
   3. Materials meeting specifications for embankment fill shall be used in the formation of embankments or otherwise utilized or disposed of. Unsatisfactory and/or excess materials shall be considered waste materials and shall be disposed of per Section 01 74 19, Waste Material Disposal.
   4. If it is not possible to place material in the proper section of permanent construction at the time of excavation, stockpile the material in approved areas for later use. Stockpiled materials should be protected from dumping of unwanted materials and dumping by the public.

B. Blasting. Use of explosives for excavation operations should not be necessary and will not be permitted.

C. Drainage. During excavation, maintain grades for complete drainage. As necessary, install temporary drains or drainage swales to intercept or divert overland flow from excavated areas. Ponding in the excavation and seepage from groundwater shall be removed.

D. Existing Utilities. Contractor shall field verify locations of existing utilities prior to extensive excavation operations. While it is the intent of the construction plans to show the known locations and sizes of existing utilities, the Architect/Engineer retains no responsibility for lines not shown on construction plans or known to the Contractor prior to excavation. Contractor shall protect existing utilities from damage during excavation. Any damage to existing utilities shall be reported immediately and shall be satisfactorily repaired.

E. Pipelines. Contractor shall suspend machine excavation within 5 feet of any pipeline right-of-way until a company representative is present to identify pipe location and to direct further excavation operations. Notification of pipeline company of Contractor's operations and request for attendance of a representative will be Contractor's responsibility. Contractor shall resume suspended operations only under supervision of pipeline company representative and employ only such excavation methods, means, equipment and safety measures as approved by representative. Contractor shall do no work on pipeline as part of this contract, such as

lowering, cribbing up, construction of bents, repairs to coating, cutting, welding, making repairs or other essential work, all of which will be done by pipeline company and at their own expense. Contractor shall be solely responsible to pipeline company for any damages to their line and any related construction as a result of Contractor's operations, irrespective of any order, directive or approval by company representative, or of his presence on the work. The Contractor will not be reimbursed directly for any extra work or expenditure as a result of intersecting any pipeline installation.

3.04 EXTRA EXCAVATION

A. Upon completion of excavation to the lines and grades given on the construction plans, areas identified as having weak or poor soil characteristics shall require extra excavation. Contractor shall remove soft or undesirable materials to a depth of 18 inches and backfill areas with stable fill material. Fill material shall comply with requirements for embankment fill and shall be compacted to specified density per Compaction paragraphs within this section.

B. The removal and replacement of unsatisfactory material shall be measured and paid for in compliance with the provisions of the General Conditions.

3.05 SUBGRADE UNDER PAVEMENTS

A. After excavation is made to subgrade lines under proposed pavements, proof roll and remove soft or undesirable material to a depth of 18 inches. Replace undesirable material with select embankment fill with materials and methods as specified under this section. Stabilize and compact the subgrade in accordance with the Section on Stabilization of Pavement Subgrade.

3.06 TREATMENT OF NATURAL SUBGRADE UNDER EMBANKMENTS

A. After clearing and grubbing and excavation to lines under proposed embankments, proof roll and remove soft or undesirable material to a depth of 18 inches. Break down sides of holes or depressions to flatten the slopes.

B. Fill each depression with the soil appropriate for the materials to be placed on the subgrade. Place the fill in layers moistened and compacted as specified in this section.

C. After depressions have been filled and immediately before placement of compacted fill in a section of the embankment, thoroughly scarify the foundation material to a depth of 6 inches. Remove roots and debris turned up while loosening the soil.

D. Compact the surface of the embankment subgrade as specified in this section.

E. Take care to prepare the embankment so that planes of seepage or weak ness are not induced. Should the Architect/Engineer suspect such a deficiency, the material must be thoroughly broken and recompacted before proceeding with construction.

3.07 EMBANKMENT

A. Inspection of Subgrade. Do not place fill on any part of the embankment subgrade until the subgrade preparation has been inspected by the Owner's representative.

B. Spreading Fill. After dumping material, break up and spread fill material. During dumping and spreading process, remove all roots, stones and debris that are uncovered in the embankment material. Construct embankments in successive horizontal layers, extending across the entire fill area. Each layer of fill shall be no greater than 8 inches in depth and shall be uniform as to material and moisture content before compaction. Individual lifts shall be scarified after compaction to prevent development of laminations between lifts. As soon as possible after placement begins, crown the surface to drain freely and maintain such conditions throughout construction.

C. Benching. When fill is to be made and compacted against hillsides and/or existing fill, the slopes of original hillside and/or fill shall be horizontally benched to key the fill material to the underlying ground. A minimum of 6 inches normal to the original slope shall be scarified and

recompacted, as the fill is brought up in layers, to ensure that the new work is constructed on firm subgrade. This subsection applies to existing slopes having a steeper than 4:1 gradient.

D. Compaction. Compact each lift to required density by blading and rolling with suitable equipment. Use mechanical tamps to obtain required density in inaccessible areas. Compact to 95 percent of maximum laboratory dry density as determined by the Standard Proctor compaction test AASHTO Test Method T99-86 (ASTM D 698-78).

E. Moisture Control. Compaction shall be completed to the required maximum density obtainable with the natural moisture of the embankment material wherever possible. However, the moisture content shall not vary from the optimum, as determined by AASHTO Test Method T99-86 (ASTM D 698-78) by more than 3 percent or less than 1 percent. Adjust wetter than optimal materials by spreading and drying. This process may be assisted by discing or harrowing if necessary. Adjust dryer than optimal materials by sprinkling layer with water and working moisture into soil by harrowing or other approved method.

3.08 DISTRIBUTION OF TOPSOIL

A. Preparation.
   1. Prior to placing topsoil, scarify the subgrade to a depth of 2 inches to provide effective bonding of the topsoil with the subgrade. Use a chisel plow with the chisels sets 10 inches apart.
   2. Shape all areas designated for grading, including cut and fill areas, to receive a minimum of 4 inches of topsoil.
   3. In areas that require only blading and dressing, the adequacy of existing topsoil will be determined by the Owner's representative.

B. Placement.
   1. Do not haul or place wet topsoil. Do not place topsoil on subgrade that is excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading or proposed planting.
   2. Distribute topsoil uniformly and spread evenly to an average thickness of 4 inches. Do not compact topsoil. Correct irregularities in the surface to prevent formation of depressions where water could stand.
   3. Perform the spreading operation so that planting can proceed with little additional tillage or soil preparation. Leave the area smooth, suitable for lawn planting.

C. Maintenance. Where any portion of the surface becomes eroded or otherwise damaged, repair the affected area to establish the condition and grade prior to topsoil placement; then replace topsoil.

3.09 FINAL GRADING

A. After other work has been completed except for exactness of finish as required, roadway shoulders, slopes and ditches shall be smoothly shaped.

B. Ditches and channels within right-of-way shall be cleared of debris and obstructions.

C. Excess earth or other waste material adjacent to structures, poles, trees or other objects shall be leveled down or otherwise disposed of as required.

D. Loose stones, rocks and boulders within (right-of-way) (project site) that would fail to pass a 2-inch ring shall be removed and disposed of as required.

E. Roots, trash and other debris shall be removed from Owner’s controlled land and entire (right-of-way) (project site) placed in a neat and presentable condition.

F. Dragging, pushing or scraping of material along or across the surface of completed pavement will not be permitted.

G. Continuously maintain sections until acceptance of work.

H. Finish surface not more than 0.10 feet above or below established grade or cross section.

I. Finish ditches and gutters to drain readily.

J. Where existing grade is disturbed in areas not marked to be graded, regrade disturbed area to original grade.

3.10 MATERIAL DISPOSAL

A. Legally dispose of waste material as specified in Section 01 74 19, Waste Material Disposal, without causing expense or damage to the Owner. The Owner's waste disposal site may be used for prescribed waste material as indicated on the plans.

3.11 TESTING

A. Laboratory Services. Owner shall appoint a commercial testing laboratory to assess adequacy of materials and compaction as outlined in Section 01 45 29, Testing Laboratory Services. Contractor shall pay for all laboratory testing services associated with earthwork operations.

B. Testing Requirements.
   1. Prepare optimum moisture/density relationship for subgrade in accordance with AASHTO T99-86 (ASTM D 698-78).
   2. Test compacted general fill embankment and backfill as follows:
      a. One field density test minimum for every 1000 cubic yards of material placed in compliance with ASTM D 1556 or D 2922.
      b. Four random field density tests minimum of backfill at each culvert, abutment and similar locations in compliance with ASTM D 1556 or D 2927.

END OF SECTION

SECTION 32 3113
CHAIN LINK FENCES AND GATES

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work included: Provide chain link fence system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 01 of these Specifications.

1.02 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 SUBMITTALS

A. Comply with pertinent provisions of Section 01 3000 – Administrative Requirements.

B. Product data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
   3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades;
   4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
   5. Samples: Accompanying the submittal described above, submit Samples of each sealant, each backing material, each primer, and each bond breaker proposed to be used.

1.04 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01 6000 – Product Requirements.

PART 2 – PRODUCTS

2.01 DIMENSIONAL DATA

A. General:
   1. Pipe sizes indicated are commercial pipe sizes.
   2. Tube sizes indicated are nominal outside dimensions.
   3. H-section sizes indicated are normal flange dimensions.
   4. Roll-formed section sizes indicated are the nominal outside dimensions.

2.02 GALVANIZING

A. On steel framework and appurtenances, provide galvanized finish with not less than the following weight of zinc per sq. ft.
   1. Pipe: 1.8 oz, complying with ASTM A120.
   2. H-sections and square tubing: 2.0 oz, complying with ASTM A123.
   3. Hardware and accessories: Comply with Table 1 of ASTM A153.
   4. Fabric: 2.0 oz, complying with class II of ASTM A121.

2.03 FABRIC - VINYL-COATED

A. Nine-gauge (9 Ga. Core wire) black resin clad fabric shall have a polyvinyl chloride coating, minimum wall thickness of .015 inches over a galvanized substrate. The base metal shall have a minimum breaking strength of five hundred fifty pounds (550 lbs.) and a zinc coat weight of .1503 pounds per square foot of uncoated wire surface. Top and bottom selvage of the fabric shall be knuckled with one and three-quarters inch (1-3/4") mesh.

2.04 POSTS, RAILS, AND ASSOCIATED ITEMS

A. Where vinyl coated fabric is specified, all post, rails and associated items shall be vinyl coated to match.

B. End, corner, slope, and pull posts: Provide at least the following minimum sizes and weights:
   1. Material and dimensions:
      a. Pipe, 2.875" outside dimension, Lbs. per lin ft: 5.79
      b. Tubing, 2-1/2" square, Lbs per lin ft: 5.70
      c. Roll-formed section, 3-1/2" x 3-1/2", Lbs per lin ft: 5.14

C. Line posts: Provide minimum sizes and weights as follows:
   1. Material and dimensions:
      a. Pipe, 2.375" outside dimension, Lbs. per lin ft: 3.65
      b. H-section, 2.25" x 1.95" x 0.143", Lbs per lin ft: 10.10

D. Gate posts: Provide gate posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:
   1. Material and dimension:
      a. Pipe, 4" outside dimension: Lbs. per lin ft: 9.10
      b. Tubing, 3" square:, Lbs. per lin ft: 9.10
      c. H-section, 4", Lbs. per lin ft: 14.00
         1) Over 13 feet wide, and up to 18 feet wide: Use 6.625" outside diameter pipe weighing 14.0 lbs. per lin ft.
         2) Over 18 feet wide: Use 8.625" outside diameter pipe weighing 24.70 lbs. per lin ft.

E. Top rails:
   1. Use 1.660" outside diameter pipe weighing 1.80 lbs. per lin ft; or
   2. Use 1.625" x 1.25" roll-formed sections weighing 1.35 lbs. per lin ft.
   3. Provide in manufacturer's longest lengths, with expansion type couplings approximately 6" long for each joint.
   4. Provide means for attaching top rail securely to each gate, corner, pull, slope, and end post.

F. Mid-Rails:
   1. Provide mid-rail for fences 8'-0" tall and higher, same as top rail.

G. Post brace assemblies:
   1. Provide at end and gate posts, and at both sides of corner, slope, and pull posts, with the horizontal brace located at mid-height of the fabric.
   2. Use 1.660" outside diameter pipe weighing 1.80 lbs. per lin ft for horizontal brace.
   3. Use 3/8" diameter rod with turnbuckle for diagonal truss.

H. Tension wire: Provide number 7 gage galvanized coiled spring wire at bottom of fabric.

I. Post tops:
   1. Provide steel, wrought iron, or malleable iron, designed as weathertight closure cap.
   2. Provide one cap for each post.
   3. Provide caps with openings to permit through passage of top rail.

J. Stretcher bars:

1. Provide one-piece lengths equal to full height of fabric, with a minimum cross-section of 3/16"x 3/4".
2. Provide one stretcher bar for each gate and end post, and two for each corner, slope, and pull post, except where fabric is woven integrally into the post.

K. Stretcher bar bands:
1. Provide steel, wrought iron, or malleable iron, spaced not over 15" on centers, to secure stretcher bars to end, corner, pull, slope, and gate posts.
2. Bands may be used also with special fittings for securing rails to end, corner, pull, slope, and gate posts.

L. Privacy Slats:
1. Equal to Fin/Slat '1000' as manufactured by Master Halco, Inc.. Provide top and bottom "U" channel. Color as selected.

2.05 GATES

A. General:
1. Fabricate gate perimeter frames of tubular members.
2. Provide additional horizontal and vertical members to assure proper operation of the gate, and for attachment of fabric, hardware, and accessories.
3. Space so frame members are not more than 8 feet apart.
4. Fabricate gate frames from:
   a. Materials and dimension:
      1) Pipe 1.90" outside diameter, Lbs. per lin ft: 2.72
      2) Tubing, 2" square, Lbs. per lin ft: 2.60

B. Fabrication:
1. Assemble gate frames by welding with special malleable or pressed steel fittings and rivets for rigid connections.
2. Use same fabric as used in the fence.
3. Install fabric with stretcher bars at vertical edges as a minimum.
4. Attach stretchers to gate frame at not more than 15" on centers.
5. Attach hardware with rivets or by other means which will provide security against removal and breakage.
6. Provide diagonal cross-bracing consisting of 3/8" diameter adjustable length truss rods on gates where required to provide frame rigidity without sag or twist.

C. Gate hardware: Provide following for each gate:
1. Hinges:
   a. Pressed or forged steel, or malleable iron, to suit the gate size; non-lift-off type, offset to permit 180 degree opening.
   b. Provide 1-1/2 pr of hinges for each leaf over 6 feet in nominal height.
2. Latches:
   a. Provide forked type or plunger-bar type to permit operation from either side of the gate.
   b. Provide padlock eye as integral part of latch.
3. Keeper: Provide keeper for vehicle gates, which automatically engages the gate leaf and holds it in the open position until manually released.
4. Double gates:
   a. Provide gate stops for double gates consisting of mushroom or flush plate, with anchors.
   b. Set in concrete to engage the center drop rod or plunger bar.
   c. Provide locking device and padlock eyes as an integral part of the latch, requiring one padlock for locking both gate leaves.

D. Chain link cantilever slide gate system: Manual or Motorized as indicated on the drawings

1. Gate to be made of Aluminum Alloy 6005-T61. All square members are 2” sq. weighing 0.94 lb. /ft. Complete frame welded to one piece track and 4” x 2” bottom rail weighing 1.71 lbs. /ft.. Supply 2 truck assemblies that are swivel type having lubricated and sealed ball bearing wheels.
2. Gateposts, 4” O.D. schedule 40 weighing 9.11 lb. /ft.
3. Fabric shall be 9 gauge G.A.W.
4. Electrically operated horizontal slide gates must be manufactured and installed to comply with the safety requirements of ASTM F2200 and UL 325.
5. See Section 32 3132-Vehicular Gate Operators for motorized gates.
6. Basis of Design: Secure-Track Chain Link Cantilever Slide Gates manufactured by Merchants Metals.

2.06 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Wire ties:
   1. For tying fabric to line posts, use number 9 gage wire ties spaced 12" on centers.
   2. For tying fabric to rails and braces, use number 9 gage wire ties spaced 24" on centers.
   3. For tying fabric to tension wire, use number ll gage hog rings spaced 24" on centers.
   4. Manufacturer's standard wire ties will be acceptable if of equal strength and durability.

B. Concrete: Comply with provisions of Section 03 3000 – Cast-in-Place Concrete for 2500 psi concrete.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 GUARANTEE

A. The contractor shall furnish a written guarantee warranting all materials, devices, and workmanship to be free of defects for a period of one year from the date of completion and acceptance. Any defects in materials, devices, and workmanship which become apparent within the guarantee period shall be repaired or replaced by the contractor at his own expense, and at no additional cost to the Owner.

3.03 INSTALLATION

A. General:
   1. Install posts at a maximum spacing of 10 feet on centers.
   2. Install corner or slope posts where changes in line or grade exceed a 30 degree deflection.

B. Excavating:
   1. Drill holes for post footings in firm, undisturbed or compacted soil, strictly adhering to the dimensions and spacing shown.
   2. Post hole dimensions:
      a. Provide 30" deep by 8" diameter foundations for line posts for 5 foot fabric height and less.
      b. Provide 36" deep by 8" diameter foundations for line posts for fabric heights exceeding 5 feet.
      c. Provide 36" deep by 12" diameter foundations for all other posts.
   3. Spread soil from excavations uniformly adjacent to the fence line, or on adjacent areas of the site if so directed.
   4. When solid rock is encountered near the surface, drill into rock at least 12" for line posts and at least 18" for end, pull, gate, and corner posts. Drill hole at least 1" greater diameter than the largest dimension of the post to be placed.

5. If solid rock is below soil overburden, drill to full depth required, except penetration into rock need not exceed minimum depths specified above.

C. Setting posts:
1. Remove loose and foreign materials from sides and bottoms of holes, and moisten soil prior to placing concrete.
2. Center and align posts in holes.
3. Place concrete around posts in a continuous pour, and vibrate or tamp for consolidation.
4. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
5. Trowel tops of footings, and slope or dome to direct water away from posts.
6. Extend footings for gate posts to the underside of bottom hinge.
7. Set keeps, stops, sleeves, and other accessories into concrete as required.
8. Keep exposed concrete surfaces moist for at least seven days after placement, or cure with membrane curing material or other curing method approved by the Architect.
9. Grout-in those posts which are set into sleeved holes, concrete constructions, or rock excavations, using non-shrink Portland cement grout or other grouting material approved by the Architect.

D. Concrete strength:
1. Allow concrete to attain at least 75% of its minimum 28-day strength before rails, tension wires, and/or fabric is installed.
2. Do not, in any case, install such items in less than seven days after placement of concrete.
3. Do not stretch and tension fabric and wire, and do not hang gates, until concrete has attained its full design strength.

E. Rails and bracing:
1. Install fence with a top rail and bottom tension wire.
2. Install top rails continuously through post caps or extension arms, bending to radius for curved runs.
3. Provide expansion couplings as recommended by the fencing manufacturer.
4. Provide bracing to the midpoint of the nearest line post or posts at all end, corner, slope, pull, and gate posts.
5. Install tension wires parallel to the line of fabric by weaving through the fabric, and tying to each post with not less than number 6 gage galvanized wire, or by securing the wire to the fabric.

F. Installing fabric:
1. Leave approximately 2" between finish grade and bottom selvage.
2. Excavate high points in the ground to clear the bottom of the fence.
3. Place and compact fill to within 1" of the bottom of the fabric in depressions.
4. Pull fabric taut and tie to posts, rails, and tension wires.
5. Install fabric on outward side facing side of fence, and anchor to framework so that the fabric remains in tension after pulling force is removed.
6. Install stretcher bars by threading through or clamping to fabric on 4" centers, and secure to posts with metal bands spaced 15" on centers.

G. Installing gates:
1. Install gates plumb, level, and secure for full opening without interference.
2. Install ground-set items in concrete for anchorage in accordance with the fence manufacturer's recommendations as approved by the Architect.
3. Lubricate and adjust the hardware for smooth operation.

H. Miscellaneous:

1. Use U-shaped tie wires, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least two full turns.
2. Bend ends of wire to minimize hazards to persons and clothing.
3. Fasteners:
   a. Install nuts for tension band and hardware bolts on side of fence opposite fabric side.
   b. Peen the ends of bolts to prevent removal of nuts.
4. Repair coatings damaged in the shop or field erection, using a hot-applied repair compound applied in accordance with its manufacturer's recommendations as approved by the Architect.

END OF SECTION

SECTION 31 23 23.15
CEMENT-SAND BACKFILLING

PART 1 GENERAL

1.01 SUMMARY

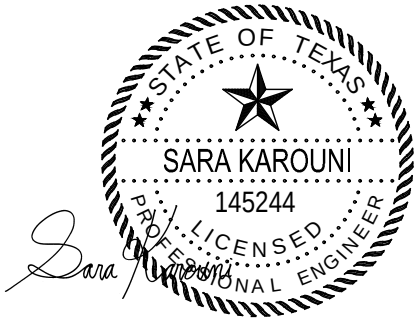
A. Provide cement-sand as bedding material under sewer pipes; for backfilling material around sewer pipes, manholes, inlets and drainage structures as required; and for backfill in pavement sections. Where this section and the Geotechnical report differ, the Geotechnical report's recommendations shall be used.

1.02 RELATED WORK

A. Manholes. Section 33 05 13.

B. Sanitary Sewers. Section 33 31 00.

C. Storm Drainage. Section 33 40 00.



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PART 2 PRODUCTS

2.01 MATERIALS

A. Sand. Provide sand from an approved source free from clay lumps, organic or other deleterious material and having a plasticity index of 4 or less.

B. Portland Cement. Furnish Portland cement to conform with ASTM C 150, Type I.

C. Water. Water shall be reasonably clean and free from injurious amounts of oil, acid, salt, organic matter, or other deleterious material.

2.02 PROPORTIONING AND MIXING

A. Add not less than 1.5 sacks of Portland cement per yard of sand mixture. Add required amount of water and mix thoroughly in an approved pug mill type mixer. Stamp batch ticket with the time of loading. Material will be rejected if not in place within 1-1/2 hours after loading or if the mixture has dried out.

PART 3 EXECUTION

3.01 BEDDING PROCEDURES

A. Place cement-stabilized sand in a trench or excavation prepared for sewer pipe to the depth shown on the drawings.

B. After bedding material is in place, set pipes in position to grade.

C. Add additional cement-sand material around pipe, filling to at least the spring line of the pipe. Place cement-sand material at optimum moisture content and in layers not to exceed 12 inches measured loose.

D. Compact with mechanical hand tamps to at least 95 percent of AASHTO density, Test Method T-99-74.

3.02 FOUNDATIONS

A. Use cement-sand for stabilizing the foundation for manholes, inlets or concrete structures, if required.

3.03 BACKFILL PROCEDURES

A. Place cement-stabilized sand in sewer trenches to within 12 inches of the pavement bottom for sewers under existing or future pavement. Use cement-sand material as backfill material around manholes if the structure adjoins pavement.

B. Place cement-sand material at optimum moisture content in layers not to exceed 12 inches, measured loose.

C. Compact with mechanical hand tamps to at least 95 percent of prescribed AASHTO density, Test Method T-99-74.

END OF SECTION

SECTION 31 23 43
TRENCH SAFETY SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Work in this section shall consist of furnishing all equipment, materials and labor for a trench safety system meeting appropriate requirements established in Occupational Safety and Health Administration (OSHA) Safety and Health Regulations, Part 1926, Subpart P - Excavations, Trenching and Shoring, as amended, including proposed rules published in Fed. Reg. (Vol. 56, No. 72), Wed., April 15, 1987. In the event of conflict of published and proposed rules, the more stringent requirement shall be used.

1.02 RELATED WORK

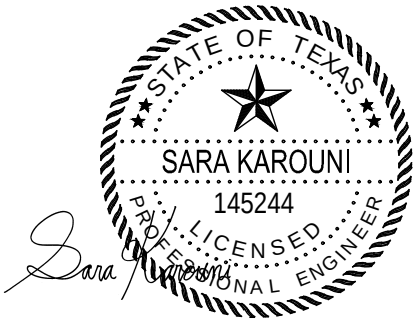
A. Earthwork. Division 31.

B. Manholes. Sections 33 05 13.

C. Water Distribution Mains. Section 33 11 00.

D. Sanitary Sewers. Section 33 31 00.

E. Storm Sewers. Section 33 40 00.



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PART 2 PRODUCTS

2.01 TIMBER

A. Trench sheeting materials shall be a minimum of 2 inches in thickness, solid and sound, free from weakening defects such as loose knots and splits. Shoring timber sizes shall not be less than that called for on the plans.

2.02 STEEL SHEET PILING

A. Steel sheet piling shall conform to the appropriate sections of the following specifications:
   1. ASTM A 36.
   2. ASTM A 307.
   3. ASTM A 328.
   4. ASTM A 572, Grade 50.

B. Steel for stringers and cross braces shall conform to ASTM A 588.

2.03 TRENCH BOXES

A. Portable trench boxes shall be constructed of steel conforming to ASTM A 36. Connecting bolts shall conform to ASTM A 307. Welds shall conform to requirements of AWS Specification D1.1.

PART 3 EXECUTION

3.01 GENERAL

A. Trench safety system shall be constructed, installed and maintained in accordance with the plans and/or to the design prepared by the Contractor's registered Professional Engineer licensed to practice in Texas to prevent death or injury to personnel or damage to structures in or near these trench excavations. Materials excavated from trench to be stored no closer to the edge of trench than one-half the depth of the trench.

3.02 INSTALLATION

A. Timber Sheeting. Timber sheeting to be installed in accordance with detail shown on plans. Drive timber sheeting to depth below trench bottom as shown on plans. Size of uprights, stringers and cross bracing to be in accordance with details shown on plans. Place cross braces in true horizontal position, spaced vertically, and secured to prevent sliding, falling or kickouts.

B. Steel Sheet Piling. Steel sheet piling of equal or greater strength may be substituted for timber trench shoring shown on the plans. Contractor to provide certification that steel sheet piling substituted provides equal or greater protection than timber trench shoring shown on plans. Certification of steel sheet piling to be provided by registered Professional Engineer. Drive steel sheet piling to minimum depth below trench bottom as recommended by Contractor's registered Professional Engineer licensed to practice in Texas providing design. Place cross braces in true horizontal position, spaced vertically and secured to prevent sliding, falling or kickouts.

C. Trench Boxes. Portable trench box to be substituted for timber trench shoring shown on plans shall be designed or the design checked by Contractor's registered Professional Engineer licensed to practice in Texas. Design trench box to provide equal or greater protection than timber trench shoring shown on plans. Certification of the design of trench boxes shall be provided by Contractor prior to its use on project. In cases where top of portable trench box will be below the top of trench, the trench must be sloped to an angle greater than the angle of repose for the soil conditions existing on the project. In areas where sloped trench will affect the integrity of existing structures, Contractor to protect structures prior to sloping trench.

D. Trench Jacks. When trench jacks are used for cross bracing and/or stringers, the Contractor shall provide certification by a registered Professional Engineer licensed to practice in Texas that the trench jacks provide protection greater than or equal to the timber cross bracing shown on plans.

3.03 SUPERVISION

A. Contractor shall provide competent supervisory personnel at each trench while work is in progress to ensure Contractor's methods, procedures, equipment and materials pertaining to the safety systems in this item are sufficient to meet requirements of OSHA Standards.

3.04 MAINTENANCE OF SAFETY SYSTEM

A. The safety system shall be maintained in the condition as shown on plans or as specified by the Contractor's registered Professional Engineer licensed to practice in Texas. The Contractor shall take all necessary precaution to ensure the safety systems are not damaged during their use. If at any time during its use a safety system is damaged, personnel shall be immediately removed from the trench or excavation area and the safety system repaired. The Contractor shall take all necessary precautions to ensure no loads, except those included in the safety system design, are imposed upon the excavation.

3.05 INSPECTION

A. Contractor shall make daily inspection of trench safety system to ensure that the system meets OSHA requirements. Daily inspection to be made by competent personnel. If evidence of

possible cave-ins or slides is apparent, all work in the trench shall cease until necessary precautions have been taken to safeguard personnel entering trench. Contractor shall maintain permanent record of daily inspections.

3.06 REMOVAL

A. Bed and backfill pipe to a point at least 1 foot above top of pipe prior to removal of any portion of trench safety system. Bedding and backfill to be in accordance to other applicable specification items. Backfilling and removal of trench supports shall progress together from bottom of trench upward. Remove no braces or trench supports until all personnel have evacuated the trench. Backfill trench to within 4 feet of natural ground prior to removal of entire trench safety system.

END OF SECTION

SECTION 32 11 13.13
LIME STABILIZATION OF SUBGRADE

PART 1 GENERAL

1.01 SUMMARY

A. Add lime to natural subgrade material and compacted embankments to stabilize them.

B. Use dry placing of lime or a commercial lime slurry to stabilize the natural in-place subgrade.

C. Where this section and the project Geotechnical report differ, the Goetechnical report's recommendation shall be used.

1.02 RELATED WORK

A. Subgrade Preparation. Section 31 23 13.

1.03 DELIVERY, STORAGE AND HANDLING

A. Store lime in weatherproof containers, bins or buildings. Protect lime from any dampness or moisture.

B. If lime is furnished in trucks, each truck shall have the weight of lime certified on a public scale or provide a scale as specified herein.

C. Bagged lime shall bear the manufacturer's certified weight.

STATE OF TEXAS
SARA KAROUNI
145244
LICENSED PROFESSIONAL ENGINEER
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PART 2 PRODUCTS

2.01 HYDRATED LIME

A. Type. Dry powder obtained by mixing quick lime with enough water to satisfy its chemical affinity to water under conditions of hydration. Provide a material consisting essentially of calcium hydroxide, or of a mixture of calcium hydroxide and small allowable percentages of calcium oxide, magnesium oxide and magnesium hydroxide. Specifications for hydrated lime apply specifically to the normal hydrate of lime made from high-calcium type limestone.

B. Chemical Composition. Furnish material which, when sampled and tested according to prescribed Texas Highway Department procedure, conforms to the following requirements as to chemical composition.

Ingredient	Percentage Allowable
Hydrate Alkalinity, percent by weight $CA(OH)_2$	90, minimum
Unhydrated lime content, percent by weight CaO	5.0, maximum
Free water content, percent by weight H_2O	4.0, maximum

C. Allowable Residue. Percent by weight of residue retained must meet the following requirements:

Sieve	Maximum Percent Retained Residue
No. 6 (3360 micron)	0.0
No. 10 (2000 micron)	1.0
No. 30 (590 micron)	2.5

2.02 COMMERCIAL LIME SLURRY

A. Provide a commercial lime slurry with a dry solids content of at least 36 percent by weight of slurry, and forming a pumpable suspension of solids in waters.

B. Water. Provide water containing dissolved matter not injurious or objectionable, either in quantity or in quality.

C. Solids. The solids portion of the mixture must consist principally of hydrated lime meeting the following requirements.

1. The solids content of the lime slurry must have a hydrate alkalinity [Ca(OH)2] of not less than 90 percent by weight.
2. Provide that the percent by weight of residue retained of the solids content of lime slurry conform to the following.

Sieve	Maximum Percent Retained Residue
No. 6 (3360 micron)	0.0
No. 10 (2200 micron)	1.0

2.03 EQUIPMENT

A. Provide equipment necessary to obtain specified results.

PART 3 EXECUTION

3.01 PREPARING SUBGRADE

A. After excavation and/or fill is made to subgrade lines, remove soft or undesirable material and replace with select material as specified for embankments under Section 31 23 13, Subgrade Preparation. Scarify the subgrade to the depth shown, providing the machine required. Stabilize unstable material below indicated depth by proper compaction.

3.02 APPLICATION

A. Dry Placing.
   1. Place lime using approved screw-type spreader box or distribute uniformly by bag at the rate shown. Do not place more than can be initially mixed during the same working day. Do not spread with a maintainer or motor grader.
   2. Cover or mix lime within 6 hours after application. Do not place lime during windy or other adverse weather. Lime may be sprinkled lightly with water to reduce dusting.

B. Slurry Placing.
   1. The lime shall be mixed with water in trucks with distributors and applied as a thin water suspension or slurry.
   2. The distribution of the slurry shall be attained by successive passes over the soil until the proper moisture and lime content has been secured.

3.03 MIXING

A. Procedures. Mixing procedures for either dry placing or slurry placing are the same.

B. Preliminary Mixing.
   1. Pulverize soil to a depth 2 inches below the bottom of the lime stabilized section.
   2. Add water to bring moisture content of the soil and lime mixture at least 5 percent above optimum.
   3. Rotary mix soil, lime and water to required depth, using approved single-pass or multiple-pass rotary speed mixer.
   4. After initial mixing, shape the subgrade to the appropriate section. Compact it lightly for preliminary curing.

C. Final Mixing.
   1. After preliminary curing, uniformly mix soil and lime to required depth. Use an approved single-pass or multiple-pass rotary speed mixer.
   2. Add water to bring moisture content of soil-lime mixture to at least 5 percent above optimum.
   3. Continue mixing and pulverizing soil until all clods are broken down to pass a 1-inch screen. At least 60 percent should pass a No. 4 sieve, nonslaking fractions excluded.
   4. After final mixing, shape subgrade to final section, compact and cure.

D. Exception. If pulverization requirements of final mixing can be met during preliminary mixing, then preliminary curing and final mixing can be eliminated.

3.04 COMPACTION

A. Preliminary Compaction. Seal surface of subgrade by rolling lightly with light pneumatic rollers. Sealing is done as a precaution against heavy rainfall.

B. Final Compaction.
   1. Attain optimum moisture content as determined by laboratory.
   2. Begin compaction immediately after final mixing.
   3. Begin compacting at the bottom, using approved heavy pneumatic or vibrating rollers, or a combination of tamping roller and light pneumatic roller, until entire depth is uniformly compacted.
   4. Compact treated material so as not to mix it with underlying subgrade material.

5. Correct all irregularities or weak spots immediately by replacing bad material with stabilized soil and recompacting.
6. Maintain smooth surface until base course or pavement is placed. Attain at least 95 percent of AASHTO density, using Test Method T-180, at optimum moisture content of treated material.
7. Use light pneumatic roller for final surface rolling.

3.05 CURING

A. Preliminary Curing. Cure soil-lime material for 2 to 4 days. Keep subgrade moist during cure.

B. Final Curing. Cure the lime-stabilized subgrade for 3 to 7 days, as directed. Keep traffic off subgrade during cure, other than a light pneumatic roller. Do not permit vehicles heavier than 10 tons on the subgrade. Use moist curing or membrane curing for final cure.
   1. Moist Cure. Keep subgrade surface damp by sprinkling. Roll with light pneumatic roller to keep surface knit together.
   2. Membrane Cure.
      a. Apply two coats of asphalt emulsion to subgrade surface the first day after final compaction.
      b. Apply one coat each day thereafter for 3 days.
      c. Total applications shall be 0.25 gallons of asphalt emulsion per square yard of subgrade surface.

END OF SECTION

SECTION 32 13 13
PORTLAND CEMENT CONCRETE PAVEMENT

PART 1 GENERAL

1.01 SUMMARY

A. Provide Portland cement concrete pavement on prepared subgrades. Construct pavement of designated thickness and to line, grade and typical cross section, as indicated. Where this section and the project Geotechnical report differ, the Geotechnical report's recommendations shall be used.

1.02 RELATED WORK

A. Subgrade Preparation. Section 31 23 13.

B. Lime Stabilization of Pavement Subgrade. Section 32 11 13.13.

C. Concrete Curbs. Section 32 16 13.

1.03 HANDLING AND STORAGE

A. Do not mix different classes of aggregate without prior written permission of the Architect/Engineer.

B. The class of aggregate being used can be changed before or during the job with proper notice. The new class must meet specifications.

C. Segregated aggregate will be rejected. Before using aggregate whose particles are separated by size, mix them uniformly to grading requirements.

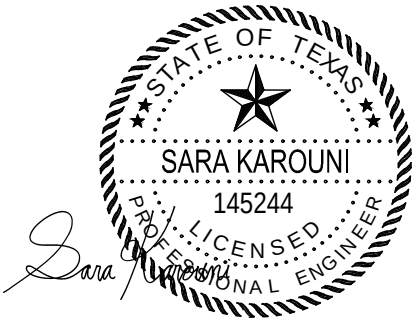
D. Aggregates mixed with dirt, weeds or foreign matter will be rejected.

E. Do not dump or store aggregate in the roadbed.

1.04 ACTION SUBMITTALS

A. LEED Submittals:

1. Product data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having



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PART 2 PRODUCTS

2.01 MATERIALS

A. Portland Cement.
   1. Sample and test cement to verify compliance with Standards of ASTM C 150, Type I or ASTM C 175, Type III.
   2. Bulk cement which meets referenced standards may be used if the method of handling is approved by the Architect/Engineer. When using bulk cement, provide satisfactory weighing devices.

B. Water. Furnish clean, drinkable water free from injurious amount of oils, acids, alkalis or other deleterious substances.

C. Coarse Aggregate. Provide crushed stone or gravel which is clean, hard, durable and well graded within specified limits. When tested by standard laboratory methods, coarse aggregate must conform to the following requirements:
   1. The maximum percentage by weight of deleterious substances must not exceed the following values:

Constituents	Percent By Weight
Removed by decantation	4.0
Shale	0.25
Clay lumps	0.25
Soft fragments	3.0
Other local deleterious substances, such as friable pieces	3.0
The sum of the percentages of above constituents shall not exceed	5.0

   2. Furnish coarse aggregate worn no more than 45 percent when tested according to AASHTO T96.
   3. Conform to the following grading requirements for aggregate tested on a standard square-opening sieve.

Sieve	Percent Retained
2-1/2 inches	0
1-3/4 inches	0 to 20
3/4 inch	25 to 65
No. 4	95 to 100

D. Fine Aggregate. Provide washed sand having clean, hard, durable grains, well graded from coarse to fine. The sand must be free from soft or flaky particles or other injurious matter. When tested by standard laboratory methods, fine aggregate must conform to the following requirements:
   1. Conform to the following grading requirements for aggregates tested on standard sieve.

Screen or Sieve	Percent Retained By Weight
3/8 inch screen	0
1/4 inch screen	0 to 5
20 mesh sieve	15 to 50
100 mesh sieve	85 to 100

   2. Weight removed by elutriation test must be not more than 2 percent.
   3. When subjected to color test for organic impurities, fine aggregate must not show color darker than standard color.

E. Mineral Filler. The addition of stone dust, sand, or crushed (oyster) shell dust of acceptable quality and cleanliness may be required as mineral filler to improve workability or plasticity of

concrete mixture. When mineral filler is used, it must be batched and weighted separately. Filler may be used in amounts not to exceed 15 percent of weight of fine aggregate. When tested with standard laboratory sieves, 95 to 100 percent of mineral filler shall pass 30 mesh sieve, and 50 to 100 percent shall pass 200 mesh sieve.

F. Reinforcing Steel.
   1. Provide new billet steel manufactured by the open hearth process and conforming to ASTM A 615, Grade 40. Store steel to protect it from mechanical injury and rust. At the time of placement, steel should be free from dirt, scale, rust, paint, oil or other injurious materials.
   2. Cold bend reinforcing steel to shapes shown. Once steel has been bent, it may not be rebent.
   3. Wire fabric must be of gauge and facing shown and must meet ASTM A 82. Use fabric in which longitudinal and transverse wires have been electrically welded at points of intersection. Welds must have sufficient strength not to be broken during handling or placing. Welding and fabrication of fabric sheets must conform to standards ASTM A 185.
   4. Furnish the manufacturers certificate giving property of steel. Provide specimens for testing, when required.

G. Air Entraining Agent. Furnish an air entraining agent which meets standards of ASTM C 260. Use MB-VR by Master Builders Company, Air-in by Hot Process Corporation-Southern, or approved substitution.

H. Retardant. As retardant provide Pozzolith No. 8 by Master Builders Company, HPS-R by Hunt Process Corporation-Southern, or approved substitution.

I. Expansion Joint Material. Furnish filler board of selected stock. Use wood of density and type as follows:
   1. Clear, all-heart cypress weighing no more than 40 pounds per cubic foot, after being oven dried to constant weight.
   2. Clear, all-heart redwood weighing no more than 30 pounds per cubic foot, after being oven dried to constant weight.

J. Joint Sealing Compound. Provide Tremco THC-900, Pecora NR 200 or Pecora NR201, color gray to match concrete.

K. Load Transmission Devices. Provide smooth steel bar dowel, as shown. Steel bars shall conform to standards of ASTM A 615, Grade 60.

L. Metal Supports for Reinforcing Steel and Joint Assembly. Employ metal of approved shape and size. Space supports as directed.

M. Liquid Membrane Forming Compound for Curing Concrete. Provide Type II white pigmented compound conforming to standards of ASTM C 309.

2.02 PROPORTIONING

A. Responsibility. Proportioning of the concrete mix is the responsibility of the Contractor. Design the concrete mixture and furnish a statement giving the proportion of materials in the mix. Submit commercial laboratory report showing that proportions and materials selected will produce laboratory mixed concrete of the specified quality, having strength 10 percent higher than that specified. Testing of design mixes is the Contractor's responsibility.

B. Concrete Mix. Provide a concrete mix that is uniform and workable. Design the mix to produce concrete which will have a compressive strength of 2,400 psi at 7 days and 3,500 psi at 28 days. Settlement of concrete must be at least 1-1/2 inches, but no more than 3 inches, when gauged by a standard slump test.
   1. Concrete pavement 5 inches thick and greater must contain at least 5-1/2 sacks of cement per cubic yard, with not more than 6.5 gallons of water, net, per sack of cement. Addition of mineral filler may be required to improve workability or plasticity of concrete.

2. The net amount of water is the amount added at the mixer, plus prewater in the aggregate, minus absorption the aggregate displays in 30 minutes. No water allowance will be made for evaporation after batching.
3. Coarse dry aggregate will not exceed 85 percent of the loose volume of concrete.
4. Add the air-entraining agent to the concrete to produce the effect that could be obtained by use of air-entrained Portland cement, as specified in ASTM C 175. Use the amount needed to entrain 3 percent to 5 percent of air by volume of concrete. Add the agent to the batch in a solution of the mixing water. Batch this solution by means of a mechanical batcher capable of accurate measurement. Ensure a uniform distribution throughout the batch during the specified mixing period.
5. Retardant is required when the temperature exceeds 85°F. Proportion is recommended by the manufacturer. Use the same brand as used for the air entraining agent. Add and batch the material using the same methods as used for the air-entraining agent.

2.03 MIXING EQUIPMENT

A. Condition. Mixing equipment must be in first class working condition and must be inspected and approved by the Architect/Engineer before paving operations will be permitted.

B. Scales.
1. Weigh materials separately and accurately using standard scales attached to a standard batching plant. Consider a sack of cement weighing 94 pounds to be 1 cubic foot.
2. Employ beam type of springless dial type scales. Equip the beam type with a springless dial indicator showing at least 100 pounds over or under the required weight. Use graduated scales or dial indicator showing increments of 5 pounds or less.
3. Use scales accurate within 4 pounds per 1,000 pounds per net load in the hopper.

C. Mixer.
1. A capacity of not less than a 14-S mixer, as rated by Mixer Manufacturers Bureau of Associated General Contractors, is required. Provide a speed regulator to hold a mixer to the normal speed of revolution. Equip the mixer with an automatic timer and lock for the discharging device to prevent discharge until all materials have been mixed together for the minimum time required. The timer and lock must operate independently of the drum. Also provide a bell to indicate completion of a mixing time. The bell must be plainly audible to a distance of 50 feet from the mixer.
2. Equip the mixer with an accurate device to measure water within 1 percent of the total amount required. Construct the measuring drum with an opening to atmospheric pressure when the measured amount of water is inside. Place and construct the drum so that a single batch of water can be discharged into a calibrated tank or a weighing device attached to the mixer, without seriously delaying paving operations. Check the operation of this water measuring device daily.

D. Batch Truck. Batch trucks, for the transportation of measured materials from the batching plant to the mixer, must be covered tight to prevent excessive evaporation or any loss of materials.

2.04 MIXING

A. Central batching and transit mixing will be permitted. A central mixing plant will be allowed upon approval of mixing and handling methods.

B. Mix concrete in a batch-mixer as specified only in such quantities as are required for immediate use. Thoroughly mix aggregate and cement for a period of not less than 50 seconds, computed from the time the last aggregate disappears into the drum until the concrete begins to appear in the discharge chute. Lock the mixer discharge with an automatic timing device until the specified time has elapsed. Introduce water into the drum during the first 15 seconds of mixing. Discharge the entire contents of the drum before the materials are placed for a succeeding batch. Retempering or remixing will not be permitted.

C. For transit mixed concrete use a water type truck mixer. Mix each batch for 100 revolutions at the mixer manufacturer's mixing speed. Perform additional mixing or agitation at the speed specified for agitation.

D. Stamp the time of loading the transit-mix truck on the delivery ticket before the truck leaves the plant. Equip truck mixers with water tank and measuring devices which permit positive measurement of mixing water. When aggregate contains more than 6 percent water, place the concrete within 1/2 hour after the introduction of water. When aggregate contains from 3 percent to 6 percent water, place the concrete within 1/2 hour after the introduction of cement. Transit-mix concrete must conform to other applicable requirements of this section.

PART 3 EXECUTION

3.01 WEATHER CONDITIONS

A. Place concrete only when the air temperature is above 35°F and rising. The Contractor is responsible for the quality and strength of concrete placed under any weather conditions.

3.02 EQUIPMENT

A. General. Equipment for preparing subgrade and for finishing and compacting must be in good working order and be approved before commencing work.

B. Subgrade Planer and Template.
   1. Use a subgrade planer with adjustable cutting blades to trim the subgrade to the exact section shown on the drawing. Select a planer with visible rollers which ride on the form. The planer frame must have sufficient weight so that it will remain on the form at all times, and have such strength and rigidity that, under tests made by changing the support from wheels to center, the planer will not develop deflection of more than 1/8 inch. Tractors used to pull the planer must not produce ruts or indentations in the subgrade. When the slip form method of paving is used, operate the subgrade planer on a prepared track grade or have it controlled by an electronic sensor system operated from a string line that established the horizontal alignment and elevation of the subbase.
   2. Provide a template for checking the contour of the subgrade. The template must be long enough to rest upon side forms and have such strength and rigidity that under tests made by changing the support to the center, the template will not show deflection of more than 1/8 inch. Fit the template with accurately adjustable rods projecting downward at 1-foot intervals. Adjust these rods to gauge the cross sections of the slab bottom when the template is resting on the side forms.

C. Machine Finisher. Provide a power-driven, transverse finishing machine designed and operated to strike off and consolidate the concrete. Select a machine with two screeds accurately adjusted to the crown of the pavement and with a frame equipped to ride on the form. Use a finishing machine with rubber tires if it operates on concrete pavement.

D. Hand Finishing.
   1. Provide a mechanical strike and tamping template the width of pavement to be finished. Shape the template to the pavement section.
   2. Also provide floats of approved design. Provide two bridges for finishing expansion and dummy joints and necessary edging and finishing tools to complete the pavement slab.

E. Burlap Drag for Finishing Slab. Furnish four plies of 10-ounce burlap material fastened to a bridge to form a continuous strip of burlap the full width of the pavement. The 3-foot width of burlap material must be in contact with the pavement surface. Keep the burlap drags clean and free of encrusted mortar.

F. Vibrators. Furnish mechanically operated synchronized vibrators mounted on a tamping bar which rides on the forms. Also employ approved hand-manipulated mechanical vibrators. Furnish vibrators with a frequency of vibration providing the maximum consolidation of concrete without segregation.

G. Traveling Form Paver. A traveling form paver of approved design may be used in lieu of construction methods employing forms, consolidating, finishing and floating equipment. If a traveling form paver is used, all requirements of this specification for subgrade, pavement tolerances, pavement depth, alignments, consolidation, finishing and workmanship must be met in full. If a traveling form paver proves inadequate, in the opinion of the Architect/Engineer, in providing a pavement which meets the drawings and specification in all respects, its use will be immediately discontinued when so ordered by the Architect/Engineer and conventional methods will be used.

1. Equip the traveling paver with a longitudinal transangular finishing float adjustable to crown and grade. The float must be long enough to extend across the pavement practically to the side forms or the edge of the slab.
2. Prior to beginning paving operations, ensure that a continuous deposit of concrete can be made at the paver to minimize starting and stopping. Pave by conventional means those locations inaccessible to a traveling paver, or having horizontal or vertical curvature that a traveling paver cannot negotiate.
3. Do not place reinforcing steel mechanically. Where the plans require tie bars to be installed for adjacent paving, securely tie and support the bars to prevent displacement. Alternatively, tie bars may be installed with an approved mechanical bar inserted mounted on a traveling-form paver. Replace any pavement in which tie bars assume a final position other than that shown on the drawing, unless corrective alternates are authorized in writing and carried out to the satisfaction of the Architect/Engineer.

3.03 SUBGRADE

A. Properly prepare, shape and compact each section of subgrade before placing forms, steel or concrete. After forms have been set to proper grade and alignment, use a subgrade planer to shape the subgrade to its final cross section. Check the contour of the subgrade with the template.

3.04 FORMS

A. Side Forms. Use metal forms of approved shape and section. A form as deep as the pavement edge thickness is preferred. Forms with depth up to 1-inch greater or less than pavement thickness may be used. Forms with less depth than pavement thickness will be brought to required depth by securely attaching wooden planks of approved section and size to the bottom of the form. Use a form section at least 10 feet in length, and staked in position with at least three pins. Forms must have adequate strength too withstand machine loads without visible springing or settlement. Use forms free from warps, bends and kinks and sufficiently true to provide a straight edge on the concrete. Test the top of each form section with a straight edge and verify that it conforms with requirements for the surface of completed pavement. Use flexible or curbed forms of wood or metal to set the proper radius on curves of 100 feet radius or less.

B. Form Setting.
   1. Rest forms directly on subgrade. Do not shim with pebbles or dirt. Remove subgrade that will not support the loaded form. Replace and compact subgrade to required density. Accurately set forms to required grade and alignment and, during the entire operation of placing, compacting and finishing of concrete, do not deviate from this grade and alignment more than 1/8-inch in 10 feet of length. Do not remove forms for at least 24 hours after the completion of finishing operations. Provide a supply of forms that will be adequate to comply with this requirement and for orderly and continuous placing of concrete. Set the forms and check the grade for at least 130 feet ahead of the mixer.
   2. Adjacent slabs may be used instead of the forms, provided that the concrete is well protected from possible damage by finishing equipment. These adjacent slabs must not be used for forms until the concrete has aged at least 7 days. For short radius curves, forms less than 10 feet in length or curved forms may be used. For curb returns at street intersections and driveways, wood forms of good grade and quality may be used. Do not use any material which, in the opinion of the Architect/Engineer, is unsuitable for forms.

3.05 REINFORCING STEEL AND JOINT ASSEMBLIES

A. Accurately place reinforcing steel and joint assemblies and position them securely in accord with details shown. Wire reinforcing bars securely together at intersections and splices. Bars and coatings must be free of rust, dirt or other foreign matter when the concrete is installed.

B. Place pavement joint assemblies at required locations and elevations, and rigidly secure all parts in required positions. Install dowel bars accurately in joint assemblies as shown, each parallel to the pavement surface and to the center line of the pavement and rigidly secure in the required position to prevent displacement during placing and finishing of concrete. Accurately cut header boards, joint filler and other material used for forming joints to receive each dowel bar.

C. Place all reinforcing steel and secure to chairs.

3.06 PLACING

A. Batches not placed as specified within 30 minutes after water or cement has been added will be rejected. Fine aggregate containing more than 6 percent moisture and coarse aggregate containing more than 3 percent moisture will likewise be rejected.

B. Deposit concrete rapidly and continuously on subgrade or subbase in successive batches. Distribute concrete to the required depth and for entire width of the pour by shoveling or by other approved methods. Do not use rakes in handling concrete. At the end of the day or in case of unavoidable interruption of more than 30 minutes, place a transverse construction joint at the point of stopping work, provided that the section on which work has been suspended is not less than 10 feet from the preceding joint. Sections less than 10 feet long must be removed and replaced.

C. Take special care in placing and spading concrete against forms and at longitudinal and transverse joints to prevent honeycombing. Voids in the edge of the finished pavement will be cause for rejection.

3.07 COMPACTING

A. Consolidate the concrete using an approved mechanical vibratory unit designed to vibrate concrete internally. Extend a vibratory unit across the pavement, not quite touching the side forms. Equip the unit with synchronized vibrators. Space individual vibrators at close enough intervals to vibrate and consolidate the entire width of the pavement uniformly. Mount mechanical vibrators to avoid contact with forms, reinforcement, transverse or longitudinal joints.

B. Furnish enough hand-manipulated mechanical vibrators for proper consolidation of concrete along forms, at joints and in areas not covered by mechanically controlled vibrators.

3.08 FINISHING

A. Finish concrete pavement by power-driven transverse finishing machines or by hand finishing methods.
   1. Use the transverse finishing machine to make at least two trips over each area. Make the last trip over a given area a continuous run of not less than 40 feet. After transverse screeding, use a hand-operated longitudinal float to test and level the surface to the required grade.
   2. Hand finish with a mechanical strike and tamping template as wide as the pavement to be finished. Shape the template to the pavement section. Move the strike template forward in the direction of the work, maintaining a slight excess of material in front of the cutting edge. Make at least two trips over each area. Screed the pavement surface to the required section. Work the screed with a combined transverse and longitudinal motion in the direction work is progressing. Maintain the screed in contact with the forms. Use a longitudinal float to level the surface.

B. On narrow strips and transitions, finish concrete pavement by hand. Thoroughly work concrete around reinforcement and embedded fixtures. Strike off concrete with a strike-off screed. Move the strike-off screed forward with combined transverse and longitudinal motion in direction work is progressing, maintaining the screed in contact with the forms, and maintaining

a slight excess of materials in front of the cutting edge. Tamp the concrete with a tamping template. Use a longitudinal float to level the surface.

C. After completion of the straightedge operation, make the first pass of a burlap drag as soon as construction operations permit and before the water sheen has disappeared from the surface. Follow this by as many passes as required to produce the desired texture depth. Permit no unnecessary delays between passes. Keep the drag wet, clean and free from encrusted mortar during use.

3.09 SURFACE TESTS

A. The entire surface before the initial set and correct irregularities or undulations. Bring surface within requirements of the following test and then finish. Place an approved 10-foot straightedge parallel to the center of the roadway to bridge any depressions and touch all high spots. Do not permit ordinates measured from the face of the straightedge to the surface of the pavement to exceed 1/16 inch per foot from the nearest point of contact. In no case permit the maximum ordinate to a 10-foot straightedge to exceed 1/8 inch.

3.10 JOINTS

A. Placement. Place joints of the types shown on drawings at required locations and at spacings shown.

B. Construction Joints. Place a transverse construction joint wherever concrete placement must be stopped for more than 30 minutes. Place longitudinal construction joints at interior edges of pavement lanes where required. Work the concrete well against the bulkhead. The key-way on the longitudinal construction joint may be omitted when a traveling form paver is used, and when No. 5 deformed tie bars, 30 inches long and spaced 18 inches on centers, are used.

C. Expansion Joints. Place expansion joints at radius points of curb returns for cross street intersections, or as shown. Use no boards shorter than 6 feet. When pavement is 24 feet or narrower, use not more than two lengths of board. Secure pieces to form a straight joint. Shape board filler accurately to the cross section of the concrete slab. Use premolded joint filler, accurately shaped, in curb section. Use load transmission devices of the type and size shown. Use a joint sealing compound as required.

D. Contraction Joints. Make contraction joints straight and place them at spacings shown. Place smoothed, painted and oiled dowels accurately and normal to the joint. Tool the edges of the groove and seal the groove with joint sealing compounds.

E. Longitudinal Weakened Plane Joints. Make a longitudinal weakened plane joint with a deformed metal strip. Adequately stake the metal strip in place to prevent lateral movement of the metal strip while the concrete is being placed.

3.11 MEMBRANE CURING

A. After the concrete surface has been finally finished and the surplus water sheen has disappeared, seal the surface with single uniform coating of an approved curing compound. Apply the compound at the rate of coverage recommended by the manufacturer and as directed by Architect/Engineer, but not less than 1 gallon per 180 square feet of surface area. Control and check the rate of application.

B. Thoroughly agitate the compound during use and apply by means of approved mechanical power pressure sprayers, equipped with satisfactory atomizing nozzles. For application on small miscellaneous items, hand powered spray equipment may be used. For all spraying equipment, provide means to prevent loss of compound between the nozzle and the concrete surface while spraying.

C. Thoroughly moisten the surface just before applying the curing compound. Where discontinuities, pin holes or other defects show, or where rain has fallen, immediately apply an additional coat of compound to the newly coated surface before the film has dried sufficiently to resist damage. Apply the added coat at the same rate of coverage as specified.

3.12 JOINT SEALING

A. Seal joints only when surface and joints are dry, ambient temperature is above 50°F, and weather is not foggy or rainy.

B. Before work is started, the joint sealing equipment shall be in first-class working condition, and be approved by the Architect/Engineer. Use a concrete grooving machine or a power-operated wire brush and other equipment such as plow, brooms, brushes and blowers as required to produce satisfactory joints.

C. Clean joints of loose scale, dirt, dust and curing compound. When required, remove the joint filler to the depth shown. The term joint includes wide joint spaces, expansion joints, dummy groove joints or cracks, either preformed or natural. Remove loose material from concrete surfaces adjacent to joints.

D. Fill joints neatly with joint sealer to the depth shown. Pour sufficient joint sealer into the joints so that, upon completion, the surface of the sealer within the joint will be 1/4 inch below the level of the adjacent surface or at an elevation as directed.

3.13 PROTECTION AND OPENING PAVEMENT TO TRAFFIC

A. Barricade a pavement section from use for at least 72 hours during the curing period. Do not open pavement to traffic until concrete is at least 10 days old. On those sections of pavement open to traffic, seal the joints, clean the pavement and place earth against the pavement edges before permitting use by traffic. Such opening of pavement to traffic in no way relieves the Contractor from his responsibility for the work.

3.14 TESTING

A. Duties. Arrange for the laboratory to inspect and test materials entering the concrete and check the design of concrete mixes to meet specified strengths, uses and finishes. The lab will analyze aggregate for quality, durability, grading and free water content. The lab will take representative specimens of ingredients and mixes; make test cylinders and measure their compressive strength. The lab will check the moisture content of aggregates and control their mix subject to approval.

B. Test Procedures. The laboratory will make tests in conformance with current standard test procedures of ASTM and AASHTO.

C. Test Reports. The laboratory will promptly furnish written reports covering results of tests and inspections to the Architect/Engineer and the Contractor.

D. Test Cylinders. Two test cylinders for compressive strength test will be made for each 600 square yards or less of pavement that is placed in one day. Cylinders will be tested at the ages of 7 and 28 days. Cylinders will be made, cured and tested using applicable ASTM standards for sampling and testing.

E. Yield. Make a yield test in accordance with ASTM C 138 for cement content per cubic yard of concrete. If such cement content is found to be less than that specified per cubic yard, reduce batch weights until the amount of cement per cubic yard of concrete conforms to requirements.

F. Core Samples. Drill core samples of concrete pavement at locations designated to measure thickness. Drill a minimum of one core for each 600 square yards of pavement. At age of 28 days, each core may be tested for compressive strength according to methods of the ASTM C 42. The 28-day compressive strength of each core tested must be at least 3000 pounds per square inch.

END OF SECTION

SECTION 32 16 13
CONCRETE CURBS

PART 1 GENERAL

1.01 SUMMARY

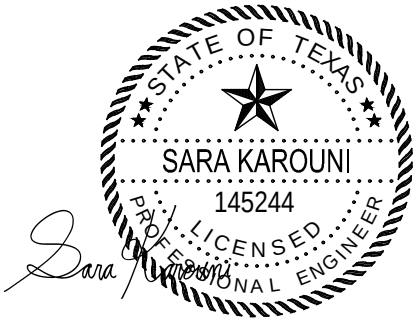
A. Provide reinforced concrete curb, reinforced monolithic concrete curb and gutter, and 12-inch mountable curb.

1.02 RELATED WORK

A. Portland Cement Concrete Paving. Section 32 13 13.

1.03 COST ASSESSMENT

A. Include the cost for 6-inch concrete curbs in the contract price bid for 6-inch concrete pavement. No separate payment will be made for 6-inch curbs.



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PART 2 PRODUCTS

2.01 MATERIALS

A. Use the materials specified for concrete pavement, Section 32 13 13.

B. A mortar finish composed of one part Portland cement and 1-1/2 parts of fine aggregate may be used when approved.

PART 3 EXECUTION

3.01 GUIDELINE

A. Set the guideline to follow the top line of the curb. Attach the indicator to provide a constant comparison between the top of the curb and the guideline.

3.02 FORMS

A. Brace forms sufficiently to maintain position during pour.

B. Use metal templates cut to the section shown on the curb and gutter drawing.

3.03 REINFORCEMENT

A. Secure reinforcing steel in proper position so that the steel will remain in place throughout the pour.

3.04 JOINTS

A. Place 3/4-inch prepared expansion joints through the curb and gutters at locations of expansion and contraction joints in pavement; at the end of radius returns at street intersections and driveways; at curb inlets; and at a maximum of 120-foot centers.

B. Place dummy groove joints at 6-foot centers at right angle to curb lines. Cut dummy grooves 1/4 inch deep using an approved edging tool.

3.05 PLACING

A. Place concrete in forms to required depth. Consolidate thoroughly. Do not permit rock pockets in the form. Entirely cover the top surfaces with mortar.

3.06 MANUAL FINISHING

A. After concrete is in place, remove front curb forms.

B. Form the exposed portions of curb, and of curb and gutter, using a mule which conforms to the curb shape shown.

C. A thin coat of mortar, similar to the mortar used in the concrete mixture, may be worked into the exposed face of the curb using a mule and a two-handled wooden darby at least 3 feet long.

D. Before applying the final finish, use a 10-foot straightedge. Starting at the gutter form, move the straightedge across the gutter and up the curb to the back form of the curb. Repeat until the curb and gutter are true to the grade and section. Lap straightedge every 5 feet. Make the face of the finished curb true and straight.

E. Steel trowel finish surfaces to a smooth, even finish.

F. Edge the outer edge of the gutter with a 1/4-inch edger.

G. Make the top surfaces of the curb and gutter of uniform width and free from humps, sags or other irregularities. Surfaces of curb top, curb face and gutter must not vary more than 1/8 inch from the edge of a straightedge laid along them, except at grade changes or curbs.

H. Finish visible surfaces and edges of the finished curb and gutter free from blemishes, form marks and tool marks, and of uniform color, shape and appearance.

3.07 MECHANICAL FINISHING

A. Mechanical curb forming and finishing machines may be used instead of or in conjunction with the previously described methods, with approval. Use of mechanical methods must provide the curb design and finish as specified and shown.

3.08 CURING

A. Immediately after finishing operations, cure the exposed surfaces of curbs and gutters in the same way as concrete pavement.

END OF SECTION

SECTION 32 17 13
CONCRETE PAVEMENT JOINTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Joints for concrete paving; concrete sidewalks, concrete driveways, curbs, and curb and gutters.

B. Saw-cutting existing concrete or asphalt pavements for new joints.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices:
   1. Payment for street pavement expansion joints, with or without load transfer, is on linear foot basis.
   2. Payment for horizontal dowels is on a unit price basis for each horizontal dowel.
   3. No separate payment will be made for formed or sawed street pavement contraction joints and longitudinal weakened plane joints. Include payment in unit price for Concrete Paving.
   4. No separate payment will be made for joints for Curb, Curb and Gutter, Saw-tooth Curb, Concrete Sidewalks, and Concrete Driveways. Include payment in unit price for Curb and Gutter, Conrete Sidewalks, and Concrete Driveways.
   5. Payment will be made for Preformed Expansion Joints on a linear foot basis only when field conditions require that sidewalk be moved adjacent to existing concrete structure (i.e., street, back of curb, etc.).
   6. Refer to Section 01270 – Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum): If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.03 REFERENCES

A. ASTM A 615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

B. ASTM D 994 – Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).

C. ASTM D 1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural construction (Nonextreuding and Resilient Bituminous Types).

D. ASTM D 3405 – Standard Specification for Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements.

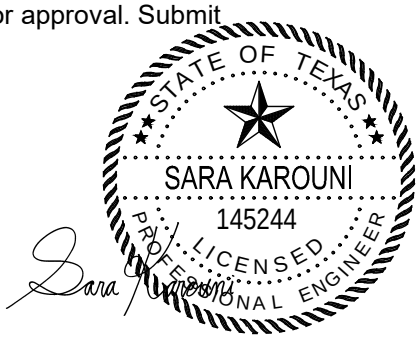
E. TxDOT Tex-525-C – Test for Asphalt and Concrete Joint Sealers

1.04 SUBMITTALS

A. Conform to requirements of Section 01330 – Submittal Procedures.

B. Submit product data for joint sealing compound and proposed sealing equipment for approval.

C. Submit samples of dowel cup, metal supports, and deformed metal strip for approval. Submit manufacturer's recommendation for placing sealant(s).



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PART 2 PRODUCTS

2.01 BOARD EXPANSION JOINT MATERIAL

A. Filler board of selected stock. Use wood of density and type as follows:
   1. Clear, all-heart cypress weighing no more than 40 pounds per cubic foot, after being oven dried to constant weight.
   2. Clear, all-heart redwood weighing no more than 30 pounds per cubic foot, after being oven dried to constant weight.

2.02 PREFORMED EXPANSION JOINT MATERIAL

A. Bituminous fiber and bituminous mastic composition material conforming to ASTM D 994 and ASTM D 1751.

2.03 JOINT SEALING COMPOUND

A. Conform joint sealants to one of sealant classes described in this section.

B. Tremco TCH-900, Pecora NR 200, or Pecora NR201, color gray to match concrete.

2.04 LOAD TANSMISSION DEVICES

A. Smooth, steel dowel bars conforming to ASTM A 615, Grade 60. When indicated on Drawings, encase one end of dowel bar in approved cap having inside diameter 1/16 inch greater than diameter of dowel bar.

2.05 SUPPORTS FOR REINFORCING STEEL AND JOINT ASSEMBLY

A. Employ supports of approved shape and size that will secure reinforcing steel and joint assembly in correct position during placing and finishing of concrete. Space supports as directed by Project Manager.

PART 3 EXECUTION

3.01 PLACEMENT

A. When new Work is adjacent to existing concrete, place joints at same location as existing joint in adjacent pavement.

B. If limit of removal of existing concrete or asphalt pavement does not fall on existing joint, saw-cut existing pavement minimum of 2 inches deep to provide straight, smooth joint surface without chipping, spalling or cracks.

3.02 CONSTRUCTION JOINTS

A. Place transverse construction joint wherever concrete placement must be stopped for more than 30 minutes. Place longitudinal construction joints where shown using No. 6 deformed tie bars, 30 inches long and spaced 18 inches on centers.

3.03 EXPANSION JOINTS

A. Place 3/4 inch expansion joints at radius points of curb returns for cross-street intersections, or as located in adjacent pavement but no further than 80 feet apart. Use no boards shorter than 6 feet. When pavement is 24 feet or narrower, us not more than 2 lengths of board. Secure pieces to form straight joint. Shape board filler accurately to cross section of concrete slab. Use load transmission devices of type and size shown on Drawings unless otherwise specified or shown as ANO Load Transfer Device.@ Seal with joint sealing compound.

3.04 CONTRATION JOINTS

A. Place contraction joints at same locations as in adjacent pavement or at spaces indicated on Drawings. Place smoothed, painted and oiled dowels accurately and normal to joint. Seal groove with joint sealing compound.

3.05 LONGITUDINAL WEAKENED PLANE JOINTS

A. Place longitudinal weakened plane joints at spaces indicated on Drawings. If more than 15 feet in width is poured, longitudinal joint must be saw-cut. Seal groove with joint sealing compound.

3.06 SAWED JOINTS

A. Use sawed joints as alternate to contraction and weakened plane joints. Use circular cutter capable of cutting straight line groove minimum of 1/4 inch wide. Maintain depth of one quarter of pavement thickness. Commence sawing as soon as concrete has hardened sufficiently to permit cutting without chipping, spalling or tearing and prior to initiation of cracks. Once sawing has commenced, continue until complete. Make saw cut with one pass. Complete sawing within 24 hours of concrete placement. Saw joints at required spacing consecutively in sequence of concrete placement.

B. Concrete Saw: Provide sawing equipment adequate in power to complete sawing to required dimensions and within required time. Maintain ample supply of saw blades at work site during sawing operations. Maintain sawing equipment on job during concrete placement.

3.07 JOINTS FOR CURB, CURB AND GUTTER

A. Place ¾ inch preformed expansion joints through curb and gutters at locations of expansion and contraction joints in pavement, at end of radius returns at street intersections and driveways, and at curb inlets. Maximum spacing shall be 120-foot centers.

3.08 JOINTS FOR CONCRETE SIDEWALKS

A. Provide ¾ inch expansion joints conforming to ASTM A 1751 along and across sidewalk at back of cubs, at intersections with driveways, steps, and walls; and across walk at intervals not to exceed 36 feet. Provide expansion joint material conforming to ASTM D 994 for small radius curves and around fire hydrants and utility poles. Extend expansion joint material full depth of slab.

3.09 JOINTS FOR CONCRETE DRIVEWAYS

A. Provide ¾ inch expansion joints conforming to ASTM D 1751 across driveway in line with street face of sidewalks, at existing concrete driveways, and along intersections with sidewalks and other structures. Extend expansion joint material full depth of slab.

3.10 JOINT SEALING

A. Seal joints only when surface and joints are dry, ambient temperature is above 50 degrees F and less than 85 degrees F and weather is not foggy or rainy.

B. Use joint sealing equipment in like-new working condition throughout joint sealing operation, and be approved by Project Manager. Use concrete grooving machine or power-operated wire brush and other equipment such as plow, brooms, brushes, blower or hydro or abrasive cleaning as required to produce satisfactory joints.

C. Clean joints of loose scale, dirt, dust and curing compound. The term joint includes wide joint spaces, expansion joints, dummy groove joints or cracks, either preformed or natural. Remove loose material from concrete surfaces adjacent to joints.

D. Fill joints neatly with joint sealer to depth shown. Pour sufficient joint sealer into joints so that, upon completion, surface of sealer within joint will be ¼ inch above level of adjacent surface or at elevation as directed.

3.11 PROTECTION

A. Maintain joints in good condition until completion of Work.

B. Replace damaged joints material with new material as required by this Section.

END OF SECTION

SECTION 33 05 13
MANHOLES

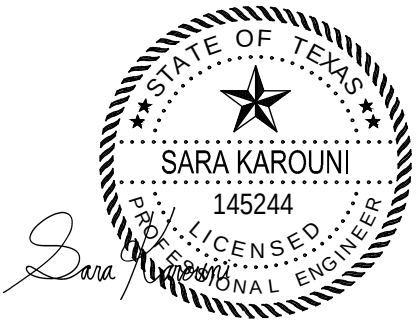
PART 1 GENERAL

1.01 SUMMARY

A. Provide manholes for storm sewer, sanitary sewer and other utilities as shown and noted.

1.02 RELATED WORK

A. Earthwork for Site Utilities. Section 31 23 00.
B. Trench Safety Systems. Section 31 23 43.
C. Sanitary Sewers. Section 33 31 00.
D. Storm Drainage. Section 33 40 00.



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1.03 SUBMITTALS

A. Manufacturer's literature and installation instructions.

1.04 SUBMITTALS

A. Details, including reinforcing, for each type and size of manhole required.
B. Manhole covers.
C. Manufacturer's technical information joint sealant.
D. Manufacturer's technical information on manhole steps.
E. Submittal drawings shall be sealed by a Professional Engineer registered in the State of Texas.

PART 2 PRODUCTS

2.01 CONCRETE

A. Compressive Strength. 3000 psi at 28 days.

B. Slump. Not exceeding 4 inches.

C. Aggregate Size. Maximum of 1 inch.

D. Reinforcing Bars. Provide ASTM A 615, Grade 60.

2.02 PRECAST CONCRETE SECTIONS

A. Where precast concrete sections are used, precast sections shall conform to the requirements of ASTM C 478 except where modified by this Section and the Drawings.

B. Provide risers and cones as shown on the Drawings.

C. Design Criteria.
   1. AASHTO H20 truck load.
   2. Active earth pressure coefficient equal to 1.0.
   3. Groundwater up to finish grade.

2.03 MANHOLE COVER AND FRAME

A. Provide model V-1420 heavy-duty manhole cover and frame as manufactured by Vulcan or approved substitution.

2.04 PORTABLE LADDER

A. Provide one adjustable ladder of aluminum construction meeting all appropriate OSHA specifications. Ladder shall be adjustable to a length equal to the depth of the deepest manhole included in the work.

2.05 MANHOLE DROPS

A. Provide manhole drops wherever pipe enters a manhole 30“or more above the invert of the manhole, or as shown on the drawings.

PART 3 EXECUTION

3.01 EXCAVATION

A. Excavate the pit for a manhole structure no wider than the manhole diameter plus 4 feet, allowing 2 feet around the structure. Manhole pit excavation is unclassified.

3.02 CONCRETE MANHOLES

A. The manhole base may be either cast-on-site or monolithic round, precast reinforced concrete base sections. The bottom or floor of precast base sections shall have a minimum thickness of 12 inches unless shown otherwise on the plans. The bottom shall project no less than 12 inches beyond the outside walls of the base to form a flange intended to resist uplift, unless shown otherwise on the plans. When the base is cast monolithic with a portion of the vertical section, the reinforcing in the vertical section shall extend into the base.

B. The precast concrete base shall have suitable cutouts or holes to receive all pipe and connections. The lowest edge of holes or cutouts shall be no less than 6 inches above the inside surface of the floor of the base.

C. Manhole barrel sections shall have tongue-and-groove or O-ring joints as shown on the drawings when shown on the drawings provide minimum wall thicknesses as shown. Joints shall be sealed with Neenah Foundry Company Manhole Sealant, Sylvax, Ram-Nek or approved substitution.

D. Where smooth exterior (i.e. steel, ductile iron or PVC) pipes are connected to the manhole base or barrel, size-on-size resilient connectors conforming to ASTM C 923 shall be used.

E. When connecting concrete or cement mortar coated steel pipes, or as an option for connecting smooth exterior pipes to the manhole base or barrel, the space between the pipe and manhole wall may be sealed with an assembly consisting of a stainless steel power sleeve, stainless steel take-up clamp and a rubber gasket. The take-up clamp shall be a minimum of 9/16 inch wide. Provide PSX positive seal gasket system by Press-Seal Gasket Corporation or approved substitution.

F. Manholes shall be built up so that the cover, when placed, shall be at the designated elevation. Not less than two precast concrete grade rings, with a thickness of not more than 12 inches each, shall be placed under the casting unless shown otherwise on the drawings.

G. Depths for the U-shaped channel(s) at the manhole bottom shall be at least half of the largest pipe diameter for pipes less than 15 inches in diameter. Depths for pipes of 15 to 24 inches in diameter shall be at least 3/4 of the largest diameter pipe. The bench provided above the channel shall be sloped at a minimum of 1/2 inch per foot.

3.03 BACKFILL

A. Excavation and backfill procedures for manholes shall conform to the requirements of Section 31 23 00, Structural Excavation, Fill and Backfill. Backfill material shall be regular material as specified in Section 31 23 23.15, unless shown otherwise on the drawings.

3.04 LEAKAGE TESTING FOR WET MANHOLES

A. After completion of manhole construction, wall sealing, or rehabilitation, but prior to backfilling, test manholes for watertightness using hydrostatic procedures.

B. Plug influent and effluent lines, including service lines, with suitably sized pneumatic or mechanical plugs. Ensure plugs are properly rated for pressures required for test; follow manufacturer’s safety and installation recommendations. Place plugs a minimum of 6 inches outside of manhole walls. Brace inverts to prevent lines from being dislodged if lines entering manhole have not been backfilled.

C. Hydrostatic Exfiltration Testing.

1. Hydrostatic exfiltration testing shall be performed as follows: all wastewater lines coming into the manhole shall be sealed with an internal pipe plug; then the manhole shall be filled with water and maintained full for at least one hour. The maximum leakage for hydrostatic testing shall be 0.025 gallons per foot diameter per foot of manhole depth per hour.
2. If water loss exceeds amount tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

END OF SECTION

SECTION 33 11 00
WATER DISTRIBUTION MAINS

PART 1 GENERAL

1.01 SUMMARY

A. Provide new water mains including valves, valve boxes, fire hydrants, blocking, fittings and other appurtenances.

1.02 RELATED WORK

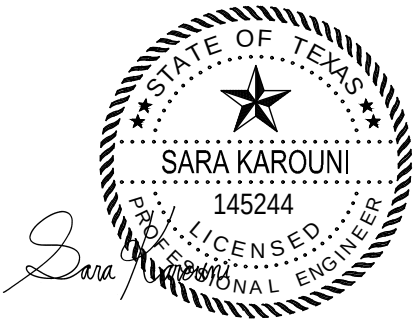
A. Excavation, Filling and Backfilling for Site Utilities. Section 31 23 00.

1.03 REFERENCE STANDARD

A. Except as otherwise specified or shown, the workmanship, methods of installation, construction procedures and materials furnished will be in strict accordance with the following publications of the Department of Public Works, City of Houston, Texas. Use the latest edition and any applicable amendments.
   1. Form WD-3, Specifications for Water Main Construction.
   2. Form WD-6, Specifications for Copper Service Line Construction.

B. In using reference standards, wherever terms “City of Houston” and “Director of Public Works” are used, substitute “the Owner” and “the Engineer,” respectively.

C. Perform all work under this section in accordance with the applicable specifications of the American Water Works Association.



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PART 2 PRODUCTS

2.01 POLYVINYL CHLORIDE PIPE

A. Provide polyvinyl-chloride water pipe up to 3-1/2-inch diameter bearing the NSF Seal of Approval and conforming to ASTM D 1785, ASTM D 2241 or Commercial Standard CS 256, Schedule 4b. Provide PVC water pipe 4-inch through 12-inch diameter in conformance with AWWA C900. Provide fittings in conformance with ASTM 2466. Furnish pipe with a minimum pressure rating of 150 pounds per square inch. Provide PVC pipe as manufactured by Certain-Teed, Clow or approved substitution.

2.02 COPPER TUBING

A. Provide copper tubing for underground service in 3/4-inch, 1-inch 1-1/2-inch and 2-inch sizes. Fabricate the tubing from Type K, soft-annealed tubing with proper bending temper.

B. Tubing must meet requirements of ASTM B 88 and Federal Specification WW-T-799, with the following exceptions:
   1. In the section of ASTM B 88 dealing with number of test samples, modify to provide one sample of each size of tubing for each 7,500 feet or less of tubing.
   2. Furnish 3/4-inch tubing in coils, preferably flat, of 60 feet each. Furnish 1-1/2-inch and 2-inch tubing in straight 20-foot lengths.

2.03 FITTINGS

A. For ductile iron pipe fittings, furnish mechanical joint, or a bolt-less, gasketed joint such as Tyton or Fastite, in accordance with AWWA C110.

B. For asbestos-cement pipe fittings, provide a mechanical joint, or an O-ring gasket such as Fluid-Tite or Ring-Tite, according to the brand of pipe selected.

C. Provide factory-forged, steel pipe fittings 4 inches through 24 inches conforming to AWWA C208. Furnish long radius fittings for all bends. Bevel ends for field butt welding. Provide fittings with wall thickness equal to or greater than the wall thickness of the pipe to which the fitting is to be welded.

2.04 GATE VALVES

A. Furnish gate valves with cast iron body, double disk, nonrising stem, O-ring seal with 2-inch-square nut. Gate valves must conform to AWWA C500, Standard for Gate Valves for Ordinary Water Works Services. Provide a mechanical joint or a hub-end, gasketed valve to match the pipe selected. Furnish a valve stem which turns clockwise to open. Provide at least one key to operate gate valves.

2.05 FIRE HYDRANTS

A. Provide fire hydrants conforming to City of Houston specification WD-3.

B. Provide fire hydrants which conform to the requirements and tests of AWWA C502, latest revision, and these specifications.

C. Furnish fire hydrants of the compression-type shutoff, closing with the pressure. Valves must have collision safety construction and be dry top designed for 150 psi working pressure. Fabricate all working parts of bronze.

D. Equip the barrel with a 6-inch inlet connection of all-bronze and having a self-centering drain valve. Provide the connection with two 2-1/2-inch inside diameter hose nozzles and a 4-1/2-inch pumper connection. Use National Standard threads at all connections.

E. Equip all nozzles with nozzle caps securely and with cap gaskets of rubber. Other hydrant gaskets may be of rubber composition, copper asbestos, lead or impregnated fiber composition. Attach nozzle caps to the barrel with chains not less than 1/8-inch diameter.

F. Provide a hydrant with bury length (the distance from the bottom of the inlet line to the ground line) as specified.

G. Have the barrel joint connecting the upper and lower hydrant sections designed so that the hydrant shutoff valve will remain closed and reasonably tight against leakage in the event of an impact resulting in damage or breaking of the hydrant above or near ground level. Provide the joint with a breakable bolt flange or breakable coupling that will include a minimum of eight bolts. Provide the valve stem with a breakable stem coupling opposite the breakaway barrel.

H. Provide the valve stem with a bronze sleeve and suitable seals and a travel stop. Do not expose operating threads to water. Lubricate the threads fully when opening and closing the shutoff valve from the lubricating reservoir sealed top and bottom. Equip the valve stem with a thrust bearing or lubricated thrust collar to minimize operating torque.

I. Furnish a valve stem which opens counterclockwise.

J. Provide a valve stem operating nut that is nonrising, pentagonal shape, with 1-1/8 inches from point to flat and depth of 1-1/4 inches.

K. All operating parts, including the valve seat, must be removable through the barrel, without digging.

L. Paint fire hydrants with one coat of red lead primer and two finishing coats of alkyd paint of color specified.

2.06 VALVE BOXES

A. Provide buried valves with coat iron valve boxes of the extension sleeve type suitable for depth of cover over pipe as shown. Furnish valve boxes at least 5 inches in diameter, 3/16 inch thick, with suitable cast iron bases and covers. Coat all parts of valve boxes, bases and covers by dipping in hot bituminous varnish. Provide Mueller H-10360, two-piece screw type with base, top section and cover as required, or an approved equal. Identify covers with the casting, WATER.

PART 3 EXECUTION

3.01 STAKING

A. Fittings and valves shall be staked by the Contractor.

3.02 SETTING VALVES, VALVE BOXES AND FIRE HYDRANTS

A. Prior to installing valves or fire hydrants, remove foreign matter from within the valves. Inspect the valves in open and closed position to verify that all parts are in satisfactory working condition.

B. Install valves, valve boxes and fire hydrants where shown or as located by the Owner. Set valves and fire hydrants plumb and as detailed on drawings. Center valve boxes on valves. Locate valves away from roads or streets. Carefully tamp earth around each valve box for a minimum radius of 4 feet, or to undisturbed trench face if less than 4 feet. Set fire hydrants 3 feet from the edge of the shoulder, at the point of curvature of the intersection curb radius and at such elevations that connecting pipe will not have less cover than distributing mains.

C. Place a Class B concrete thrust block opposite pipe connections, set against the vertical face of the trench to prevent the hydrant from blowing off the line. If the character of the soil is such that the fire hydrant cannot be securely wedged in this manner, provide bridle rods and rod collars of not less than 3/4-inch stock protected by a coat of acid-resisting paint.

D. Place at least 5 cubic feet of broken stone around the base of the fire hydrant to ensure drainage. Compact backfill thoroughly around the hydrant to grade line.

3.03 PIPE INSTALLATION

A. Preparation.
   1. Use piping and materials for water mains of types specified, unless otherwise shown.
   2. Do not lay pipe in water, or when trench or weather are unsuitable for work, except with permission of the Engineer. Keep water out of trench until jointing is complete. When work is not in progress, close ends of pipe and fittings securely so that no trench water, earth or other substance will enter pipes or fittings.
   3. Keep the inside of the pipe free from foreign matter during operations by plugging or other approved method.
   4. Place pipe so that the full length of each section rests solidly upon the pipe bed, with recesses excavated to accommodate bells and joints. Take up and relay pipe when the grade or joint is disturbed after laying.
   5. Locate no joints closer than 9 feet from sanitary sewer crossovers. Where possible, lay water lines 9 feet above sewers at crossovers.
   6. Where pipe ends are left for future connections, install valves, plugs or caps, as shown.
   7. Handle pipe and accessories so that all pipe placed in the trench is sound and undamaged. Take particular care not to injure pipe coating. Do not place other pipe or anything else inside of pipe or fitting after coating has been applied.
   8. Cut neatly, using approved type mechanical cutter without damaging pipe. Use wheel cutters when practicable.
   9. Before installation, inspect pipe for defects and tap with a light hammer to detect cracks. Replace sections of pipe found to be defective, damaged or unsound, before or after laying.

B. Pipe Bedding and Backfill.
   1. For bedding, accurately grade the bottom of the trench 6 inches below the elevation of the normal pipe installation and limit clear space on either side of the pipe to 6 inches at and below the top of the pipe. Place and compact 6 inches of bank sand in the trench before the pipe is laid. Install the pipe and place additional bank sand. Compact around the pipe to a height of 6 inches above the top of pipe. Compact to a minimum density of 95 percent using AASHTO Standard Method T-99.

2. Backfill as specified in the section describing earthwork. Unless otherwise directed, use bank sand for backfilling water pipe trenches which will be beneath concrete pavement.

C. Placing and Laying.
1. Bury water lines 12 inches and smaller and fire hydrants leads to a minimum depth of 4 feet. Bury water lines 14 inches and larger to a minimum depth of 5 feet.
2. Do not exceed pipe manufacturer's recommendations for deflections from straight line or grade as required by vertical curves, horizontal curves, or offsets. If alignment requires deflections in excess of these limitations, furnish special bends or sufficient number of shorter lengths of pipe to provide angular deflections within the limits set or approved.
3. After a length of pipe is placed in the trench, hold packing material for the joint around the bottom of the spigot so that packing will enter the bell as the pipe is pushed into position, or a rubber gasket may be inserted in the bell before pushing the pipe into place. Center the spigot on the bell and push the spigot into required alignment and position. Except where necessary in making connections with other lines, lay pipe with bells facing in the direction of laying. Except at closures, position at least two lengths of pipe ahead of each joint, with packing installed and earth fill tamped alongside pipe, before joint is poured.

D. Joints.
1. Install mechanical joints according to the recommendations of the manufacturer.
2. Make slip-on joints according to the recommendations of the manufacturer.

E. Anchorage of Fittings.
1. Thrust Block. Anchor tees, elbows and plugs of water mains with Class B concrete thrust blocks as shown. Place blocks so that the joints will be accessible for inspection and repair.
2. Substitution. In lieu of thrust blocking on cast iron pipe, substitute push-on, locking-type joints. Provide joints such as Lok-Tyton as manufactured by the United States Pipe and Foundry Company. Equip these joints with Lok-Tyton gaskets and pipe groove according to manufacturer's recommendations.

3.04 SERVICE CONNECTIONS

A. Provide water service leads and include corporation and meter stops and meter vault installed as shown. Provide corporation and stop thread single-strap service clamps for service lead connection on 6-inch water main if asbestos cement pipe is used. Furnish a service clamp with 250 psi working pressure and include a neoprene gasket cemented in place. Make the body of malleable iron galvanized after fabrication. Provide a service clamp manufactured by the Mueller Company, Decatur, Illinois, or approved substitution.

3.05 STERILIZATION

A. Sterilize each unit of the completed distribution system with chlorine before acceptance for domestic operation. Use not less than 100 parts of chlorine per million parts of water. Introduce chlorinating material to the water lines and distribution systems in an approved manner. If possible, flush lines thoroughly before introducing chlorinating materials. After contact period of not less than 24 hours, flush system with clean water until residual chlorine is no greater than 1.0 part per million parts of water. Open and close valves in lines being sterilized several times during contact period.

3.06 TESTING

A. Hydrostatic Tests. Prior to the completion of backfill, and while joints and fittings are still exposed, test new water lines hydrostatically. Conduct hydrostatic tests in the presence of the Engineer and in an approved manner. Apply test pressure equal to normal static line pressure plus 60 psi, and maintain this pressure for a minimum of 2 hours. Do not permit line losses during the test to exceed 50 U.S. gallons per inch of pipe diameter per mile per day. Regardless of the rate of line loss, repair observed leaks. Replace faulty or defective materials

at no change in the contract sum. Provide all pumps, gauges, meters and other equipment necessary for performance of the tests.

B. Bacteriological Tests. After sterilizing and flushing mains, obtain the services of an approved laboratory to gather representative samples and conduct bacteriological tests. Test results must meet Texas Department of Health requirements. Make all necessary corrections, repeat sterilization and flushing procedures, and retest affected lines if test results are not acceptable. Repeat this procedure until satisfactory results are obtained.

END OF SECTION

SECTION 33 31 00
SANITARY SEWERS

PART 1 GENERAL

1.01 SUMMARY

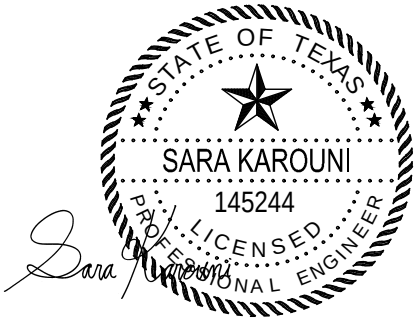
A. Provide sanitary sewers and appurtenances, including drops, cleanouts, stacks and service connections.

1.02 RELATED WORK

A. Excavation, Filling and Backfilling for Site Utilities. Section 31 23 00.

B. Cement Stabilized Backfill. Section 31 23 13.15.

C. Manholes. Section 33 05 13.



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PART 2 PRODUCTS

2.01 MATERIALS

A. Except as otherwise specified, furnish materials according to requirements of the governing specification.

2.02 SANITARY SEWER PIPE

A. For Gravity Sewer or Force Main.
   1. Ductile Iron Pipe. Pipe shall be manufactured according to AWWA C151-76 with polyethylene wrap. Use pressure class 350 for pipe sizes 4 inches through 24 inches and pressure class 250 for pipe sizes 30 inches through 64 inches.
   2. Polyvinyl Chloride Pipe (PVC). Pipe shall be manufactured according to ASTM D 2241. PVC shall be Type 1, Grade 1, manufactured from virgin plastic. Unless otherwise specified, pipe shall be SDR 26.
   3. High Density Polyethylene Pipe. HDPE pipe and fittings for sizes 4 inches through 48 inches shall be made of high density, high molecular weight polyethylene pipe material complying with the requirements of ASTM D 3350, cell classification PE 345434C, or ASTM D 1248, Type III, Grade C, Category 5, Grade P34. Dimensions and workmanship are specified by ASTM F 714. HDPE pipe shall have a minimum SDR 26 for gravity service and a minimum pressure rating of 150 psi for force main service. HDPE pressure pipe and fittings for 1/2 inch through 3 inches shall comply with the requirements of AWWA C901, pressure class 160. All molded and fabricated fittings shall be rated at same pressure as the pipe.

B. For Gravity Sewer Only.
   1. Ductile Iron Pipe. Pipe shall be manufactured according to AWWA C151-76 with polyethylene wrap. Use pressure class 350 for pipe sizes 4 inches through 24 inches and pressure class 250 for pipe sizes 30 inches through 64 inches.
   2. Polyvinyl Chloride Pipe. Provide best quality polyvinyl chloride (PVC) pipe and fittings meeting the requirements of ASTM D 3034, SDR 35, or ASTM F 679 (UNI-BELL UNI-B-7), as applicable. Total allowable deflection for all PVC pipe shall be 5 percent of the base inside diameter. For the purpose of these specifications, deflection shall be defined as the reduction of vertical inside diameter.
   3. Fiberglass Reinforced Plastic Pipe. Provide centrifugally cast, fiberglass-reinforced polyester pipe, fittings and joints manufactured in accordance with ASTM D 3262, ASTM D 3754 and AWWA C950. Pipe outside dimensions shall be in accordance with AWWA C151 and C950. Pipe shall have a minimum pipe stiffness of 46 psi (SN46) for non-pressure service.

2.03 JOINTS

A. Ductile Iron Pipe.
   1. Push-on Joint. Joint shall utilize a rubber gasket or O-ring as the only element to make the joint watertight. Gasket shall be smooth, free from blisters or imperfections, and shall be specifically designed for the pipe used. Joint shall conform to ANSI 21.11-1976.
   2. Mechanical Joint. Joint shall be of the stuffing-box type adapted for use of a gasket, gland and bolts. Joint shall conform to ANSI 21.11-1976.
   3. Flanged Joint. Joint shall be used above ground only, unless otherwise shown on the drawings. Bolts, nuts and washers shall be as recommended by the pipe manufacturer. Joint shall conform to ANSI 21.15-1976.

B. Polyvinyl Chloride Pipe. Joint shall be factory-premolded, compression-type, vulcanized, high-grade elastomeric compound gasket joint. Joint shall meet the requirements of ASTM D 3212. Fittings for force mains shall be cast iron in accordance with AWWA C110, cement lined.

C. Fiberglass Reinforced Plastic Pipe. Provide fiberglass sleeve couplings that utilize elastomeric sealing gaskets made of EPDM rubber compound. Joint shall meet performance requirements of ASTM D 4161. For connections to concrete structures, provide spigot with elastomeric gasket contained in a groove. Provide the fabricated steel companion, complete with 2-1/2-inch wide seal ring for casting in wall of structure.

D. High-Density Polyethylene Pipe. Joined using a heat fusion technique called "butt fusion." Provide convoluted backup flanges constructed of ductile iron, ASTM A 536, Grade 65/45/12, ANSI B16.5 dimensions, used in conjunction with molded stub ends which are butt fusion to HDPE pipe, for connections to cleanouts, valves and aboveground piping.

2.04 PIPE COATINGS AND ENCASEMENT

A. Ductile Iron Pipe.
   1. Preparation. Commercial blast cleaning conforming to SSPC-SP6.
   2. Liner Thickness. Nominal 40 mils, minimum 35 mils, for pipe barrel interior; minimum 6 to 10 mils at gasket groove and outside spigot end to 6 inches back from end.
   3. Testing. ASTM G 62, Method B for voids and holidays; provide written certification.
   4. Acceptable Lining Materials.
      a. Virgin polyethylene conforming to ASTM D 1248, with inert fillers and carbon black to resist ultraviolet degradation during storage heat bonded to interior surface of pipe and fittings; "Polyline" by American Cast Iron Pipe Company, or approved substitution.
      b. Polyurethane. CORROPIPE II by Madison Chemicals.
      c. Ceramic Epoxy. Protecto-401 by Enduron Protective Coatings.
   5. Exterior. Prime coat and outside asphaltic coating conforming to ANSI A21.10, ANSI A21.15, or ANSI A21.51 for pipe and fittings in open cut excavation and in casings.
   6. Polyethylene Wrap. For buried water lines and sanitary sewers, including point repairs, provide polyethylene wrap unless otherwise specified or shown. Provide polyethylene wrap for buried ductile iron pipe, including polyurethane coated pipe. conform to requirements of Section 02528, Polyethylene Wrap.
   7. For flanged joints in buried service, provide petrolatum wrapping system, Denso, or approved substitution, for the complete joint and alloy steel fasteners. Alternatively, provide bolts made of Type 304 stainless steel.

2.05 CLEANOUTS

A. Cleanouts shall be constructed as shown in the drawing details. Pipe shall be cast iron or ductile iron of a diameter as shown on the plans.

2.06 STACKS

A. Stacks for service connections shall be provided wherever the top of the sewer is 8 feet or more below the finished grade. Stacks shall be made of the same material as the sanitary sewer and constructed as shown on the drawing details.

2.07 MANHOLE DROPS

A. Manhole drops shall be provided wherever the invert of the influent sewer is 3 or more feet above the invert in the manhole. Drop pipe shall be of any pipe material acceptable per this section for sanitary sewer construction. The drop structure shall be encased in mortar to form on continuous structure with the manhole.

2.08 SERVICE CONNECTIONS

A. The materials for all service connections shall be restricted to those herein permitted for sanitary sewer construction. Wye or tee shall be provided at point of connection where shown on the plans.

PART 3 EXECUTION

3.01 PIPE BEDDING

A. Provide Class A bedding as described in the reference specification, except where detailed otherwise.

B. Provide bedding as detailed for pipe placed in trenches excavated with equipment other than ladder-type trenching machine and other detailed locations where Class A bedding is not required.

C. Bedding types AA, A and B shall conform to specifications in Section 02321, Earthwork for Site Utilities.

D. Unless otherwise specified, pipe 15 inches or less in size shall be laid with Class B bedding where line lies above a 10-foot depth.

E. Unless otherwise specified, sanitary sewer pipe below a 10-foot depth shall be laid with Class A bedding.

F. Pipe larger than 15 inches in size shall be laid in Class A bedding.

G. Pipe installed between side lots shall be laid in Class AA bedding.

H. Provide Class AA bedding for all installation of PVC pipe and HDPE pipe.

3.02 MANHOLE DROPS

A. Provide manhole drops wherever invert of sewer enters a manhole 3 feet or more above the manhole invert. Drop shall be constructed as shown on the drawings.

3.03 SERVICE CONNECTIONS

A. Locate far-side service connections and near-side service stubs as shown on the drawings. Use wyes and tees as indicated. Obtain verification from Engineer on location before actual field installation. Show actual locations of all service connections on project record drawings.

B. Plug service connections after installation. Mark the location of plugged or capped end with either a No. 4 steel rod or creosote coated wood 2″ x 4″ brought vertically from the plug to the finished surface. A 16-penny nail shall be driven into the exposed end of the 2″ x 4″ marker to aid in future location.

3.04 STACKS

A. Where the top of the sewer is 10 feet or more below grade, stacks shall be built at each wye connection to bring the connection to 8 feet below grade. Stacks shall be built according to the plan details.

3.05 CLEANOUTS

A. Locate cleanouts as shown on the drawings. After installation, mark the location with a flagged 2″ x 4″ wood stake. Show the installed location of all cleanouts on project record drawings.

3.06 TESTING

A. Leakage Testing. During construction, the Contractor shall perform tests as the work progresses. No more than 1000 linear feet of installed sewer shall be allowed to remain untested. Test in accordance with City of Houston Standard Specification, Section 02533, Acceptance Testing for Sanitary Sewers, and all applicable amendments. Perform the test under observation of an inspector. Supply the test plugs and risers necessary to perform the test.

B. Leakage Testing. During construction, the Contractor shall perform tests as the work progresses. No more than 1000 linear feet of installed sewer shall be allowed to remain untested. After backfilling and removing debris from each section of sewer line, conduct a line acceptance test under observation of the Engineer. Test the sanitary sewer lines in strict

accordance with the following leakage test using low-pressure air. If the test results indicate an unacceptable installation, locate the source of leakage, correct the defect, and retest until the installation is proven satisfactory.

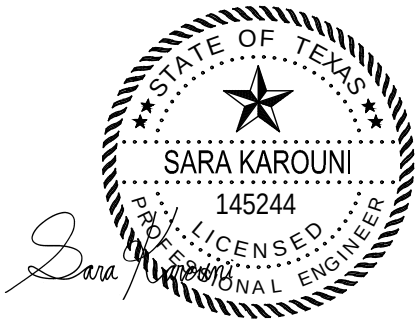
1. Minimum Requirements for Equipment.
   a. Control panel.
   b. Low-pressure air supply connected to control panel.
   c. Pneumatic plugs shall be of acceptable size for diameter of pipe to be tested; capable of withstanding internal test pressure without leaking or requiring external bracing.
   d. Air hose from control panel to:
      1) Air supply.
      2) Pneumatic plugs.
      3) Sealed line for pressurizing.
      4) Sealed line for monitoring internal pressure.
2. Test Pneumatic Plugs. Test plugs before using in actual test installation. Place one length of pipe on ground and seal at both ends with pneumatic plugs to be checked. Pressurize plugs to 25 psig; then pressurize sealed pipe to 5 psig. The plugs are acceptable if they remain in place against the test pressure without external aids.
3. Compensating for Groundwater Pressure.
   a. Where groundwater exists, install a capped pipe nipple at the same time the sewer line is placed. Use a 1/2-inch capped pipe nipple approximately 10 inches long. Make the installation through the manhole wall on top of the sewer line where the line enters the manhole.
   b. Immediately before performing the line acceptance test, remove the pipe cap, clear the pipe nipple with air pressure, and connect a clear plastic tube to pipe nipple. Support the tube vertically and allow water to rise in the tube. After the water stops rising, measure the height in feet of water over the invert of the pipe. Divide this height by 2.3 feet/psi to determine the groundwater pressure to be used in line testing.
4. Line Testing. After pneumatic plugs have been checked, place plugs in line at manholes and inflate plugs to 25 psig. Introduce low-pressure air into the sealed line until the internal air pressure reaches 4 psig greater than the groundwater pressure. Allow at least 2 minutes for air pressure to stabilize. If at least 3.5 psig over groundwater pressure is maintained, disconnect the air hose from the control panel to the air supply and measure the time of the pressure drop between 3.5 and 2.5 psig above groundwater pressure. The installation is acceptable if the air loss rate does not exceed 0.003 cfm per square foot of internal pipe surface with an average test pressure of 3.0 psig greater than groundwater pressure. The line between manholes is within acceptable limits if the time for the 1 psig pressure drop is not less than the time listed below for pipe sizes indicated.

Pipe Diameter in Inches	**Minutes Pressure is Maintained**
6	3.0
8	4.0
10	5.0
12	5.5
15	7.5
18	8.5
21	10.0
24	11.5
30	14.5
36	17.0

C. Test for Displacement of Sewers.
   1. After the trench has been backfilled to 2 feet above the pipe and tamped as specified, check the alignment as follows. Flash a light through the sewer between manholes. Use a flashlight or reflect sunlight with a mirror. If the illuminated interior of the pipe shows poor alignment, pipe displacement or other defects, remedy them satisfactorily.
   2. Plastic pipe sizes 6 inches through 30 inches shall be tested for deflection by pulling a mandrel with an outside diameter equal to 95 percent of the base inside diameter of the pipe through the pipe after backfilling is complete. All base inside diameters for PVC pipe shall be as per pipe manufacturer's published data.
      a. The mandrel shall be cylindrical in shape and constructed with at least seven evenly spaced arms or prongs. Mandrels with less arms will be rejected as not sufficiently accurate. The contact length of the mandrel's arms shall equal or exceed the nominal diameter of the sewer to be inspected.
      b. The mandrel shall be hand pulled through all plastic sewer lines. Any sections of sewer not passing the mandrel shall be uncovered and the Contractor shall be re-round or replace the sewer. Repaired or replaced sewer shall be retested.
      c. The inspection shall be conducted no earlier than 30 days after reaching final trench backfill grade, provided that the soil has thoroughly settled throughout the entire trench.
      d. The Contractor shall submit drawings with complete dimensioning of the proposed mandrel device to the Engineer for review. Each mandrel, one for each diameter and specification of pipe, shall have nameplate with pertinent information, i.e. 5 percent D-3034, 8-inch diameter, SDR 35.

END OF SECTION

SECTION 33 40 00
STORM DRAINAGE



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PART 1 GENERAL

1.01 SUMMARY

A. Provide storm sewers including drainage inlets.

1.02 RELATED WORK

A. Cast-in-Place Concrete. Section 03 31 02.

B. Jacking, Boring and Tunneling Pipe. Section 31 05 23.

C. Excavation, Filling and Backfilling for Site Utilities. Section 31 23 00.

D. Cement-Sand Backfill. Section 31 23 23.15.

E. Trench Safety Systems. Section 31 23 43.

F. Manholes. Section 33 05 13.

PART 2 PRODUCTS

2.01 STORM SEWER PIPE

A. Reinforced Concrete Pipe. Provide reinforced concrete pipe which conforms with ASTM C 76, Class III, with the following additional requirements. For circular pipe with elliptical reinforcing, apply a readily visible stripe at least 12 inches long painted or otherwise applied on the inside and outside of the pipe at each end so that when the pipe is laid in the proper position the line will be at the center of the top of the pipe.

B. High Density Polyethylene (HDPE) Pipe. Provide HDPE pipe which conforms with AASHTO M294.

2.02 PIPE JOINT MATERIAL

A. Neoprene or Rubber Gasket Joints. For concrete pipe, provide gasket joints meeting requirements of ASTM C 443. Provide a lubricant which shall have no detrimental effect on the gasket or pipe and is specifically recommended by the gasket manufacturer.

B. Elastomeric Compound Gaskets. For PVC pipe, use push-on type joints with a compression-type vulcanized high-grade elastomeric compound gasket meeting requirements of ASTM D 3212. Provide a lubricant which has no detrimental effect on the pipe or the gasket.

2.03 INLET MATERIAL

A. Cast Iron. Furnish cast iron inlet material conforming to ASTM A 48 for Class 20, gray cast iron. Provide castings that are clean, perfect, free from sand or blow holes or other defects. Holes in the cover must be clean and free from plugs. Machine bearing surfaces of inlet frames and grates or plates so that grates or plates will bear evenly when seated in the frames.

B. Brick. Provide brick made from clay or shale and meeting ASTM C 32, Grade MS, except that not more than 16 percent maximum absorption by 65-hour boiling will be permitted for individual brick. Use only first quality, sound, hardburned, perfectly shaped bricks.

C. Mortar. Furnish mortar conforming to ASTM C 270, Mortar Type S using Portland Cement.

D. Aggregate for Mortar. Use aggregate conforming to ASTM C 144.

PART 3 EXECUTION

3.01 EXCAVATION

A. Dig the trench and bottom as specified in Section 31 23 00, Excavation, Filling and Backfilling for Site Utilities, and as detailed on the drawings.

3.02 PIPE BEDDING

A. Lay pipe on Class A bedding as shown and specified in Earthwork for Site Utilities.

3.03 PIPE INSTALLATION

A. Pipe Sewers and Culverts. Furnish and place in position, as directed, all necessary stakes, grade and batter boards for locating work. Do not place pipe until the excavation has been completed, the bottom of the trench shaped, proper bedding material placed and approval by the Architect/Engineer for condition, line and grade has been obtained. Lay pipe accurately to line and grade in a straight line with spigot or tongue end of the pipe pointing in the direction of flow. Fit pipes together and match them so that when laid, the pipe will form a sewer or culvert with a smooth and uniform invert. Where shown on plans or as approved, pipe and culverts may be jacked, bored or tunneled as specified in Section 02400, Jacking, Boring or Tunneling Pipe.

B. Steel or Aluminum Structural Plate Pipe Arch. Haul pipe sections to the site for field spraying and assembly.
   1. Field spray pipe inside and out using a Hydra-Mastic spray pump. Apply a coating at least 0.05 inches thick. Clean and dry the surface to be sprayed. Use a gun with a No. 551 orifice and an air line from the compressor to the pump at least 3/4-inch inside diameter. After pipe installation, respray skinned spots to maintain the original 0.05-inch thickness.
   2. Assemble corrugated structural plate sections progressively, in accordance with the manufacturer's assembly instructions. Use only a sufficient number of bolts to hold plates loosely in position until assembly has been completed for four or more rings. Approximately three rings behind where plates are in position, insert all bolts not already in place and tighten nuts, tightening progressively through the structure. Tighten all nuts a second time to a torque of not less than 150 foot-pounds nor more than 250 foot-pounds. Where tests indicate loose bolts, properly tighten bolts in that area and make additional tests. Standard bolts are furnished in two lengths. Place short bolts where two plates lap. Place long bolts where three plates lap. Replace all service bolts used in drawing plates together with standard bolts.

3.04 CONCRETE PIPE OR BOX JOINT INSTALLATION

A. Cold Compound Joints.
   1. Bell and Spigot Pipe. Completely coat the inside surface of pipe bells and the outside surface of spigot ends with joint primer. Prime pipe only when the pipe is clean and dry. Apply coating sufficiently in advance so that primer will be thoroughly dry when pipe is laid. Pipe 24 inches and larger must be primed at the point of manufacture. Apply a fillet of compound on jute around the bottom half of inside of bell. Press enough dry twisted jute into the compound to pass around the pipe and lap at the top and shove home the spigot of the pipe. Bring the jute around the pipe, firmly caulking the jute into place. Jute should be sufficient to fill one-fourth of the depth of the bell. Fill the remaining three-fourths of the depth of bell with compound, taking care to leave no voids and to provide sufficient compound to form a fillet sloping 45 degrees from outer end of the bell to the barrel of the next pipe.
   2. Tongue-and-Groove Pipe or Box. With compound, coat both ends of the pipe with primer on all surfaces that will be in contact. Coat pipe only when the pipe is clean and dry. Allow the primer to dry before the pipe is laid. Pipe 24 inches and larger must be primed at the factory. After pipe has been set to proper line and grade in the trench, trowel or otherwise apply to the groove end of the pipe a 1/2-inch-thick layer of compound. Cover

about two-thirds of the joint face around the entire circumference. Next, shove home the tongue end of the next pipe with sufficient pressure to make a tight joint. Take care to avoid leaving ridges of compound projecting into the pipe in a manner that would obstruct flow. Make necessary adjustments in the quality and consistency of the compound, as directed.

3. Band for Tongue-and-Groove Pipe or Box. Install an outside band of joint compound completely around the circumference of the pipe at the joint. This will necessitate digging bell holes at each joint. The band must have a thickness at the center of at least 3/4 inch tapering uniformly to nothing approximately 3 inches each side of center. Where Type A bedding is used, the band may be omitted on the portions of the joint that will be embedded in cement stabilized sand bedding.

B. Neoprene or Rubber Gasket Joints. Rubber gaskets meeting ASTM C 443 may be used in jointing concrete pipe. Ends of the pipe must be accurately made and designed for use with gaskets.

1. Lay the pipe sections in the trench to true alignment and grade. Take exceptional care in placing pipe and making field joints.
2. Properly lubricate the groove end of the pipe and rubber gasket with flax soap or equal. Mineral lubricants will not be permitted.
3. Stretch a gasket over the spigot end of the pipe and carefully seat the gasket in the groove. Do not twist, roll, cut, crimp, or otherwise injure gaskets or force them out of position during closure of the joint.
4. Joints in pipe 12 inches and over may be pulled home by suitable winch, come-along or jack, 3 tons minimum capacity. Correct joint rebound before backfilling pipe.
5. Pull or push home pipe smaller than 12 inches in diameter by suitable means. Remove foreign matter or dirt from the pipe and keep the pipe clean during and after laying.

C. Positioning. Joints made with cold compound may be pulled home by means of a suitable winch or other suitable power equipment or a come-along. Do not use a bar stuck into the ground for positioning joints on pipe larger than 10 inches. A bar may be used to push home the joints in pipe 10 inches and smaller, provided the joints are pushed all the way home. Positioning joints multiplied by the laying length per joint must equal the actual length of sewer in any given section. Pull pipe home in a straight line with all parts of the pipe on the line and grade. Do not permit horizontal or vertical movement of the pipe during or after the pulling operation. Pull or push home rubber gasket joints by any suitable means that will provide adequate pressure to ensure proper assembly of the joint. Use special care to ensure that the joints in accordance with the published instructions of the manufacturer. Do not point the outside of joints with mortar.

3.05 CORRUGATED STEEL OR ALUMINUM COUPLING INSTALLATION

A. Preparation. Keep the space between the pipe and connecting bands free from dirt and grit so that the corrugations fit snugly. While tightening the connecting band, tap the band with a soft-headed mallet made of wood, rubber or plastic to take up slack and to ensure a tight joint. After jointing, fill the annular space between abutting sections with bituminous material.

B. Standard Field Joints. Unless otherwise specified, make field joints with outside bands, each band consisting of one or two pieces. Provide the type, size and gauge of the band and the size of angles and bolts as indicated or, where not indicated, as specified in the applicable standards or specifications for the pipe.

C. Rubber-Type Gasketed Joints.

1. Make gaskets used with circular pipe having not over 5 percent ellipse of 3/8-inch-thick by 1/2-inch minimum width closed-cell expanded synthetic rubber. Fabricate the gasket in the form of a cylinder with a diameter approximately 10 percent less than the nominal pipe size. Provide gasket material conforming to the requirements of ASTM C 443.

2. Furnish connecting bands of the angle-lug, rod-and-lug, or U-bolt type. Provide the type, size and gauge of band and the size of angles, bolts, rods and U-bolts as indicated or, where not indicated, as specified in the applicable standards or specifications for the pipe.
3. Install gaskets in accordance with the recommendations of the gasket manufacturer. Use lubricants and cements recommended by the manufacturer and comply with the manufacturer's installation requirements.
4. Place the gasket over one end of the section of pipe for half the width of the gasket. Double the other half over the end of the same pipe. When the adjoining section of pipe is in place, roll the doubled-over half of the gasket over the adjoining section. Correct any unevenness in overlap so that the gasket covers the ends of the pipe sections equally. Center the connecting bands over the adjoining sections of pipe, place the rods or bolts in position and tighten the nuts. Tighten the band evenly, keeping even tension on the rods or bolts. Verify that the gasket is seating properly in the corrugations.

3.06 PUSH-ON TYPE JOINT INSTALLATION

A. Preparation. Clean the bell and rubber gasket so that no foreign material can interfere with the assembly of the pipe spigot. Clean the pipe spigot with a clean dry cloth. Lubricate the spigot end of the pipe with a material specifically recommended by the pipe manufacturer. Cover entire spigot end circumference. Do not allow any bedding material to touch the spigot after it has been lubricated.

B. Assembly. Insert the spigot end into the bell so that it is in contact with the rubber gasket. Keep the pipe lengths in proper alignment. Brace the bell while the spigot is pushed in under the rubber gasket. Pipe can be pushed home by hand or by bar and block. Stabbing pipe is not permitted. Complete joint assembly as recommended by the pipe manufacturer's installation requirements.

3.07 INLET INSTALLATION

A. All inlets to be pre cast Park Inlets.

3.08 BACKFILL

A. Pipe Sewers and Culverts. Backfill the trench in accordance with Section 02321, Earthwork for Site Utilities, and with details shown on the drawings.

B. Inlets.
   1. Bed the inlet structure on a 6-inch layer of cement-stabilized sand compacted to 95 percent Standard Density in accordance with AASHTO Test Method T-99.
   2. Backfill with cement-stabilized sand around that portion of the inlet that will be underneath the proposed pavement. Place cement-sand in 8-inch lifts. Compact backfill to 95 percent Standard Density in accordance with AASHTO Test Method T-99. Place additional backfill from select local material in 8-inch lifts and compact to 95 percent Standard Density (AASHTO T-99). Select local material having a PI less than 7.

END OF SECTION

SECTION 02767
THERMOPLASTIC PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This item includes the application of thermoplastic pavement markings, in conformance with the minimum optical and physical properties required for a thermoplastic road marking compound described herein, in a molten state, onto a pavement surface.

1.02 RELATED SECTIONS

A. Section 01270 — Measure and Payment

B. Section 02762 — Blast Cleaning of Pavement

1.03 MEASUREMENT AND PAYMENT

A. Unit Prices

1. Payment for thermoplastic pavement markings is on a linear foot basis.
2. Payment for words and symbols is for each word or symbol.
3. Payment for green colored pavement markings is on a square foot basis.
4. Payment for railroad crossing markings, to include stop line and two transverse lines, is for each crossing marked. For multi-lane approaches to railroad crossings, the solid 8-inch lines will be measured in linear feet, complete in place.
5. Unit price bid for each item shall be full compensation for materials, application of pavement markings, equipment, labor, tools, and incidentals necessary to complete Work in accordance with the plans and specifications.
6. Refer to Section 01270 — Measure and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). When Contract is Stipulated Price Contract, payment for work in the Section is included in total Stipulated Price.

1.04 REFERENCES

A. FHWA memorandum dated 4/15/2011: “Interim Approval for Optional Use of Green Colored Pavement for Bike Lanes (IA-14).”

B. TxDOT DMS-8220, “Hot Applied Thermoplastic.”

C. Texas Manual on Uniform Traffic Control Devices.

1.05 QUALITY ASSURANCE

A. Acceptance

1. Sampling Procedure. Random samples may be taken at the job site at the discretion of the City Traffic Engineer for quality assurance. The City reserves the right to conduct the tests deemed necessary to identify component materials and verify results of specific tests indicated in conjunction with the specification requirements.
2. The samples shall be labeled as to the shipment number, lot number, date, quantity, and any other pertinent information. At least three randomly selected bags shall be obtained from each lot. A 10-pound sample from the three bags shall be submitted for testing and acceptance. The lot size shall be approximately 44,000 pounds unless the total order is less than this amount.

B. Notification

1. The Contractor shall notify the Construction Inspector 72 hours prior to the placement of the thermoplastic markings to enable the inspector to be present during the application operation. At the time of notification, the Contractor shall indicate the manufacturer and the lot numbers of the thermoplastic that will be used.
2. A check shall be made by the Contractor to ensure that the approved lot numbers appear on the material package. Failure to do so is cause for rejection.

STATE OF TEXAS
SARA KAROUNI
145244
LICENSED PROFESSIONAL ENGINEER
08/07/2026
F-9756

1.06 DELIVERY, STORAGE, AND HANDLING

A. Packaging
   1. Containers. The thermoplastic material shall be delivered in 50-pound containers or bags of sufficient strength to permit normal handling during shipment and handling on the job without loss of material.
   2. Labeling. Each container shall be clearly marked to indicate the color of the material, the process batch number and/or manufacturer's formulation number, the manufacturer's name and address, and the date of manufacture.

1.07 WARRANTY

A. Warranty or Guarantee. If the normal trade practice for manufacturers is to furnish warranties or guarantees for the materials and equipment specified herein, the Contractor shall turn the guarantees and warranties over to the Engineer for potential dealing with the manufacturers. The extent of such warranties or guarantees will not be a factor in selecting the successful bidder.

PART 2 PRODUCTS

2.01 MATERIALS

A. All materials shall conform to the requirements of TxDOT DMS-8220, “Hot Applied Thermoplastic.” Thermoplastic materials shall be stored in a dry environment to minimize the amount of moisture retained during storage.

B. Materials used for green colored pavement (bicycle green) shall be manufactured with appropriate pigment to ensure that the resulting colors comply with the Light Green color as specified in the FHWA memorandum dated 4/15/2011, “Interim Approval for Optional Use of Green Colored Pavement for Bike Lanes (IA-14).” Green colored pavement is defined as transverse markings.

2.02 SOURCE QUALITY CONTROL

A. Manufacturer’s Responsibility

1. Sampling and Testing. The manufacturer shall submit test results from an approved independent laboratory. All material samples shall be obtained 20 days in advance of the pavement marking operations. The cost of testing shall be included in the price of thermoplastic material. The approved independent laboratory’s test results shall be submitted to the City Traffic Engineer in the form of a certified test report.
2. Bill of Lading. The manufacturer shall furnish the Material and Tests Laboratory with copies of Bills of Lading for all materials inspected. Bill of Lading shall indicate the consignee and destination, date of shipment, lot numbers, quantity, type of material, and location of source.
3. Material Acceptance. Final acceptance of a particular lot of thermoplastic will be based on the following:
    a. Compliance with the specification for material composition requirements, verified by an approved independent laboratory with test results.
    b. Compliance with the specification for the physical properties required, verified by an approved independent laboratory with test results.
    c. Manufacturer’s test results for each lot of thermoplastic have been received.
    d. Identification requirements are satisfactory

PART 3 EXECUTION

3.01 EQUIPMENT

A. Provide the necessary equipment to conduct the work specified herein. All equipment shall be maintained in good working order such that neat and clean thermoplastic markings are applied at the proper thicknesses and glass beads are placed at the correct rate. Equipment that is deemed deficient by the Engineer shall be replaced immediately.

3.02 CONSTRUCTION

A. The appearance of the finished markings shall have a uniform surface, crisp edges with minimum overspray, clean cutoff, meet straightness requirements, and conform to the design drawings and/or Engineer's instructions.

B. The Contractor shall provide the Engineer with certification from the marking manufacturer that the Contractor has been adequately trained and certified to apply the manufacturer's material. This certification shall be considered current if the certification date provided by the manufacturer is within two years of the date of marking application.

C. All striping and pavement markings shall be placed in accordance with the requirements of this specification, the detailed plans, and the current edition of the Texas Manual on Uniform Traffic Control Devices (TMUTCD). The Contractor shall provide all other engineering services necessary for pre-marking of all proposed stripe within the limits of the designated Work.

D. Unless authorized otherwise in writing by the Engineer, striping shall be accomplished during daylight hours. Approved lighting arrangements will be required for nighttime operations when allowed. The Contractor may be required to place markings over existing markings, as determined by the Engineer. The Contractor shall adjust the operation of the thermoplastic screed shoe to match the previous lengths of stripes and skips, when necessary.

E. Failure of the striping material to adhere to the pavement surface during the life of the Contract shall be prima facie evidence that the materials, even though complying with these specifications, or the application thereof, was inconsistent with the intent of the requirements for the Work under the latest City specifications and shall be cause for ordering corrective action or replacement of the marking without additional cost to the City.

F. Unless otherwise approved by the Engineer, permanent pavement markings on newly constructed pavements surfaced with asphaltic concrete or bituminous seals shall not be applied for a minimum of 14 days or a maximum of 35 days. Temporary pavement marking shall be provided during the 14- to 35-day period.

G. Surface Preparation

1. Moisture. All surfaces shall be inspected for moisture content prior to application of thermoplastic. Approximately two square feet of clear plastic or tar paper shall be laid on the road surface and held in place for 15 to 20 minutes. The underside of the plastic or tar paper shall then be inspected for a buildup of condensed moisture from the road surface. Pavement is considered dry if there is no condensation on the underside of the plastic or tar paper. In the event of moisture, this test shall be repeated until there is no moisture on the underside of the plastic or tar paper.
2. Cleaning. All surfaces shall be clean and dry before thermoplastic can be applied. Loose dirt and debris shall be removed by thoroughly blowing compressed air over the area to be striped. If the thermoplastic is to be applied over existing paint lines, the paint line shall be swept with a mechanical sweeper or wire brush to remove poorly adhered paint and dirt that would interfere with the proper bonding of the thermoplastic. Additional cleaning through the use of compressed air may be required to remove embedded dirt and debris after sweeping. Laitance and curing compound shall be removed from all new Portland

cement concrete surfaces in accordance with Section 02762, “Blast Cleaning of Pavement.”

3. Layout. The pavement markings shall be placed in proper alignment with guidelines established on the roadway. Deviation from the alignment established shall not exceed 2 inches and, in addition, the deviation in alignment of the marking being placed shall not exceed 1 inch per 200 feet of roadway, nor shall any deviation be abrupt.
4. No striping material shall be applied over a guide cord; only longitudinal joints, existing stripes, primer, or other approved type guides will be permitted. In the absence of a longitudinal joint or existing stripe, the Contractor shall mark the points necessary for placing the proposed stripe. Edge striping shall be adjusted as necessary so that the edge stripe will be parallel to the centerline and shall not be placed off the edge of the pavement.
5. Longitudinal markings shall be offset at least 2 inches from construction joints of Portland cement concrete surfaces and joints and shoulder breaks of asphalt surfaces.
6. Primer Sealer. Primer sealer shall be used on all Portland cement concrete surfaces. A primer sealer shall be used on asphalt surfaces that are over two years old and/or on asphalt surfaces that are worn or oxidized to a condition where 50 percent or more of the wearing surface is exposed aggregate. Existing pavement markings may act as the primer sealer if, after cleaning, more than 70 percent of the existing pavement marking is still properly bonded to the asphalt surface.

H. Primer Sealer Application. When required as described, the primer-sealer shall be applied to the road surface in a continuous film at a minimum thickness of 3 to 5 mils. Before the thermoplastic is applied, the primer-sealer shall be allowed to dry to a tacky state. The thermoplastic shall be applied within 4 hours after the primer application.

I. Temperature Requirements
   1. Ambient Conditions. The ambient air and road surface shall be 55°F and rising before application of thermoplastic can begin.
   2. Material Requirements. Unless otherwise specified by the material manufacturer, the thermoplastic compound shall be heated from 400°F to 450°F and shall be a minimum of 400°F as it makes contact with the road surface during application. An infrared temperature gun shall be used to determine the temperature of the thermoplastic as it is being applied to the road surface.

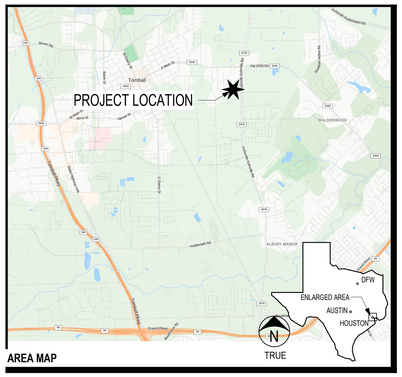
J. Drop-on Glass Sphere Application
   1. Application Rate. Retroreflective glass spheres shall be applied at the rate of 10 pounds per 100 square feet of applied markings. This application rate shall be determined by confirming the following consumption rates:
      a. 200 pounds of drop-on glass spheres per ton of applied thermoplastic when the thermoplastic is being applied at 0.090-inch film thickness.
      b. 150 pounds of drop-on glass spheres per ton of applied thermoplastic when the thermoplastic is being applied at 0.125-inch film thickness.
   2. Application Method. Retroreflective glass spheres shall be applied by a mechanical dispenser properly calibrated and adjusted to provide proper application rates and uniform distribution of the spheres across the cross section of the entire width of the line. To enable the spheres to embed themselves into the hot thermoplastic, the sphere dispenser shall be positioned immediately behind the thermoplastic application device. This ensures that the spheres are applied to the thermoplastic material while it is still in the molten state.

K. Application Thickness
   1. Longitudinal and Transverse Markings. On previously unmarked pavements or pavements where markings have been effectively removed, all lane lines, centerlines, transverse markings, and pavement markings in traffic areas with ≤1,000 vehicles per day per lane shall have a minimum film thickness of 0.090 inch at the edges and a maximum of 0.145

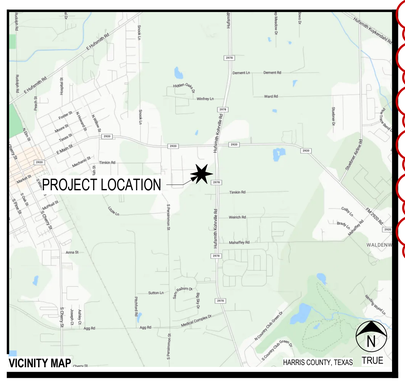
inch at the center. A minimum average film thickness of 0.090 inch shall be maintained. On pavements with existing markings meeting the traffic requirements stated above, all lane lines, centerlines, transverse markings, and pavement markings shall have a minimum film thickness of 0.060 inch for reapplication over existing stripe line.

2. High-Wear Longitudinal and Transverse Markings. On previously unmarked pavements or pavements where markings have been effectively removed, all lane lines, centerlines, transverse markings, and pavement markings in high-traffic areas (>1,000 vehicles per day per lane) shall have a minimum film thickness of 0.125 inch at the edges and a maximum of 0.188 inch at the center. A minimum average film thickness of 0.125 inch shall be maintained. On pavements with existing markings meeting the traffic requirements stated above, all lane lines, centerlines, transverse markings, and pavement markings shall have a minimum film thickness of 0.090 inch for reapplication over existing stripe line.

END OF SECTION



AREA MAP



VICINITY MAP

ALTERNATE #1: SECTION 23 6426 ROTARY SCREW WATER CHILLERS - OWNER WILL SELECT ONE ALTERNATE FROM 1A-1C TO BE INCLUDED WITH THE BASE PROPOSAL. DO NOT INCLUDE ROTARY SCREW WATER CHILLERS IN THE BASE PROPOSAL.
1A: PROVIDE ROTARY-SCREW WATER CHILLERS AS MANUFACTURED BY CARRIER CORPORATION AS SPECIFIED AND AS SHOWN ON THE DRAWINGS.
1B: PROVIDE ROTARY-SCREW WATER CHILLERS AS MANUFACTURED BY TRANE TECHNOLOGIES PLC AS SPECIFIED AND AS SHOWN ON THE DRAWINGS.
1C: PROVIDE ROTARY-SCREW WATER CHILLERS AS MANUFACTURED BY JCI/YORK CORPORATION AS SPECIFIED AND AS SHOWN ON THE DRAWINGS.

ALTERNATE #2:SECTION 23 7313 - MODULAR CENTRAL STATION AIR HANDLING UNITS - OWNER WILL SELECT ONE ALTERNATE FROM ALTERNATES 2A-2C TO BE INCLUDED WITH THE BASE PROPOSAL. DO NOT INCLUDE MODULAR CENTRAL STATION AIR HANDLING UNITS IN THE BASE PROPOSAL.
2A: PROVIDE MODULAR CENTRAL-STATION AIR-HANDLING UNITS AS MANUFACTURED BY CARRIER AS SPECIFIED AND AS SHOWN ON THE DRAWINGS.
2A: PROVIDE MODULAR CENTRAL-STATION AIR-HANDLING UNITS AS MANUFACTURED BY TRANE TECHNOLOGIES AS SPECIFIED AND AS SHOWN ON THE DRAWINGS.
2C: PROVIDE MODULAR CENTRAL-STATION AIR-HANDLING UNITS AS MANUFACTURED BY JCI/YORK AS SPECIFIED AND AS SHOWN ON THE DRAWINGS

ALTERNATE #3: SECTION 23 0923 - DIRECT DIGITAL CONTROL DEVICES FOR HVAC - OWNER WILL SELECT ONE ALTERNATE FROM ALTERNATES 3A-3B TO BE INCLUDED WITH THE BASE PROPOSAL. DO NOT INCLUDE DIRECT DIGITAL CONTROL FOR HVAC IN THE BASE PROPOSAL.
3A: PROVIDE DDC DEVICES FOR HVAC AS MANUFACTURED BY AUTOMATED LOGIC AS SPECIFIED AND SHOWN IN THE DRAWINGS.
3B: PROVIDE DDC DEVICES FOR HVAC AS MANUFACTURED BY UNIFY CONTROLS AS SPECIFIED AND AS SHOWN IN THE DRAWINGS.

ALTERNATE #4: PROVIDE PEX PIPING IN LIEU OF 1-1/2" PIPE AND BELOW COPPER PIPING

ALTERNATE #5: PROVIDE STRIPING WITHIN FIRE TURNING CIRCLE AS SPECIFIED AND AS SHOWN ON THE AS DRAWING SHEETS.

ALTERNATE #6: PROVIDE OPTIONAL ADJUSTMENT TO BASE PROPOSAL.

ALTERNATES

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Revision /	Date	
1	08/07/26	ADDENDUM 02

VOLUME 01

GENERAL	
G1.11	COVER SHEET - VOLUME 01
G1.12	GENERAL DATA - VOLUME 01
G2.01	CODE ANALYSIS MASTER PLAN - LEVEL 01
G2.02	CODE ANALYSIS MASTER PLAN - LEVEL 02
G2.03	FIRE PROOFING PLAN - SECOND FLOOR ASSEMBLY
G2.04	FIRE PROOFING PLAN - ROOF PLAN
G3.01	ROOF, EXTERIOR WALL, & INTERIOR PARTITION TYPES
G3.02	TYPICAL INTERIOR PARTITION DETAILS
G3.03	TYPICAL INTERIOR PARTITION DETAILS
G3.04	WALL PENETRATIONS - GYP BD
G3.05	WALL PENETRATIONS - ACOUSTICAL
G3.06	WALL PENETRATIONS - CMU
G4.01	TEA COMPLIANCE
G5.01	SCHEDULE OF MATERIALS AND COLORS
G5.02	SCHEDULE OF MATERIALS AND COLORS
CIVIL	
C0.0	COVER SHEET
C0.1	PLAT 1 OF 3
C0.2	PLAT 2 OF 3
C0.3	PLAT 3 OF 3
C0.4	TOPOGRAPHIC SURVEY 1 OF 4 (FOR REFERENCE ONLY)
C0.5	TOPOGRAPHIC SURVEY 2 OF 4 (FOR REFERENCE ONLY)
C0.6	TOPOGRAPHIC SURVEY 3 OF 4 (FOR REFERENCE ONLY)
C0.7	TOPOGRAPHIC SURVEY 4 OF 4 (FOR REFERENCE ONLY)
C1.1	CITY OF TOMBALL GENERAL NOTES
C1.2	GENERAL NOTES
C1.3	OVERALL LAYOUT
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E3.1D	LIGHTING RCP - LEVEL 01 - AREA D
E3.1E	LIGHTING RCP - LEVEL 01 - AREA E
E3.1F	LIGHTING RCP - LEVEL 01 - AREA F
E3.2A	LIGHTING RCP - LEVEL 02 - AREA A
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E6.03	ELECTRICAL DETAILS
E6.04	ELECTRICAL DETAILS
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T1.01	MASTER FLOOR PLAN - LEVEL 01
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T1.1B	FLOOR PLAN - LEVEL 01 - AREA B
T1.1C	FLOOR PLAN - LEVEL 01 - AREA C
T1.1D	FLOOR PLAN - LEVEL 01 - AREA D
T1.1E	FLOOR PLAN - LEVEL 01 - AREA E
T1.1F	FLOOR PLAN - LEVEL 01 - AREA F
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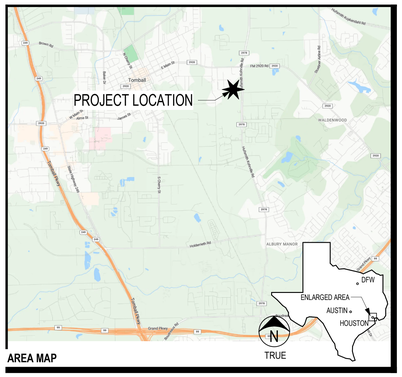
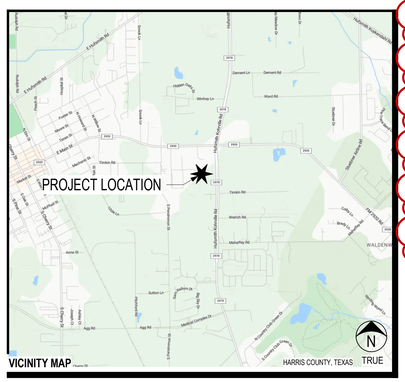
T1.2C	FLOOR PLAN - LEVEL 02 - AREA C
T1.2D	FLOOR PLAN - LEVEL 02 - AREA D
T1.2E	FLOOR PLAN - LEVEL 02 - AREA E
T2.1A	REFLECTED CEILING PLAN - LEVEL 01 - AREA A
T2.1B	REFLECTED CEILING PLAN - LEVEL 01 - AREA B
T2.1C	REFLECTED CEILING PLAN - LEVEL 01 - AREA C
T2.1D	REFLECTED CEILING PLAN - LEVEL 01 - AREA D
T2.1E	REFLECTED CEILING PLAN - LEVEL 01 - AREA E
T2.1F



AREA MAP



VICINITY MAP

ALTERNATE #1: SECTION 23 6426 ROTARY SCREW WATER CHILLERS - OWNER WILL SELECT ONE ALTERNATE FROM 1A-1C TO BE INCLUDED WITH THE BASE PROPOSAL. DO NOT INCLUDE ROTARY SCREW WATER CHILLERS IN THE BASE PROPOSAL.
1A: PROVIDE ROTARY-SCREW WATER CHILLERS AS MANUFACTURED BY CARRIER CORPORATION AS SPECIFIED AND AS SHOWN ON THE DRAWINGS.
1B: PROVIDE ROTARY-SCREW WATER CHILLERS AS MANUFACTURED BY TRANE TECHNOLOGIES PLC AS SPECIFIED AND AS SHOWN ON THE DRAWINGS.
1C: PROVIDE ROTARY-SCREW WATER CHILLERS AS MANUFACTURED BY JCI/YORK CORPORATION AS SPECIFIED AND AS SHOWN ON THE DRAWINGS.

ALTERNATE #2:SECTION 23 7313 - MODULAR CENTRAL STATION AIR HANDLING UNITS - OWNER WILL SELECT ONE ALTERNATE FROM ALTERNATES 2A-2C TO BE INCLUDED WITH THE BASE PROPOSAL. DO NOT INCLUDE MODULAR CENTRAL STATION AIR HANDLING UNITS IN THE BASE PROPOSAL.
2A: PROVIDE MODULAR CENTRAL-STATION AIR-HANDLING UNITS AS MANUFACTURED BY CARRIER AS SPECIFIED AND AS SHOWN ON THE DRAWINGS.
2A: PROVIDE MODULAR CENTRAL-STATION AIR-HANDLING UNITS AS MANUFACTURED BY TRANE TECHNOLOGIES AS SPECIFIED AND AS SHOWN ON THE DRAWINGS.
2C: PROVIDE MODULAR CENTRAL-STATION AIR-HANDLING UNITS AS MANUFACTURED BY JCI/YORK AS SPECIFIED AND AS SHOWN ON THE DRAWINGS

ALTERNATE #3: SECTION 23 0923 - DIRECT DIGITAL CONTROL DEVICES FOR HVAC - OWNER WILL SELECT ONE ALTERNATE FROM ALTERNATES 3A-3B TO BE INCLUDED WITH THE BASE PROPOSAL. DO NOT INCLUDE DIRECT DIGITAL CONTROL FOR HVAC IN THE BASE PROPOSAL.
3A: PROVIDE DDC DEVICES FOR HVAC AS MANUFACTURED BY AUTOMATED LOGIC AS SPECIFIED AND SHOWN IN THE DRAWINGS.
3B: PROVIDE DDC DEVICES FOR HVAC AS MANUFACTURED BY UNIFY CONTROLS AS SPECIFIED AND AS SHOWN IN THE DRAWINGS.

ALTERNATE #4: PROVIDE PEX PIPING IN LIEU OF 1-1/2" PIPE AND BELOW COPPER PIPING

ALTERNATE #5: PROVIDE STRIPING WITHIN FIRE TURNING CIRCLE AS SPECIFIED AND AS SHOWN ON THE AS DRAWING SHEETS.

ALTERNATE #6: PROVIDE OPTIONAL ADJUSTMENT TO BASE PROPOSAL.

ALTERNATES

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Revision /	Date	
1	08/07/26	ADDENDUM 02

Project:

TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

VOLUME 01

GENERAL	
G1.11	COVER SHEET - VOLUME 01
G1.12	GENERAL DATA - VOLUME 01
G2.01	CODE ANALYSIS MASTER PLAN - LEVEL 01
G2.02	CODE ANALYSIS MASTER PLAN - LEVEL 02
G2.03	FIRE PROOFING PLAN - SECOND FLOOR ASSEMBLY
G2.04	FIRE PROOFING PLAN - ROOF PLAN
G3.01	ROOF, EXTERIOR WALL, & INTERIOR PARTITION TYPES
G3.02	TYPICAL INTERIOR PARTITION DETAILS
G3.03	TYPICAL INTERIOR PARTITION DETAILS
G3.04	WALL PENETRATIONS - GYP BD
G3.05	WALL PENETRATIONS - ACOUSTICAL
G3.06	WALL PENETRATIONS - CMU
G4.01	TEA COMPLIANCE
G5.01	SCHEDULE OF MATERIALS AND COLORS
G5.02	SCHEDULE OF MATERIALS AND COLORS
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C0.1	PLAT 1 OF 3
C0.2	PLAT 2 OF 3
C0.3	PLAT 3 OF 3
C0.4	TOPOGRAPHIC SURVEY 1 OF 4 (FOR REFERENCE ONLY)
C0.5	TOPOGRAPHIC SURVEY 2 OF 4 (FOR REFERENCE ONLY)
C0.6	TOPOGRAPHIC SURVEY 3 OF 4 (FOR REFERENCE ONLY)
C0.7	TOPOGRAPHIC SURVEY 4 OF 4 (FOR REFERENCE ONLY)
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C1.2	GENERAL NOTES
C1.3	OVERALL LAYOUT
C1.4	DEMOLITION PLAN
C2.1	STORM WATER POLLUTION PREVENTION PLAN
C2.2	STORM WATER POLLUTION PREVENTION PLAN DETAILS
C3.1	DIMENSION CONTROL & SIGNAGE PLAN (1 OF 2)
C3.2	DIMENSION CONTROL & SIGNAGE PLAN (2 OF 2)
C4.1	GRADING PLAN (1 OF 2)
C4.2	GRADING PLAN (2 OF 2)
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C5.2	UTILITY PLAN -WATER & SANITARY (2 OF 2)
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C6.1	UTILITY PLAN -STORM SEWER (1 OF 2)
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C7.2	DRAINAGE CALCULATION
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C13.2	STORM WATER POLLUTION PREVENTION PLAN DETAILS
C14.1	PROPOSED DRIVEWAYS
C15.1	PROPSED LEFT TURN LANE
C16.1	PLAN & PROFILE - 8" SANITARY SEWER
C17.1	HARRIS COUNTY TRAFFIC CONTROL PLAN
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S1.04	MASTER PLAN - DIMENSION CONTROL - ROOF FRAMING PLAN
S1.05	MASTER PLAN - DEEP FOUNDATION ELEMENTS
S1.06	MASTER PLAN - ANCHOR ROD PLAN
S1.07	MASTER PLAN - FOUNDATION
S1.08	MASTER PLAN - FLOOR FRAMING
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S1.11	MASTER PLAN - JOIST LOADING
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S3.03	TYPICAL FOUNDATION DETAILS
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S3.06	FOUNDATION DETAILS
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S7.05	TYPICAL FRAMING DETAILS - ROOF
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S7.11	FRAMING SECTIONS
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S7.21	FRAMING SECTIONS
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A1.01	MASTER FLOOR PLAN - LEVEL 1
A1.1A	FLOOR PLAN - LEVEL 1 - AREA A
A1.1B	FLOOR PLAN - LEVEL 1 - AREA B
A1.1C	FLOOR PLAN - LEVEL 1 - AREA C
A1.1D	FLOOR PLAN - LEVEL 1 - AREA D
A1.1E	FLOOR PLAN - LEVEL 1 - AREA E
A1.1F	FLOOR PLAN - LEVEL 1 - AREA F
A1.02	MASTER FLOOR PLAN - LEVEL 2
A1.2B	FLOOR PLAN - LEVEL 2 - AREA B
A1.2C	FLOOR PLAN - LEVEL 2 - AREA C
A1.2D	FLOOR PLAN - LEVEL 2 - AREA D
A1.2E	FLOOR PLAN - LEVEL 2 - AREA E
A1.30	FLOOR PLAN - EQUIPMENT PLATFORMS
A1.31	TOILET ACCESSORIES AND PLUMBING FIXTURES
A1.32	TOILET ROOMS AND COMPARTMENTS
A1.33	ENLARGED PLANS - TOILETS
A1.34	ENLARGED PLANS - STAIRS
A1.35	ENLARGED PLANS - STAIRS
A1.36	ENLARGED PLANS - STAIRS
A1.37	ENLARGED PLANS - LEARNING STAIRS
A1.38	ENLARGED PLANS - LEARNING STAIRS
A1.39	ENLARGED PLANS - LEARNING STAIRS
A1.40	ENLARGED PLANS - RAMPS AND ELEVATORS
A1.41	PLAN DETAILS
A1.42	PLAN DETAILS
A1.43	PLAN DETAILS
A1.44	PLAN DETAILS
A1.45	PLAN DETAILS
A1.49	EXPANSION JOINT DETAILS
A1.50	DIMENSIONAL CONTROL PLAN
A2.01	MASTER REFLECTED CEILING PLAN - LEVEL 01
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A2.1C	REFLECTED CEILING PLAN - LEVEL 01 - AREA C
A2.1D	REFLECTED CEILING PLAN - LEVEL 01 - AREA D
A2.1E	REFLECTED CEILING PLAN - LEVEL 01 - AREA E
A2.1F	REFLECTED CEILING PLAN - LEVEL 01 - AREA F
A2.02	MASTER REFLECTED CEILING PLAN - LEVEL 02
A2.2A	REFLECTED CEILING PLAN - LEVEL 02 - AREA A
A2.2B	REFLECTED CEILING PLAN - LEVEL 02 - AREA B
A2.2C	REFLECTED CEILING PLAN - LEVEL 02 - AREA C
A2.2D	REFLECTED CEILING PLAN - LEVEL 02 - AREA D
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A3.13	TYP. MASONRY VENEER/CMU/SF DETAILS
A3.14	TYP. MASONRY VENEER/CFMF/CW DETAILS
A3.15	TYP. MASONRY VENEER/CMU/CW DETAILS
A3.16	TYP. MASONRY VENEER & METAL PANEL/CFMF/HM DETAILS
A3.17	TYP. MASONRY VENEER/CMU/HM DETAILS
A3.18	TYP. METAL PANEL/CFMF/SF DETAILS
A3.19	TYP. METAL PANEL/CMU/SF DETAILS
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A3.21	TYP. EXT. OVERHEAD BI-FOLD DOOR
A4.01	MASTER FINISH PLAN - LEVEL 01
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A4.1B	FINISH PLAN - LEVEL 01 - AREA B
A4.1C	FINISH PLAN - LEVEL 01 - AREA C
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A4.1E	FINISH PLAN - LEVEL 01 - AREA E
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A4.02	MASTER FINISH PLAN - LEVEL 02
A4.2B	FINISH PLAN - LEVEL 02 - AREA B
A4.2C	FINISH PLAN - LEVEL 02 - AREA C
A4.2D	FINISH PLAN - LEVEL 02 - AREA D
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A4.30	FINISH PLAN - EQUIPMENT PLATFORMS
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A4.36	INTERIOR ELEVATIONS
A4.37	INTERIOR ELEVATIONS
A4.38	INTERIOR ELEVATIONS
A4.39	INTERIOR ELEVATIONS
A4.40	INTERIOR ELEVATIONS
A4.41	INTERIOR ELEVATIONS
A4.42	INTERIOR ELEVATIONS
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A4.44	INTERIOR DETAILS AND TYPICAL INTERIOR FINISH DETAILS
A4.45	INTERIOR FINISH DETAILS
A4.46	INTERIOR FINISH DETAILS
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A6.05	WALL SECTIONS
A6.06	WALL SECTIONS
A6.07	WALL SECTIONS
A6.08	WALL SECTIONS
A6.09	WALL SECTIONS
A6.10	WALL SECTIONS
A6.11	WALL SECTIONS
A6.12	WALL SECTIONS
A6.13	WALL SECTIONS
A6.14	WALL SECTIONS
A6.15	WALL SECTIONS
A6.16	WALL SECTIONS
A6.17	FOUNDATION DETAILS
A6.18	FOUNDATION DETAILS
A6.19	FOUNDATION DETAILS
A6.20	WALL SECTIONS - BASE FLASHING, ELEVATOR PIT, AND MASONRY DETAILS
A6.21	WALL SECTION DETAILS
A6.22	WALL SECTION DETAILS
A6.23	WALL SECTION DETAILS
A6.24	WALL SECTION DETAILS
A6.25	WALL SECTION DETAILS
A6.26	WALL SECTION DETAILS
A6.27	WALL SECTION DETAILS
A6.28	WALL SECTION DETAILS - ENLARGED
A6.29	WALL SECTION DETAILS - ENLARGED
A6.30	WALL SECTION DETAILS - ENLARGED
A6.31	WALL SECTIONS - STAIR DETAILS
A6.32	WALL SECTIONS - STAIR DETAILS
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A7.03	TYPICAL ROOFING DETAILS MOD-BIT
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A7.05	TYPICAL COMMON ROOFING DETAILS
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A8.1C	SIGNAGE & EQUIPMENT PLAN - LEVEL 01 - AREA C
A8.1D	SIGNAGE & EQUIPMENT PLAN - LEVEL 01 - AREA D
A8.1E	SIGNAGE & EQUIPMENT PLAN - LEVEL 01 - AREA E
A8.1F	SIGNAGE & EQUIPMENT PLAN - LEVEL 01 - AREA F
A8.2B	SIGNAGE & EQUIPMENT PLAN - LEVEL 02 - AREA B
A8.2C	SIGNAGE & EQUIPMENT PLAN - LEVEL 02 - AREA C
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P2.1C	PLUMBING PLAN - LEVEL 01 - AREA C
P2.1D	PLUMBING PLAN - LEVEL 01 - AREA D
P2.1E	PLUMBING PLAN - LEVEL 01 - AREA E
P2.1F	PLUMBING PLAN - LEVEL 01 - AREA F
P2.2A	PLUMBING PLAN - LEVEL 02 - AREA A
P2.2B	PLUMBING PLAN - LEVEL 02 - AREA B
P2.2C	PLUMBING PLAN - LEVEL 02 - AREA C
P2.2D	PLUMBING PLAN - LEVEL 02 - AREA D
P2.2E	PLUMBING PLAN - LEVEL 02 - AREA E
P2.2F	PLUMBING PLAN - LEVEL 02 - AREA F
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P4.03	PLUMBING ENLARGED PLAN - SCIENCE CLASSROOMS
P5.01	PLUMBING RISER DIAGRAMS
P5.02	PLUMBING RISER DIAGRAMS
P5.03	PLUMBING RISER DIAGRAMS
P5.04	PLUMBING RISER DIAGRAMS
P5.05	PLUMBING RISER DIAGRAMS
P5.06	PLUMBING RISER DIAGRAMS
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M0.01	MECHANICAL SYMBOL LEGEND
M0.02	MECHANICAL SCHEDULES
M0.03	MECHANICAL SCHEDULES
M2.1A	MECHANICAL PLAN - LEVEL 01 - AREA A
M2.1B	MECHANICAL PLAN - LEVEL 01 - AREA B
M2.1C	MECHANICAL PLAN - LEVEL 01 - AREA C
M2.1D	MECHANICAL PLAN - LEVEL 01 - AREA D
M2.1E	MECHANICAL PLAN - LEVEL 01 - AREA E
M2.1F	MECHANICAL PLAN - LEVEL 01 - AREA F
M2.2A	MECHANICAL PLAN - LEVEL 02 - AREA A
M2.2B	MECHANICAL PLAN - LEVEL 02 - AREA B
M2.2C	MECHANICAL PLAN - LEVEL 02 - AREA C
M2.2D	MECHANICAL PLAN - LEVEL 02 - AREA D
M2.2E	MECHANICAL PLAN - LEVEL 02 - AREA E
M2.2F	MECHANICAL PLAN - LEVEL 02 - AREA F
M2.3A	MECHANICAL PLAN - ROOF - AREA A, B, C
M2.3B	MECHANICAL PLAN - ROOF - AREA D, E, F
M3.1A	MECHANICAL PIPING PLAN - LEVEL 01 - AREA A
M3.1B	MECHANICAL PIPING PLAN - LEVEL 01 - AREA B
M3.1C	MECHANICAL PIPING PLAN - LEVEL 01 - AREA C
M3.1D	MECHANICAL PIPING PLAN - LEVEL 01 - AREA D
M3.1E	MECHANICAL PIPING PLAN - LEVEL 01 - AREA E
M3.1F	MECHANICAL PIPING PLAN - LEVEL 01 - AREA F
M3.2A	MECHANICAL PIPING PLAN - LEVEL 02 - AREA A
M3.2B	MECHANICAL PIPING PLAN - LEVEL 02 - AREA B
M3.2C	MECHANICAL PIPING PLAN - LEVEL 02 - AREA C
M3.2D	MECHANICAL PIPING PLAN - LEVEL 02 - AREA D
M3.2E	MECHANICAL PIPING PLAN - LEVEL 02 - AREA E
M3.2F	MECHANICAL PIPING PLAN - LEVEL 02 - AREA F
M4.1	MECHANICAL SERVICE YARD
M4.2	MECHANICAL PIPING RISER DIAGRAMS
M4.3	MECHANICAL PIPING RISER DIAGRAMS
M5.1	MECHANICAL CONTROL DIAGRAMS
M5.2	MECHANICAL CONTROL DIAGRAMS
M5.3	MECHANICAL CONTROL DIAGRAMS
M5.4	MECHANICAL CONTROL DIAGRAMS
M6.1	MECHANICAL DETAILS
M6.2	MECHANICAL DETAILS
M6.3	MECHANICAL DETAILS
ELECTRICAL	
E0.01	ELECTRICAL GENERAL NOTES
E0.02	ELECTRICAL SCHEDULES
E1.00	ELECTRICAL POWER SITE PLAN
E2.1A	POWER PLAN - LEVEL 01 - AREA A
E2.1B	POWER PLAN - LEVEL 01 - AREA B
E2.1C	POWER PLAN - LEVEL 01 - AREA C
E2.1D	POWER PLAN - LEVEL 01 - AREA D
E2.1E	POWER PLAN - LEVEL 01 - AREA E
E2.1F	POWER PLAN - LEVEL 01 - AREA F
E2.2A	POWER PLAN - LEVEL 02 - AREA A
E2.2B	POWER PLAN - LEVEL 02 - AREA B
E2.2C	POWER PLAN - LEVEL 02 - AREA C
E2.2D	POWER PLAN - LEVEL 02 - AREA D
E2.2E	POWER PLAN - LEVEL 02 - AREA E
E2.2F	POWER PLAN - LEVEL 02 - AREA F
E2.3	ELECTRICAL ROOF PLAN
E3.00	ELECTRICAL SITE LIGHTING PLAN
E3.1A	LIGHTING RCP - LEVEL 01 - AREA A
E3.1B	LIGHTING RCP - LEVEL 01 - AREA B
E3.1C	LIGHTING RCP - LEVEL 01 - AREA C
E3.1D	LIGHTING RCP - LEVEL 01 - AREA D
E3.1E	LIGHTING RCP - LEVEL 01 - AREA E
E3.1F	LIGHTING RCP - LEVEL 01 - AREA F
E3.2A	LIGHTING RCP - LEVEL 02 - AREA A
E3.2B	LIGHTING RCP - LEVEL 02 - AREA B
E3.2C	LIGHTING RCP - LEVEL 02 - AREA C
E3.2D	LIGHTING RCP - LEVEL 02 - AREA D
E3.2E	LIGHTING RCP - LEVEL 02 - AREA E
E3.2F	LIGHTING RCP - LEVEL 02 - AREA F
E4.01	ENLARGED KITCHEN PLAN
E4.02	ENLARGED ELECTRICAL ROOMS
E4.03	ENLARGED IDF/MDF ROOMS
E5.01	ELECTRICAL RISER DIAGRAM
E5.02	ELECTRICAL PANEL SCHEDULES
E5.03	ELECTRICAL PANEL SCHEDULES
E5.04	ELECTRICAL PANEL SCHEDULES
E5.05	ELECTRICAL PANEL SCHEDULES
E5.06	ELECTRICAL PANEL SCHEDULES
E5.07	ELECTRICAL PANEL SCHEDULES
E5.08	ELECTRICAL PANEL SCHEDULES
E5.09	ELECTRICAL PANEL SCHEDULES
E5.10	ELECTRICAL PANEL SCHEDULES
E6.01	ELECTRICAL DETAILS
E6.02	ELECTRICAL DETAILS
E6.03	ELECTRICAL DETAILS
E6.04	ELECTRICAL DETAILS
TECHNOLOGY	
T0.00	GENERAL NOTES AND LEGENDS
T1.0	TECHNOLOGY OVERALL SITE PLAN
T1.01	MASTER FLOOR PLAN - LEVEL 01
T1.1A	FLOOR PLAN - LEVEL 01 - AREA A
T1.1B	FLOOR PLAN - LEVEL 01 - AREA B
T1.1C	FLOOR PLAN - LEVEL 01 - AREA C
T1.1D	FLOOR PLAN - LEVEL 01 - AREA D
T1.1E	FLOOR PLAN - LEVEL 01 - AREA E
T1.1F	FLOOR PLAN - LEVEL 01 - AREA F
T1.02	MASTER FLOOR PLAN - LEVEL 02
T1.2B	FLOOR PLAN - LEVEL 02 - AREA B
T1.2C	FLOOR PLAN - LEVEL 02 - AREA C
T1.2D	FLOOR PLAN - LEVEL 02 - AREA D
T1.2E	FLOOR PLAN - LEVEL 02 - AREA E
T2.1A	REFLECTED CEILING PLAN - LEVEL 01 - AREA A
T2.1B	REFLECTED CEILING PLAN - LEVEL 01 - AREA B
T2.1C	REFLECTED CEILING PLAN - LEVEL 01 - AREA C
T2.1D	REFLECTED CEILING PLAN - LEVEL 01 - AREA D
T2.1E	REFLECTED CEILING PLAN - LEVEL 01 - AREA E
T2.1F	REFLECTED CEILING PLAN - LEVEL 01 - AREA F
T2.2B	REFLECTED CEILING PLAN - LEVEL 02 - AREA B
T2.2C	REFLECTED CEILING PLAN - LEVEL 02 - AREA C
T2.2D	REFLECTED CEILING PLAN - LEVEL 02 - AREA D
T2.2E	REFLECTED CEILING PLAN - LEVEL 02 - AREA E
T3.1	ENLARGED PLANS
T3.2	ENLARGED PLANS
T3.3	ENLARGED PLANS
T3.4	SECURITY CAMERA ELEVATIONS
T18.01	STRUCTURED CABLING PLATE DETAILS
T18.02	STRUCTURED CABLING PLATE DETAILS
T18.04	STRUCTURED CABLING LABELING DETAILS
T18.05	STRUCTURED CABLING GROUNDING AND BONDING DETAILS
T18.06	STRUCTURED CABLING DETAILS
T18.07	UNDERGROUND DETAILS
T18.08	WALL PENETRATIONS
T18.10	CABLE PATHWAY DETAILS
T18.11	RISER DIAGRAMS
T19.10	SECURITY DEVICE SCHEDULE
T19.70

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1) PROJECT IDENTIFICATION
A. OWNER: TOMBALL I.S.D.
B. PROJECT NAME: TOMBALL IS REPLACEMENT
C. PHYSICAL ADDRESS: 11211 FM 2920, TOMBALL, TEXAS 77375

2) STUDENT CAPACITY
A. MAXIMUM CAPACITY: 1,210
B. STUDENT CAPACITY (PROJECTED ENROLLMENT): 1,100 STUDENTS
C. GRADES SERVED: 5TH - 6TH GRADES

3) FACULTY & STAFF: 110 (ESTIMATED)

4) APPLICABLE CODES
A. INTERNATIONAL BUILDING CODE (IBC) 2021
B. INTERNATIONAL PLUMBING CODE 2021
C. INTERNATIONAL MECHANICAL CODE 2021
D. NATIONAL ELECTRICAL CODE (NEC) 2023
E. INTERNATIONAL FIRE CODE 2021
F. ELIMINATION OF ARCHITECTURAL BARRIERS ACT; TEXAS DEPT. OF LICENSING AND REGULATION
G. INTERNATIONAL ENERGY CONSERVATION CODE 2021
H. LOCAL AMENDMENTS

5) OCCUPANCY CLASSIFICATION
A. OCCUPANCY: GROUP E
B. SEPARATED USES: NONE
C. INCIDENTAL USE AREAS: RATED PER TABLE 509
D. ACCESSORY OCCUPANCIES

6) TYPE OF CONSTRUCTION / FIRE-RESISTIVE REQUIREMENTS
A. CONSTRUCTION TYPE: I-B

TABLE 601

BUILDING ELEMENT	TYPE I B
PRIMARY STRUCTURAL FRAME	2***
BEARING WALLS EXTERIOR	2
BEARING WALLS INTERIOR	2*
NON-BEARING WALLS & PARTITIONS (EXTERIOR)	1**
NON-BEARING WALLS & PARTITIONS (INTERIOR)	0
FLOOR CONSTRUCTION	2
ROOF CONSTRUCTION & SECONDARY MEMBERS	1.0***

* FIRE RESISTANCE RATINGS OF PRIMARY STRUCTURAL FRAME AND BEARING WALLS ARE PERMITTED TO BE REDUCED BY 1 HOUR WHERE SUPPORTING A **ROOF ONLY**.
** FIRE RATING REQUIRED WHERE FIRE SEPARATION DISTANCE IS LESS THAN 30 FT.
*** ROOF CONSTRUCTION SHALL BE FIRE RATED IF ANY PART OF THE ROOF IS WITHIN 20' OF NEAREST FLOOR LEVEL.

REFER TO STRUCTURAL DRAWINGS FOR LOAD-BEARING WALL DESIGNATIONS. LOAD-BEARING WALL FIRE RATING IS FOR STRUCTURAL INTEGRITY PURPOSES ONLY, NOT FOR FIRE-SEPARATION PURPOSES. THEREFORE NO ASSOCIATED OPENINGS ARE REQUIRED TO BE FIRE-PROTECTED UNLESS REQUIRED TO BE SO BY OTHER CODE PROVISIONS AND/OR AS SHOWN ON THESE DOCUMENTS.

7) FIRE-PROTECTION SYSTEMS
A. AUTOMATIC SPRINKLER SYSTEM: YES
B. PORTABLE FIRE EXTINGUISHERS SHALL BE PROVIDED PER INTERNATIONAL FIRE CODE
C. FIRE ALARM PROVIDED: YES
D. EMERGENCY VOICE/ALARM COMMUNICATION SYSTEM PROVIDED: YES

8) EXIT REQUIREMENTS
A. TRAVEL DISTANCES
1. ALLOWED, SPRINKLERED BUILDING:
TO EXIT FROM WITHIN A SPACE FOR OCCUPANCY LOAD GREATER THAN 50 = 250 FT.
TO EXIT FROM WITHIN BUILDING = 250 FT.
COMMON PATH OF EGRESS TRAVEL = 75 FT.
2. ACTUAL - REFER TO PLAN FOR PATHS & DISTANCE

BUILDING DESIGN CRITERIA

THE EMERGENCY ACCESS LOCK BOX(ES) SHALL BE AS SPECIFIED. REFER TO SPECIFICATIONS SECTION 10 4400. BOTTOM ELEVATION OF BOX SHALL BE 6'-0" ABOVE GROUND LEVEL (VERIFY WITH FIRE MARSHAL)

FIREMAN'S EMERGENCY LOCK BOX(ES)

COUNTY: HARRIS
CLIMATE ZONE: 2A

THE I.E.C.C. ESTABLISHES THE REQUIREMENTS FOR INSULATING THE BUILDING. THE MINIMUM REQUIREMENTS THAT ARE ACCEPTABLE (FOR STANDARD OCCUPIED BUILDINGS) ARE: ROOF= R-25ci (U-0.039), MASS WALLS= R-5.7ci (U-0.151), MTL FRAMED= R-13 + 5ci (U-0.077), FLOORS= R-6.3ci (U-0.107) OR R-30 (U-0.033)

ENERGY CODE R VALUES

1. THIS CODE ANALYSIS PLAN IS PROVIDED AS A TOOL FOR VIEWING THE OVERALL CODE COMPLIANCE FOR THE ENTIRE FACILITY. WHILE STATED U.L. RATINGS REQUIRED THROUGH WALLS MUST BE MET, ALL CONTRACTORS MUST CONSTRUCT THIS FACILITY FROM THE MATERIALS AND IN THE DIMENSIONS DESCRIBED IN THE CONSTRUCTION DOCUMENTS. ANY APPARENT CONFLICT SHALL BE RESOLVED WITH THE ARCHITECT.
2. FIRE RATED WALLS NOT DESIGNED TO EXTEND ABOVE ROOF LEVEL SHALL EXTEND TO THE ROOF DECK WITH U.L. APPROVED CLOSURE TO THE DECK U.N.O.
3. ALL PENETRATIONS OF FIRE RATED WALLS SHALL BE CLOSED WITH CODE APPROVED METHODS AND MATERIALS TO MAINTAIN THE SPECIFIED RATING, INCLUDING FIRE TREATED BLOCKING / PLYWD.
4. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL REQUIREMENTS FOR FIRE AND SMOKE DAMPERS.
5. REFER TO G3 SHEETS FOR TYP WALL CONSTRUCTION DETAILS.
6. SQUARE FOOT (SF) AREAS INDICATED ARE FOR CODE ANALYSIS ONLY. CONTRACTOR IS RESPONSIBLE FOR VERIFYING AREAS FOR CONSTRUCTION PURPOSES.

CODE ANALYSIS PLAN NOTES

FLOOR ASSEMBLY: UL # D722 (1-4 HR) & UL # D779 (1-4 HR)
ROOF ASSEMBLY: UL # P701
COLUMNS: REF. G2.03 - G2.04 DETAILS
BEAMS: REF. G2.03 - G2.04 DETAILS
FLOOR PERIMETER FIRE CONTAINMENT: UL # CW-D-1015

CONTRACTOR HAS OPTION TO SUBMIT SUBSTITUTE UL DESIGN ASSEMBLIES FOR REVIEW BY ARCHITECT.

TYPICAL UL RATED ASSEMBLY NUMBERS

EGRESS (AUTO-SPRINKLERED)

1. 3'-0" DOOR (32" CLR) AT 0.15" / OCCUPANT = 213 OCCUPANTS
2. 4'-0" DOOR (44" CLR) AT 0.15"/OCCUPANT = 293 OCCUPANTS
3. PAIR OF 3'-0" DOOR (68" CLR) AT 0.15" / OCCUPANT = 453 OCCUPANTS
4. STAIRS (6'-0") (60" APPLICABLE TO EGRESS) AT 0.2"/OCCUPANT = 300 OCCUPANTS
5. PAIR OF 4'-0" DOOR (92" CLR) AT 0.15" / OCCUPANT = 613 OCCUPANTS
6. STAIRS (9'-0") (96" APPLICABLE TO EGRESS) AT 0.2"/OCCUPANT = 480 OCCUPANTS
7. STAIRS (6'-0") (60" APPLICABLE TO EGRESS) AT 0.2"/OCCUPANT = 300 OCCUPANTS
8. 3'-0" GATE (36" CLR) AT 0.2"/OCCUPANT = 180 OCCUPANTS
9. PAIR OF 3'-0" GATES (72" CLR) AT 0.2"/OCCUPANT = 360 OCCUPANTS

EGRESS FACTORS LEGEND

1 HR. FIRE BARRIER ———————————————

2 HR. FIRE BARRIER ———————————————

SMOKE RESISTANT PARTITION - - - - - - - - - - - - - - - -

WALLS SHALL MEET ALL CODE REQUIREMENTS FOR RATED CONSTRUCTION. WINDOW ASSEMBLIES SHALL COMPLY WITH IBC AND BE U.L. LABELED. DOORS SHALL HAVE CLOSERS, BE U.L. LABELED, AND RATED AS SCHEDULED.

FIRE RATED CONSTRUCTION LEGEND

NEW CONSTRUCTION

PRIMARY OCCUPANCY: GROUP E **TYPE:** I-B
ALLOWABLE HEIGHT: 160 FEET (I-B) (AUTO-SPRINKLERED)
TOTAL HEIGHT PROVIDED: 43' - 10"
ALLOWABLE NUMBER OF STORIES: 6
ALLOWABLE AREA: UNLIMITED SQ. FT.
IN ACCORDANCE WITH TABLE 506.2

TOTAL AREA PROVIDED:

LEVEL 1:	88,700 SQ. FT.
LEVEL 2:	48,150 SQ. FT.
SUB-TOTAL	136,850 SQ. FT.
ROOF OVERHANG:	6,550 SQ. FT.
TOTAL BUILDING AREA:	**143,400 SQ. FT.**

OCCUPANT LOAD:

LEVEL 1 OCCUPANT LOAD:	2,056 OCCUPANTS
LEVEL 2 OCCUPANT LOAD:	1,021 OCCUPANTS
TOTAL OCCUPANT LOAD:	**3,077 OCCUPANTS**

EGRESS CAPACITY:

LEVEL 1 REQUIRED:	308 INCHES
LEVEL 1 PROVIDED:	984 INCHES
LEVEL 2 REQUIRED:	153 INCHES
LEVEL 2 PROVIDED:	248 INCHES

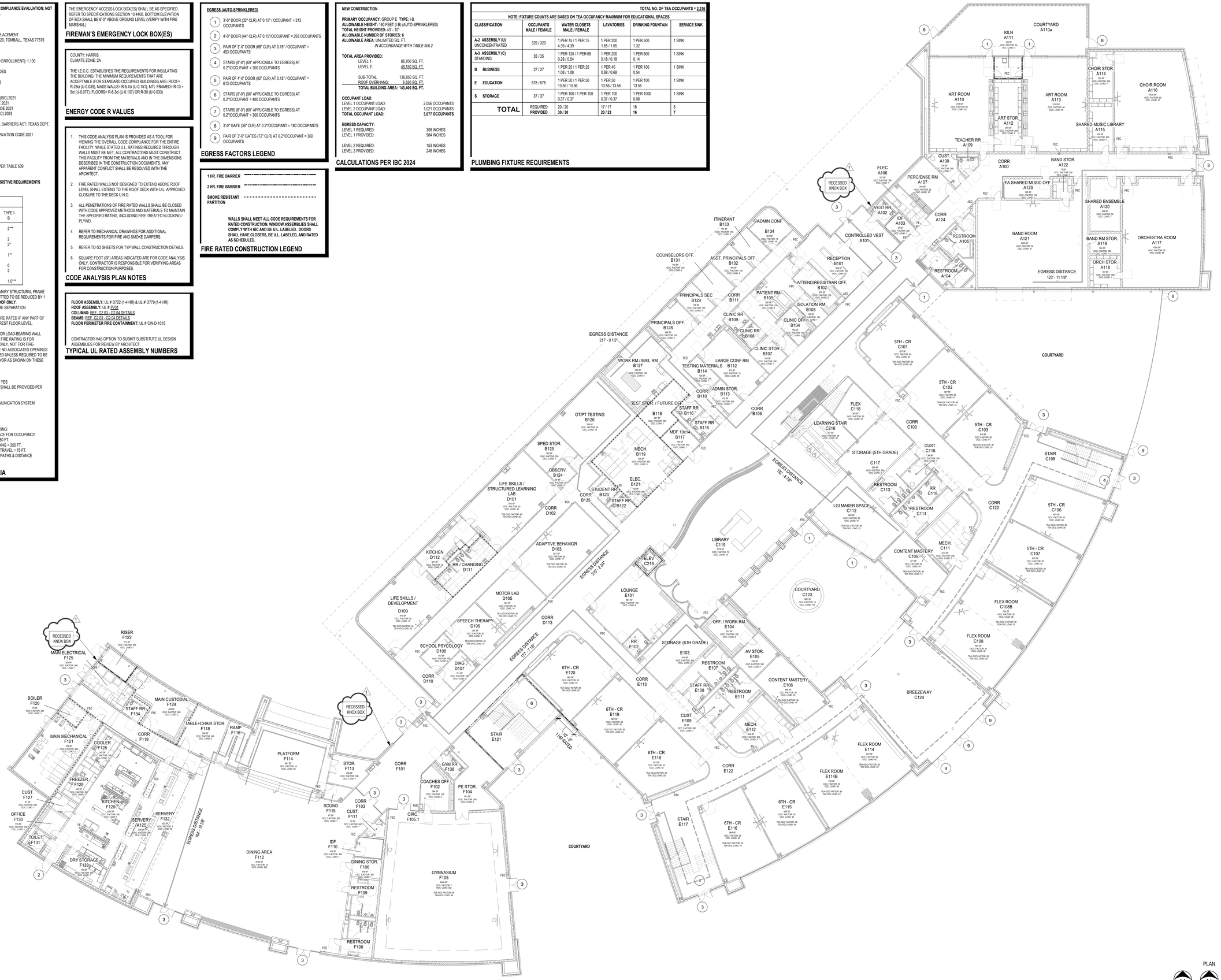
CALCULATIONS PER IBC 2024

TOTAL NO. OF TEA OCCUPANTS = 2,316

NOTE: FIXTURE COUNTS ARE BASED ON TEA OCCUPANCY MAXIMUM FOR EDUCATIONAL SPACES

CLASSIFICATION	OCCUPANTS MALE / FEMALE	WATER CLOSETS MALE / FEMALE	LAVATORIES	DRINKING FOUNTAIN	SERVICE SINK
A-2 ASSEMBLY (U) UNCONCENTRATED	329 / 329	1 PER 75 / 1 PER 75 4.39 / 4.39	1 PER 200 1.65 / 1.65	1 PER 500 1.32	1 SINK
A-3 ASSEMBLY (C) STANDING	35 / 35	1 PER 125 / 1 PER 65 0.28 / 0.54	1 PER 200 0.18 / 0.18	1 PER 500 0.14	1 SINK
B BUSINESS	27 / 27	1 PER 25 / 1 PER 25 1.08 / 1.08	1 PER 40 0.68 / 0.68	1 PER 100 0.54	1 SINK
E EDUCATION	678 / 678	1 PER 50 / 1 PER 50 13.56 / 13.56	1 PER 50 13.56 / 13.56	1 PER 100 13.56	1 SINK
S STORAGE	37 / 37	1 PER 100 / 1 PER 100 0.37 / 0.37	1 PER 100 0.37 / 0.37	1 PER 1000 0.08	1 SINK
TOTAL	REQUIRED **PROVIDED**	17 / 17 **23 / 23**	16 **16**	5 **7**	

PLUMBING FIXTURE REQUIREMENTS



1 CODE PLAN ANALYSIS - LEVEL 1
1/16" = 1'-0"

PLAN
N
TRUE

Revision /	Date
1	ADDENDUM 02 08/07/26

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

REGISTERED ARCHITECT
CHRISTIN HERRON
STATE OF TEXAS
29154
08/07/2026

Huckabee
www.huckabee-inc.com
800.687.1229

CODE ANALYSIS MASTER PLAN - LEVEL 01
VOLUME 01

Job No. 03802-04-01	Sheet No. G2.01
Drawn By: CB, KR	
Date: 07.15.26	

8/8/2026 3:51:19 PM
Autodesk Docs://TOMBALL ISD - IS REPLACEMENT/03802-04-01_Tomball ISD IS Replacement_ARCH.rvt

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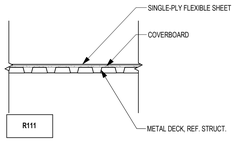
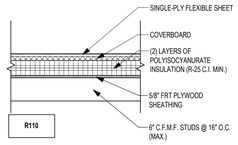
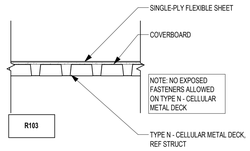
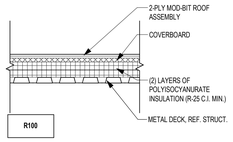
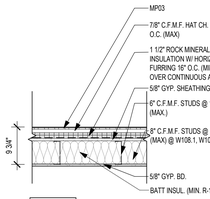


NOTE: ONLY USED WHEN ROOF IS NOT PART OF THERMAL/WEATHER BARRIER

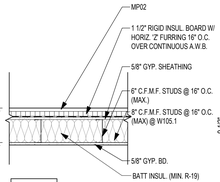




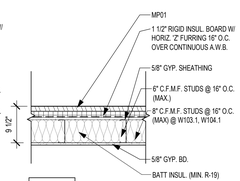




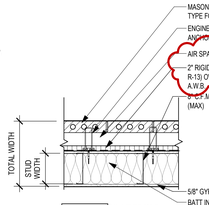
W108	
W108.1	8" C.F.M.F. STUDS
W109	NO RIGID INSULATION BOARD
W109.1	8" C.F.M.F. STUDS NO RIGID INSULATION BOARD



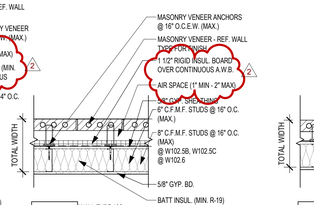
W105	
W105.1	8" C.F.M.F. STUDS
W106	NO RIGID INSULATION BOARD



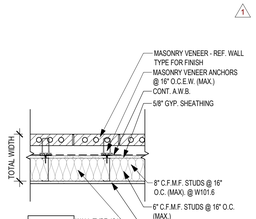
W103	
W103.1	8" C.F.M.F. STUDS
W104	NO RIGID INSULATION BOARD
W104.1	8" C.F.M.F. STUDS NO RIGID INSULATION BOARD



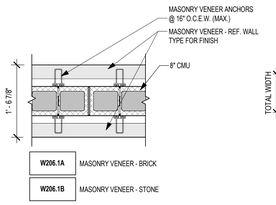
W102-E	WALL TYPE 102-E
W102.5E	MASONRY VENEER - FACE BRICK BRK01
W102.6E	MASONRY VENEER - STONE CSUM01



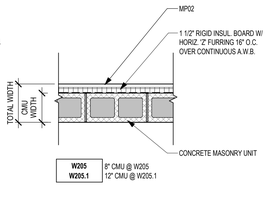
W102	WALL TYPE 102
W102.1 W102.5	MASONRY VENEER - FACE BRICK BRK02 @ W102.1B / W102.5B BRK01 @ W102.1C W102.5C
W102.1E	MASONRY VENEER - FACE BRICK BRK01 NO RIGID INSULATION BOARD
W102.2 W102.6 W102.7	MASONRY VENEER - STONE 10" C.F.M.F. STUDS
W102.3	IN-LIEU OF 5/8" GYP. BOARD, PROVIDE 1/4" & 3/8" GYP. BOARD
W102.3A	MASONRY VENEER - STONE NO RIGID INSULATION BOARD



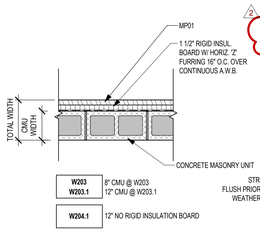
W101	WALL TYPE 101
W101.1	MASONRY VENEER - FACE BRICK
W101.2 W101.6	MASONRY VENEER - STONE



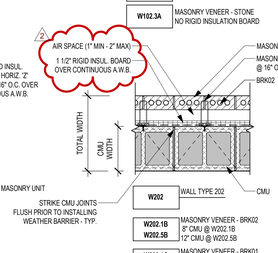
W206.1A	MASONRY VENEER - BRICK
W206.1B	MASONRY VENEER - STONE



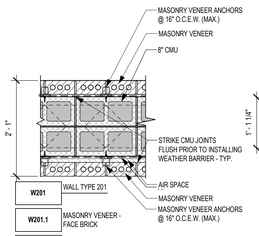
W205 W205.1	8" CMU @ W205 12" CMU @ W205.1



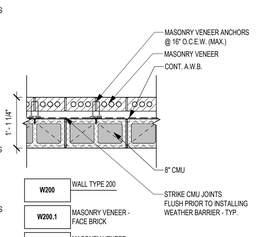
W203 W203.1	8" CMU @ W203 12" CMU @ W203.1
W204.1	12" NO RIGID INSULATION BOARD



W202	WALL TYPE 202
W202.1B W202.5B	MASONRY VENEER - BRK02 8" CMU @ W202.1B 12" CMU @ W202.5B
W202.1C W202.5C	MASONRY VENEER - BRK01 8" CMU @ W202.1C 12" CMU @ W202.5C
W202.2 W202.6	MASONRY VENEER - CSMU01 8" CMU @ W202.2 12" CMU @ W202.6



W201	WALL TYPE 201
W201.1	MASONRY VENEER - FACE BRICK
W201.2	MASONRY VENEER - STONE



W200	WALL TYPE 200
W200.1	MASONRY VENEER - FACE BRICK
W200.2	MASONRY VENEER - STONE

PARTITION TYPE TAGS

LETTERS TO THE RIGHT INDICATE PARTITION HEIGHT, FIRE RATING AND ACOUSTICAL PROPERTIES:

- D — WALL TO **D**ECK / STRUCTURE
- C — WALL TO 6" (MIN.) ABOVE **C**EILING
- FR — **F**IRE **R**ATED WALL TO DECK / STRUCTURE
- AD — **A**COUSTICAL WALL TO **D**ECK / STRUCTURE
- AC — **A**COUSTICAL WALL TO 6" (MIN.) ABOVE **C**EILING
- AR — **A**COUSTICAL **R**ATED WALL TO DECK / STRUCTURE
- GD — GYP WALL ABOVE TO **D**ECK / STRUCTURE
- SR — **S**MOKE **R**ESISTANT PARTITION TO DECK / STRUCTURE

LETTER & NUMBER TO THE LEFT INDICATE PARTITION TYPE & STUD OR CMU SIZE AS FOLLOWS:

- 1 - 7/8" HAT CHANNEL
- 2 - 1 5/8" CFMF
- 3 - 2 1/2" CFMF
- 4 - 3 5/8" CFMF OR CMU
- 6 - 6" CFMF OR 5 5/8" CMU
- 8 - 8" CFMF OR 7 5/8" CMU
- 10 - 9 5/8" CMU
- 12 - 11 5/8" CMU

EXTERIOR WALL TYPE TAGS

LETTER INDICATES EXTERIOR WALL

NUMBER INDICATES BACKUP CONSTRUCTION AS FOLLOWS:

- **100** - CFMF
- **200** - CMU

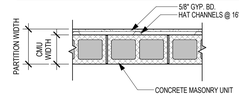
NOTE: AIR SPACE CAVITY IN ALL EXTERIOR MASONRY VENEER WALLS MUST BE 2" MINIMUM CLEAR

WALL / PARTITION NOTES:

1. ALL INTERIOR WALL/PARTITIONS NOT OTHERWISE DESCRIBED BY A WALL SECTION ARE IDENTIFIED BY A SYMBOL WITH AN ALPHANUMERIC CODE INDICATING MATERIALS (BY LETTER), NOMINAL THICKNESS OF STRUCTURE (BY NUMBER) AND AN ALPHANUMERIC CODE REPRESENTING HEIGHT, FIRE RATING AND ACOUSTICAL PROPERTIES.
2. **UNTAGGED WALL/PARTITIONS AND COLUMN FURRINGS** SHALL BE ASSUMED TO BE **"TYPICAL"**, AS FOLLOWS, FOR BIDDING PURPOSES:
   GYP BOARD (EXTENDS TO 6" ABOVE CEILING U.N.O.)
   WALLS/PARTITIONS - TYPE **M4**, ACOUSTICAL
   COLUMN FURRING - **M4**, NON-ACOUSTICAL
   MASONRY (EXTENDS TO 4" ABOVE CEILING OR TO NEAREST 8" COURSING ABOVE 4" U.N.O.)
   WALLS/PARTITIONS - TYPE **A8**, NON-ACOUSTICAL
   COLUMN FURRING - TYPE **A8**, NON-ACOUSTICAL
   ANY UNTAGGED PARTITIONS WHICH APPEAR INCONSISTENT WITH THE DESCRIPTIONS ABOVE SHALL BE VERIFIED WITH THE ARCHITECT PRIOR TO BIDDING.
3. WALL TYPES IDENTIFIED AS CMU MAY INCLUDE ACMU. FLOOR PLAN HATCH PATTERNS WILL DIFFERENTIATE REGULAR SMOOTH FACE CMU FROM ARCHITECTURAL CMU. FINISH PLANS AND SCHEDULES WILL IDENTIFY ACMU SELECTIONS (GROUND FACE, SPLIT FACE, ETC.) AND IDENTIFY WHICH SIDE OF A SINGLE WYTHE ACMU WALL IS THE FINISH SIDE.
4. WALL/PARTITION TYPES IDENTIFIED AS INCLUDING VENEER MAY INCLUDE BRICK, STONE, OR ACMU. FLOOR PLAN HATCH PATTERNS WILL DIFFERENTIATE REGULAR SMOOTH FACE CMU, BRICK, STONE, OR ARCHITECTURAL CMU. FINISH PLANS AND SCHEDULES WILL IDENTIFY ACMU SELECTIONS (GROUND FACE, SPLIT FACE, ETC.)
5. WALL/PARTITIONS INDICATED BY TAG "GYP WALL ABOVE TO DECK" SHALL BE CONSTRUCTED OF THE SPECIFIED WALL TYPE TO ONE FULL COURSE (MIN.) ABOVE THE CEILING, BRACED, AND AN HX (OR M4) WALL/PARTITION (H6 OR M6 WHERE REQUIRED BY UNBRACED HEIGHT) SHALL BE BUILT FROM THE TOP OF WALL TO DECK. WALL/PARTITIONS INDICATED BY TAG "ACOUSTICAL GYP WALL ABOVE TO DECK" SHALL BE CONSTRUCTED OF THE SPECIFIED WALL TYPE TO A ONE FULL COURSE (MIN.) ABOVE THE CEILING, BRACED, AND AN HX (OR M4) WALL/PARTITION (H6 OR M6 WHERE REQUIRED BY UNBRACED HEIGHT) WITH BATT INSULATION SHALL BE BUILT FROM THE TOP OF WALL TO DECK, WHERE INDICATED BY THE FIRE CODE PLAN TO BE FIRE RATED, ALL CONNECTIONS SHALL MEET RATING REQUIREMENTS.
6. FIRE-RATED WALL/PARTITIONS ARE INDICATED ON THE FIRE CODE PLANS ON THE G2 SHEETS. ALL GYP BOARD IN A RATED ASSEMBLY MUST BE 5/8" TYPE "X" AND CONSTRUCTION MUST MATCH THE ASSIGNED UL NUMBER. REFERENCE THE TYPE SCHEDULES ON THIS SHEET FOR UL NUMBERS WHERE APPLICABLE. SUBSTITUTE UL ASSEMBLIES MAY BE PRESENTED FOR THE CONSIDERATION OF THE ARCHITECT , BUT MUST NOT BE USED UNLESS APPROVED IN WRITING. PARTITIONS NOT IDENTIFIED AS RATED SHALL BE BUILT WITH STANDARD GYP BOARD.
7. WHERE FIRE-RATED MASONRY WALL/PARTITIONS ARE INDICATED TO EXTEND TO DECK, ANY VENEER OR ACMU MAY TERMINATE ABOVE CEILING LEVEL. THE CMU WALL/PARTITION SHALL EXTEND TO DECK WITH REGULAR CMU OF SAME THICKNESS AS THE CMU (OR ACMU) IN THE WALL ASSEMBLY.
8. ALL ACOUSTICAL GYP BD WALL-PARTITIONS REQUIRE HIGHER QUALITY CONSTRUCTION AND SHALL BE FULL HEIGHT SOUND ATTENUATING BATT INSULATION. IN ORDER TO ACHIEVE THE INDICATED STC RATING, ALL WALL/PARTITIONS ARE TO HAVE ALL PIN HOLES & VOIDS, PIPES, DUCTS, CONDUITS, ETC ACOUSTICALLY FILLED ON BOTH SIDES. ALL WALL BOXES ON BOTH SIDES OF WALL/PARTITION ARE TO HAVE ACOUSTICAL PUTTY PADS ON THE INTERIOR SIDE AS DETAILED. BOTH SIDES OF WALL/PARTITION SHALL BE SEALED TIGHT TO DECK AS DETAILED. THE FLOOR TRACK SHALL BE SET ON AN ACOUSTICAL ISOLATOR PAD.
9. ALL ACOUSTICAL CMU WALL/PARTITIONS REQUIRE A HIGHER QUALITY CONSTRUCTION, SHALL BE NORMAL WEIGHT CMU BLOCK, EXTEND TO DECK AND HAVE FULL HEAD JOINTS. ALL PENETRATIONS SHALL BE ACOUSTICALLY SEALED ON BOTH SIDES OF WALL MORTAR JOINTS TO BE FILLED W/ NO PIN HOLES OR VOIDS. HEAD OF WALL SHALL BE SEALED TIGHT TO DECK AS DETAILED.
10. ALL COLD FORM METAL FRAMING ARE SUBJECT TO THE DESIGN OF A QUALIFIED STRUCTURAL ENGINEER. FINAL DETERMINATION OF GAUGE AND DIMENSIONS OF FRAMING WILL BE DETERMINED BY STRUCTURAL DESIGN. ENGINEERS RECOMMENDATIONS WHICH WOULD SIGNIFICANTLY IMPACT WALL THICKNESS MUST BE COORDINATED WITH THE ARCHITECT FOR ALIGNMENT PRIOR TO CONSTRUCTION.
11. REFER TO TYPICAL INTERIOR WALL/PARTITION BRACING DETAILS FOR ADDITIONAL INFORMATION REGARDING FLOOR AND DECK CONNECTIONS. FIRE-RATED WALLS SHALL USE FIRE STOPPING SEALANTS OR ASSEMBLIES WHERE THE WALL/PARTITION ABUTS THE DECK, INCLUDING MINERAL WOOL INSULATION WHERE APPLICABLE. NON-RATED PARTITIONS SHALL USE ACOUSTICAL SEALANTS AND INSULATION WHERE THE WALL/PARTITION ABUTS THE DECK.
12. FOR ANY DISCREPANCY BETWEEN WALL/PARTITION TYPES AND WALL SECTIONS, WALL SECTION SHALL SUPERCEDE.
13. NOT ALL WALL/PARTITION TYPES SHOWN WILL BE USED.

WALL TYPE	CMU WIDTH	PARTITION WIDTH	FIRE RATING	UL LISTING	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
B8	7 5/8"	9 1/8"	2HR	U905	47	54
B12	11 5/8"	1'- 1 1/8"	2HR	U905	51	59
BN8	7 5/8"	9 1/8"	2HR	U905	47	54
BN12	11 5/8"	1'- 1 1/8"	2HR	U905	51	59

***NOTE:** FIRE RATINGS ARE BASED ON NCMA TEK 7.1 EQUIVALENT THICKNESS CALCULATIONS FOR LIGHT WEIGHT CMU OF EXPANDED CLAY, SHALE, OR SLATE.
***NOTE:** (AN) WALL TYPE DENOTES NON LOAD-BEARING MASONRY WALLS. LOCATIONS TO BE COORDINATED WITH STRUCTURAL DRAWINGS.

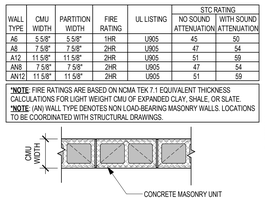


B GYP. BD. FURRING ON CMU

INTERIOR & EXTERIOR PARTITION TYPE LEGEND

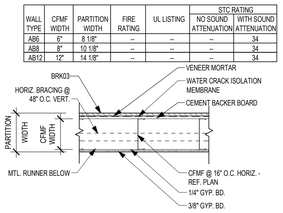
WALL TYPE	CMU WIDTH	PARTITION WIDTH	FIRE RATING	UL LISTING	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
A6	5 5/8"	5 5/8"	1HR	U905	45	50
A8	7 5/8"	7 5/8"	2HR	U905	47	54
A12	11 5/8"	11 5/8"	2HR	U905	51	59
AN8	7 5/8"	7 5/8"	2HR	U905	47	54
AN12	11 5/8"	11 5/8"	2HR	U905	51	59

***NOTE:** FIRE RATINGS ARE BASED ON NCMA TEK 7.1 EQUIVALENT THICKNESS CALCULATIONS FOR LIGHT WEIGHT CMU OF EXPANDED CLAY, SHALE, OR SLATE.
***NOTE:** (AN) WALL TYPE DENOTES NON LOAD-BEARING MASONRY WALLS. LOCATIONS TO BE COORDINATED WITH STRUCTURAL DRAWINGS.



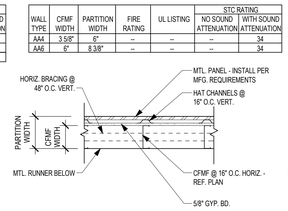
A SINGLE-WYTHE CMU

WALL TYPE	CFMF WIDTH	PARTITION WIDTH	FIRE RATING	UL LISTING	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
AB6	6"	8 1/8"	--	--	--	34
AB8	8"	10 1/8"	--	--	--	34
AB12	12"	14 1/8"	--	--	--	34



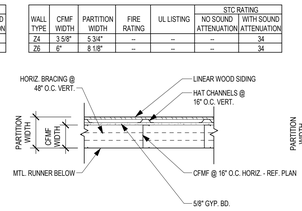
AB MASONRY VENEER ON BACKER BD.FURRING

WALL TYPE	CFMF WIDTH	PARTITION WIDTH	FIRE RATING	UL LISTING	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
AA4	3 5/8"	6"	--	--	--	34
AA6	6"	8 3/8"	--	--	--	34



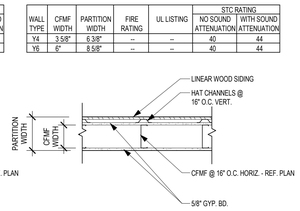
AA METAL PANEL ON GYP. BD. FURRING

WALL TYPE	CFMF WIDTH	PARTITION WIDTH	FIRE RATING	UL LISTING	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
Z4	3 5/8"	5 3/4"	--	--	--	34
Z6	6"	8 1/8"	--	--	--	34



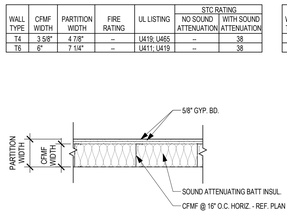
Z WOOD ON GYP. BD. FURRING

WALL TYPE	CFMF WIDTH	PARTITION WIDTH	FIRE RATING	UL LISTING	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
Y4	3 5/8"	6 3/8"	--	--	40	44
Y6	6"	8 5/8"	--	--	40	44



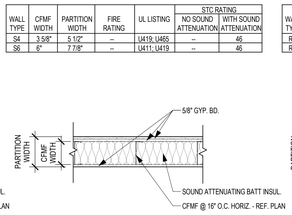
Y WOOD FURRING ON CFMF

WALL TYPE	CFMF WIDTH	PARTITION WIDTH	FIRE RATING	UL LISTING	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
T4	3 5/8"	4 7/8"	--	U419; U465	--	38
T6	6"	7 1/4"	--	U411; U419	--	38



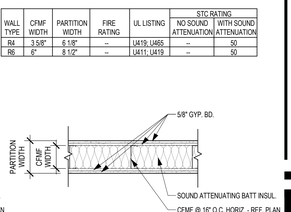
T GYP. BD. ON CFMF - SOUND ASSY.

WALL TYPE	CFMF WIDTH	PARTITION WIDTH	FIRE RATING	UL LISTING	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
S4	3 5/8"	5 1/2"	--	U419; U465	--	46
S6	6"	7 7/8"	--	U411; U419	--	46



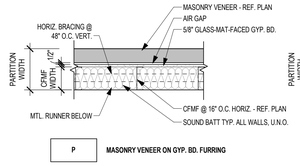
S GYP. BD. ON CFMF - SOUND ASSY.

WALL TYPE	CFMF WIDTH	PARTITION WIDTH	FIRE RATING	UL LISTING	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
R4	3 5/8"	6 1/8"	--	U419; U465	--	50
R6	6"	8 1/2"	--	U411; U419	--	50



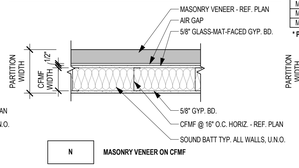
R GYP. BD. ON CFMF - SOUND ASSY.

WALL TYPE	CFMF WIDTH	PARTITION WIDTH	FIRE RATING	IBC (PRESCRIPTIVE FIRE RESISTANCE) TABLE 721.1	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
P4	3 5/8"	8 3/8"	1-2 HR	REF. IBC 721.1(2)	--	34
P6	6"	10 3/4"	1-2 HR	REF. IBC 721.1(2)	--	34



P MASONRY VENEER ON GYP. BD. FURRING

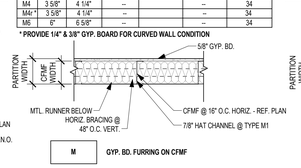
WALL TYPE	CFMF WIDTH	PARTITION WIDTH	FIRE RATING	IBC (PRESCRIPTIVE FIRE RESISTANCE) TABLE 721.1	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
N4	3 5/8"	5"	1-2 HR	REF. IBC 721.1(2)	40	44
N6	6"	11 3/8"	1-2 HR	REF. IBC 721.1(2)	40	44
N8	8"	1'- 1 3/8"	1-2 HR	REF. IBC 721.1(2)	40	44



N MASONRY VENEER ON CFMF

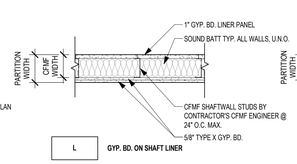
WALL TYPE	CFMF WIDTH	PARTITION WIDTH	FIRE RATING	UL LISTING	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
M1	7/8"	1 1/2"	--		--	34
M2	1 5/8"	2 1/4"	--		--	34
M3	2 1/2"	3 1/8"	--		--	34
M4	3 5/8"	4 1/4"	--		--	34
M4*1	3 5/8"	4 1/4"	--		--	34
M6	6"	6 5/8"	--		--	34

***PROVIDE 1/4" & 3/8" GYP. BOARD FOR CURVED WALL CONDITION**



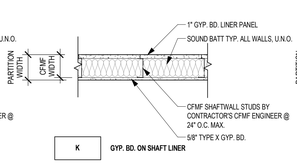
M GYP. BD. FURRING ON CFMF

WALL TYPE	CFMF WIDTH	PARTITION WIDTH	FIRE RATING	UL LISTING	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
L3	2 1/2"	3 3/4"	2 HR	U415	40	51
L4	4"	5 1/4"	2 HR	U415	40	51
L6	6"	7 1/4"	2 HR	U415	40	51



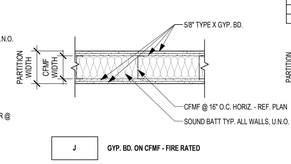
L GYP. BD. ON SHAFT LINER

WALL TYPE	CFMF WIDTH	PARTITION WIDTH	FIRE RATING	UL LISTING	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
K3	2 1/2"	3 1/8"	1 HR	U415	37	48
K4	4"	4 5/8"	1 HR	U415	37	48
K6	6"	6 5/8"	1 HR	U415	37	48



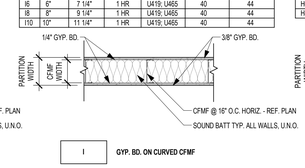
K GYP. BD. ON SHAFT LINER

WALL TYPE	CFMF WIDTH	PARTITION WIDTH	FIRE RATING	UL LISTING	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
J4	3 5/8"	6 1/8"	2 HR	U411; U419	45	53
J6	6"	8 1/2"	2 HR	U411; U419	45	53



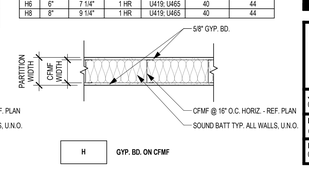
J GYP. BD. ON CFMF - FIRE RATED

WALL TYPE	CFMF WIDTH	PARTITION WIDTH	FIRE RATING	UL LISTING	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
I4	3 5/8"	4 7/8"	--	U419; U465	40	44
I4	3 5/8"	4 7/8"	1 HR	U419; U465	40	44
I6	6"	7 1/4"	--	U419; U465	40	44
I6	6"	7 1/4"	1 HR	U419; U465	40	44
I8	8"	9 1/4"	1 HR	U419; U465	40	44
I10	10"	11 1/4"	1 HR	U419; U465	40	44



I GYP. BD. ON CURVED CFMF

WALL TYPE	CFMF WIDTH	PARTITION WIDTH	FIRE RATING	UL LISTING	STC RATING NO SOUND ATTENUATION	STC RATING WITH SOUND ATTENUATION
H4	3 5/8"	4 7/8"	--	U419; U465	40	44
H4	3 5/8"	4 7/8"	1 HR	U419; U465	40	44
H6	6"	7 1/4"	--	U419; U465	40	44
H6	6"	7 1/4"	1 HR	U419; U465	40	44
H8	8"	9 1/4"	1 HR	U419; U465	40	44


5/8" GYP. BD.

G5 - SCHEDULE OF MATERIALS & COLORS

11d	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES.	CONTACT

DIVISION 3 - CONCRETE
03 3543 - BONDED ABRASIVE POLISHED CONCRETE FLOORS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
COS	CONCRETE, SEALED									

03 5400 - DECORATIVE CONCRETE TOPPING

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
DCT01	DECORATIVE CONCRETE TOPPING									

DIVISION 4 - MASONRY
04 2000 - UNIT MASONRY

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
CSMU01	CALCIUM SILICATE MASONRY UNIT	ARRISCRAFT	GEORGIA RENAISSANCE	CUSTOM COLOR MATCH TO EXISTING BAKER HUGHES BUILDING - TO BE CONFIRMED BY OWNER	REFER TO DRAWINGS	SMOOTH	CONCAVE MORTAR JOINT - MORTAR TO MATCH COLOR OF BRICK	REFER TO DRAWING DETAILS FOR RECESSED BRICK LOCATIONS	FINAL DESIGN TO BE CONFIRMED BY ARCHITECT AND OWNER AT MOCK-UP BEFORE INSTALLATION	UPCHURCH KIMBROUGH, BRIAN O'NEAL, briano@upchurchkimbrough.com, 713-957-152
BRK01	BRICK	ENDICOTT	FACE BRICK	MANGANESE IRONSPOT	SLIM UTILITY (NOMINALLY 4"X3"X12")	VELOUR	CONCAVE MORTAR JOINT - MORTAR: BLACK	REFER TO DRAWING DETAILS FOR RECESSED BRICK LOCATIONS	FINAL DESIGN TO BE CONFIRMED BY ARCHITECT AND OWNER AT MOCK-UP BEFORE INSTALLATION	UPCHURCH KIMBROUGH, BRIAN O'NEAL, briano@upchurchkimbrough.com, 713-957-152
BRK02	BRICK	ENDICOTT	FACE BRICK	MANGANESE IRONSPOT	SLIM UTILITY (NOMINALLY 4"X3"X12")	SMOOTH	CONCAVE MORTAR JOINT - MORTAR: BLACK, VERTICAL STACK BOND (SOLDIER). REF DRAWINGS W HORINZONTAL REFINF PER MASONRY STANDARD 402	AT WINDOW OPENINGS	FINAL DESIGN TO BE CONFIRMED BY ARCHITECT AND OWNER AT MOCK-UP BEFORE INSTALLATION	UPCHURCH KIMBROUGH, BRIAN O'NEAL, briano@upchurchkimbrough.com, 713-957-152
BRK03	BRICK	ENDICOTT	THIN BRICK	MANGANESE IRONSPOT	NOMINALLY 4"X12"X1"	SMOOTH	CONCAVE MORTAR JOINT - MORTAR: BLACK, VERTICAL STACK BOND (SOLDIER). REF DRAWINGS	BELOW CURTAINWALL IN LIBRARY		UPCHURCH KIMBROUGH, BRIAN O'NEAL, briano@upchurchkimbrough.com, 713-957-152

DIVISION 5 - METALS
05 5000 - METAL FABRICATIONS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
	METAL HANDRAILS			100% STAINLESS STEEL						

05 5516 - METAL STAIR NOSINGS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
	METAL STAIR NOSINGS	SCHLUTER	TREP-G-S	STAINLESS STEEL			AT TILE			

05 7000 - DECORATIVE METAL

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
	DECORATIVE METAL RAILINGS	VIVA RAILINGS	SOLO	GLASS CLEAR LAMINATED	REF DRAWINGS	100% STAINLESS STEEL				PKlement@vivarailings.com

DIVISION 6 - WOOD-PLASTICS
06 6400 - TRANSLUCENT RESIN PANEL SYSTEM

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
RP01	RESIN PANEL	LUMICOR		SAHARA	3/8" THICK			LIBRARY SCREEN		
RP01.1	RESIN PANEL	LUMICOR		SAHARA + SANDSTONE SILVER	3/8" THICK			LIBRARY SCREEN		
RP01.2	RESIN PANEL	LUMICOR		SAHARA + SANDSTONE SILVER+ SANDSTONE SILVER	1/2" THICK	DOUBLE SIDED		LIBRARY SCREEN		
RP02	RESIN PANEL	LUMICOR		POMEGRANATE+ SUNSET + ORCHID + POMEGRANATE	3/8" THICK			LIBRARY SCREEN		
RP02.1	RESIN PANEL	LUMICOR		POMEGRANATE+ SUNSET + ORCHID + POMEGRANATE + SANDSTONE SILVER	3/8" THICK			LIBRARY SCREEN		
RP02.2	RESIN PANEL	LUMICOR		POMEGRANATE+ SUNSET + ORCHID + POMEGRANATE + SANDSTONE SILVER	1/2" THICK	DOUBLE SIDED		LIBRARY SCREEN		
RP03	RESIN PANEL	LUMICOR		PHANTOM	3/8" THICK			LIBRARY SCREEN		
RP03.1	RESIN PANEL	LUMICOR		PHANTOM + SANDSTONE SILVER	3/8" THICK			AUDITORIUM SURROUND		
RP06	RESIN PANEL	LUMICOR		PHANTOM + SANDSTONE SILVER	1/2" THICK	DOUBLE SIDED		LIBRARY SCREEN		

06 8316 - FIBERGLASS REINFORCED PANELING

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
FRP01	FIBERGLASS REINFORCED PLASTIC PANEL SYSTEM									

DIVISION 7 - THERMAL AND MOISTURE PROTECTION
07 4213 - METAL WALL PANELS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
MP01	METAL WALL PANEL	ZEEFF	PAINTED ALUMINUM	CUSTOM COLOR MATCH TO EXISTING BAKER HUGHES BUILDING - TO BE CONFIRMED BY OWNER			CONFIRM CLIP SIZE AND COUNT WITH MANUF. REQUIREMENTS.			DEREK LEDY, dledy@zeeffpanels.com, 989-854-9439
MP02	METAL WALL PANEL	BERRIDGE	HC-16	CUSTOM COLOR MATCH TO CLEAR ANODIZED	AS NOTED ON DRAWINGS	TBD	CONCEALED FASTENERS			
MP03	METAL WALL PANEL	LONGBOARD	6" V-GROOVE PLANK	LIGHT NATIONAL WALNUT		TBD			"MP03-V" DESIGNATES VENTED CONDITIONS AS CALLED OUT ON THE DRAWINGS	RED RAMSEY - 469.927.5670 Rramsey@longboardproducts.com
MS02	METAL SOFFIT	LONGBOARD	6" V-GROOVE PLANK	LIGHT NATIONAL WALNUT		TBD			"MS02-V" DESIGNATES VENTED CONDITIONS AS CALLED OUT ON THE DRAWINGS	RED RAMSEY - 469.927.5670 Rramsey@longboardproducts.com
MP04	METAL WALL PANEL	PAC-CLAD	7/8" CORRUGATED PANEL	COLOR MATCH TO MP02 1/8" HOLES, .324" STAGGERED, 13.5% OPEN				MECHANICAL SCREENS - HOLE PATTERN, SIZE, AND OPENNESS FOR PRICING ONLY. ARCHITECT SHALL SELECT FROM ALL OPTIONS FROM MANUFACTURER IN COORDINATION WITH THE CITY REQUIREMENTS		

07 8123 - INTUMESCENT FIRE PROTECTION

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
TFIP01	INTUMESCENT FIRE PROTECTION			MATCH PNT01						NAME EMAIL PHONE

DIVISION 8 - OPENINGS
08 1113 - HOLLOW METAL DOORS AND FRAMES

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
HM	HOLLOW METAL	SHERWIN WILLIAMS		PEPPERCORN / SW7674						NAME EMAIL PHONE

08 1116 - ALUMINUM DOORS AND FRAMES

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
AL	ALUMINUM			CLEAR ANODIZED						NAME EMAIL PHONE

08 1416 - FLUSH WOOD DOORS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
SC	SOLID CORE (DOOR)	WILSONART		WALNUT HEIGHTS / 765K-12						NAME EMAIL PHONE

08 3323 - OVERHEAD COILING DOORS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
OCD	OVERHEAD COILING DOORS			COLOR MATCH TO CLEAR ANODIZED						NAME EMAIL PHONE

08 3326 - OVERHEAD COILING GRILLES

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
OCG	OVERHEAD COILING GRILLE			CLEAR ANODIZED						NAME EMAIL PHONE

08 3613 - SECTIONAL DOORS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
SD	SECTIONAL DOOR	RENLITA	S-3000 FOLDAWAY	CLEAR ANODIZED						NAME EMAIL PHONE

08 4313 - ALUMINUM FRAMED STOREFRONTS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
AL	ALUMINUM			CLEAR ANODIZED						NAME EMAIL PHONE

08 4413 - GLAZED ALUMINUM CURTAIN WALLS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
AL	ALUMINUM			CLEAR ANODIZED						NAME EMAIL PHONE

DIVISION 9 - FINISHES
09 3000 - TILING

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
BSS	BASE, ALUMINUM									
BT01	TILE, QUARRY	DALTILE	QUETREAD	CHARCOAL	6"x 6"					EVELYN IACOBUCCI evelyn.iacobucci@daltile.com
BTQ01	BASE, TILE, QUARRY	DALTILE	QUETREAD	CHARCOAL	6" x 6"					
TC01	TILE, CERAMIC	DALTILE	COLOR WHEEL LINEAR	MATTE ARTIC WHITE 0790	4"x12"	MATTE	STACKED BOND	SERVING LINE WALLS		EVELYN IACOBUCCI evelyn.iacobucci@daltile.com
GROUT				FROST / 77						
TC02	TILE, CERAMIC	DALTILE	COLOR WHEEL LINEAR	ARTIC WHITE 0190	4"x12"	SEMI-GLOSS	STACKED BOND	SERVING LINE WALLS		
GROUT		MAPEI		FROST / 77						
TP01	TILE, PORCELAIN	DALTILE	HADDONSTONE / RECTANGLE CROSSCUT	PEONY, HS04	12" x 24"	MATTE	STACKED BOND	CORRIDOR TILE WAINSCOT		EVELYN IACOBUCCI evelyn.iacobucci@daltile.com
GROUT		MAPEI		WARM GRAY / 93						
TP02	TILE, PORCELAIN	DALTILE	HADDONSTONE / RECTANGLE RIDGE	PEONY, HS04	12" x 24"	TEXTURED	STACKED BOND	CORRIDOR TILE WAINSCOT ACCENT		EVELYN IACOBUCCI evelyn.iacobucci@daltile.com
GROUT		MAPEI		WARM GRAY / 93						
TP03	TILE, PORCELAIN	DALTILE	HADDONSTONE / RECTANGLE CROSSCUT	ATLAS, HS06	12" x 24"	MATTE	STACKED BOND	CURVED CORRIDOR, SCIENCE AND FINE ARTS CLASS ENTRY ALCOVES TILE WAINSCOT, AT ELEVATOR		EVELYN IACOBUCCI evelyn.iacobucci@daltile.com
GROUT		MAPEI		WALNUT / 106						
TP04	TILE, PORCELAIN	DALTILE	HADDONSTONE / RECTANGLE RIDGE	ATLAS, HS06	12" x 24"	TEXTURED	STACKED BOND	CURVED CORRIDOR, SCIENCE AND FINE ARTS CLASS ENTRY ALCOVES TILE WAINSCOT ACCENT, AT ELEVATOR		EVELYN IACOBUCCI evelyn.iacobucci@daltile.com
GROUT		MAPEI		WALNUT / 106						
TP05	TILE, PORCELAIN	DALTILE	HADDONSTONE / RECTANGLE CROSSCUT	VELVET, HS08	12" x 24"	MATTE	STACKED BOND	RESTROOMS ENTRY, BEHIND BENCH UNDER MAIN STAIRS		EVELYN IACOBUCCI evelyn.iacobucci@daltile.com
GROUT		MAPEI		CHARCOAL / 47						
TP06	TILE, PORCELAIN	CROSSVILLE STUDIOS	TWIN PEAKS - UP	SNOW	3" x 12"			SERVING LINE OPENING		DANA ANTAKE DANA.ANTAKE@AHFPRODUCTS.COM 713.203.4253
GROUT		MAPEI		FROST / 77						
TP07	TILE, PORCELAIN	CROSSVILLE STUDIOS	TWIN PEAKS - MEDIUM	SNOW	3" x 12"			SERVING LINE OPENING		DANA ANTAKE DANA.ANTAKE@AHFPRODUCTS.COM 713.203.4253
GROUT		MAPEI		FROST / 77						
TP08	TILE, PORCELAIN	TRINITY SURFACES	ROCKLEDGE / MATTE	CLAY	24" X 48"			RESTROOMS FLOOR		CLAIRE ZOGG CZOGG@TRINITYSURFACES.COM 281.979.5081
GROUT		MAPEI		SAHARA BIEGE / 11						
TP09	TILE, PORCELAIN	TRINITY SURFACES	ARABELLA	DAWN	2" x 10"			CLASSROOM CORRIDOR CURVED CORNER		CLAIRE ZOGG CZOGG@TRINITYSURFACES.COM 281.979.5081
GROUT		MAPEI		IVORY / 39						
TP10	TILE, PORCELAIN	TRINITY SURFACES	ARABELLA	DAWN	2" x 10"			CLASSROOM CORRIDOR CURVED CORNER		CLAIRE ZOGG CZOGG@TRINITYSURFACES.COM 281.979.5081
GROUT		MAPEI		IVORY / 39						
TP11	TILE, PORCELAIN	ARIZONA TILE	GEM	VINO	2" x 16"			SERVING LINE		EMILY HILL EHILL@ARIZONATILE.COM
GROUT		MAPEI		WARM GRAY / 93						
TP12	TILE, PORCELAIN	AUDREY LANE	WATERJET GIRLS BEST FRIEND	PATTERN "A" CALACATTA MATTE, PURE BLACK MATTE, ARCTIC GILD METAL	MODEST SCALE			RESTROOMS AND BEHIND WATER FOUNTAINS		CLAIRE ZOGG CZOGG@TRINITYSURFACES.COM 281.979.5081
GROUT		MAPEI		WARM GRAY / 93						
TP13	TILE,PORCELAIN	AUDREY LANE	WATERJET GIRLS BEST FRIEND	CALACATTA MATTE, ARCTIC GILD METAL	MODEST SCALE			LIFE SKILLS RESTROOM		
GROUT		MAPEI		WARM GRAY / 93						
TP14	TILE, PORCELAIN	DALTILE	HADDONSTONE / RECTANGLE CROSSCUT	PEONY, HS04	24" X 48"			DINING COLUMNS AT BENCH		
GROUT		MAPEI		WARM GRAY / 93						
TP15	TILE, PORCELAIN	DALTILE	HADDONSTONE / RECTANGLE CROSSCUT	VELVET, HS08	24" X 48"			SERVING LINE FLOOR		
GROUT		MAPEI		CHARCOAL / 47						
BTP01	BASE, TILE, PORCELAIN	DALTILE	HADDONSTONE / COVE BASE, S36C9	VELVET, HS08	6" x 12"			SERVING LINE FLOOR	TERMINATE BASE AT TILE TRANSITION TO QUARRY TILE IN SERVING LINE	

09 5100 - ACOUSTICAL CEILINGS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
L1	LAY-IN SUSPENDED CEILING	CERTAINTEED	FINE FISSURED HHF-157	WHITE, UNO	24" x 24"				STANDARD	NAME EMAIL PHONE
L4	LAY-IN SUSPENDED CEILING	CERTAINTEED	VINYLROCK 1142-CRF-1	WHITE, UNO	24" x 24"				VINYL COVERED (FOOD SERVICE)	NAME EMAIL PHONE
L6	LAY-IN SUSPENDED CEILING	CERTAINTEED	SYMPHONY F 1362-IOF-1	WHITE, UNO	24" x 24"				ACOUSTICAL 'ABSORPTIVE' (GLASS FIBER)	NAME EMAIL PHONE
L9	LAY-IN SUSPENDED CEILING	CERTAINTEED	SYMPHONY M 1228-85-1	WHITE, UNO	24" x 72"		SUSPENDED CLOUDS	CLASSROOM CORRIDORS	MINERAL FIBER (LARGE FORMAT)	NAME EMAIL PHONE
L10	LAY-IN SUSPENDED CEILING	CERTAINTEED	SYMPHONY M 1229-75-1	WHITE, UNO	30" x 60"			SECURED VESTIBULE	MINERAL FIBER (LARGE FORMAT)	
L11	LAY-IN SUSPENDED CEILING	CERTTAINTEED	FINE FISSURED HIGH NRC HHF-457 HNRC	WHITE,UNO	24"x24"				STANDARD, HIGH NRC	

09 5426 - LINEAR WOOD CEILINGS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
LCS01	LINEAR CEILING SYSTEM	ARMSTRONG CEILINGS	ENCORE SERIES 1	STAINED TO MATCH PL02	6" GROOVE SPACING			LIBRARY		NAME EMAIL PHONE
LCS02	LINEAR CEILING SYSTEM	CERTAINTEED	CONTINIOUS LINEAR PLANK	STAINED TO MATCH PL02	6" PLANK			LIBRARY AT SCREEN AND DINING	FELT REVEALS	NAME EMAIL PHONE

09 6433 - LAMINATED WOOD FLOORING

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
WMP01	WOOD PLANK FLOORING	NYDREE	MAPLE	PERFECT BROWN	4" PLANKS			LEARNING STAIR IN LIBRARY		
WMP02	WOOD PLANK FLOORING	NYDREE	PLAINSAWN WHITE OAK	PERFECT BROWN	2 2/3" PLANKS			CURVED BENCHES AT CORRIDORS		
WMP03	WOOD PLANK FLOORING	NYDREE	PLAINSAWN WHITE OAK	PERFECT BROWN	4" PLANKS			LEARNING STAIR NOSING		

09 6500 - RESILIENT FLOORING

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
BR01	BASE, RUBBER	ROPPE		BLACK BROWN / 193	4"					STER STEPHANIE.FOSTER@TARKETT.COM 281.702.5258
BR02	BASE, RUBBER	ROPPE		ESPRESSO / 691	4"					NAME EMAIL PHONE
BR03	BASE, RUBBER	ROPPE	TOELESS	BLACK / 100	2.5"					
BRV01	BASE, RUBBER VENTED	ROPPE		BLACK BROWN / 193	4"					NAME EMAIL PHONE
LVT01A	LUXURY VINYL TILE	MANNINGTON	COLOR ANCHOR / GROVE	FLANNEL / C146	6" x 36" (30MIL)			GENERAL FIELD VINYL TILE		MICHELLE MORRIS MICHELLE.MORRIS@MANNINGTON.COM 832.823.3421
LVT01B	LUXURY VINYL TILE	MANNINGTON	COLOR ANCHOR / GROVE	FLANNEL / C146	18" x 18" (30MIL)			FLOORING PATTERN AT INTERSECTION IN AREA A, C AND E		
LVT02A	LUXURY VINYL TILE	MANNINGTON	COLOR ANCHOR / GROVE	TRUFFLE / C147	6" x 36" (30MIL)			GENERAL ACCENT VINYL TILE		MICHELLE MORRIS MICHELLE.MORRIS@MANNINGTON.COM 832.823.3421
LVT02B	LUXURY VINYL TILE	MANNINGTON	COLOR ANCHOR / GROVE	TRUFFLE / C147	12" x 24" (30MIL)			FLOORING PATTERN AT INTERSECTION IN AREA A, C AND E		
LVT03	LUXURY VINYL TILE	MANNINGTON	COLOR ANCHOR / GROVE	BUZZY YELLOW / C104	6" x 36" (30MIL)			GENERAL ACCENT VINYL TILE		MICHELLE MORRIS MICHELLE.MORRIS@MANNINGTON.COM 832.823.3421
LVT04	LUXURY VINYL TILE	MANNINGTON	COLOR ANCHOR / GROVE	RHUBARB PIE / C102	6" x 36" (30MIL)			GENERAL AND FLOORING PATTERN AT INTERSECTION IN AREA S, C AND E		MICHELLE MORRIS MICHELLE.MORRIS@MANNINGTON.COM 832.823.3421
RTR01	RUBBER TREADS	ROPPE	RUBBER TREAD	PEWTER / 178		SAFETY ROUNDS		EGRESS STAIRS AND RAMP	AT STAIR NOSING PROVIDE RUBBER INSERT, COLOR BLACK	

09 6566 - RESILIENT ATHLETIC FLOORING

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
RAFF01	RESILIENT ATHLETIC FLUID FLOORING	CONNOR SPORTS	ELASTIPLUS - HYBRID ATHLETICSURFACE	COLOR TO BE SELECTED FROM MANUF. FULL RANGE OF COLOR OPTION BY SUBMITTAL	7 + 2mm THICK			GYM		NAME EMAIL

09 6816 - SHEET CARPETING

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
CPT01	CARPET, SHEET	TARKETT	TEXTUREMAP / 11129	NOCTURNAL / 42807				FIELD		
CPT02	CARPET, SHEET	TARKETT	MEADOWSWEET / 11365	SUN-LIT / 67506				CIRCULAR ALCOVES AT LIBRARY		STER STEPHANIE.FOSTER@TARKETT.COM 281.702.5256
CPT03	CARPET, SHEET	TARKETT	MEADOWSWEET / 11365	CUSTOM COLOR / 116277360-10		-		ALCOVES AT SCIENCE LABS		STER STEPHANIE.FOSTER@TARKETT.COM 281.702.5256
WOC01	WALK-OFF CARPET	TARKETT	ASSERTIVE ACTION / 04837	LEAD SHOT / 26207						

09 7200 - WALLCOVERINGS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
AWC01	ACOUSTICAL WALLCOVERING	ACOUFELT	FRACTURE TWO TONE BARCODE- PREMIER	CURRANT CU59 / SLATE SL27	48"x108"x12mm THICK			BACK WALL OF RECESSED SEATING AREA		NAME EMAIL PHONE
AWC02	ACOUSTICAL WALLCOVERING	ACOUFELT	FRACTURE TWO TONE BARCODE- PREMIER	POPCORN PO26 / SLATE SL27	48"x108"x12mm THICK			BACK WALL OF SEAT UNDER THE STAIR		
AWC03	ACOUSTICAL WALLCOVERING	ACOUFELT	FRACTURE-SPIROGRAPH	ALMOND AL55 / POPCORN PO26	48"x108"x24mm THICK		LAYOUT 3	WALL AT PLATFORM		

09 7223 - CUSTOM DIGITAL WALLCOVERING

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
CDW01	CUSTOM DIGITAL WALLCOVERING	DREAMSCAPE	MYSTICAL	CUSTOM DIGITAL ARTWORK		EMBOSSED				NAME EMAIL PHONE
CDW02	CUSTOM DIGITAL WALLCOVERING	DREAMSCAPE	MYSTICAL	CUSTOM DIGITAL ARTWORK		EMBOSSED				NAME EMAIL PHONE
CDW03	CUSTOM DIGITAL WALLCOVERING	DREAMSCAPE	MYSTICAL	CUSTOM DIGITAL ARTWORK		EMBOSSED				
CDW04	CUSTOM DIGITAL WALLCOVERING	DREAMSCAPE	MYSTICAL	CUSTOM DIGITAL ARTWORK		EMBOSSED				
CDW05	CUSTOM DIGITAL WALLCOVERING	DREAMSCAPE	MYSTICAL	CUSTOM DIGITAL ARTWORK		EMBOSSED				

09 7400 - LINEAR WOOD WALL SYSTEM

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT

REFER TO PROJECT SPECIFICATIONS SECTION 09 9000 FOR ADDITIONAL INFORMATION REGARDING FINISH MATERIALS AND PAINT FINISH CODES.

XY - ## (MATERIAL TYPE / FINISH COLOR AND MATERIAL SIZE AS NOTED)

ACB - ACOUSTICAL CEILING BAFFLE
ACC - ACOUSTICAL CEILING CLOUD
ACMU - ARCHITECTURAL CONCRETE MASONRY UNIT
AL - ALUMINUM (DOORS AND FRAMES)
AP - ACOUSTICAL PANELS
AWC - ACOUSTICAL WALL COVERING
B - HORIZONTAL BLINDS
BCT - BASE, COVE FLOOR-TO-WALL TRANSITION
BRES - BASE, RESINOUS INTEGRAL
BRK - BRICK
BR - BASE, RUBBER
BRV - BASE, RUBBER VENTED
BTC - BASE, TILE, CERAMIC
BTG - BACK-PAINTED, TEMPERED GLASS
BTM - BASE, TILE, MOSAIC
BTP - BASE, TILE, PORCELAIN
BTQ - BASE, TILE, QUARRY
BTZ - BASE, TERRAZZO PRECAST
BWD - BASE, WOOD
BVSF - BASE, VINYL SHEET FLOORING
CC - CUBICLE CURTAIN
CCD - COILING COUNTER DOOR
CDAP - CUSTOM DIGITALLY PRINTED ACOUSTIC PANEL
CDF - CUSTOM DIGITAL FILM
CDW - CUSTOM DIGITAL WALLCOVERINGS
CG - CORNER GUARD
COP - CONCRETE, POLISHED
COS - CONCRETE, SEALED
COST - CONCRETE, STAINED
CPT - CARPET, SHEET
CS - CAST STONE
CSM - CONCRETE STONE MASONRY
CSMU - CALCIUM SILICATE MASONRY UNIT
CT - CARPET, TILED
CWF - CUSTOM WINDOW FILM
DCT - DECORATIVE CONTRETE TOPPING
DEW - DRY ERASE WALLCOVERING
EPNT - EPOXY PAINT
ERC - EPOXY RESIN COUNTERTOP
FRP - FIBERGLASS REINFORCED PLASTIC PANEL SYSTEM
FSS - FIXED SUN SCREENS
GFRC - GLASS FIBER REINFORCED CONCRETE
GRF - GROUND FACE CMU (BURNISHED)
HM - HOLLOW METAL
IFP - INTUMESCENT FIRE PROTECTION
L - LAY-IN SUSPENDED CEILING TILE
LCK - LOCKERS
LCS - LINEAR CEILING SYSTEM
LF - LINOLEUM FLOORING
LVT - LUXURY VINYL TILE
LWS - LINEAR WALL SYSTEM
MB - MARKER BOARD
MCM - METAL COMPOSITE MATERIAL
MP - METAL WALL PANEL
MRP - METAL ROOF PANEL
MS - METAL SOFFIT
NS - NATURAL STONE
OCD - OVERHEAD COILING DOOR
OCG - OVERHEAD COILING GRILLE
OHGL - OVERHEAD GLASS DOOR
OP - OPERABLE PARTITION
PC - PROTECTIVE COVERS
PCP - PORTLAND CEMENT PLASTER
PL - PLASTIC LAMINATE
PLP - PLASTIC LAMINATE PANEL SYSTEM
PNT - PAINT
PWC - PAINT, WOOD CASEWORK
QTZ - QUARTZ SURFACING
RAFF - RESILIENT ATHLETIC FLUID FLOORING
RAFS - RUBBER ATHLETIC FLOORING SHEET
RAFV - RESILIENT ATHLETIC FLOORING VINYL
RES - RESINOUS FLOORING
RP - RESIN PANEL
RS - RUBBER SHEET
RT - RUBBER TILE
RTR - RUBBER TREADS AND RISERS
S - WINDOW SHADES
SAC - SEAMLESS ACOUSTICAL CEILING SYSTEM
SB - BLACKOUT WINDOW SHADES
SC - SOLID CORE (DOOR)
SM - MOTORIZED WINDOW SHADES
SMB - MOTORIZED BLACKOUT WINDOW SHADES
SPEC - SPECIAL FINISHES, REF. ROOM FINISH SCHEDULE & INTERIOR ELEVATIONS
SPF - SPLIT-FACE CONCRETE MASONRY UNIT
SS - STAINLESS STEEL
SSM - SOLID SURFACE MATERIAL
STG - STAGE CURTAIN
TAP - TOILET ACCESSORY, PARTITION
TB - TACK BOARD
TC - TILE, CERAMIC
TM - TILE, MOSAIC
TP - TILE, PORCELAIN
TQ - TILE, QUARRY
TRC - TERRACOTTA RAINSCREEN CLADDING
TS - TACKABLE SURFACE
TZ - TERRAZZO
TZP - TERRAZZO, PRECAST STAIR TREADS AND RISERS
TZT - TERRAZZO TILE
UP - UPHOLSTERY
VCT - VINYL COMPOSITION TILE
VSF - VINYL SHEET FLOORING
VTR - VINYL TREADS AND RISERS
VWC - VINYL WALL COVERING
WAF - WOOD ATHLETIC FLOORING
WDF - WOOD FLOORING
WMS - WOOD MASONITE FLOOR SYSTEM
WOM - WALK-OFF MAT
WOT - WALK-OFF TILE
WVC - WOOD VENEER CASEWORK

FINISH KEY (NOT ALL ABBREVIATIONS MAY BE USED)

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Revision / 1 — Date 08/07/26 — ADDENDUM 02

Project: TOMBALL INTERMEDIATE SCHO

G5 - SCHEDULE OF MATERIALS & COLORS

11d	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES.	CONTACT
LWS01	LINEAR WALL SYSTEM	ARMSTRONG CEILINGS	ENCORE SERIES 1	PL02	8" GROOVE SPACIN/ 7.5" PLANK			LIBRARY WALL AND CEILING		NAME EMAIL PHONE

09 8400 - ACOUSTICAL PANELS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
AP01	ACOUSTICAL PANELS	MAHARAM	DELTA	001 SNOWBLIND						
AP02	ACOUSTICAL PANELS	MAHARAM	DELTA	004 CANDID						
AP03	ACOUSTICAL PANELS	MAHARAM	DELTA	006 ANONYMOUS						
AP04	ACOUSTICAL PANELS	MAHARAM	BECK / 466570	034 LAMBIC						NAME EMAIL PHONE
AP05	ACOUSTICAL PANELS	MAHARAM	BECK / 466570	043 LINGONBERRY						NAME EMAIL PHONE
AP06	ACOUSTICAL PANELS	CARNEGIE	XOREL SPINE / 0269	13						JENNIFER BRAGUIERA 713.876.9443 JENNIFER@AVIDSONDES.COM
ACB01	ACOUSTICAL CEILING BAFFLE	FRASCH	BAFL - CUSTOM SHAPE	OFF WHITE				LIBRARY	COORDINATE FIRE SUPPRESSION REQUIREMENTS AND MOUNTING HEIGHTS WITH ARCHITECT AND MEP ENGINEER	NAME EMAIL PHONE
AWB01	ACOUSTICAL WALL BAFFLE	ACOUFELT	SOFTEN UP / FOOOTHILL	CURRANT CU5				LIBRARY NOOKS	REFER TO INTERIOR ELEVATIONS FOR PATTERN	
AWB02	ACOUSTICAL WALL BAFFLE	ACOUFELT	SOFTEN UP / FOOOTHILL	POPCORN PO26				LIBRARY NOOKS	REFER TO INTERIOR ELEVATIONS FOR PATTERN	
AWB03	ACOUSTICAL WALL BAFFLE	ACOUFELT	SOFTEN UP / FOOOTHILL	ALMOND AL55				LIBRARY NOOKS	REFER TO INTERIOR ELEVATIONS FOR PATTERN	

09 9000 - PAINTING AND COATING

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
EPNT01	PAINT, EPOXY	SHERWIN WILLIAMS		MATCH PNT01						NAME EMAIL PHONE
EPNT02	PAINT, EPOXY	SHERWIN WILLIAMS								NAME EMAIL PHONE
PNT01	PAINT	SHERWIN WILLIAMS		ORIGAMI WHITE / SW7636						NAME EMAIL PHONE
PNT02	PAINT	SHERWIN WILLIAMS		ELEPHANT EAR / SW7022						NAME EMAIL PHONE
PNT03	PAINT	SHERWIN WILLIAMS		CORDIAL / SW6306						NAME EMAIL PHONE
PNT04	PAINT,	SHERWIN WILLIAMS		CEREMONIAL GOLD / SW6382						NAME EMAIL PHONE
PNT05	PAINT	SHERWIN WILLIAMS		IRON ORE / SW7069						
PNT06	PAINT	SHERWIN WILLIAMS		HIGH REFLECTIVE WHITE / SW7757						NAME EMAIL PHONE
PNT07	PAINT	SHERWIN WILLIAMS		LOGGIA / SW7506						
PNT08	PAINT	SHERWIN WILLIAMS		PEPPERCORN / SW7674				LIBRARY SCREEN HSS MEMBERS		

DIVISION 10 - SPECIALTIES

10 1100 - VISUAL DISPLAY UNITS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
MB	MARKER BOARD			CLEAR ANODIZED						NAME EMAIL PHONE
TB	TACK BOARD	KOROSEAL	TAC-WALL	EARTHEN / 08						NAME EMAIL PHONE
TS	TACKABLE SURFACE								*** SOME TACKABLE SURFACE REQUIRES A LEVEL 5 GYPSUM BOARD FINISH. NOTE THAT HERE IF REQUIRED.***	NAME EMAIL PHONE
	DISPLAY CASES			CLEAR ANODIZED						NAME EMAIL PHONE
	DISPLAY CASES TACKABLE SURFACE			COLOR TO BE SELECTED FROM MANUF. FULL RANGE OF COLOR OPTION BY SUBMITTAL						NAME EMAIL PHONE

10 1400 - SIGNAGE

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
	EXTERIOR SIGNAGE									
	INTERIOR ROOM SIGNS / TOP	PL01					REF A8 SERIES FOR ROOM NAME AND NUMBER			
	INTERIOR ROOM SIGNS / BOTTOM	PL01					REF A8 SERIES FOR ROOM NAME AND NUMBER			
	INTERIOR ROOM SIGNS / DEMARCATION LINE	MATCH PNT05					REF A8 SERIES FOR ROOM NAME AND NUMBER			
	INTERIOR ROOM SIGNS / LETTERS	MATCH PNT05					REF A8 SERIES FOR ROOM NAME AND NUMBER			
	INTERIOR ROOM SIGNS / EDGE	PL01					REF A8 SERIES FOR ROOM NAME AND NUMBER			

10 2113.19 - PLASTIC TOILET COMPARTMENTS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
TAP	TOILET ACCESSORY, PARTITION	ASI	COLOR-THRU PHENOLIC	CHARCOAL 3077					CLASS A, NFPA 286; COLOR THRU PANELS w/ VANDAL RESISTANT TOP	

10 2123 - CUBICLE CURTAINS AND TRACK

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
CC	CUBICLE CURTAIN	INPRO	SOFETTI	PEBBLE						

10 2239 - FOLDING PANEL PARTITIONS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
OP	OPERABLE PARTITION					FULL HEIGHT MARKERBOARD				NAME EMAIL PHONE

10 2241 - OPERABLE GLASS PARTITIONS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
OGP	OPERABLE PARTITION			CLEAR ANODIZED						NAME EMAIL PHONE

10 2600 - WALL AND DOOR PROTECTION

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
CG	CORNER GUARD	ACROVYN		TBD			CORNER GUARD TO SPAN FROM FINISH FLOOR TO 8'-0" AFF.			NAME EMAIL PHONE

10 5100 - LOCKERS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
LCK	LOCKERS			BLACK	TYPE A - REF A8.30			MAIN CUSTODIAL & KITCHEN		NAME EMAIL PHONE

10 7113.43 - FIXED SUN SCREENS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
FSS	FIXED SUN SCREENS			CLEAR ANODIZED			INTEGRAL TO STOREFRONT SYSTEM			NAME EMAIL PHONE

10 7300 - PROTECTIVE COVERS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
PC	PROTECTIVE COVERS			CLEAR ANODIZED						NAME EMAIL PHONE

10 7340 - FABRIC SUN SHADES

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
FSC	FABRIC SHADE CANOPIES			CONFIRM WITH OWNER FROM STANDARD COLORS						NAME

DIVISION 11 - EQUIPMENT

11 6100 - THEATRICAL EQUIPMENT

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
STG	STAGE CURTAIN	TEXAS SCENIC	CHARISMA	RUBY / 1047						NAME EMAIL PHONE

11 6623 - GYMNASIUM EQUIPMENT

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
WP01	WALL PADDING	DRAPER		MAROON						NAME EMAIL PHONE

DIVISION 12 - FURNISHINGS

12 2100 - WINDOW BLINDS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
B	HORIZONTAL BLINDS	SWF CONTRACT	S3000 1" CORDLESS MINI BLINDS	ALMOST WHITE GLOSS 065	1"		AT ALL LOCATIONS PLACE BLINDS INSIDE OF FRAME	REFER TO FINISH PLANS FOR LOCATIONS	MANUAL PUSH/PULL LIFT	NAME EMAIL PHONE

12 2400 - WINDOW SHADES

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
S	WINDOW SHADES	MECHO SHADE	MECHO/S SYSTEM / 1600 SERIES	SOHO / LIGHT GREY / 1603				REFER TO FINISH PLANS FOR LOCATIONS		NAME EMAIL PHONE

G5 - SCHEDULE OF MATERIALS & COLORS

11d	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES.	CONTACT
SM	MOTORIZED WINDOW SHADES	MECHO SHADE	ELECTRO/2 / 1600 SERIES	SOHO / LIGHT GREY / 1603				REFER TO FINISH PLANS FOR LOCATIONS		NAME EMAIL PHONE
SMB	MOTORIZED BLACKOUT WINDOW SHADES	MECHO SHADE	ELECTRO/2- CLASSIC BLACKOUT / 0700 SERIES	SOHO / LIGHT GREY 0702		LIGHT GREY ON BOTH SIDES OF SHADE CLOTH		REFER TO FINISH PLANS FOR LOCATIONS		NAME EMAIL PHONE

12 3200 - MANUFACTURED WOOD CASEWORK

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
PL01	PLASTIC LAMINATE	WILSONART		RAW COTTON / 4947-38				COUNTERTOP		NAME EMAIL PHONE
PL02	PLASTIC LAMINATE	WILSONART		WALNUT HEIGHTS / 765K-12				DOORS & DRAWERS		NAME EMAIL PHONE
PL03	PLASTIC LAMINATE	NEVAMAR		SUNRAY / S4022T		TEXTURED		CUBBIE BACKS AT LEARNING STAIR		NAME EMAIL PHONE
PL04	PLASTIC LAMINATE	NEVAMAR		BURGUNDY / S1015T		TEXTURED		CUBBIE BACKS AT LEARNING STAIR		

12 3600 - COUNTERTOPS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
QTZ01	QUARTZ SURFACING	CAMBRIA		CROWNDALE				RECEPTION DESK AND CIRCULATION DESK		NAME EMAIL PHONE
SSM01	SOLID SURFACE MATERIAL	CORIAN		SPARKLING GRANITA				WINDOW SILLS, TV RECESS SURROUND, SEATING BENCH		NAME EMAIL PHONE
SSM02	SOLID SURFACE MATERIAL	CORIAN		CARBON CONCRETE				UNDERSTAIR SEATING, CURVED CORNER AND CORRIDOR BENCH		
SSM03	SOLID SURFACE MATERIAL	CORIAN		DESIGNER WHITE				SURROUD OF PLATFORM OPENING		

12 5219 - UPHOLSTERED SEAT CUSHIONS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
UP01	UPHOLSTERY	CARNEGIE	XOREL TWINE / 6217	32						NAME EMAIL PHONE
UP02	UPHOLSTERY	MOMENTUM TEXTILE & WALLCOVERINGS	SILICA LEATHER	MARIGOLD				CUSHION SEATS AT LEARNING STAIR		
UP03	UPHOLSTERY	DESIGNTEX	SILICONE ELEMENT	OXFORD / 3919-304				CUSHION SEATS AT LEARNING STAIR		

DIVISION 14 - ELEVATORS

14 2400 - HYDRAULIC ELEVATORS

KEY	TYPE	MANUFACTURER	MODEL/SERIES	COLOR/NUMBER	SIZE	FINISH	INSTALLATION	LOCATION	NOTES	CONTACT
	ELEVATOR CAB FLOOR	TARKETT		LVT01						NAME EMAIL PHONE
	ELEVATOR CAB WALLS			STAINLESS STEEL						NAME EMAIL PHONE
	ELEVATOR HOISTWAY DOORS			STAINLESS STEEL						NAME EMAIL PHONE

REFER TO PROJECT SPECIFICATIONS SECTION 09 9000 FOR ADDITIONAL INFORMATION REGARDING FINISH MATERIALS AND PAINT FINISH CODES.

XY . ##
MATERIAL TYPE — FINISH COLOR AND MATERIAL SIZE AS NOTED

ACB - ACOUSTICAL CEILING BAFFLE
ACC - ACOUSTICAL CEILING CLOUD
ACMU - ARCHITECTURAL CONCRETE MASONRY UNIT
AL - ALUMINUM (DOORS AND FRAMES)
AP - ACOUSTICAL PANELS
AWC - ACOUSTICAL WALL COVERING
B - HORIZONTAL BLINDS
BCT - BASE, COVE FLOOR-TO-WALL TRANSITION
BRES - BASE, RESINOUS INTEGRAL
BRK - BRICK
BR - BASE, RUBBER
BRV - BASE, RUBBER VENTED
BTC - BASE, TILE, CERAMIC
BTG - BACK-PAINTED, TEMPERED GLASS
BTM - BASE, TILE, MOSAIC
BTP - BASE, TILE, PORCELAIN
BTQ - BASE, TILE, QUARRY
BTZ - BASE, TERRAZZO PRECAST
BWD - BASE, WOOD
BVSF - BASE, VINYL SHEET FLOORING
CC - CUBICLE CURTAIN
CCD - COILING COUNTER DOOR
CDAP - CUSTOM DIGITALLY PRINTED ACOUSTIC PANEL
CDF - CUSTOM DIGITAL FILM
CDW - CUSTOM DIGITAL WALLCOVERINGS
CG - CORNER GUARD
COP - CONCRETE, POLISHED
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COST - CONCRETE, STAINED
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LCS - LINEAR CEILING SYSTEM
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WDF - WOOD FLOORING
WMS - WOOD MASONITE FLOOR SYSTEM
WOM - WALK-OFF MAT
WOT - WALK-OFF TILE
WVC - WOOD VENEER CASEWORK

FINISH KEY (NOT ALL ABBREVIATIONS MAY BE USED)

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Revision / 1
Date 08/07/26 ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

REGISTERED ARCHITECT — KATHLEEN HUCKABEE — STATE OF TEXAS — 29453
08/07/2026

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SCHEDULE OF MATERIALS AND COLORS
VOLUME 01

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Sheet No. G5.02
Drawn By: CB,MA
Date: 07.15.26

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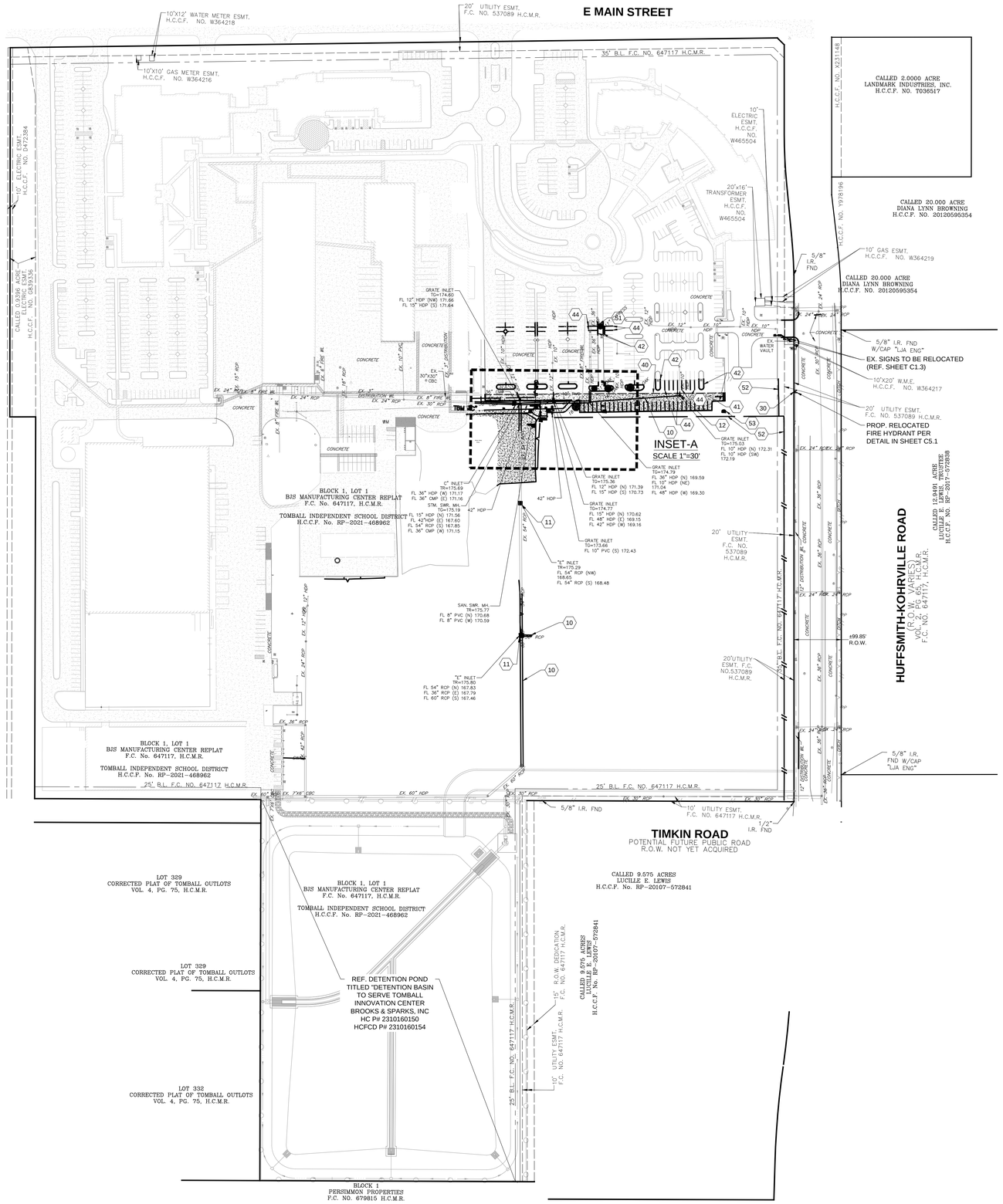

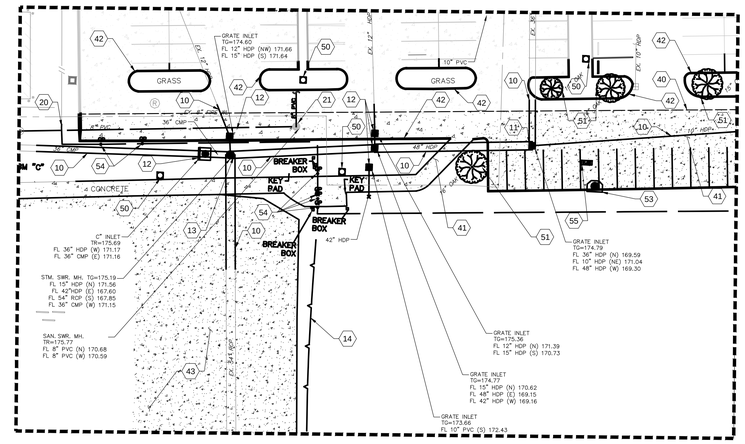

ENLARGED DEMOLITION DETAIL-A
SCALE 1"=30'

0 100 200
SCALE: 1" = 100'

SITE DEMOLITION NOTES:

ALL EXISTING FACILITIES, AS DEPICTED ON THE TOPOGRAPHIC SURVEY, BOTH ABOVE GROUND AND UNDERGROUND, TO BE REMOVED BY CONTRACTOR UNLESS OTHERWISE NOTED. CONTRACTOR TO CONTACT 811 (CITY OF HOUSTON) OR LOCAL EQUIVALENT PRIOR TO DIGGING OR REMOVAL OF ANY WET OR DRY UTILITIES.

CONTRACTOR TO COORDINATE GAS, ELECTRIC, AND COMMUNICATION REMOVAL/RELOCATION WITH THE PROPER PUBLIC & PRIVATE JURISDICTIONAL AGENCIES. WGA DOES NOT GUARANTEE THE LOCATION OR STATUS OF ANY EXISTING UTILITIES SHOWN.

OVERALL LAYOUT LEGEND:

	PROPERTY LINE
	RIGHT OF WAY LINE

DEMOLITION KEYNOTES

STORM SEWER DEMOLITION:

10 STORM SEWER TO BE REMOVED
11 INLET TO BE REMOVED
12 INLET TO BE CAPPED
13 STORM SEWER MANHOLE TO BE CAPPED
14 SWALE TO BE REMOVED

SANITARY SEWER DEMOLITION:

20 SANITARY SEWER LINE TO BE REMOVED
21 SANITARY MANHOLE TO BE REMOVED

WATER DEMOLITION:

30 FIRE HYDRANT TO BE REMOVED

PAVEMENT DEMOLITION:

40 PROPOSED SAWCUT
41 CONCRETE PAVING TO BE REMOVED
42 CURB TO BE REMOVED
44 STRIPING TO BE REMOVED

MISCELLANEOUS DEMOLITION:

50 LIGHT POLE TO BE REMOVED
51 TREE TO BE REMOVED
52 FENCE TO BE REMOVED
53 TELEPHONE MANHOLE TO BE REMOVED
54 GATE POST TO BE REMOVED
55 ELECTRIC JUNCTION BOX TO BE REMOVED

KEY MAP (N.T.S.):

BENCHMARKS:

REFERENCE BENCHMARK PUBLISHED ELEVATION - 140.69'

RM120165 - ALUMINUM ROD WITH LOGO CAP STAMPED "120165" LOCATED ON THE WEST SIDE OF TUWA ROAD ±120' NORTH OF THE CENTERLINE OF THE DRIVEWAY FOR 22803 TUWA ROAD IN KEY MAP 289H IN THE WILLOW CREEK WATERSHED. (NAVD 88, 2001 ADJ.)

TEMPORARY BENCHMARK 'B' ELEVATION - 174.74'

BOX CUT ON "C1" INLET LOCATED ON THE EAST SIDE OF HUFSMITH-KOHRVILLE RAD ±1,175' SOUTH OF F.M. 2920 AND ±450' NORTH OF THE MOST EASTERLY SOUTHEAST CORNER OF THE SUBJECT TRACT.
TEMPORARY BENCHMARK 'C' ELEVATION - 176.71'

BOX XUT ON CONCRETE BASE OF LIGHT STANDARD LOCATED ±40' SOUTHWEST OF THE SOUTHWEST CORNER OF THE SOUTHEAST PARKING LOT.
TEMPORARY BENCHMARK 'D' ELEVATION - 177.49'

BOX CUT ON CONCRETE BASE OF LIGHT STANDARD LOCATED ON THE NORTH SIDE OF THE DIESEL FUELING STATION.

FLOODPLAIN NOTE:

THIS SUBJECT TRACT LIES WITHIN UNSHADED ZONE "X" AREAS DETERMINED TO BE OUTSIDE THE 100-YEAR FLOODPLAIN (1% ANNUAL FLOODPLAIN CHANCE) AS DELINEATED ON THE FLOOD INSURANCE MAP FOR HARRIS COUNTY, TEXAS AND INCORPORATED AREAS, MAP NO. 48201C0230L MAP REVISED JUNE 18TH, 2007.

WGA
TEXAS REGISTERED ENGINEERING FIRM F-9756
2500 Tanglewilde, Suite 120 Houston, Texas 77063 713.789.1900
4526 Research Forest, Suite 360 The Woodlands, Texas 77381 713.789.1900

SCALE	DESIGN	DRAWN
1"= 100'	AH	CT

Revision / Addendum	Date
2 ADDENDUM 02	08/07/2026

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

SARA KAROUNI 145244 LICENSED PROFESSIONAL ENGINEER
8/7/26

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DEMOLITION PLAN
VOLUME 01

Job No.	Sheet No.
00788-002	C1.4
Drawn By: CT	
Date: 08.07.26	

ADDENDUM 02

11/18/2025 8:39:50 AM
Autodesk Docs://TOMBALL ISD - IS REPLACEMENT/00802-04-01_Tomball ISD IS Replacement_ARCH.rvt
Drawing: Z:\00788 (Huckabee)\002 Tomball Intermediate School Replacement\500 CAD\530 Sheets\C1.3 Demolition Plan.dwg Last Plotted: Fri Aug 07, 2026 - 11:43am By: dfuerte

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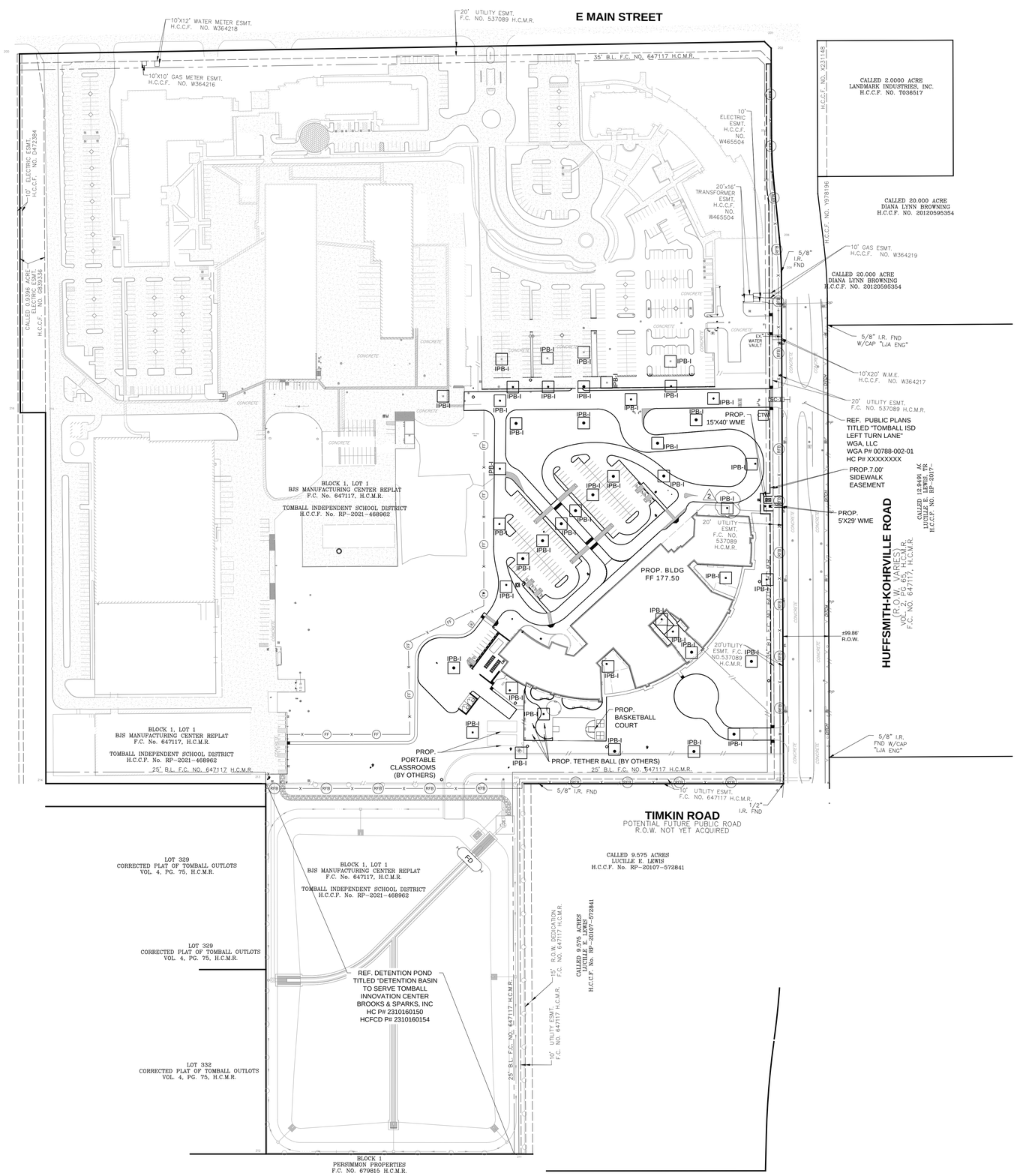

0 100 200

SCALE: 1" = 100'

EROSION CONTROL SCHEDULE AND SEQUENCING

I. ROUGH GRADING
GRADING CONSTRUCTION ENTRANCE/EXIT, SILT FENCE PROTECTION, AND STONE OVERFLOW STRUCTURES SHALL BE INSTALLED PRIOR TO THE INITIATION OF ROUGH GRADING, AS NEEDED.

I. UTILITY INSTALLATION
ALL PRIOR EROSION CONTROL MEASURES INSTALLED ABOVE TO BE MAINTAINED AS NECESSARY DURING UTILITY INSTALLATION. INLET PROTECTION SHALL BE INSTALLED AS STORM DRAINAGE SYSTEM IS CONSTRUCTED.

III. PAVING
ALL PRIOR EROSION CONTROL MEASURES INSTALLED ABOVE TO BE MAINTAINED AS NECESSARY DURING PAVING AND THROUGHOUT THE REMAINDER OF THE PROJECT.

IV. FINAL GRADING/SOIL
STABILIZATION: ALL TEMPORARY EROSION CONTROL MEASURES TO BE REMOVED AT THE CONCLUSION OF THE PROJECT ONCE FINAL STABILIZATION HAS BEEN ACHIEVED.

SWPPP NOTE:

ANY OFF-SITE STAGING AREA UTILIZED BY THE OPERATOR OF THIS SITE MUST BE INCLUDED IN THE SWPPP NARRATIVE PLAN AND TO SWPPP SITE PLAN AS REQUIRED BY THE TPDES TEXAS GENERAL PERMIT TXR150000 (SECTION F). ANY SUCH AREA INCLUDED IN THE SWPPP WILL BE TREATED BY THE OPERATOR AS ANY OTHER PART OF THE CONSTRUCTION ACTIVITY FOR THE PURPOSES OF STORM WATER POLLUTION PREVENTION.

SWPPP LEGEND:

SC-1	STABILIZED CONSTRUCTION EXIT
RFB	REINFORCED FILTER FABRIC FENCE
FF	FILTER FABRIC FENCE
IPB-I	INLET PROTECTION BARRIER TYPE I
IPB-II	INLET PROTECTION BARRIER TYPE II
CTW	CONCRETE TRUCK WASHOUT AREA
FD	FILTER DAM

KEY MAP (N.T.S.):

BENCHMARKS:

REFERENCE BENCHMARK PUBLISHED ELEVATION - 140.69'

RM120165 - ALUMINUM ROD WITH LOGO CAP STAMPED "120165" LOCATED ON THE WEST SIDE OF TUWA ROAD ±120' NORTH OF THE CENTERLINE OF THE DRIVEWAY FOR 22803 TUWA ROAD IN KEY MAP 289H IN THE WILLOW CREEK WATERSHED. (NAVD 88, 2001 ADJ.)

TEMPORARY BENCHMARK 'B' ELEVATION - 174.74'

BOX CUT ON "C1" INLET LOCATED ON THE EAST SIDE OF HUFSMITH-KOHRVILLE RAD ±1,175' SOUTH OF F.M. 2920 AND ±450' NORTH OF THE MOST EASTERLY SOUTHEAST CORNER OF THE SUBJECT TRACT.
TEMPORARY BENCHMARK 'C' ELEVATION - 176.71'

BOX XUT ON CONCRETE BASE OF LIGHT STANDARD LOCATED ±40' SOUTHWEST OF THE SOUTHWEST CORNER OF THE SOUTHEAST PARKING LOT.
TEMPORARY BENCHMARK 'D' ELEVATION - 177.49'

BOX CUT ON CONCRETE BASE OF LIGHT STANDARD LOCATED ON THE NORTH SIDE OF THE DIESEL FUELING STATION.

FLOODPLAIN NOTE:

THIS SUBJECT TRACT LIES WITHIN UNSHADED ZONE "X" AREAS DETERMINED TO BE OUTSIDE THE 100-YEAR FLOODPLAIN (1% ANNUAL FLOODPLAIN CHANCE) AS DELINEATED ON THE FLOOD INSURANCE MAP FOR HARRIS COUNTY, TEXAS AND INCORPORATED AREAS, MAP NO. 48201C0230L MAP REVISED JUNE 18TH, 2007.

WGA
TEXAS REGISTERED ENGINEERING FIRM F-9756
2500 Tanglewilde, Suite 120 Houston, Texas 77063 713.789.1900
4526 Research Forest, Suite 360 The Woodlands, Texas 77381 713.789.1900

SCALE	DESIGN	DRAWN
1"=100'	AH	CT

Revision / Date
2 ADDENDUM 02 08/07/2026

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

SARA KAROUNI 145244 LICENSED PROFESSIONAL ENGINEER
8/7/26

Huckabee
www.huckabee-inc.com
800.687.1229

STORM WATER POLLUTION PREVENTION PLAN
VOLUME 01

Job No. 00788-002	Sheet No. C2.1
Drawn By: CT	
Date: 08.07.26	

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11/18/2025 8:39:30 AM
Autodesk Docs://TOMBALL ISD - IS REPLACEMENT/00802-04-01_Tomball ISD IS Replacement_ARCH.rvt
Drawing: Z:\00788 (Huckabee)\002 Tomball Intermediate School Replacement\500 CAD\530 Sheets\C2.1 SWPPP.dwg Last Plotted: Fri Aug 07, 2026 - 7:54am By: dhuerta

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MATCHLINE
(SEE SHEET C3.1)

REF. PUBLIC PLANS TITLED "TOMBALL ISD LEFT TURN LANE" WGA, LLC WGA P# 00788-002-01 HC P# XXXXXXXX

N
0 30 60
SCALE: 1" = 30'

LEGEND:

	EXISTING PAVEMENT (CONCRETE/ASPHALT AS NOTED)
	PROPOSED 4½" CONCRETE PAVEMENT (SIDEWALK)
	PROPOSED 5" CONCRETE PAVEMENT
	PROPOSED 6" CONCRETE PAVEMENT
	PROPOSED 7" CONCRETE PAVEMENT
	PROPOSED SALTED CONCRETE (REF. ARCH. FOR DETAILS)
	PROPOSED BUILDING

FIRE LANE LEGEND:

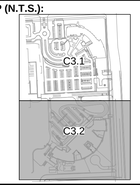
	PROPOSED FIRE LANE

SHEET NOTES:

1. ALL DIMENSIONS ARE TO FACE OF CURB UNLESS OTHERWISE NOTED.
2. REFERENCE ARCHITECTURAL PLANS FOR EXACT BUILDING DIMENSIONS.
3. ALL CURB RADII TO BE 3' (FEET) UNLESS OTHERWISE SHOWN ON PLAN.
4. PROPOSED HANDICAP SIGN SEE PAVEMENT DETAILS.
5. PROPOSED SIGN. REFERENCE LANDSCAPE ARCHITECT PLANS FOR DETAILS.
6. CONTRACTOR SHALL REFERENCE THE LANDSCAPE ARCHITECTURAL PLANS FOR ALL COURTYARD DETAILS.
7. EXISTING SURVEY WAS DONE BY WEST BELT SURVEYING, INC. WITH THEIR CONTACT INFORMATION AS FOLLOWS:

WEST BELT SURVEYING, INC.
21020 PARK ROW KATY, TX 77449
Phone (281) 599-8288 Fax (281) 492-6026

KEY MAP (N.T.S.):



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WGA
TEXAS REGISTERED ENGINEERING FIRM F-9756
2500 Tanglewilde, Suite 120, Houston, Texas 77063, 713.789.1900
4526 Research Forest, Suite 360, The Woodlands, Texas 77381, 713.789.1900

SCALE	DESIGN	DRAWN
1"=30'	AH	CT

Revision / Date
1 ADDENDUM 02 08/07/2026

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

SARA KAROUNI
145244
LICENSED
PROFESSIONAL ENGINEER
8/7/26

Huckabee
www.huckabee-inc.com
800.687.1229

DIMENSION CONTROL & SIGNAGE PLAN (2 OF 2)
VOLUME 01

Job No. 00788-002 | Sheet No. C3.2
Drawn By: CT
Date: 08.07.26

ADDENDUM 02

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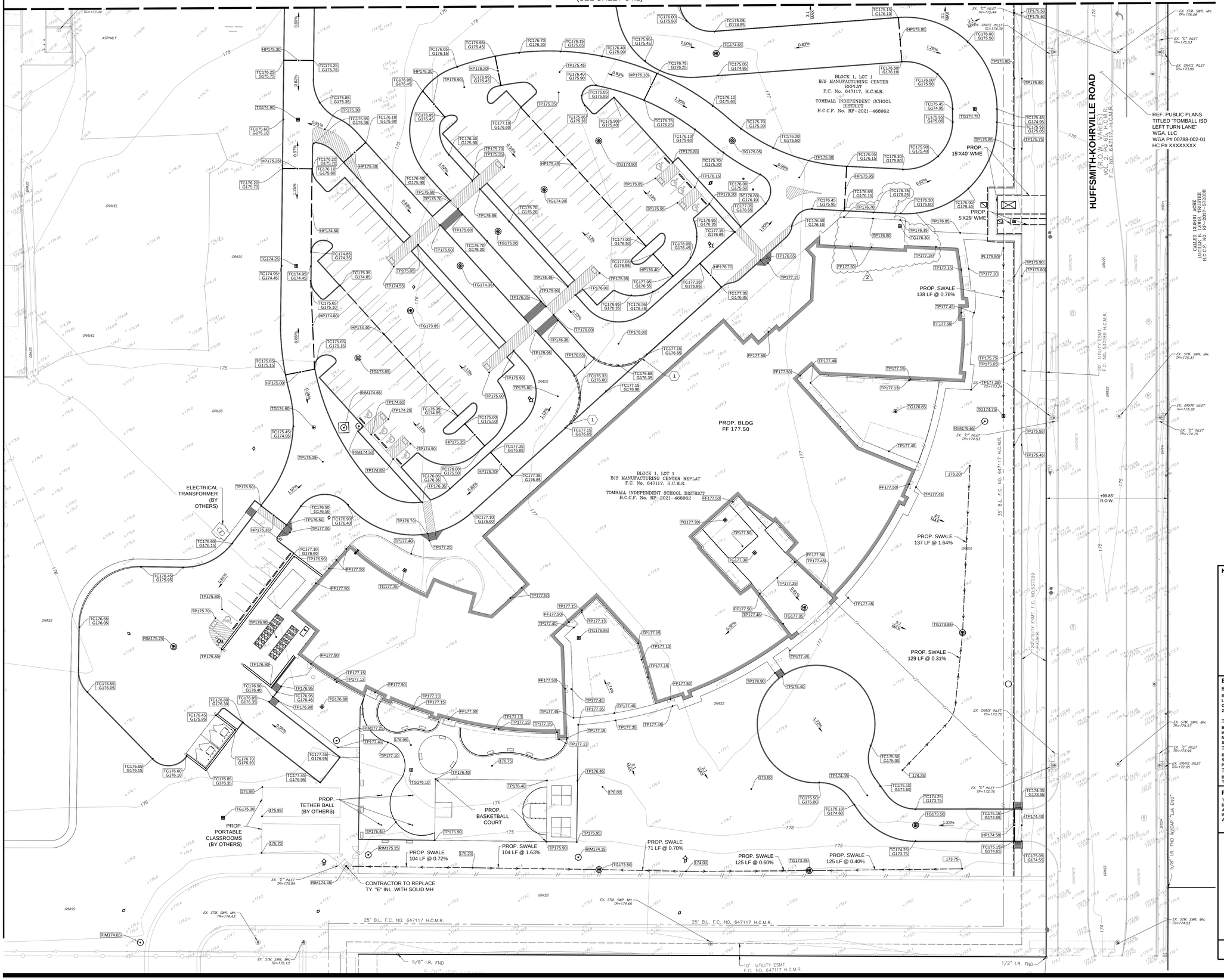
MATCHLINE
(SEE SHEET C4.1)


HUFFSMITH-KOHRVILLE ROAD
VOL. D, PG. 1 D.R.H.C.T.
F.C. NO. 647117, H.C.M.R.
BLOCK 1, LOT 1
BJS MANUFACTURING CENTER REPLAT
F.C. No. 647117, H.C.M.R.
TOMBALL INDEPENDENT SCHOOL DISTRICT
H.C.C.F. No. RP-2021-468962
PROP. 15'X40' WME
PROP. 5'X29' WME
REF. PUBLIC PLANS TITLED "TOMBALL ISD LEFT TURN LANE" WGA, LLC WGA P# 00788-002-01 HC P# XXXXXXXX
CALLED 12.8491 ACRE HUFFSMITH-KOHRVILLE ROAD, LLC H.C.C.F. No. RP-2021-719283838
PROP. BLDG FF 177.50
PROP. SWALE 138 LF @ 0.76%
PROP. SWALE 137 LF @ 1.64%
PROP. SWALE 129 LF @ 0.31%
PROP. SWALE 104 LF @ 0.72%
PROP. SWALE 104 LF @ 1.63%
PROP. SWALE 71 LF @ 0.70%
PROP. SWALE 125 LF @ 0.60%
PROP. SWALE 125 LF @ 0.40%
PROP. BASKETBALL COURT
PROP. TETHER BALL (BY OTHERS)
PROP. PORTABLE CLASSROOMS (BY OTHERS)
ELECTRICAL TRANSFORMER (BY OTHERS)
CONTRACTOR TO REPLACE TY. "E" INL. WITH SOLID MH
±99.85' R.O.W.
25' B.L. F.C. NO. 647117 H.C.M.R.
35' B.L. F.C. NO. 647117 H.C.M.R.
10' UTILITY ESMT. F.C. NO. 637089 H.C.M.R.
10' UTILITY ESMT. F.C. NO. 647117 H.C.M.R.
5/8" I.R. FND
1/2" I.R. FND
5/8" I.R. FND W/CAP "LJA ENG"
EX. STM. SWR. MH. TR=175.44
EX. GRATE INLET TG=174.39
EX. "C" INLET TR=175.53
EX. GRATE INLET TG=173.86
EX. STM. SWR. MH. TR=176.08
EX. STM. SWR. MH. TR=175.31
EX. GRATE INLET TG=173.39
EX. "C" INLET TR=174.75
EX. "C" INLET TR=174.53
EX. STM. SWR. MH. TR=174.53
EX. "C" INLET TR=173.89
EX. GRATE INLET TG=172.65
EX. "C" INLET TR=173.75
EX. STM. SWR. MH. TR=174.43
EX. STM. SWR. MH. TR=175.13
EX. STM. SWR. MH. TR=174.65
EX. STM. SWR. MH. TR=174.53
EX. GRATE INLET TG=173.75
GRADE BREAK
GRADE BREAK
GRADE BREAK

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MATCHLINE
(SEE SHEET C5.1)

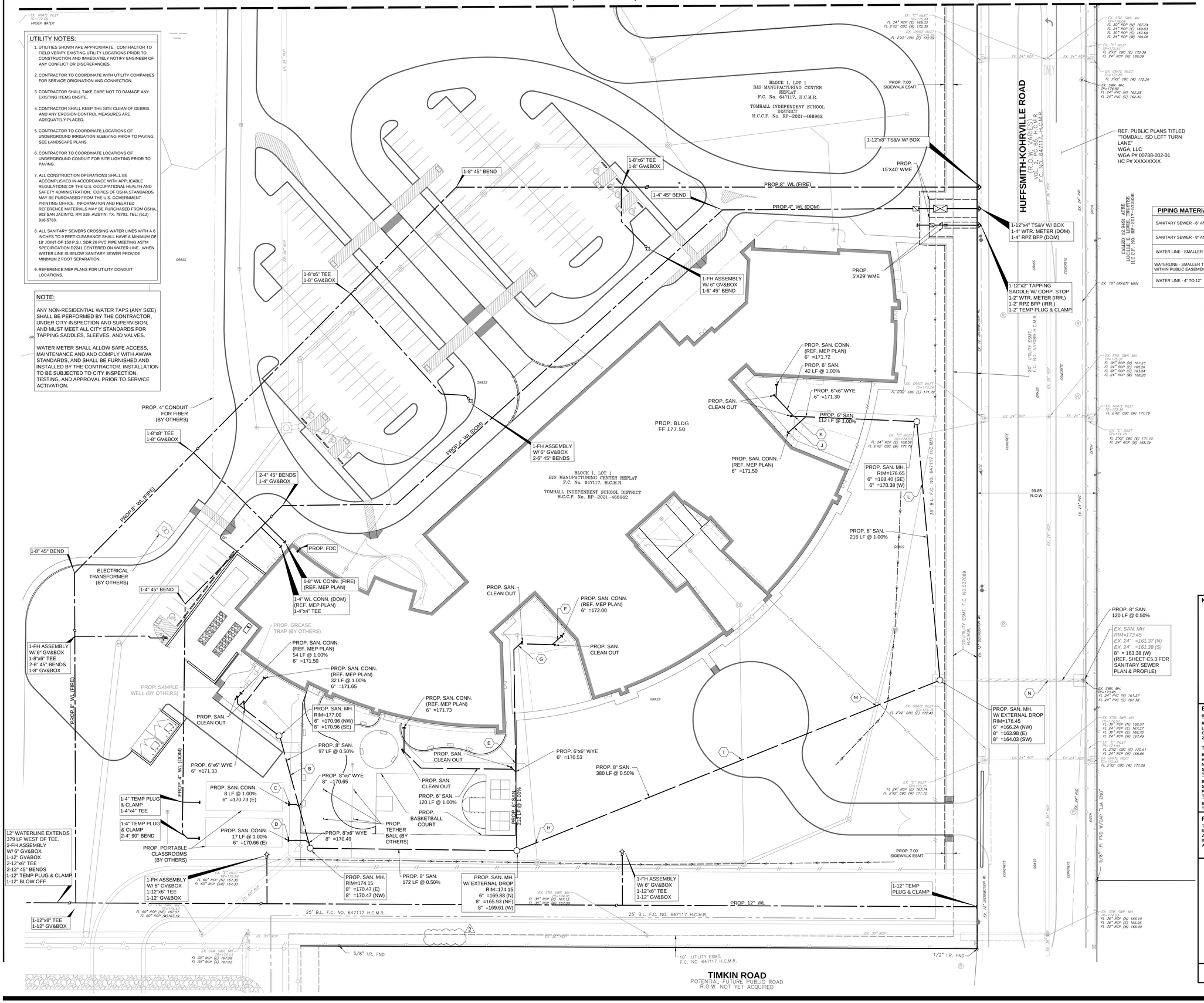
UTILITY NOTES:

1. UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR TO FIELD VERIFY EXISTING UTILITY LOCATIONS PRIOR TO CONSTRUCTION AND IMMEDIATELY NOTIFY ENGINEER OF ANY CONFLICT OR DISCREPANCIES.
2. CONTRACTOR TO COORDINATE WITH UTILITY COMPANIES FOR SERVICE ORIGINATION AND CONNECTION.
3. CONTRACTOR SHALL TAKE CARE NOT TO DAMAGE ANY EXISTING ITEMS ONSITE.
4. CONTRACTOR SHALL KEEP THE SITE CLEAN OF DEBRIS AND ANY EROSION CONTROL MEASURES ARE ADEQUATELY PLACED.
5. CONTRACTOR TO COORDINATE LOCATIONS OF UNDERGROUND IRRIGATION SLEEVING PRIOR TO PAVING. SEE LANDSCAPE PLANS.
6. CONTRACTOR TO COORDINATE LOCATIONS OF UNDERGROUND CONDUIT FOR SITE LIGHTING PRIOR TO PAVING.
7. ALL CONSTRUCTION OPERATIONS SHALL BE ACCOMPLISHED IN ACCORDANCE WITH APPLICABLE REGULATIONS OF THE U.S. OCCUPATIONAL HEALTH AND SAFETY ADMINISTRATION. COPIES OF OSHA STANDARDS MAY BE PURCHASED FROM THE U.S. GOVERNMENT PRINTING OFFICE. INFORMATION AND RELATED REFERENCE MATERIALS MAY BE PURCHASED FROM OSHA, 903 SAN JACINTO, RM 319, AUSTIN, TX. 78701. TEL: (512) 916-5783.
8. ALL SANITARY SEWERS CROSSING WATER LINES WITH A 6 INCHES TO 9 FEET CLEARANCE SHALL HAVE A MINIMUM OF 18' JOINT OF 150 P.S.I. SDR 26 PVC PIPE MEETING ASTM SPECIFICATION D2241 CENTERED ON WATER LINE. WHEN WATER LINE IS BELOW SANITARY SEWER PROVIDE MINIMUM 2 FOOT SEPARATION.
9. REFERENCE MEP PLANS FOR UTILITY CONDUIT LOCATIONS.

NOTE:

ANY NON-RESIDENTIAL WATER TAPS (ANY SIZE) SHALL BE PERFORMED BY THE CONTRACTOR, UNDER CITY INSPECTION AND SUPERVISION, AND MUST MEET ALL CITY STANDARDS FOR TAPPING SADDLES, SLEEVES, AND VALVES.

WATER METER SHALL ALLOW SAFE ACCESS, MAINTENANCE AND AND COMPLY WITH AWWA STANDARDS, AND SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR. INSTALLATION TO BE SUBJECTED TO CITY INSPECTION, TESTING, AND APPROVAL PRIOR TO SERVICE ACTIVATION.


HUFFSMITH-KOHRVILLE ROAD
(FARM TO MARKET ROAD 2920)
VOL. 2, PG. 65, H.C.M.R.
F.C. NO. 647117, H.C.M.R.
BLOCK 1, LOT 1
BJS MANUFACTURING CENTER REPLAT
F.C. No. 647117, H.C.M.R.
TOMBALL INDEPENDENT SCHOOL DISTRICT
H.C.C.F. No. RP-2021-468962
PROP. BLDG FF 177.50
PROP. 7.00' SIDEWALK ESMT.
PROP. 8" WL (FIRE)
PROP. 4" WL (DOM)
1-8" 45° BEND
1-8"x6" TEE
1-8" GV&BOX
1-4" 45° BEND
1-12"x8" TS&V W/ BOX
PROP. 15'X40' WME
1-12"x4" TS&V W/ BOX
1-4" WTR. METER (DOM)
1-4" RPZ BFP (DOM)
1-12"x2" TAPPING SADDLE W/ CORP. STOP
1-2" WTR. METER (IRR.)
1-2" RPZ BFP (IRR.)
1-2" TEMP PLUG & CLAMP
1-FH ASSEMBLY W/ 6" GV&BOX 1-6" 45° BEND
PROP. 5'X29' WME
1-FH ASSEMBLY W/ 6" GV&BOX 2-6" 45° BENDS
2-4" 45° BENDS 1-4" GV&BOX
PROP. FDC
1-8" WL CONN. (FIRE) (REF. MEP PLAN)
1-4" WL CONN. (DOM) (REF. MEP PLAN) 1-4"x4" TEE
PROP. 4" CONDUIT FOR FIBER (BY OTHERS)
ELECTRICAL TRANSFORMER (BY OTHERS)
PROP. GREASE TRAP (BY OTHERS)
PROP. SAMPLE WELL (BY OTHERS)
1-FH ASSEMBLY W/ 6" GV&BOX 1-8"x6" TEE 2-6" 45° BENDS 1-8" GV&BOX
PROP. SAN. CLEAN OUT
PROP. SAN. CONN. (REF. MEP PLAN) 54 LF @ 1.00% 6" =171.50
PROP. SAN. CONN. (REF. MEP PLAN) 32 LF @ 1.00% 6" =171.65
PROP. SAN. MH. RIM=177.00 6" =170.96 (NW) 8" =170.96 (SE)
PROP. 8" SAN. 97 LF @ 0.50%
PROP. 6"x6" WYE 6" =171.33
PROP. 8"x6" WYE 8" =170.65
PROP. SAN. CONN. 8 LF @ 1.00% 6" =170.73 (E)
PROP. SAN. CONN. 17 LF @ 1.00% 6" =170.66 (E)
PROP. 8"x6" WYE 8" =170.49
1-4" TEMP PLUG & CLAMP 1-4"x4" TEE
1-4" TEMP PLUG & CLAMP 2-4" 90° BEND
PROP. PORTABLE CLASSROOMS (BY OTHERS)
12" WATERLINE EXTENDS 379 LF WEST OF TEE. 2-FH ASSEMBLY W/ 6" GV&BOX 1-12" GV&BOX 2-12"x6" TEE 2-12" 45° BENDS 1-12" TEMP PLUG & CLAMP 1-12" BLOW OFF
1-12"x8" TEE 1-12" GV&BOX
1-FH ASSEMBLY W/ 6" GV&BOX 1-12"x6" TEE 1-12" GV&BOX
PROP. SAN. MH. RIM=174.15 8" =170.47 (E) 8" =170.47 (NW)
PROP. 8" SAN. 172 LF @ 0.50%
PROP. SAN. MH. W/ EXTERNAL DROP RIM=174.15 6" =169.88 (N) 8" =165.93 (NE) 8" =169.61 (W)
PROP. SAN. CONN. (REF. MEP PLAN) 6" =171.72
PROP. 6" SAN. 42 LF @ 1.00%
PROP. 6"x6" WYE 6" =171.30
PROP. SAN. CLEAN OUT
PROP. 6" SAN. 112 LF @ 1.00%
PROP. SAN. CONN. (REF. MEP PLAN) 6" =171.50
PROP. SAN. MH. RIM=176.65 6" =168.40 (SE) 6" =170.38 (W)
PROP. 6" SAN. 216 LF @ 1.00%
PROP. SAN. CONN. (REF. MEP PLAN) 6" =172.00
PROP. SAN. CLEAN OUT
PROP. SAN. CONN. (REF. MEP PLAN) 6" =171.73
PROP. SAN. CLEAN OUT
PROP. 6" SAN. 120 LF @ 1.00%
PROP. 6"x6" WYE 6" =170.53
PROP. 8" SAN. 380 LF @ 0.50%
PROP. TETHER BALL (BY OTHERS)
PROP. BASKETBALL COURT
PROP. 8" SAN. 212 LF @ 1.00%
PROP. 8" SAN. 120 LF @ 0.50%
EX. SAN. MH. RIM=173.45 EX. 24" =161.37 (N) EX. 24" =161.38 (S) 8" = 163.38 (W) (REF. SHEET C5.3 FOR SANITARY SEWER PLAN & PROFILE)
PROP. SAN. MH. W/ EXTERNAL DROP RIM=176.45 6" =166.24 (NW) 8" =163.98 (E) 8" =164.03 (SW)
PROP. 12" WL
1-12" TEMP PLUG & CLAMP
1-FH ASSEMBLY W/ 6" GV&BOX 1-12"x6" TEE 1-12" GV&BOX
REF. PUBLIC PLANS TITLED "TOMBALL ISD LEFT TURN LANE" WGA, LLC WGA P# 00788-002-01 HC P# XXXXXXXX
CALLED 12.8439 ACRE LEFT TURN LANE H.C.C.F. NO. RP-2017-572838
20' UTILITY ESMT. F.C. NO. 537089 H.C.M.R.
35' B.L. F.C. NO. 647117 H.C.M.R.
25' B.L. F.C. NO. 647117 H.C.M.R.
99.85' R.O.W.
EX. 12" DISTRIBUTION W.L.
EX. 24" PVC
EX. 36" RCP
EX. 30" RCP
EX. 24" RCP
EX. 18" GRAVITY MAIN
EX. 8" PVC
EX. 6" PVC
EX. 8" SAN.
EX. 10" SAN.
EX. 12" SAN.
EX. 15" SAN.
EX. 18" SAN.
EX. 24" SAN.
EX. 27" SAN.
EX. 30" SAN.
EX. 36" SAN.
EX. 42" SAN.
EX. 48" SAN.
EX. 54" SAN.
EX. 60" SAN.
EX. 66" SAN.
EX. 72" SAN.
EX. 78" SAN.
EX. 84" SAN.
EX. 90" SAN.
EX. 96" SAN.
EX. 102" SAN.
EX.

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MATCHLINE
(SEE SHEET C6.1)

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9. REFERENCE MEP PLANS FOR UTILITY CONDUIT LOCATIONS.

EX. GRATE INLET TG=177.09 UNDER WATER
ASPHALT
EX. 24" RCP
PROP. 12" STM. 148 LF @ 0.44%
PROP. TY. "A" INL. (B2) TG=174.90 12" =167.90 (N) 15" =167.90 (S)
PROP. 15" STM. 120 LF @ 0.33%
PROP. TY. "A" INL. (B3) TG=174.25 15" =167.50 (N) 18" =167.50 (SE)
GRASS
PROP. 18" STM. 133 LF @ 0.26%
PROP. J-BOX RIM=174.65 24" =167.11 (NW) 42" =167.11 (E) 54" ± =168.10 (W) 60" =167.11 (SW)
PROP. TY. "A" INL. (B4) TG=174.60 18" =167.16 (N) 24" =167.16 (E)
GRAVEL
PROP. 4" CONDUIT FOR FIBER (BY OTHERS)
GRASS
PROP. 24" STM. 25 LF @ 0.18%
PROP. 42" STM. 12 LF @ 0.082%
PROP. 60" STM. 227 LF @ 0.051%
PROP. 60" STM. 244 LF @ 0.051%
PROP. 42" STM. 56 LF @ 0.082%
PROP. 42" STM. 58 LF @ 0.082%
PROP. TY. "C" MH. (A3) W/ GRATE TOP TG=174.65 12" =169.73 (NW) 15" =169.73 (NE) 24" =169.48 (SW)
PROP. 15" STM. 58 LF @ 0.33%
PROP. 24" STM. 73 LF @ 0.18%
PROP. TY. "C" MH (A5) W/ GRATE TOP TG=174.90 30" =168.20 (SW) 30" =168.70 (E)
PROP. TY. "C" MH. (A6) W/ GRATE TOP TG=174.90 30" =168.12 (NE) 36" =168.12 (SW)
PROP. 30" STM. 60 LF @ 0.13%
PROP. 30" STM. 110 LF @ 0.13%
PROP. TY. "A" INL. (A4) TG=175.05 6" =170.89 (SE) 18" =170.29 (NE) 24" =169.34 (NE) 30" =168.84 (W)
BLOCK 1, LOT 1 BJS MANUFACTURING CENTER REPLAT F.C. No. 647117, H.C.M.R. TOMBALL INDEPENDENT SCHOOL DISTRICT H.C.C.P. No. RP-2021-468962
PROP. 18" STM. 201 LF @ 0.26%
PROP. CB (A4.1) TG=174.75 18" =170.82 (SW)
18" =170.61
PROP. 8" STM. 93 LF @ 0.75%
PROP. 36" STM. 51 LF @ 0.11%
PROP. TY. "C" MH. (A7) W/ GRATE TOP TG=175.00 8" =170.61 (SE) 36" =168.07 (NE) 36" =167.57 (SW)
PROP. 36" STM. 42 LF @ 0.11%
PROP. TY. "C" MH. (A8) W/ GRATE TOP TG=174.35 36" =167.52 (NE) 36" =167.52 (SW)
PROP. 36" STM. 55 LF @ 0.11%
PROP. TY. "C" MH. (A9) W/ GRATE TOP TG=173.85 36" =167.46 (NE) 42" =167.21 (SW)
PROP. TY. "C" MH. (A10) W/ GRATE TOP TG=173.85 42" =167.16 (NE) 42" =167.16 (S)
PROP. TY. "C" (MH1) RIM=174.50 8" =169.75 (SE) 42" =167.12 (N, W)
PROP. 8"x6" WYE 8" =170.27
PROP. 42" STM. 12 LF @ 0.082%
PROP. TY. "C" (MH3) RIM=174.65
EX. 60" ± =166.87±ME (N)
60" =166.87 (N)
PROP. TY. "C" (A11) RIM=175.00 60" =166.99 (NE, SW)
PROP. BLDG FF 177.50
PROP. CB RIM=177.30 8" =170.26 (SW)
PROP. 8" STM. 36 LF @ 0.75%
8" =170.08
PROP. CB RIM=177.30 8" =169.99 (SW)
PROP. 6" STM. 89 LF @ 1.00%
PROP. TY. "A" INL. (C4.1) TG=177.05 8" =169.53 (NW) 15" =169.37 (S)
PROP. CB (C5.1) TG=176.55 6" =170.43 (NW) 8" =169.10 (E) 15" =168.10 (S)
8" =170.03
8" =170.02
PROP. 8" STM. 61 LF @ 0.75%
PROP. CB (C2) TG=173.20 24" =169.24 (NE) 30" =168.49 (SW)
PROP. CB (C5) TG=173.50 15" =167.47 (N) 36" =167.47 (E) 42" =167.47 (W)
PROP. 36" STM. 173 LF @ 0.11%
PROP. CB (C4) TG=172.90 15" =168.66 (N) 30" =167.66 (NE) 36" =167.66 (W)
PROP. 30" STM. 95 LF @ 0.13%
PROP. TY "A" INL. (C3) TG=173.10 30" =168.28 (NE) 30" =167.78 (SW)
PROP. 15" STM. 216 LF @ 0.33%
PROP. 30" STM. 162 LF @ 0.13%
PROP. 15" STM. 181 LF @ 0.33%
PROP. 15" STM. 139 LF @ 0.33%
PROP. 15" STM. 78 LF @ 0.33%
PROP. CB RIM=175.30 15" =171.26 (S)
PROP. CB RIM=176.10 15" =167.48 (S)
PROP. CB RIM=176.60 32 LF @ 1.00% 6" =169.91 (S)
PROP. GENERATOR (BY OTHERS)
PROP. CB RIM=177.40 6" =171.39 (SW)
PROP. PORTABLE CLASSROOMS (BY OTHERS)
PROP. TETHER BALL (BY OTHERS)
PROP. BASKETBALL COURT
42" =167.22
PROP. 42" STM. 207 LF @ 0.082%
PROP DS CONN. (REF MEP PLANS) 156 LF @ 0.75% 8" =170.92 (S)
PROP DS CONN. (REF MEP PLANS) 37 LF @ 1.00% 6" =170.45
PROP DS CONN. (REF MEP PLANS) 26 LF @ 1.00% 6" =170.29
PROP DS CONN. (REF MEP PLANS) 35 LF @ 1.00% 6" =170.37
PROP DS CONN. (REF MEP PLANS) 83 LF @ 1.00% 6" =171.92
PROP DS CONN. (REF MEP PLANS) 49 LF @ 1.00% 6" =170.92
PROP DS CONN. (REF MEP PLANS) 43 LF @ 0.75% 8" =169.42
PROP DS CONN. (REF MEP PLANS) 3 LF @ 1.00% 6" =171.89
PROP DS CONN. (REF MEP PLANS) 117 LF @ 1.00% 6" =171.44
PROP DS CONN. (REF MEP PLANS) 140 LF @ 1.00% 6" =169.91
PROP DS CONN. (REF MEP PLANS) 123 LF @ 1.00% 6" =168.96
6" =171.09 (S)
6" =171.86
6" =169.59
PROP DS CONN. (REF MEP PLANS) 101 LF @ 1.00% 6" =171.90
PROP DS CONN. (REF MEP PLANS) 18 LF @ 1.00% 6" =171.67
PROP. TY "A" INL. TG=176.30 6" =171.49 (E) 8" =171.30 (NW)
PROP DS CONN. (REF MEP PLANS) 176 LF @ 0.75% 8" =171.93
PROP. CB RIM=176.65 6" =172.01 (E, W)
PROP. CB (C1) TG=174.75 6" =171.12 (W) 24" =169.57 (S)
PROP DS CONN. (REF MEP PLANS) 49 LF @ 1.00% 6" =172.50
PROP DS CONN. (REF MEP PLANS) 49 LF @ 1.00% 6" =172.50
EX. STM. SWR. MH. (MH4) TG=174.40±ME 60" ± =167.07 (NE) ±ME 60" ± =167.19 (W) ±ME
EX. STM. SWR. MH. TN=174.45 FL 60" RCP (NE) 167.07 FL 60" RCP (W) 167.19
EX. "E" INLET TN=175.84 FL 60" RCP (N) 167.55 FL 60" RCP (SW) 167.33
EX. TY. "E" INL. (C6) CONTRACTOR TO TIE INTO EX. INL. AND REPLACE TY "E" INL. TOP WITH SOLID MH TOP TG=174.45 6" =168.51 (N) 15" =170.80 (W) 42" =167.30 (E) EX. 60" ± =167.30± (SW)
EX. STM. SWR. MH. TN=175.13 FL 30" RCP (S) 167.53 FL 30" RCP (S) 167.53
EX. STM. SWR. MH. TN=174.65 FL 30" RCP (E) 167.12 FL 30" RCP (W) 167.06
EX. 60" RCP
EX. 30" RCP
25' B.L. F.C. NO. 647117 H.C.M.R.
10' UTILITY ESMT. F.C. NO. 647117 H.C.M.R.
5/8" I.R. FND
1/2" I.R. FND
GRASS
CONCRETE
BLOCK 1, LOT 1 BJS MANUFACTURING CENTER REPLAT F.C. No. 647117, H.C.M.R. TOMBALL INDEPENDENT SCHOOL DISTRICT H.C.C.P. No. RP-2021-468962
EX. "C" INLET TN=175.44 FL 24" RCP (E) 169.33 FL 2'X2' CBC (W) 172.50
EX. GRATE INLET TG=175.55 FL 2'X2' CBC (E) 172.55
EX. STM. SWR. MH. TN=176.08 FL 30" RCP (N) 167.74 FL 24" RCP (E) 169.03 FL 30" RCP (S) 167.68 FL 24" RCP (W) 169.06
EX. "C" INLET TN=175.51 FL 2'X2' CBC (E) 172.39 FL 24" RCP (W) 169.09
EX. GRATE INLET TG=173.86 FL 2'X2' CBC (W) 172.26
EX. SWR. MH. TN=174.82 FL 24" PVC (N) 162.28 FL 24" PVC (S) 162.40
REF. PUBLIC PLANS TITLED "TOMBALL ISD LEFT TURN LANE" WGA, LLC WGA P# 00788-002-01 HC P# XXXXXXXX
HUFFSMITH-KOHRVILLE ROAD
99.85' R.O.W.
20' UTILITY ESMT. F.C. NO.537089 H.C.M.R.
EX. 12" DISTRIBUTION ML
EX. 24" PVC
EX. 36" RCP
EX. 24" RCP
EX. 18" GRAVITY MAIN
CULLED 12.8491 ACRE LOT 1 BJS MANUFACTURING H.C.C.P. NO. RP-2017-573838
EX. GRATE INLET TG=173.24 FL 2'X2' CBC (E) 171.79
EX. "C" INLET TN=174.53 FL 24" RCP (E) 168.58 FL 2'X2' CBC (W) 171.79
EX. GRATE INLET TG=173.24 FL 2'X2' CBC (W) 171.19
EX. "C" INLET TN=174.75 FL 2'X2' CBC (E) 171.10 FL 24" RCP (W) 168.39
EX. STM. SWR. MH. TN=175.11 FL 36" RCP (N) 167.23 FL 24" RCP (E) 168.24 FL 36" RCP (S) 163.84 FL 24" RCP (W) 168.28
EX. GRATE INLET TG=173.24 FL 2'X2' CBC (E) 172.43
EX. "C" INLET TN=173.75 FL 24" RCP (E) 167.74 FL 2'X2' CBC (W) 171.10
EX. SWR. MH. TN=173.45 FL 24" PVC (N) 161.37 FL 24" PVC (S) 161.38
EX. STM. SWR. MH. TN=174.32 FL 24" RCP (N) 166.57 FL 24" RCP (E) 163.37 FL 24" RCP (S) 166.70 FL 24" RCP (W) 167.49
EX. "C" INLET TN=173.99 FL 2'X2' CBC (E) 170.91 FL 24" RCP (W) 168.86
EX. GRATE INLET TG=170.65 FL 2'X2' CBC (W) 171.08
EX. STM. SWR. MH. TN=174.51 FL 36" RCP (N) 166.10 FL 36" RCP (S) 165.95 FL 30" RCP (W) 165.99
EX. 24" PVC
EX. 36" RCP
DITCH
5/8" I.R. FND W/CAP "LJA ENG"
EX. 24" RCP
EX. 30" RCP
EX. 36" RCP
EX. 24" PVC
DITCH
EX. 24" PVC
EX. 36" RCP
EX. 24" RCP
EX. 24" RCP
EX. 24

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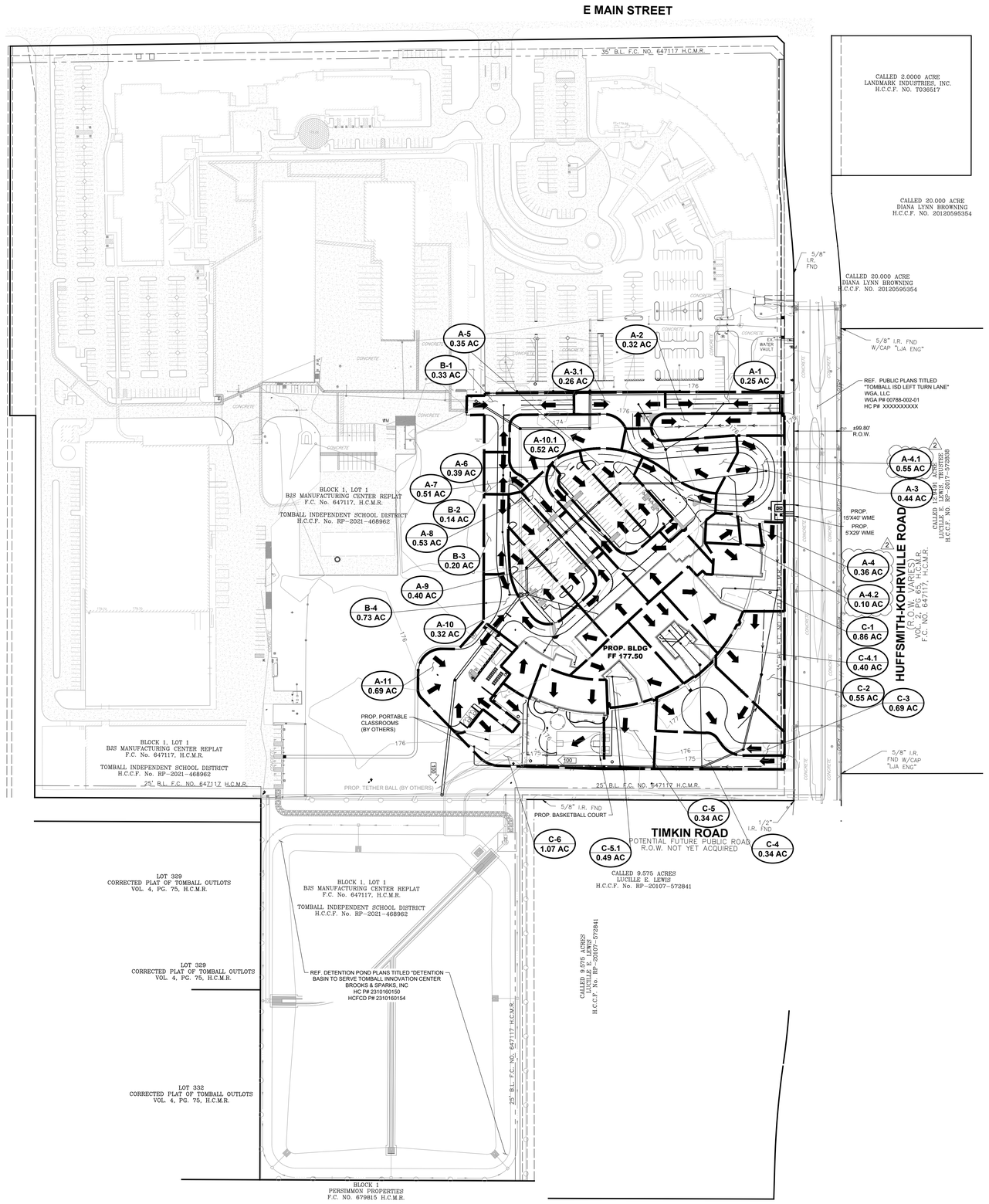
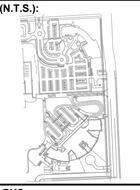


DRAINAGE AREA MAP LEGEND:

A 1.52 AC	DRAINAGE AREA AREA IN ACRES
	EXISTING DRAINAGE BOUNDARY
	PROPOSED DRAINAGE BOUNDARY
	25-YEAR SHEET FLOW
100	100-YEAR SHEET FLOW
	OFF-SITE SHEET FLOW
130	EXISTING CONTOUR

KEY MAP (N.T.S.):



BENCHMARKS:

REFERENCE BENCHMARK PUBLISHED ELEVATION - 140.69'

RM120165 - ALUMINUM ROD WITH LOGO CAP STAMPED "120165" LOCATED ON THE WEST SIDE OF TUWA ROAD ±120' NORTH OF THE CENTERLINE OF THE DRIVEWAY FOR 22303 TUWA ROAD IN KEY MAP 289H IN THE WILLOW CREEK WATERSHED. (NAVD 88, 2001 ADJ.)

TEMPORARY BENCHMARK 'B' ELEVATION - 174.74'

BOX CUT ON "C1" INLET LOCATED ON THE EAST SIDE OF HUFSMITH-KOHRVILLE RAD ±1,175' SOUTH OF F.M. 2920 AND ±450' NORTH OF THE MOST EASTERLY SOUTHEAST CORNER OF THE SUBJECT TRACT.
TEMPORARY BENCHMARK 'C' ELEVATION - 176.71'

BOX XUT ON CONCRETE BASE OF LIGHT STANDARD LOCATED ±40' SOUTHWEST OF THE SOUTHWEST CORNER OF THE SOUTHEAST PARKING LOT.
TEMPORARY BENCHMARK 'D' ELEVATION - 177.49'

BOX CUT ON CONCRETE BASE OF LIGHT STANDARD LOCATED ON THE NORTH SIDE OF THE DIESEL FUELING STATION.

FLOODPLAIN NOTE:

THIS SUBJECT TRACT LIES WITHIN UNSHADED ZONE "X" AREAS DETERMINED TO BE OUTSIDE THE 100-YEAR FLOODPLAIN (1% ANNUAL FLOODPLAIN CHANCE) AS DELINEATED ON THE FLOOD INSURANCE MAP FOR HARRIS COUNTY, TEXAS AND INCORPORATED AREAS, MAP NO. 48201C0230L MAP REVISED JUNE 18TH, 2007.

WGA
TEXAS REGISTERED ENGINEERING FIRM F-9756
2500 Tanglewilde, Suite 120
Houston, Texas 77063
713.789.1900
4526 Research Forest, Suite 360
The Woodlands, Texas 77381
713.789.1900

SCALE	DESIGN	DRAWN
1"=100'	AH	CT

Revision / Date
2 ADDENDUM 02 08/07/2026

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

SARA KAROUNI
145244
LICENSED
PROFESSIONAL ENGINEER
8/7/26

Huckabee
www.huckabee-inc.com
800.687.1229

DRAINAGE AREA MAP
VOLUME 01

Job No.	Sheet No.
00788-002	C7.1
Drawn By: CT	
Date: 08.07.26	

ADDENDUM 02

11/18/2025 8:39:39 AM
Autodesk Docs://TOMBALL ISD - IS REPLACEMENT/00002-04-01 - Tomball ISD IS Replacement_ARCH.rvt

Drawing: Z:\00788 (Huckabee)\002 Tomball Intermediate School Replacement\500 CAD\530 Sheets\C7.1 Drainage Area Map.dwg Last Plotted: Fri Aug 07, 2026 - 8:02am By: ahuerta

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DETENTION SUMMARY

TOTAL AREA	=	70.05 AC
DETENTION RATE REQUIRED	=	0.75 AC-FT / AC
DETENTION VOLUME REQUIRED	=	52.54 AC-FT
EXISTING DETENTION VOLUME	=	63.51 AC-FT

*NO DETENTION REQUIRED FOR TOMBALL ISD SCHOOL REPLACEMENT. REFERENCE HC PROJECT NO. 2310160150 FOR DETENTION BASIN PLANS AND CITY OF TOMBALL PERMIT NUMBER SP-23-028.

2

WGA

STORM SEWER CALCULATIONS

Project: Tomball ISD Intermediate School Replacement
Job No: 00788-002
System: A, B & C
By: AH
DATE 8-7-2026
Rainfall Frequency (years): 25

$$I = \frac{b}{(t_c + d)^e}$$

C_f = 1.00
b = 54.97
d = 6.27
e = 0.6446

Z:\00788 (Huckabee)\002 Tomball Intermediate School Replacement\400 Engineering\403 Drainage\[Tomball ISD - Updated Storm Calcs.xls]DESIGN (25-year)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
											LINE						DESIGN					HYD. GRAD										
ID	From MH	To MH	Sub Area Acres	Total Area Acres	Sub Runoff Coeff. C	Sub Runoff Coeff. C*Cf	Sum of CF'C'A	Time of Conc. min.	Intensity I (In / Hr.)	Sum of Flows cfs Q	Reach Length Feet	Dia. in. or Rise (ft)	# of Pipes/ Boxes	Width of box (ft)	Slope %	Mannings n"	Capacity cfs Q	Velocity fps	drop at down stream manhole	Actual Velocity fps	Hydraulic Gradient %	Change in Head Ft.	Elev. Up Stream	Elev. Down Stream	TG/ Gutter Elevation Upstream	TG/ Gutter Elevation Downstream	MH UP	flowline upstream	MH DOWN	flowline downstream	Top of Pipe (upstream)	Top of Pipe downstream
"A"	1	2	0.25	0.25	0.80	0.80	0.20	16.60	7.31	1.46	60	12	1		0.44	0.012	2.57	3.27	0.25	3.37	0.143	0.086	173.57	173.49	174.20	173.95	1	170.56	2	170.30	171.56	171.30
"A"	2	3	0.32	0.57	0.80	0.80	0.46	16.91	7.25	3.31	98	15	1		0.33	0.012	4.03	3.28	0.25	3.65	0.223	0.219	173.49	173.27	173.95	174.65	2	170.05	3	169.73	171.30	170.98
"A"	3	4	0.44	1.02	0.80	0.80	0.82	17.40	7.15	5.83	73	24	1		0.18	0.012	10.43	3.32	0.50	3.40	0.057	0.041	173.27	173.23	174.65	175.05	3	169.48	4	169.34	171.48	171.34
"A"	4	5	0.36	1.94	0.80	0.80	1.55	17.77	7.08	10.99	110	30	1		0.13	0.012	16.06	3.27	0.50	3.51	0.061	0.067	173.23	173.16	175.05	174.90	4	168.84	5	168.70	171.34	171.20
"A"	5	6	0.35	2.29	0.80	0.80	1.83	18.33	6.97	12.78	60	30	1		0.13	0.012	16.06	3.27	0.00	3.63	0.083	0.050	173.16	173.11	174.90	174.90	5	168.20	6	168.12	170.70	170.62
"A"	6	7	0.39	2.68	0.80	0.80	2.14	18.64	6.92	14.84	51	36	1		0.11	0.012	24.03	3.40	0.50	3.56	0.042	0.021	173.11	173.09	174.90	175.00	6	168.12	7	168.07	171.12	171.07
"A"	7	8	0.51	3.19	0.80	0.80	2.55	18.89	6.88	17.55	42	36	1		0.11	0.012	24.03	3.40	0.00	3.70	0.059	0.025	173.09	173.07	175.00	174.35	7	167.57	8	167.52	170.57	170.52
"A"	8	9	0.53	3.72	0.80	0.80	2.96	19.09	6.84	20.35	55	36	1		0.11	0.012	24.03	3.40	0.25	3.81	0.079	0.044	173.07	173.02	174.35	173.85	8	167.52	9	167.46	170.52	170.46
"A"	9	10	0.40	4.12	0.80	0.80	3.30	19.36	6.79	22.39	58	42	1		0.08	0.012	30.91	3.21	0.00	3.50	0.042	0.024	173.02	173.00	173.85	174.45	9	167.21	10	167.16	170.71	170.66
"A"	10	MH1	0.32	4.96	0.80	0.80	3.97	19.66	6.74	26.75	56	42	1		0.08	0.012	30.91	3.21	0.00	3.61	0.060	0.034	173.00	172.96	173.85	174.50	10	167.16	MH1	167.12	170.66	170.62
"A"	MH1	J-BOX	0.00	4.96	0.80	0.80	3.97	19.95	6.69	26.75	12	42	1		0.08	0.012	30.91	3.21	0.00	3.61	0.060	0.007	172.96	172.96	174.50	174.65	MH1	167.12	J-BOX	167.11	170.62	170.61
"A"	J-BOX	11	0.00	6.88	0.80	0.80	5.50	20.01	6.68	36.78	227	60	1		0.05	0.012	63.89	3.25	0.00	3.36	0.017	0.039	172.96	172.92	174.65	175.25	J-BOX	167.11	11	166.99	172.11	171.99
"A"	11	MH3	0.69	7.57	0.80	0.80	6.06	21.18	6.50	39.36	244	60	1		0.05	0.012	63.89	3.25	0.00	3.40	0.019	0.047	172.92	172.87	174.25	174.40	11	166.99	MH3	166.87	171.99	171.87
																												166.87				
"A"	4.1	4	0.55	0.55	0.80	0.80	0.44	16.60	7.31	3.22	201	18	1		0.26	0.012	5.82	3.29	0.95	3.37	0.080	0.161	173.39	173.23	174.75	175.05	4.1	170.82	4	170.29	172.32	171.79
																												169.34				
"A"	4.2	4	0.01	0.01	0.80	0.80	0.01	11.13	8.72	0.07	93	8	1		0.75	0.012	1.14	3.26	0.00	1.75	0.003	0.003	173.23	173.23	176.30	175.05	4.2	171.24	4	170.54	171.90	171.21
																												170.54				
"A"	3.1	3	0.26	0.26	0.80	0.80	0.21	11.13	8.72	1.81	111	12	1		0.44	0.012	2.57	3.27	0.00	3.54	0.221	0.245	173.41	173.16	174.85	174.90	3.1	170.21	3	169.73	171.21	170.73
"B"	1	2	0.33	0.33	0.80	0.80	0.26	11.64	8.56	2.26	148	12	1		0.44	0.012	2.57	3.27	0.00	3.68	0.342	0.507	173.93	173.43	174.50	174.90	1	168.55	2	167.90	169.55	168.90
"B"	2	3	0.14	0.47	0.80	0.80	0.38	12.40	8.33	3.13	120	15	1		0.33	0.012	4.03	3.28	0.00	3.63	0.200	0.240	173.43	173.19	174.90	174.25	2	167.90	3	167.50	169.15	168.75
"B"	3	4	0.20	0.67	0.80	0.80	0.54	13.01	8.16	4.37	133	18	1		0.26	0.012	5.82	3.29	0.00	3.60	0.148	0.197	173.19	172.99	174.25	174.60	3	167.50	4	167.16	169.00	168.66
"B"	4	J-BOX	0.73	1.40	0.80	0.80	1.12	13.68	7.98	8.94	25	24	1		0.18	0.012	10.43	3.32	0.00	3.73	0.133	0.033	172.99	172.96	174.60	174.65	4	167.16	J-BOX	167.11	169.16	169.11
																												167.11				
"A"	10.1	J-BOX	0.52	0.52	0.80	0.80	0.42	14.37	7.81	3.25	393	54	1		0.23	0.012	102.44	6.44	0.99	2.90	0.000	0.001	172.96	172.96	175.40	174.65	10.1	169.01	J-BOX	168.10	173.51	172.60
																												167.11				
"C"	1	2	0.86	0.86	0.80	0.80	0.69	11.01	8.76	6.03	181	24	1		0.18	0.012	10.43	3.32	0.75	3.42	0.060	0.109	173.39	173.28	174.75	174.50	1	169.57	2	169.24	171.57	171.24
"C"	2	3	0.55	1.41	0.80	0.80	1.13	11.91	8.47	9.56	162	30	1		0.13	0.012	16.06	3.27	0.50	3.40	0.046	0.075	173.28	173.21	174.50	173.50	2	168.49	3	168.28	170.99	170.78
"C"	3	4	0.69	2.10	0.80	0.80	1.68	12.74	8.24	13.84	95	30	1		0.13	0.012	16.06	3.27	0.00	3.68	0.097	0.092	173.21	173.12	173.50	173.25	3	167.78	4	167.66	170.28	170.16
"C"	4	5	0.34	2.84	0.80	0.80	2.27	13.22	8.10	18.41	173	36	1		0.11	0.012	24.03	3.40	0.00	3.74	0.065	0.112	173.12	173.00	173.25	173.90	4	167.66	5	167.47	170.66	170.47
"C"	5	6	0.34	3.67	0.80	0.80	2.94	14.07	7.88	23.15	207	42	1		0.08	0.013	28.89	3.00	0.00	3.33	0.053	0.110	173.00	172.89	173.90	174.45	5	167.47	6	167.30	170.97	170.80
"C"	6	MH4	1.07	4.74	0.80	0.80	3.79	15.22	7.61	28.86	96	60	1		0.11	0.013	86.61	4.41	0.12	3.93	0.012	0.012	172.89	172.88	174.45	174.43	6	167.30	MH4	167.19	172.30	172.19
"C"	MH4	MH3	0.00	4.74	0.80	0.80	3.79	15.58	7.53	28.86	96	60	1		0.11	0.013	86.61	4.41	0.00	3.93	0.012	0.012	172.88	172.87	174.43	174.40	MH4	167.07	MH3	166.87	172.07	171.87
																												166.87				
"C"	4.1	4	0.40	0.40	0.80	0.80	0.32	12.40	8.33	2.67	216	15	1		0.33	0.012	4.03	3.28	1.00	3.50	0.145	0.313	173.43	173.12	177.05	172.90	4.1	169.37	4	168.66	170.62	169.91
																												167.66				
"C"	5.1	5	0.49	0.49	0.80	0.80	0.39	12.12	8.41	3.30	191	15	1		0.33	0.012	4.03	3.28	0.00	3.65	0.222	0.424	173.43	173.00	176.55	173.90	5.1	168.10	5	167.47	169.35	168.72
																												167.47				

WGA

STORM SEWER CALCULATIONS

Project: Tomball ISD Intermediate School Replacement
Job No: 00788-002
System: A, B & C
By: AH
DATE 8-7-2026
Rainfall Frequency (years): 100

$$I = \frac{b}{(t_c + d)^e}$$

C_f = 1.00
b = 53.93
d = 4.53
e = 0.5870

Z:\00788 (Huckabee)\002 Tomball Intermediate School Replacement\400 Engineering\403 Drainage\[Tomball ISD - Updated Storm Calcs.xls]DESIGN (100-year)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
											LINE						DESIGN					HYD. GRAD										
ID	From MH	To MH	Sub Area Acres	Total Area Acres	Sub Runoff Coeff. C	Sub Runoff Coeff. C*Cf	Sum of CF'C'A	Time of Conc. min.	Intensity I (In / Hr.)	Sum of Flows cfs Q	Reach Length Feet	Dia. in. or Rise (ft)	# of Pipes/ Boxes	Width of box (ft)	Slope %	Mannings n"	Capacity cfs Q	Velocity fps	drop at down stream manhole	Actual Velocity fps	Hydraulic Gradient %	Change in Head Ft.	Elev. Up Stream	Elev. Down Stream	TG/ Gutter Elevation Upstream	TG/ Gutter Elevation Downstream	MH UP	flowline upstream	MH DOWN	flowline downstream	Top of Pipe (upstream)	Top of Pipe downstream
"A"	1	2	0.25	0.25	0.80	0.80	0.20	16.60	9.00	1.80	60	12	1		0.44	0.012	2.57	3.27	0.25	3.52	0.217	0.130	173.94	173.81	174.20	173.95	1	170.56	2	170.30	171.56	171.30
"A"	2	3	0.32	0.57	0.80	0.80	0.46	16.91	8.92	4.07	98	15	1		0.33	0.012	4.03	3.28	0.25	3.74	0.338	0.331	173.81	173.48	173.95	174.65	2	170.05	3	169.73	171.30	170.98
"A"	3	4	0.44	1.02	0.80	0.80	0.82	17.40	8.80	7.18	73	24	1		0.18	0.012	10.43	3.32	0.50	3.58	0.086	0.063	173.48	173.41	174.65	175.05	3	169.48	4	169.34	171.48	171.34
"A"	4	5	0.36	1.94	0.80	0.80	1.55	17.77	8.72	13.53	110	30	1		0.13	0.012	16.06	3.27	0.50	3.66	0.093	0.102	173.41	173.31	175.05	174.90	4	168.84	5	168.70	171.34	171.20
"A"	5	6	0.35	2.29	0.80	0.80	1.83	18.33	8.59	15.74	60	30	1		0.13	0.012	16.06	3.27	0.00	3.73	0.125	0.075	173.31	173.24	174.90	174.90	5	168.20	6	168.12	170.70	170.62
"A"	6	7	0.39	2.68	0.80	0.80	2.14	18.64	8.52	18.28	51	36	1		0.11	0.012	24.03	3.40	0.50	3.74	0.064	0.033	173.24	173.20	174.90	175.00	6	168.12	7	168.07	171.12	171.07
"A"	7	8	0.51	3.19	0.80	0.80	2.55	18.89	8.47	21.62	42	36	1		0.11	0.012	24.03	3.40	0.00	3.85	0.090	0.038	173.20	173.17	175.00	174.35	7	167.57	8	167.52	170.57	170.52
"A"	8	9	0.53	3.72	0.80	0.80	2.96	19.09	8.43	25.08	55	36	1		0.11	0.012	24.03	3.40	0.25	3.86	0.120	0.066	173.17	173.10	174.35	173.85	8	167.52	9	167.46	170.52	170.46
"A"	9	10	0.40	4.12	0.80	0.80	3.30	19.36	8.37	27.59	58	42	1		0.08	0.012	30.91	3.21	0.00	3.63	0.064	0.037	173.10	173.06	173.85	174.50	9	167.21	10	167.16	170.71	170.66
"A"	10	MH1	0.32	4.96	0.80	0.80	3.97	19.66	8.31	32.98	56	42	1		0.08	0.012	30.91	3.21	0.00	3.61	0.092	0.051	173.06	173.01	173.85	174.50	10	167.16	MH1	167.12	170.66	170.62
"A"	MH1	J-BOX	0.00	4.96	0.80	0.80	3.97	19.95	8.25	32.98	12	42	1		0.08	0.012	30.91	3.21	0.00	3.61	0.092	0.011	173.01	173.00	174.50	174.65	MH1	167.12	J-BOX	167.11	170.62	170.61
"A"	J-BOX	11	0.00	6.88	0.80	0.80	5.50	20.01	8.24	45.35	227	60	1		0.05	0.012	63.89	3.25	0.00	3.53	0.026	0.059	173.00	172.94	174.65	175.25	J-BOX	167.11	11	166.99	172.11	171.99
"A"	11	MH3	0.69	7.57	0.80	0.80	6.06	21.18	8.02	48.56	244	60	1		0.05	0.012	63.89	3.25	0.00	3.58	0.030	0.072	172.94	172.87	174.25	174.40	11	166.99	MH3	166.87	171.99	171.87
																												166.87				
"A"	4.1	4	0.55	0.55	0.80	0.80	0.44	16.60	9.00	3.96	201	18	1		0.26	0.012	5.82	3.29	0.95	3.53	0.121	0.243	173.66	173.41	174.75	175.05	4.1	170.82	4	170.29	172.32	171.79
																												169.34				
"A"	4.2	4	0.01	0.01	0.80	0.80	0.01	11.13	10.73	0.09	93	8	1		0.75	0.012	1.14	3.26	0.00	1.88	0.004	0.004	173.42	173.41	176.30	175.05	4.2	171.24	4	170.54	171.90	171.21
																												170.54				
"A"	3.1	3	0.26	0.26	0.80	0.80	0.21	11.13	10.73	2.23	111	12	1		0.44	0.012	2.57	3.27	0.00	3.68	0.334	0.371	173.68	173.31	174.85	174.90	3.1	170.21	3	169.73	171.21	170.73
"B"	1	2	0.33	0.33	0.80	0.80	0.26	11.64	10.53	2.78	148	12	1		0.44	0.012	2.57	3.27	0.00	3.54	0.518	0.767	174.48	173.71	174.50	174.90	1	168.55	2	167.90	169.55	168.90
"B"	2	3	0.14	0.47	0.80	0.80	0.38	12.40	10.25	3.85	120	15	1		0.33	0.012	4.03	3.28	0.00	3.74	0.303	0.364	173.71	173.35	174.90	174.25	2	167.90	3	167.50	169.15	168.75
"B"	3	4	0.20	0.67	0.80	0.80	0.54	13.01	10.04	5.38	133	18	1		0.26	0.012	5.82	3.29	0.00	3.73	0.223	0.297	173.35	173.05	174.25	174.60	3	167.50	4	167.16	169.00	168.66
"B"	4	J-BOX	0.73	1.40	0.80	0.80	1.12	13.68	9.82	11.00	25	24	1		0.18	0.012	10.43	3.32	0.00	3.75	0.201	0.050	173.05	173.00	174.60	174.65	4	167.16	J-BOX	167.11	169.16	169.11
																												167.11				
"A"	10.1	J-BOX	0.52	0.52	0.80	0.80	0.42	14.37	9.61	4.00	393	54	1		0.23	0.012	102.44	6.44	0.99	3.05	0.000	0.001	173.00	173.00	175.40	174.65	10.1	169.01	J-BOX	168.10	173.51	172.60
																												167.11				
"C"	1	2	0.86	0.86	0.80	0.80	0.69	11.01	10.78	7.41	181	24	1		0.18	0.012	10.43	3.32	0.75	3.60	0.092	0.166	173.66	173.49	174.75	174.50	1	169.57	2	169.24	171.57	171.24
"C"	2	3	0.55	1.41	0.80	0.80	1.13	11.91	10.42	11.76	162	30	1		0.13	0.012	16.06	3.27	0.50	3.56	0.070	0.113	173.49	173.38	174.50	173.50	2	168.49	3	168.28	170.99	170.78
"C"	3	4	0.69	2.10	0.80	0.80	1.68	12.74	10.13	17.02	95	30	1		0.13	0.012	16.06	3.27	0.00	3.70	0.147	0.139	173.38	173.24	173.50	173.25	3	167.78	4	167.66	170.28	170.16
"C"	4	5	0.34	2.84	0.80	0.80	2.27	13.22	9.97	22.64	173	36	1		0.11	0.012	24.03	3.40	0.00	3.86	0.098	0.170	173.24	173.07	173.25	173.90	4	167.66	5	167.47	170.66	170.47
"C"	5	6	0.34	3.67	0.80	0.80	2.94	14.07	9.70	28.47	207	42	1		0.08	0.013	28.89	3.00	0.00	3.42	0.080	0.166	173.07	172.91	173.90	174.45	5	167.47	6	167.30	170.97	170.80
"C"	6	MH4	1.07	4.74	0.80	0.80	3.79	15.22	9.36	35.50	96	60	1		0.11	0.013	86.61	4.41	0.00	4.17	0.019	0.018	172.91	172.89	174.45	174.43	6	167.30	MH4	167.19	172.30	172.19
"C"	MH4	MH3	0.00	4.74	0.80	0.80	3.79	15.58	9.26	35.50	96	60	1		0.11	0.013	86.61	4.41	0.00	4.17	0.019	0.018	172.89	172.87	174.43	174.40	MH4	167.07	MH3	166.87	172.07	171.87
																												166.87				
"C"	4.1	4	0.40	0.40	0.80	0.80	0.32	12.40	10.25	3.28	216	15	1		0.33	0.012	4.03	3.28	1.00	3.65	0.220	0.474	173.72	173.24	177.05	172.90	4.1	169.37	4	168.66	170.62	169.91
																												167.66				
"C"	5.1	5	0.49	0.49	0.80	0.80	0.39	12.12	10.35	4.06	191	15	1		0.33	0.012	4.03	3.28	0.00	3.74	0.336	0.642	173.71	173.07	176.55	173.90	5.1	168.10	5	167.47	169.35	168.72
																												167.47				

Revision / Date
2 ADDENDUM 02 08/07/2026

Project: TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

SARAH KAROUNI
145244
LICENSED
PROFESSIONAL ENGINEER
8/7/26

Huckabee
www.huckabee-inc.com
800.687.1229

WGA
TEXAS REGISTERED ENGINEERING FIRM F-9756
2500 Tanglewilde, Suite 120, Houston, Texas 77063, 713.789.1900
4526 Research Forest, Suite 360, The Woodlands, Texas 77381, 713.789.1900

SCALE	DESIGN	DRAWN
N/A	AH	CT

DRAINAGE CALCULATIONS
VOLUME 01

Job No. 00788-002 | Sheet No. C7.2
Drawn By: CT
Date: 08.07.26

ADDENDUM 02

11/18/2025 8:39:30 AM
Autodesk Docs://TOMBALL ISD - IS REPLACEMENT/000002-14-01_Tomball ISD IS Replacement_ARCH.rvt

Drawing: Z:\00788 (Huckabee)\002 Tomball Intermediate School Replacement\500 CAD\530 Sheets\C7.2 Drainage Area Calculations.dwg Last Plotted: Fri Aug 07, 2026 – 8:07am By: dtuerto

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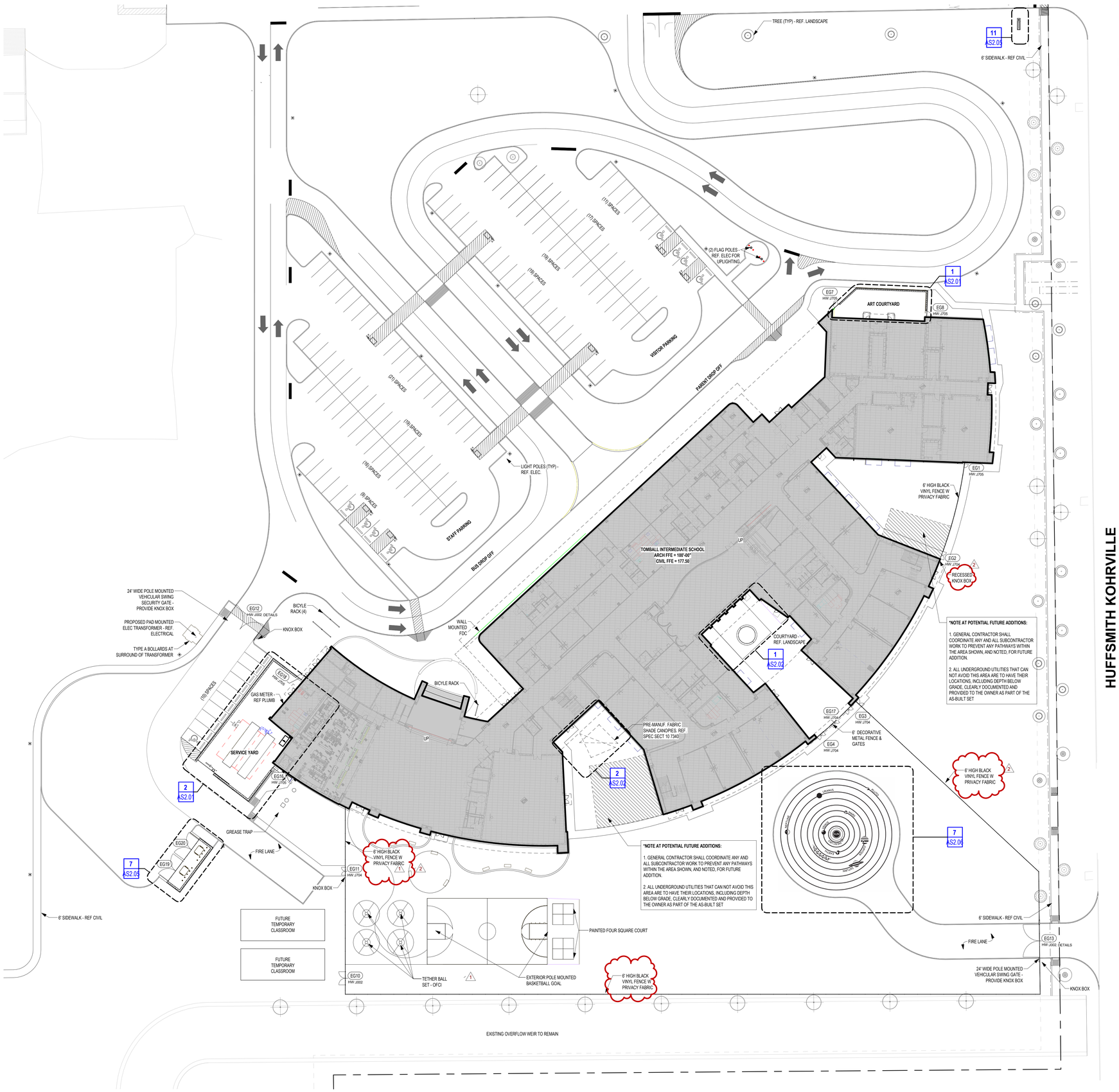

1 ARCHITECTURAL SITE PLAN - OVERALL
1" = 30'-0"

GRAPHIC SCALE
0 30 60 90 120

N TRUE

PLAN

Revision /	Date	
1	07/24/26	ADDENDUM 01
2	08/07/26	ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

REGISTERED ARCHITECT
CAITLIN M. HINSON
29554
STATE OF TEXAS
08/07/2026

Huckabee
www.huckabee-inc.com
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ENLARGED ARCHITECTURAL SITE PLAN

VOLUME 01

Job No.	Sheet No.
03802-04-01	AS1.02
Drawn By: CB	
Date: 07.15.26	

8/7/2026 1:22:33 PM
Autodesk Docs://TOMBALL ISD - IS REPLACEMENT/03802-04-01_Tomball ISD IS Replacement_ARCH.rvt

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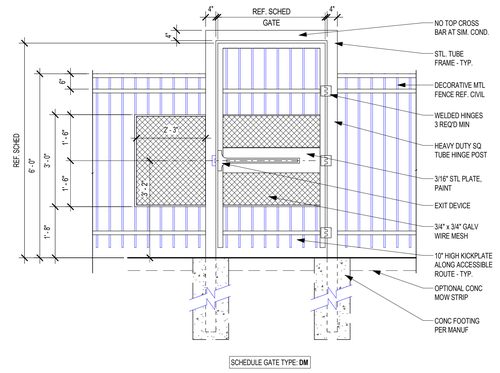
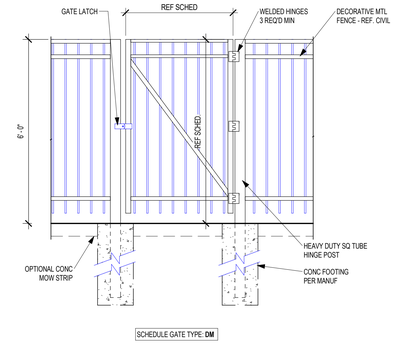
GATE SCHEDULE

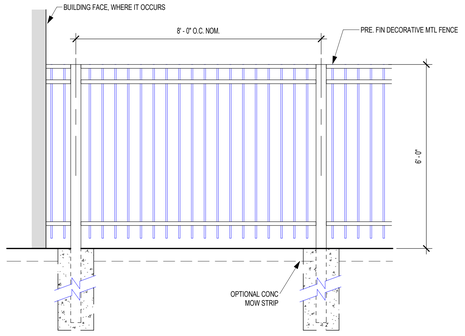
MARK	HARDWARE SET	GATE HEIGHT	GATE WIDTH	GATE MATERIAL & TYPE	PANIC HARDWARE	DETAILS & NOTES COMMENTS
EG1	J705	6' - 0"	3' - 0"	CL	Yes	BLACK VINYL REF. 5/AS2.03
EG2	J704	6' - 0"	6' - 0"	CL (PR)	Yes	BLACK VINYL REF. 3/AS2.03
EG3	J704	6' - 0"	6' - 0"	STL(PR)	Yes	CUSTOM DESIGN, REF. AS2.03
EG4	J704	6' - 0"	6' - 0"	STL(PR)	Yes	CUSTOM DESIGN, REF. AS2.03
EG7	J705	6' - 0"	4' - 0"	STL	No	DECORATIVE REF. 10/AS2.03
EG8	J705	6' - 0"	4' - 0"	STL	Yes	DECORATIVE REF. 10/AS2.03
EG10	J704	6' - 0"	10' - 0"	CL(PR)	No	BLACK VINYL REF. 2/AS2.03
EG11	J704	6' - 0"	6' - 0"	CL (PR)	Yes	BLACK VINYL REF. 3/AS2.03
EG12	REF. DETAILS	3' - 0"	26' - 0"	STL(V-PR)	No	PROVIDE POLE MOUNTED KNOX BOX
EG13	REF. DETAILS	3' - 0"	24' - 0"	STL(V-PR)	No	PROVIDE POLE MOUNTED KNOX BOX
EG16	J705	6' - 0"	4' - 0"	STL	Yes	DECORATIVE REF. 10/AS2.03
EG17	J704	6' - 0"	6' - 0"	STL(PR)	Yes	CUSTOM DESIGN, REF. AS2.03
EG18	J705	6' - 0"	4' - 0"	STL	Yes	DECORATIVE REF. 10/AS2.03
EG19	J002	10' - 0"	18' - 10"	CL (PR)	No	BLACK VINYL REF. 2/AS2.05
EG20	J002	10' - 0"	18' - 10"	CL (PR)	No	BLACK VINYL REF. 2/AS2.05



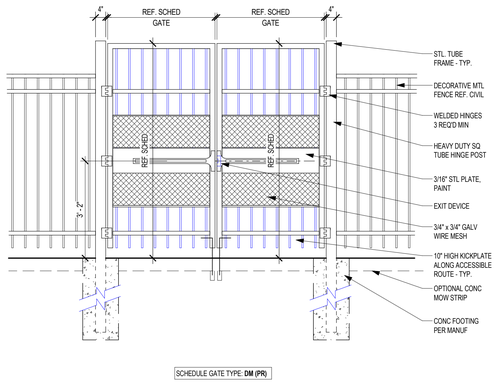
10 DECORATIVE METAL FENCE - SINGLE W/PANIC HDWR AND CLOSER
1/2" = 1'-0"



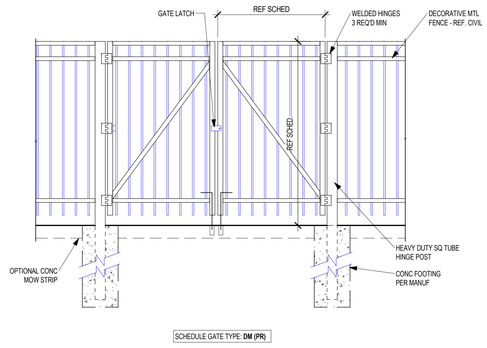
9 DECORATIVE METAL FENCE - SINGLE
1/2" = 1'-0"



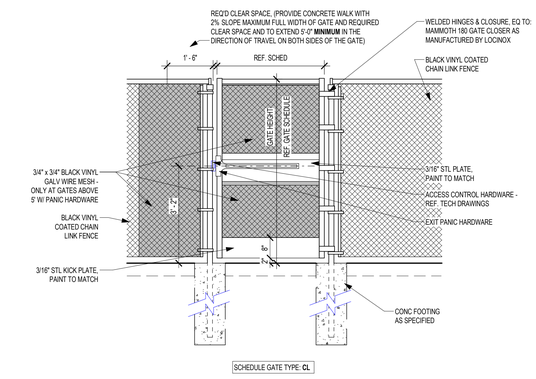
8 DECORATIVE METAL FENCE
1/2" = 1'-0"



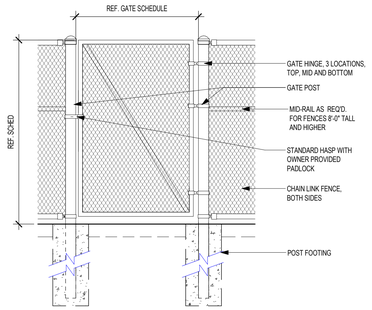
7 DECORATIVE METAL - DOUBLE W/PANIC HDWR AND CLOSER
1/2" = 1'-0"



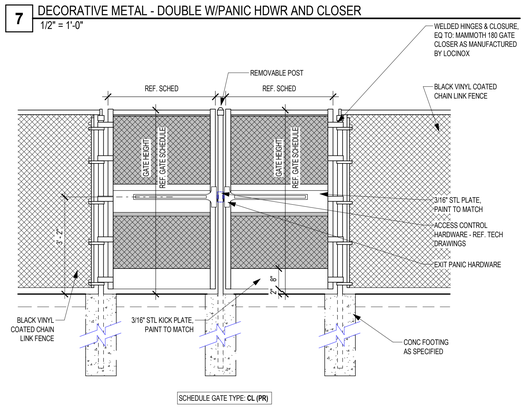
6 DECORATIVE METAL - DOUBLE
1/2" = 1'-0"



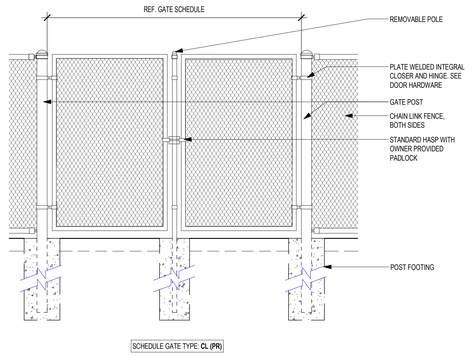
5 CHAIN LINK GATE - SINGLE W/ PANIC HARDWARE
1/2" = 1'-0"



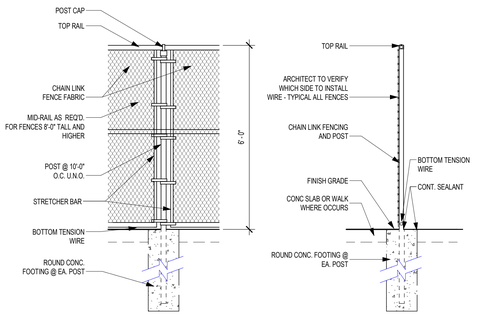
4 CHAIN LINK GATE - SINGLE
1/2" = 1'-0"



3 CHAIN LINK GATE - DOUBLE W/ PANIC HARDWARE
1/2" = 1'-0"



2 CHAIN LINK GATE - DOUBLE
1/2" = 1'-0"



1 CHAIN LINK FENCE
1/2" = 1'-0"

Revision / 1 — Date 08/07/26 — ADDENDUM 02

Project: TOMBALL INTERMEDIATE SCHOOL REPLACEMENT FOR TOMBALL INDEPENDENT SCHOOL DISTRICT TOMBALL, TEXAS

REGISTERED ARCHITECT CAITLIN MUNCH 29361 STATE OF TEXAS
08/07/2026

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FENCE & GATE DETAILS

VOLUME 01

Job No.	Sheet No.
00802-04-01	AS2.03
Drawn By: CB	
Date: 07.15.26	

8/7/2026 1:31:46 PM
Autodesk Docs://TOMBALL ISD - IS REPLACEMENT/00802-04-01_Tomball ISD IS Replacement_A9Ch1.rvt

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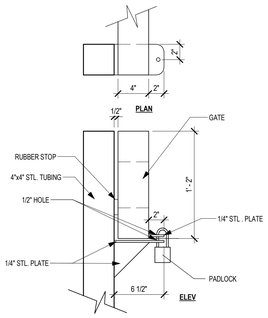
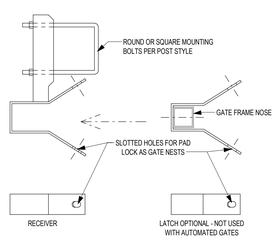
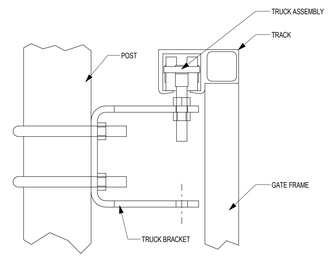
NOTE:
1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.



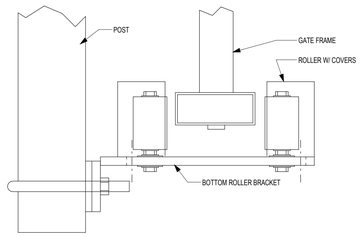
9 LATCH POST DETAIL
1 1/2" = 1'-0"



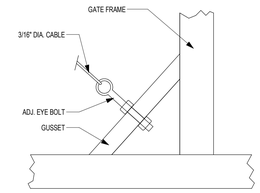
8 SLIDING CL GATE RECEIVER DETAIL
1/2" = 1'-0"



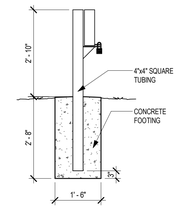
7 SLIDING CL GATE TOP
1/2" = 1'-0"



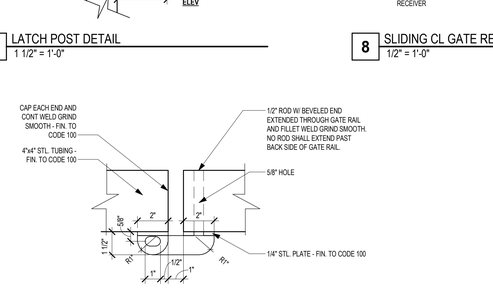
6 SLIDING CL GATE BOTTOM BRACKET DETAIL
1/2" = 1'-0"



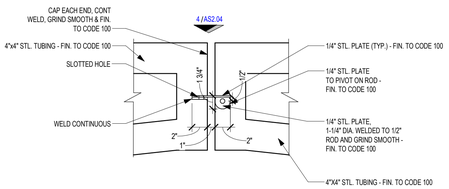
5 AS_SLIDING CL GATE GUSSET DETAIL
1/2" = 1'-0"



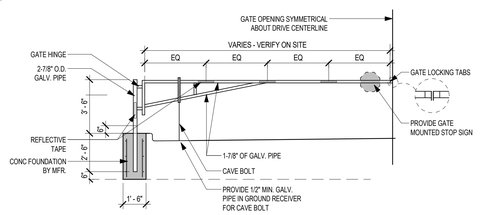
10 SECURITY GATE - LATCH POST
1/2" = 1'-0"



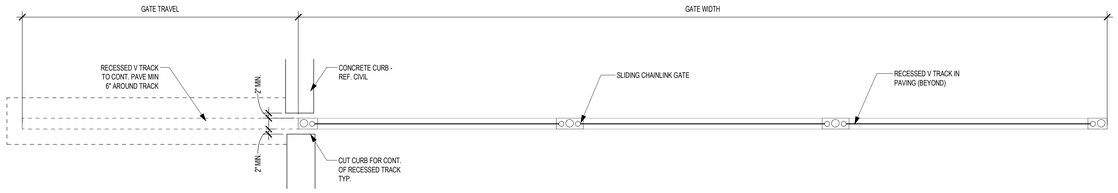
4 SECURITY LATCH ASSEMBLY PLAN DETAIL
3" = 1'-0"



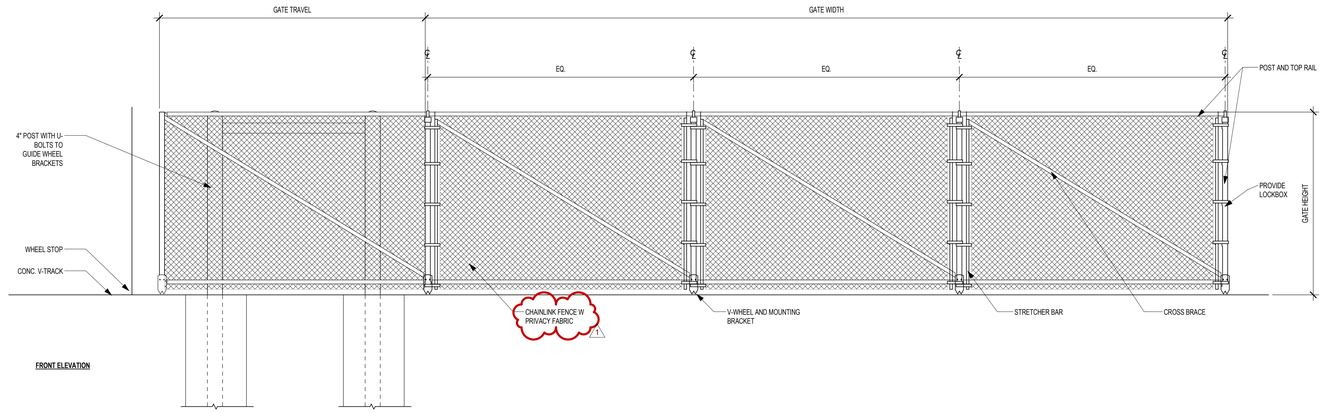
3 SECURITY LATCH ASSEMBLY - ELEV. DETAIL - FRONT VIEW
1 1/2" = 1'-0"



2 MANUAL DRIVE GATE ELEVATION
1/4" = 1'-0"

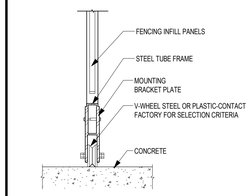


PLAN

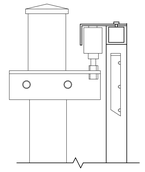


FRONT ELEVATION

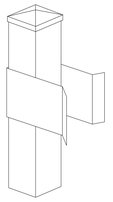
1 ROLLING BLACK VINYL CL GATE ELEVATION
1/2" = 1'-0"



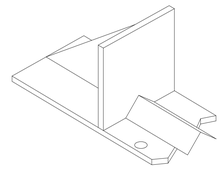
SINGLE WHEEL



GUIDE WHEELS



CLOSE GATE POST WITH GUIDE



WHEEL STOP

Revision / 1 — Date 08/07/26 — ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

REGISTERED ARCHITECT — CAITLIN MUNSON — 33915 — STATE OF TEXAS
08/07/2026

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VEHICULAR GATE DETAILS

VOLUME 01

Job No. 0/2602-04-01
Drawn By: CB
Date: 07.15.26
Sheet No. AS2.04

8/7/2026 1:32:12 PM
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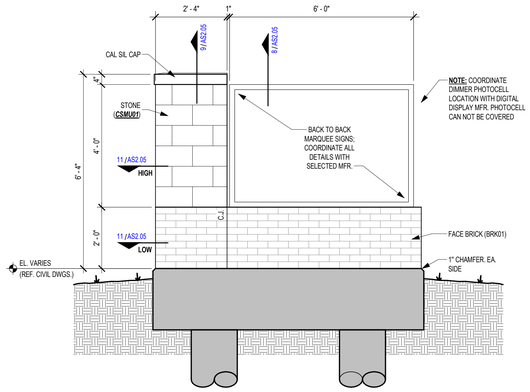
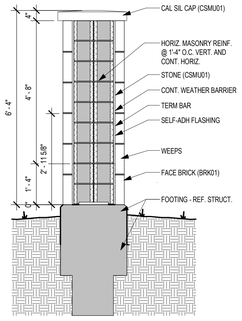
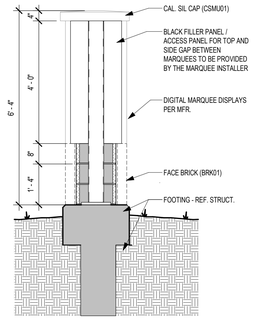


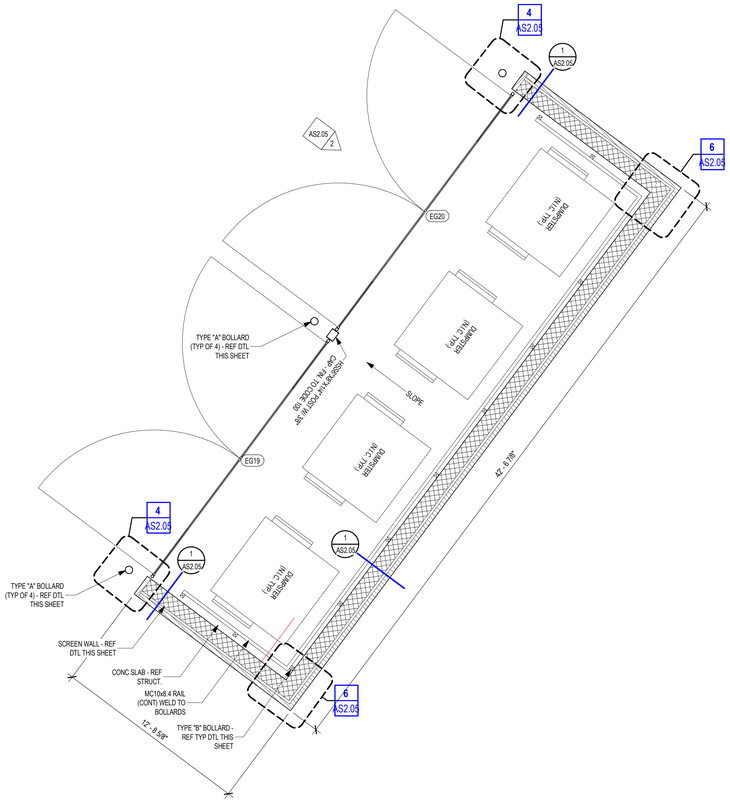
10 MONUMENT SIGN ELEVATION
1/2" = 1'-0"



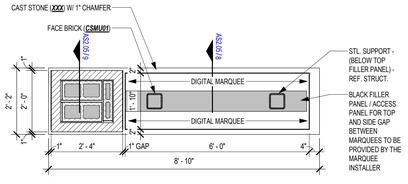
9 MONUMENT SIGN SECTION
1/2" = 1'-0"



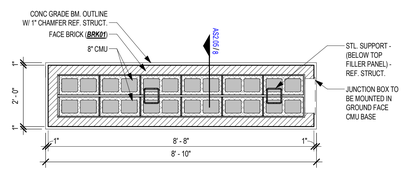
8 MONUMENT SIGN SECTION
1/2" = 1'-0"



7 DUMPSTER ENCLOSURE PLAN
1/4" = 1'-0"

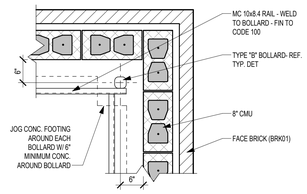


PLAN (HIGH)

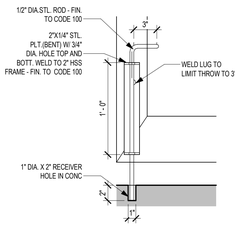


PLAN (LOW)

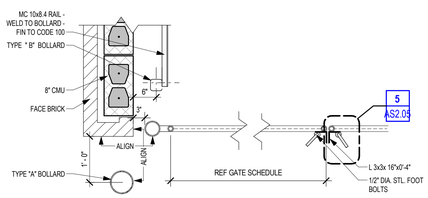
11 MONUMENT SIGN PLAN DETAIL
1/2" = 1'-0"



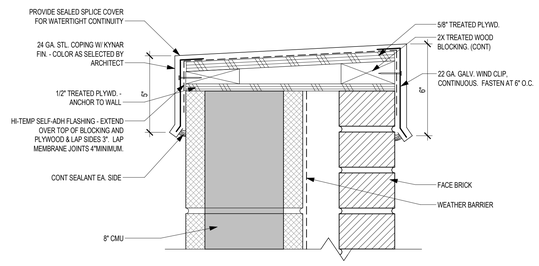
6 DUMPSTER ENCLOSURE FENCE DETAIL
3/4" = 1'-0"



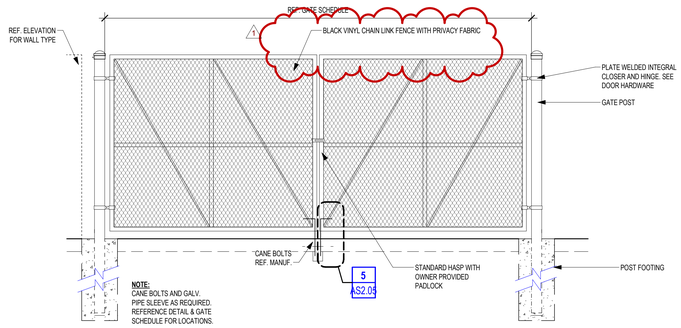
5 CANE BOLT DETAIL
1 1/2" = 1'-0"



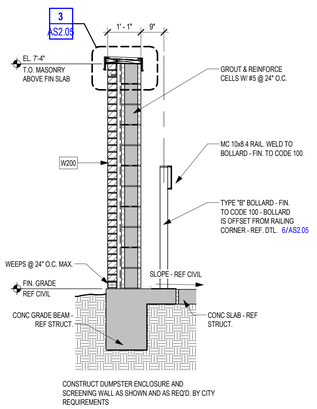
4 GATE PLAN DETAIL
3/4" = 1'-0"



3 DUMPSTER ENCLOSURE CAP DETAIL
3" = 1'-0"



2 VEHICULAR CHAIN LINK GATE
1/2" = 1'-0"



1 DUMPSTER ENCLOSURE SECTION
1/2" = 1'-0"

Revision / 1 — Date 08/07/26 — ADDENDUM 02

Project: TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

REGISTERED ARCHITECT — CAITLIN MUNSON — STATE OF TEXAS
08/07/2026

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DUMPSTER ENCLOSURE & MONUMENT SIGN DETAILS
VOLUME 01

Job No. 00803-04-01
Drawn By: CB
Date: 07.15.26
Sheet No. AS2.05

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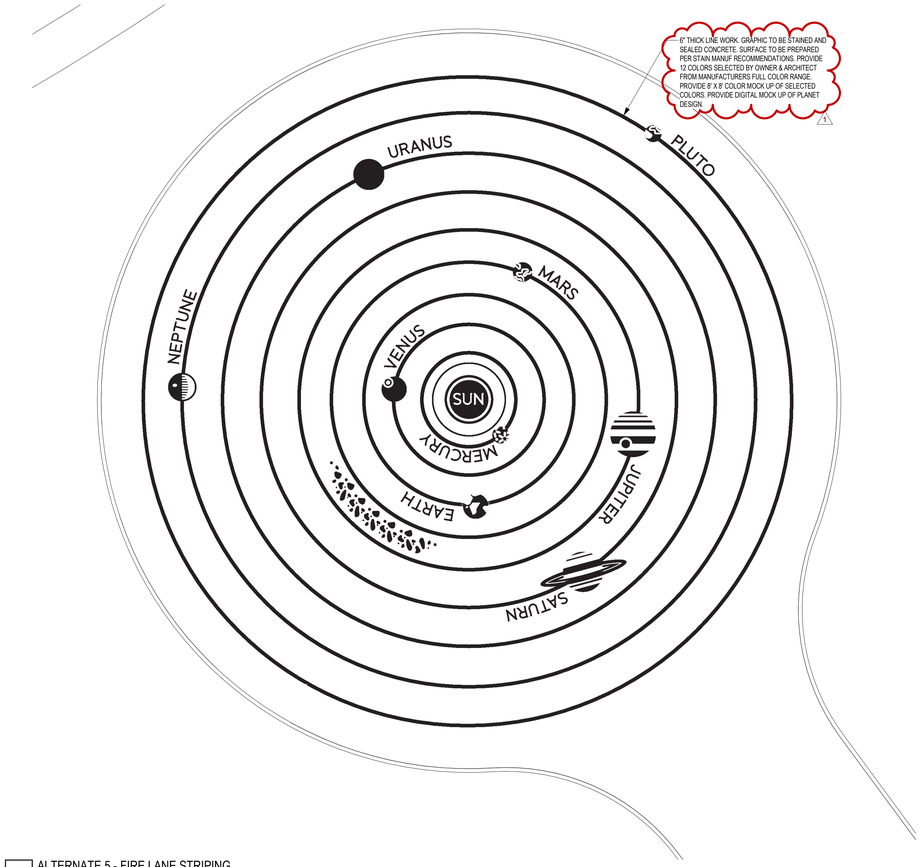
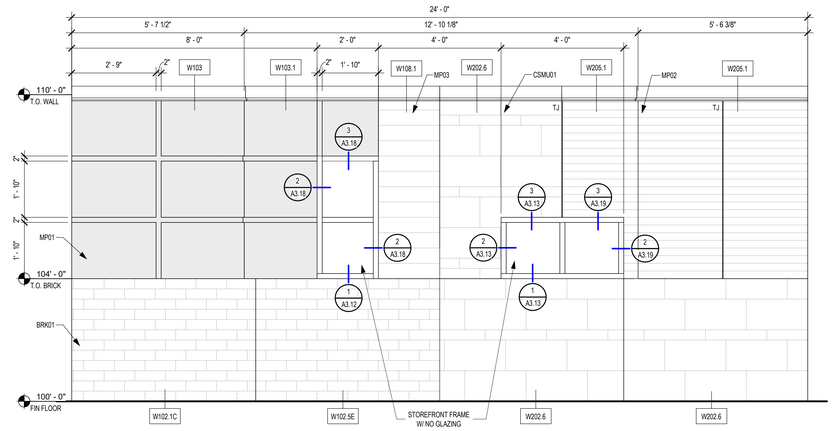
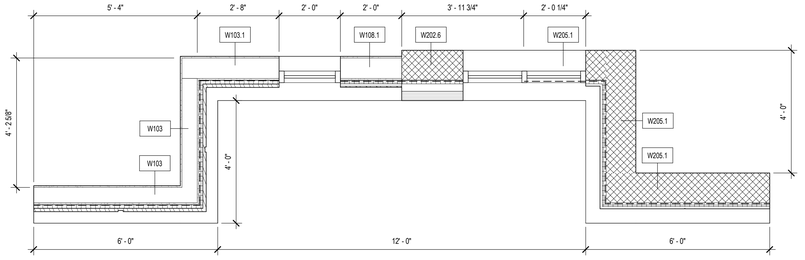


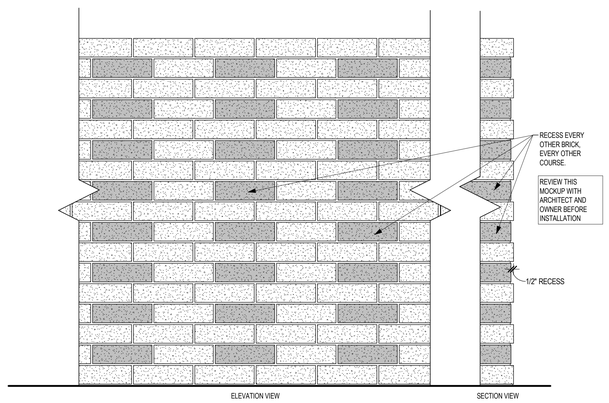
7 ALTERNATE 5 - FIRE LANE STRIPING
1/8" = 1'-0"



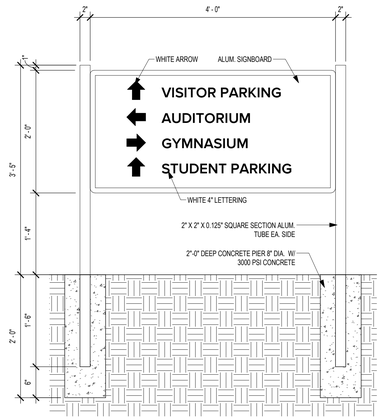
8 MOCK UP WALL - ELEVATION
1/2" = 1'-0"



6 MOCK UP WALL - PLAN
1/2" = 1'-0"



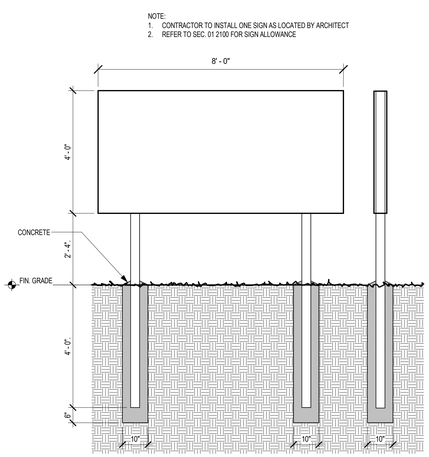
5 BRICK PATTERNING DETAIL FOR MOCK-UP WALL - BRK01
1" = 1'-0"



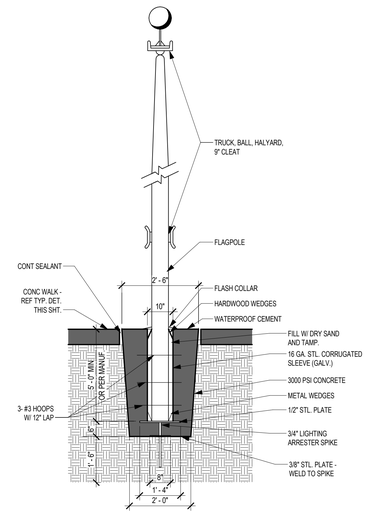
NOTE: FINAL SIGN WORDING AND DIRECTIONAL ARROWS TO BE APPROVED BY OWNER AND ARCHITECT PRIOR TO INSTALLATION.

NOTE: PROVIDE (15) DOUBLE SIDED SITE SIGNS. ASSUME 4 ROWS OF TEXT PER SIDE AS SHOWN ON THE EXAMPLE.

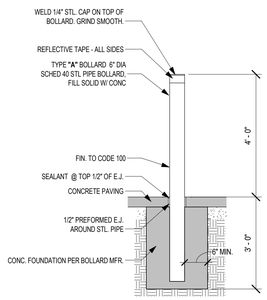
4 SITE DIRECTIONAL SIGNAGE
1" = 1'-0"



3 PROJECT SIGN
1/2" = 1'-0"



2 FLAGPOLE SECTION
1/2" = 1'-0"



1 TYPICAL BOLLARD DETAIL
1/2" = 1'-0"

Revision / 1 — Date 08/07/26 — ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

REGISTERED ARCHITECT — CLIFTON MUNCY — 29467 — STATE OF TEXAS
08/07/2026

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MISC. SITE DETAILS

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Job No. 00802-04-01
Drawn By: CB
Date: 07.15.26
Sheet No. AS2.06

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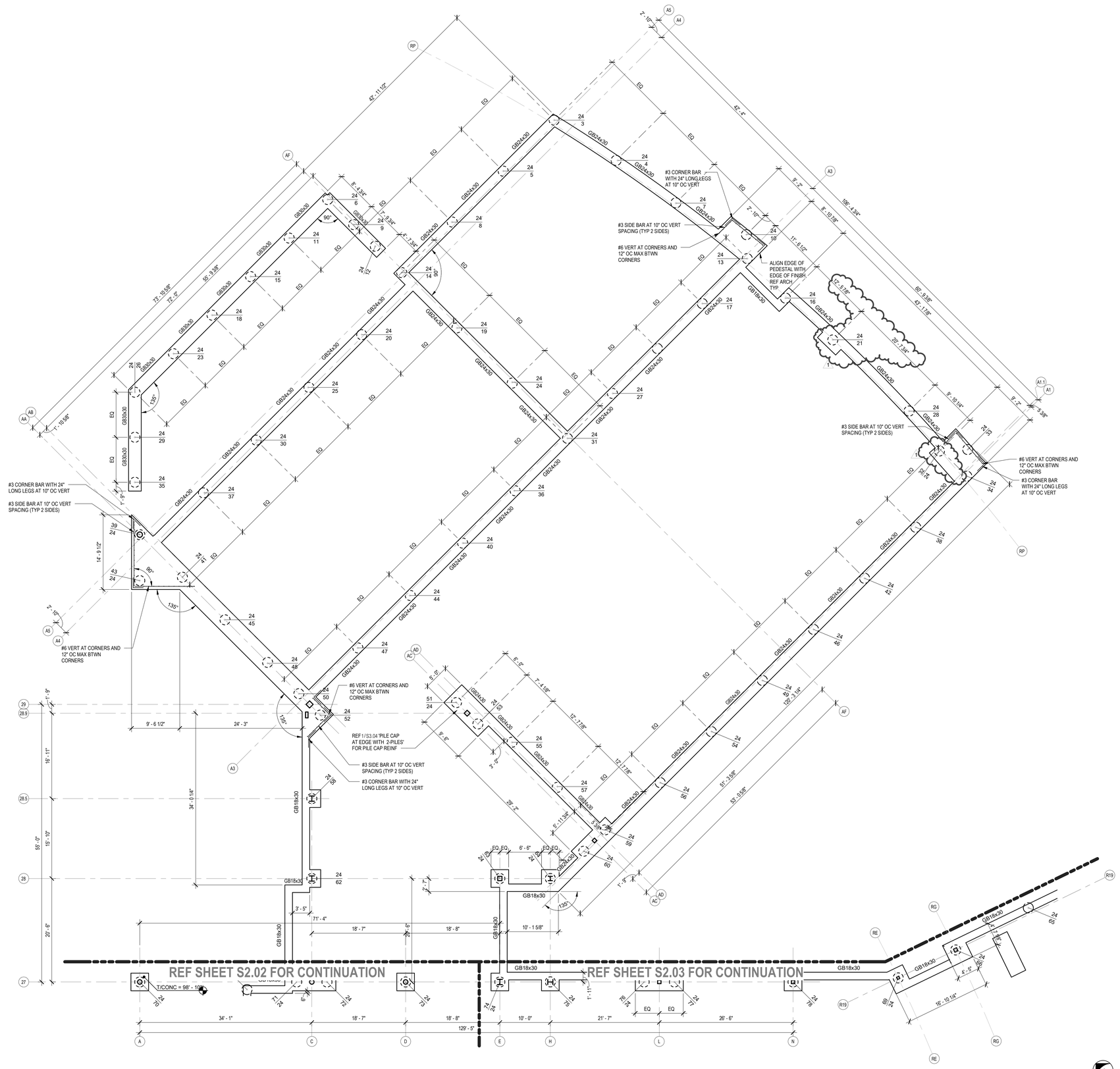
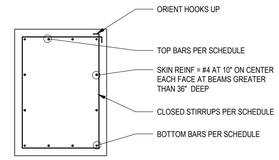


1 DEEP FOUNDATION ELEMENTS PLAN - AREA A
S2.01 1/8" = 1'-0"

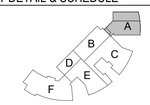


NOTE: THE BOTTOM OF ALL GRADE BEAMS SHALL EXTEND A MINIMUM OF 12" BELOW ALL EXTERIOR FINAL GRADE. CONTRACTOR TO COORDINATE GRADE BEAM DEPTHS (AFTER ALL ADDENDUM) AND INCREASE THE DEPTH OF THE GRADE BEAMS AS REQUIRED TO MEET THIS REQUIREMENT.

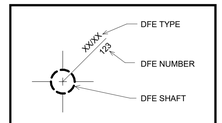
GRADE BEAM SCHEDULE

Mark	GRADE BEAM (GB) SIZE		Top Reinf	Bot Reinf	Stirrups	Comments
	Width (in)	Height (in)				
GB14x30	14"	30"	3 - #8	3 - #8	#4 @ 10" OC	
GB18x30	18"	30"	4 - #8	4 - #8	#4 @ 12" OC	
GB24x30	24"	30"	4 - #8	4 - #8	#4 @ 12" OC	
GB30x30	30"	30"	4 - #8	4 - #8	#4 @ 8" OC	
GB52 x30	52"	30"	6 - #8	6 - #8	(2) #4 @ 10" OC	

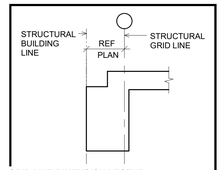
2 TYPICAL GRADE BEAM REINFORCEMENT DETAIL & SCHEDULE
S2.01 3/4" = 1'-0"



KEY PLAN - 1ST FLOOR
N.T.S.



DFE PLAN LEGEND



GRID LINE DIMENSION LEGEND

1. REFERENCE 1/S3.01 FOR TYPICAL DEEP FOUNDATION ELEMENT DETAIL AND SCHEDULE.
2. DEEP FOUNDATION ELEMENT SHALL BE CENTERED UNDER GRADE BEAMS OR COLUMNS UNLESS NOTED OTHERWISE.
3. TOP OF DEEP FOUNDATION ELEMENT ELEVATION SHALL EQUAL TO BOTTOM OF GRADE BEAM OR PILASTER UNLESS NOTED OTHERWISE.
4. STRUCTURAL MEMBERS SHALL BE EQUALLY SPACED BETWEEN MAJOR SUPPORT POINTS SUCH AS COLUMN GRIDS, DFE GRIDS, WALLS, AND GIRDERS UNLESS DIMENSIONED OTHERWISE.

DFE PLAN NOTES

Revision /	Date	
1	06.07.26	ADDENDUM 02

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

IEG
Innovative Engineering Group
www.iegengineers.com
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TBPELS Firm No. F-5923

STATE OF TEXAS
R. CRAIG McKEE
111569
REGISTERED
PROFESSIONAL ENGINEER
8.7.2026

F-1252
F-5923

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DEEP FOUNDATION ELEMENTS PLAN - AREA A

VOLUME 01

Job No.	Sheet No.
00802-04-01	S2.01
Drawn By: IEG	
Date: 07.15.26	

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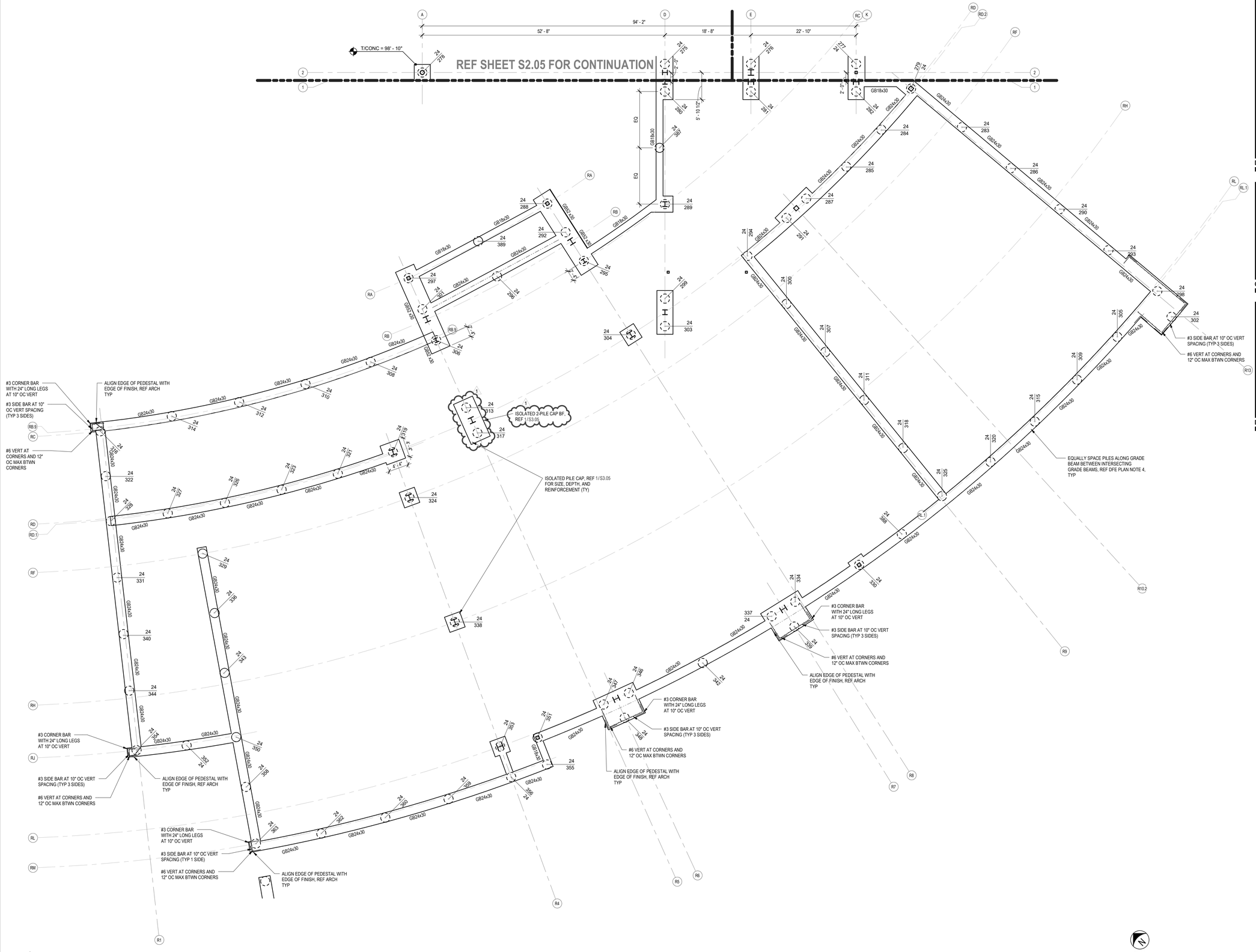
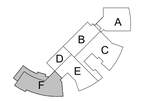
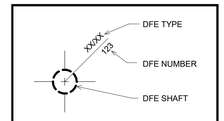


1 DEEP FOUNDATION ELEMENTS PLAN - AREA F
S2.06 1/8" = 1'-0"

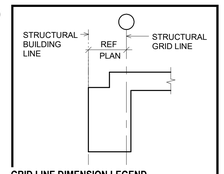
PLAN



KEY PLAN - 1ST FLOOR
N.T.S.



DFE PLAN LEGEND



GRID LINE DIMENSION LEGEND

1. REFERENCE 1/S3.01 FOR TYPICAL DEEP FOUNDATION ELEMENT DETAIL AND SCHEDULE.
2. DEEP FOUNDATION ELEMENT SHALL BE CENTERED UNDER GRADE BEAMS OR COLUMNS UNLESS NOTED OTHERWISE.
3. TOP OF DEEP FOUNDATION ELEMENT ELEVATION SHALL EQUAL TO BOTTOM OF GRADE BEAM OR PILASTER UNLESS NOTED OTHERWISE.
4. STRUCTURAL MEMBERS SHALL BE EQUALLY SPACED BETWEEN MAJOR SUPPORT POINTS SUCH AS COLUMN GRIDS, DFE GRIDS, WALLS, AND GIRDERS UNLESS DIMENSIONED OTHERWISE.

DFE PLAN NOTES

Revision /	Date	
1	08.07.26	ADDENDUM 02

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
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DEEP FOUNDATION ELEMENTS PLAN - AREA F

VOLUME 01

Job No.	Sheet No.
03802-04-01	S2.06
Drawn By: IEG	
Date: 07.15.26	

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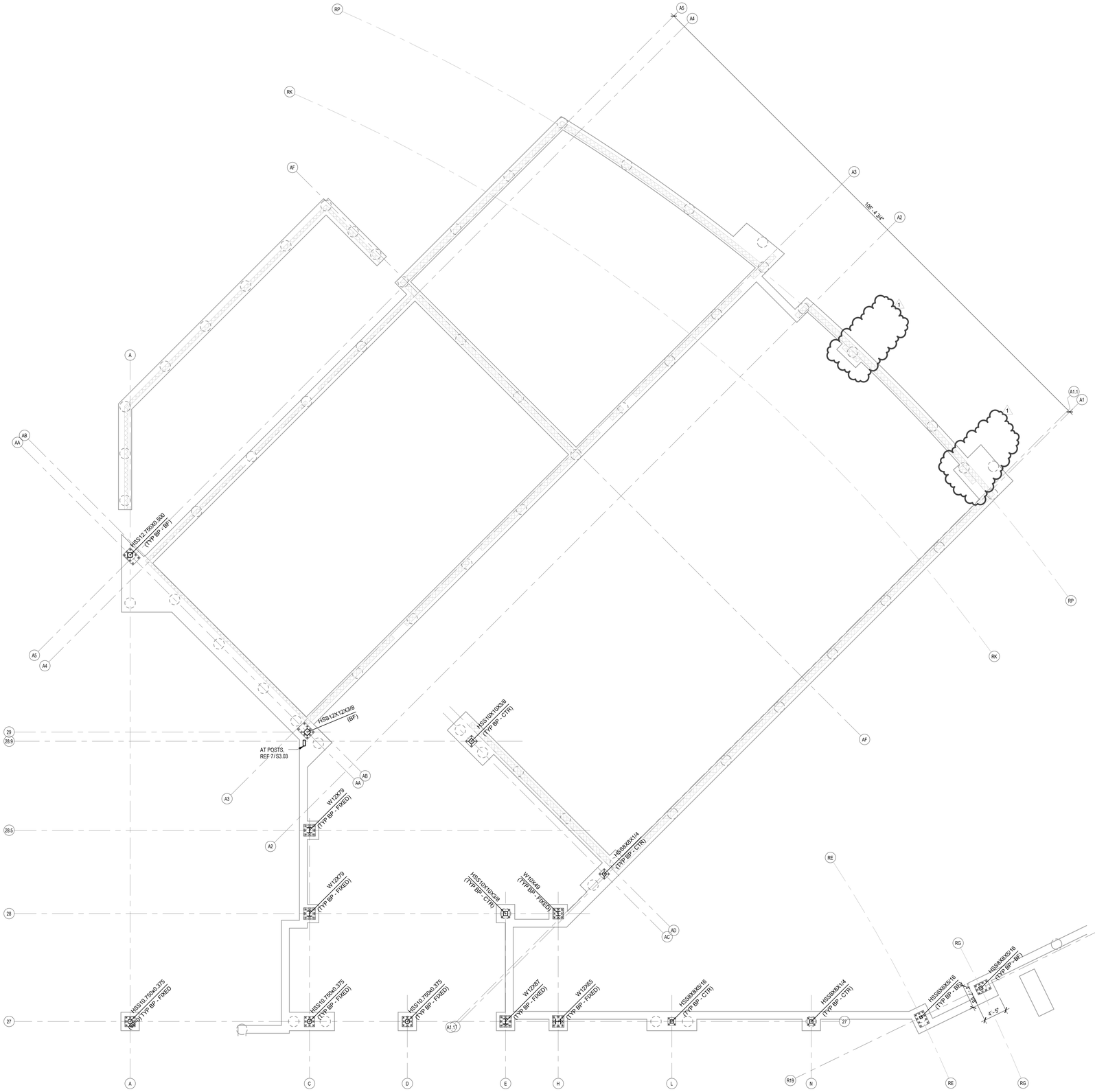
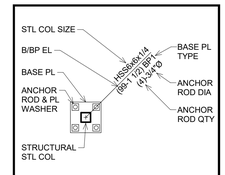
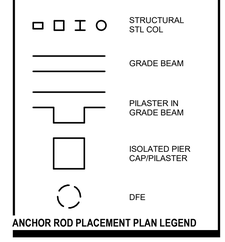


1 ANCHOR ROD PLACEMENT PLAN - AREA A
S2.07 1/8" = 1'-0"





ANCHOR ROD PLACEMENT PLAN LEGEND

1. THIS ANCHOR ROD PLACEMENT PLAN IS INTENDED TO BE AN AIDE TO THE CONTRACTOR FOR PREPARING THEIR OWN ANCHOR ROD PLACEMENT PLANS, AND IS NOT A SUBSTITUTE FOR PREPARATION OF THOSE SHOP DRAWINGS.
2. B/BP EL = 99'-5 1/2" UNO.
3. FOR BASE PLATE LABELED "TYP BP - CTR" REFERENCE 2/S3.02
4. FOR BASE PLATE LABELED "TYP BP - EDGE" REFERENCE 2/S3.02
5. FOR BASE PLATE LABELED "TYP BP - FIXED" REFERENCE 5/S3.02
6. FOR BASE PLATE LABELED "TYP BP - BF" REFERENCE 3/S3.02

ANCHOR ROD PLACEMENT PLAN NOTES

Revision /	Date	
1	06.07.26	ADDENDUM 02

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
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PROFESSIONAL
ENGINEER
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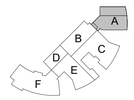

KEY PLAN - 1ST FLOOR
N.T.S.

PLAN

ANCHOR ROD PLACEMENT PLAN - AREA A

VOLUME 01

Job No.	Sheet No.
00802-04-01	S2.07
Drawn By: IEG	
Date: 07.15.26	

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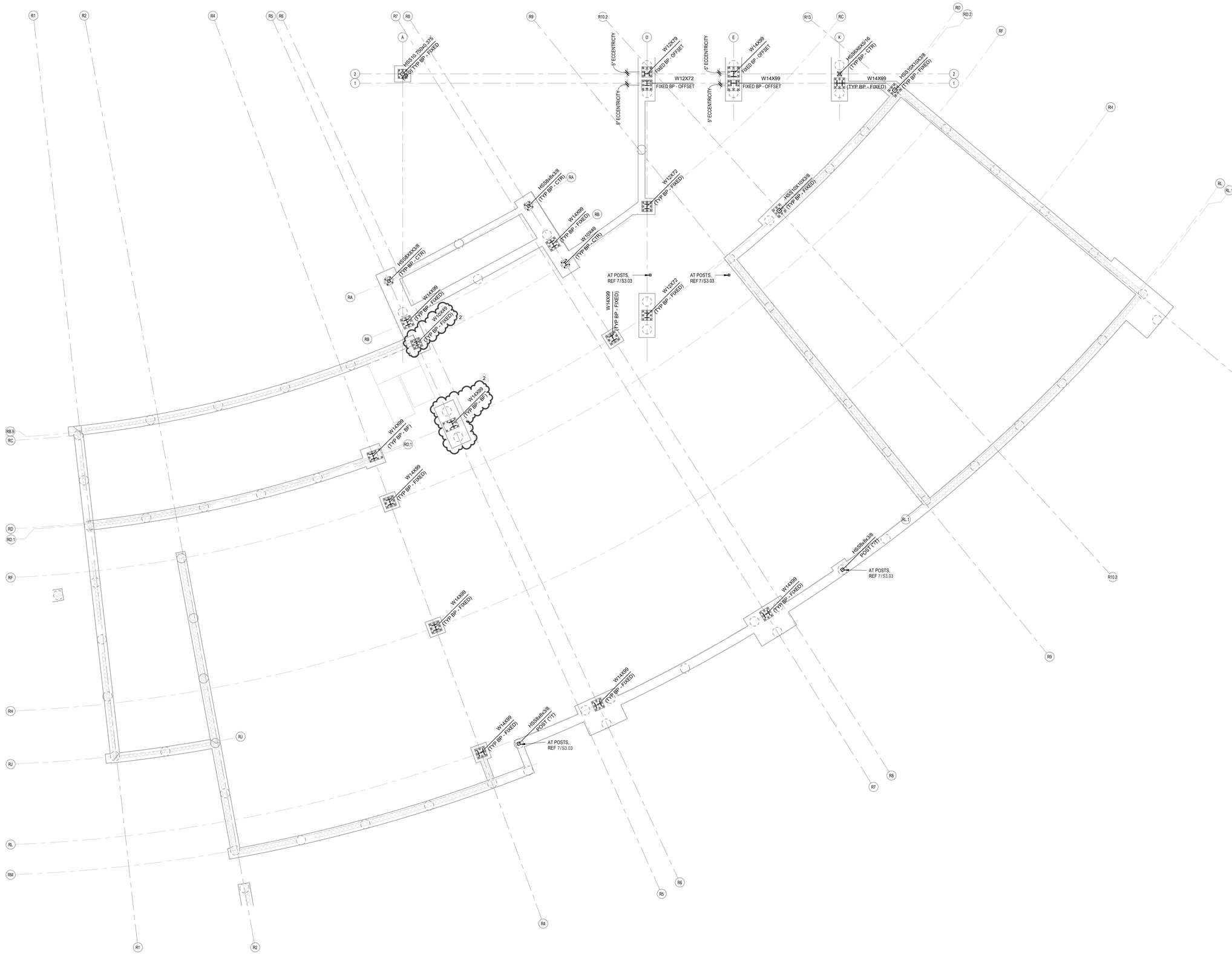
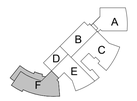
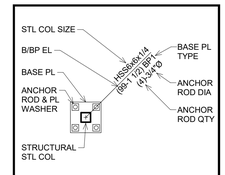


1 ANCHOR ROD PLACEMENT PLAN - AREA F
S2.12 1/8" = 1'-0"

PLAN



KEY PLAN - 1ST FLOOR
N.T.S.



STRUCTURAL STL COL

GRADE BEAM

PILASTER IN GRADE BEAM

ISOLATED PIER CAP/PILASTER

DFE

ANCHOR ROD PLACEMENT PLAN LEGEND

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4. FOR BASE PLATE LABELED "TYP BP - EDGE" REFERENCE 2/S3.02
5. FOR BASE PLATE LABELED "TYP BP - FIXED" REFERENCE 5/S3.02
6. FOR BASE PLATE LABELED "TYP BP - BF" REFERENCE 3/S3.02

ANCHOR ROD PLACEMENT PLAN NOTES

Revision /	Date	
1	07.24.26	ADDENDUM 01
2	08.07.26	ADDENDUM 02

Project:

TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
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ANCHOR ROD PLACEMENT PLAN - AREA F

VOLUME 01

Job No.	Sheet No.
00802-04-01	S2.12
Drawn By: IEG	
Date: 07.15.26	

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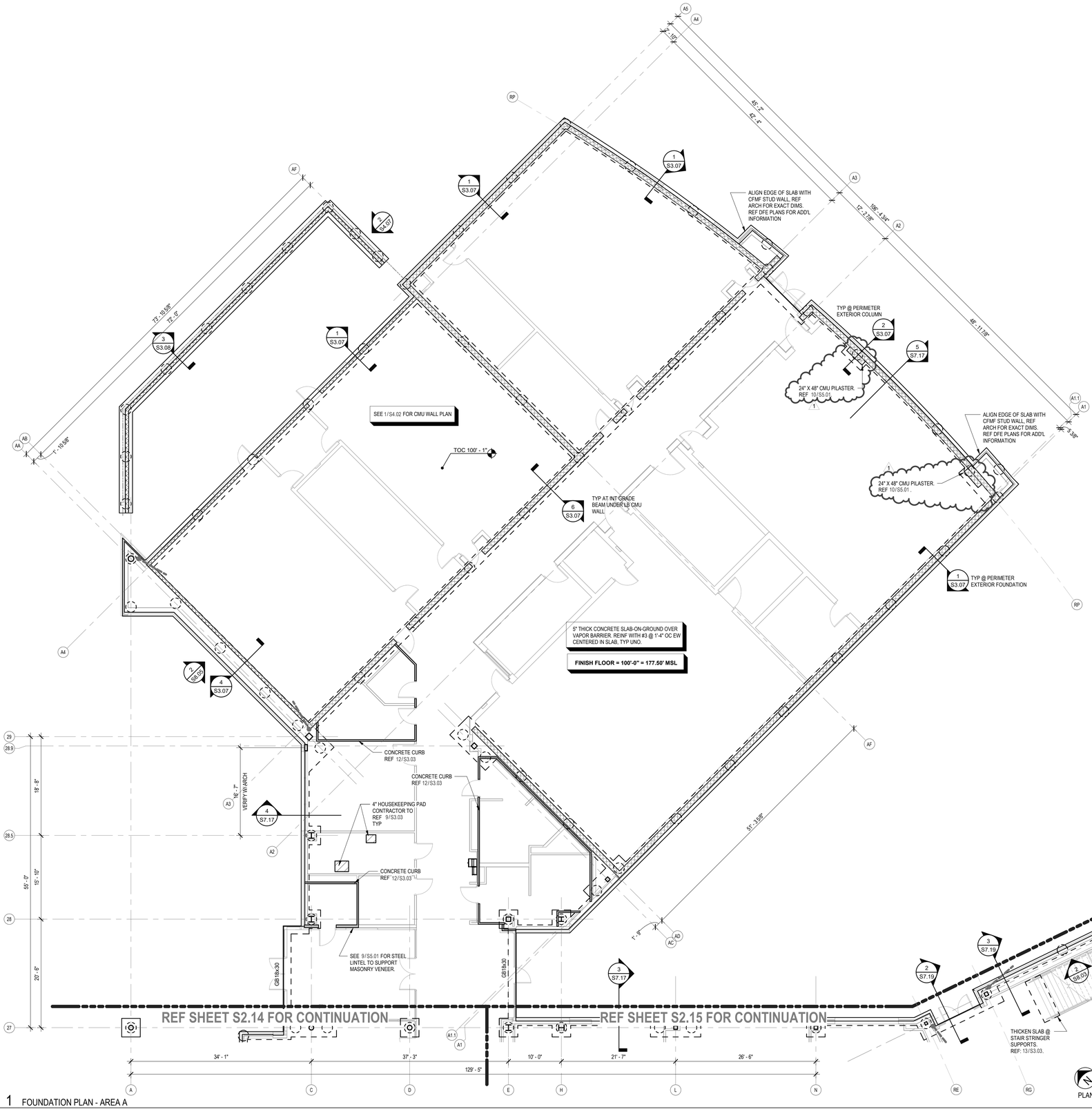


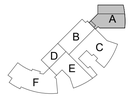
1 FOUNDATION PLAN - AREA A
S2.13 1/8" = 1'-0"

INT NON LOAD-BEARING STUD WALL
INT NON LOAD-BEARING CMU OR STUD WALL
LOAD BEARING OR EXTERIOR NON-LOAD BEARING CMU
BUILDING LINE
CMU LINTEL SEE TYPICAL DETAILS
GRADE BEAM
PILE CAP
SLAB STEP
FREEZER SLAB REF ARCH FOR EXTENTS & ADD'L INFO
OVERBUILD SLAB
FD FLOOR DRAIN
FS FLOOR SINK
T/CONC = XX'-XX" T/SLAB ELEVATION
STRUCTURAL STEEL COLUMN
BUILDING LINE
LOW END BRACE FRAME

FOUNDATION LEGEND

1. FOR GENERAL NOTES, SEE DWG. S0.01.
2. FOR FOUNDATION SECTIONS & DETAILS, SEE S3 SERIES DRAWINGS.
3. SEE ARCH DRAWINGS FOR EXACT LOCATION OF SLAB DEPRESSIONS, OPENINGS AND ENTRY AREAS.
4. SLOPE TOP AND BOTTOM OF STRUCTURAL SLAB AT ALL FLOOR DRAINS, MAINTAINING THE MINIMUM OVERALL CONCRETE SLAB THICKNESS AS SPECIFIED.
5. STRUCTURAL MEMBERS SHALL BE EQUALLY SPACED BETWEEN MAJOR SUPPORT POINTS SUCH AS COLUMN GRIDS, DFE GRIDS, WALLS, AND GIRDERS UNLESS DIMENSIONED OTHERWISE.
6. CONTRACTOR TO COORDINATE CLEARANCES, LAYOUT, STRUCTURAL REQUIREMENTS, AND INFRASTRUCTURAL REQUIREMENTS WITH SELECTED ELEVATOR(S). DIMENSIONS AND OTHER INFORMATION WILL VARY AND DIFFER FROM EACH ELEVATOR PRODUCT / MODEL / MANUFACTURER AND MAY EVEN CHANGE WHEN USING THE BASIS-OF-DESIGN PRODUCT. DO NOT COMMENCE THIS WORK, RELATED TO FOUNDATION WORK, STEEL FABRICATION OR OTHER IMPACTED ACTIVITIES UNTIL SUBMITTALS AND SHOP DRAWINGS HAVE BEEN PRODUCED, COORDINATED WITH THE OTHER WORK, AND REVIEWED.

FOUNDATION PLAN NOTES



KEY PLAN - 1ST FLOOR
N.T.S.

Revision /	Date	
1	06.07.26	ADDENDUM 02

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
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FOUNDATION PLAN - AREA A

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00802-04-01	S2.13
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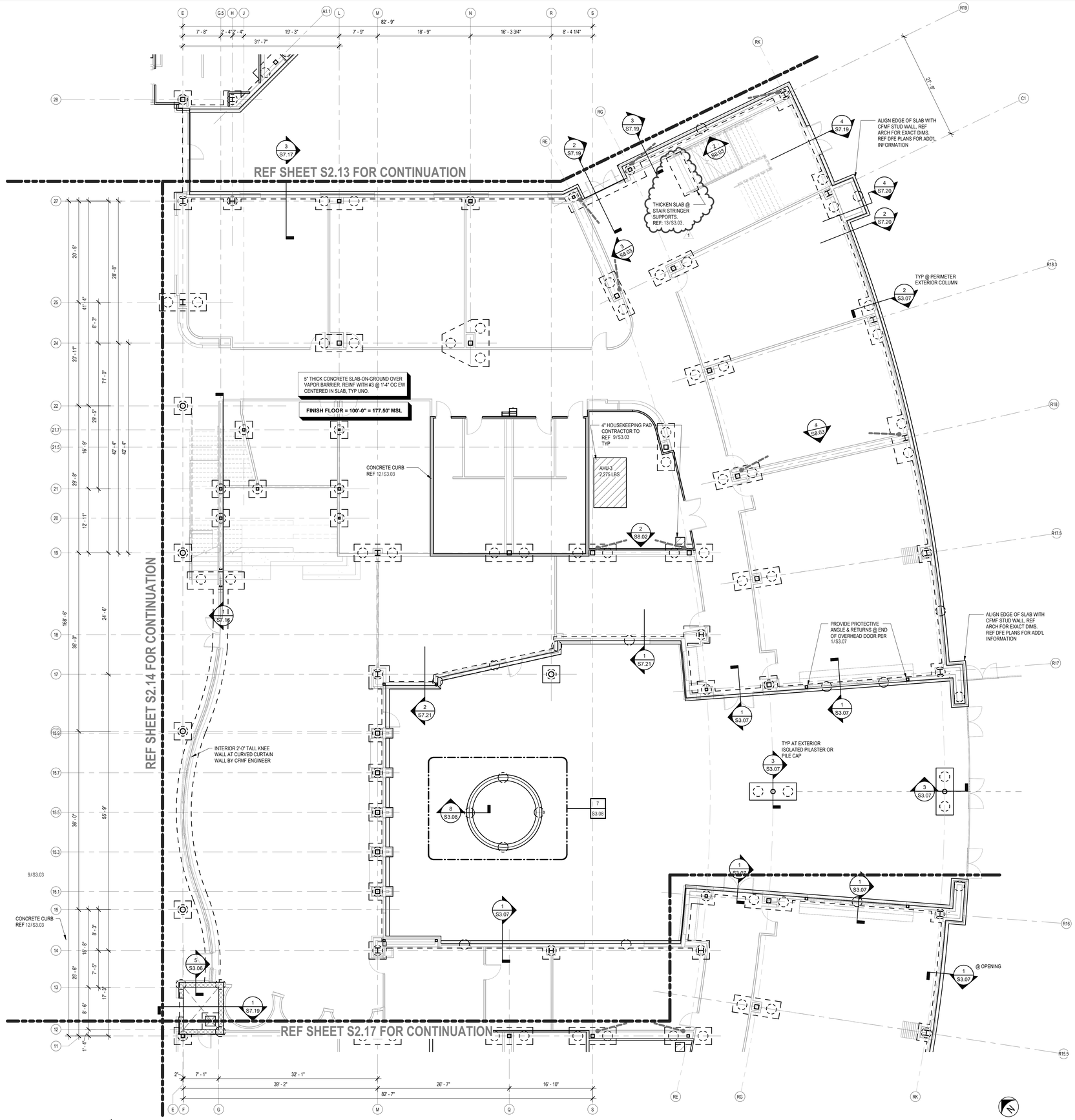

1 FOUNDATION PLAN - AREA C
S2.15 1/8" = 1'-0"

KEY PLAN - 1ST FLOOR
N.T.S.

FOUNDATION LEGEND

- INT NON LOAD-BEARING STUD WALL
- INT NON LOAD-BEARING CMU OR STUD WALL
- LOAD BEARING OR EXTERIOR NON-LOAD BEARING CMU
- BUILDING LINE
- CMU LINTEL SEE TYPICAL DETAILS
- GRADE BEAM
- PILE CAP
- SLAB STEP
- FREEZER SLAB REF ARCH FOR EXTENTS & ADD'L INFO
- OVERBUILD SLAB
- FD FLOOR DRAIN
- FS FLOOR SINK
- T/CONC = XX'-XX" T/SLAB ELEVATION
- STRUCTURAL STEEL COLUMN
- BUILDING LINE
- LOW END BRACE FRAME

FOUNDATION PLAN NOTES

1. FOR GENERAL NOTES, SEE DWG. S0.01.
2. FOR FOUNDATION SECTIONS & DETAILS, SEE S3 SERIES DRAWINGS.
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Revision /	Date	
1	08.07.26	ADDENDUM 02

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

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FOUNDATION PLAN - AREA C

VOLUME 01

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00802-04-01	S2.15
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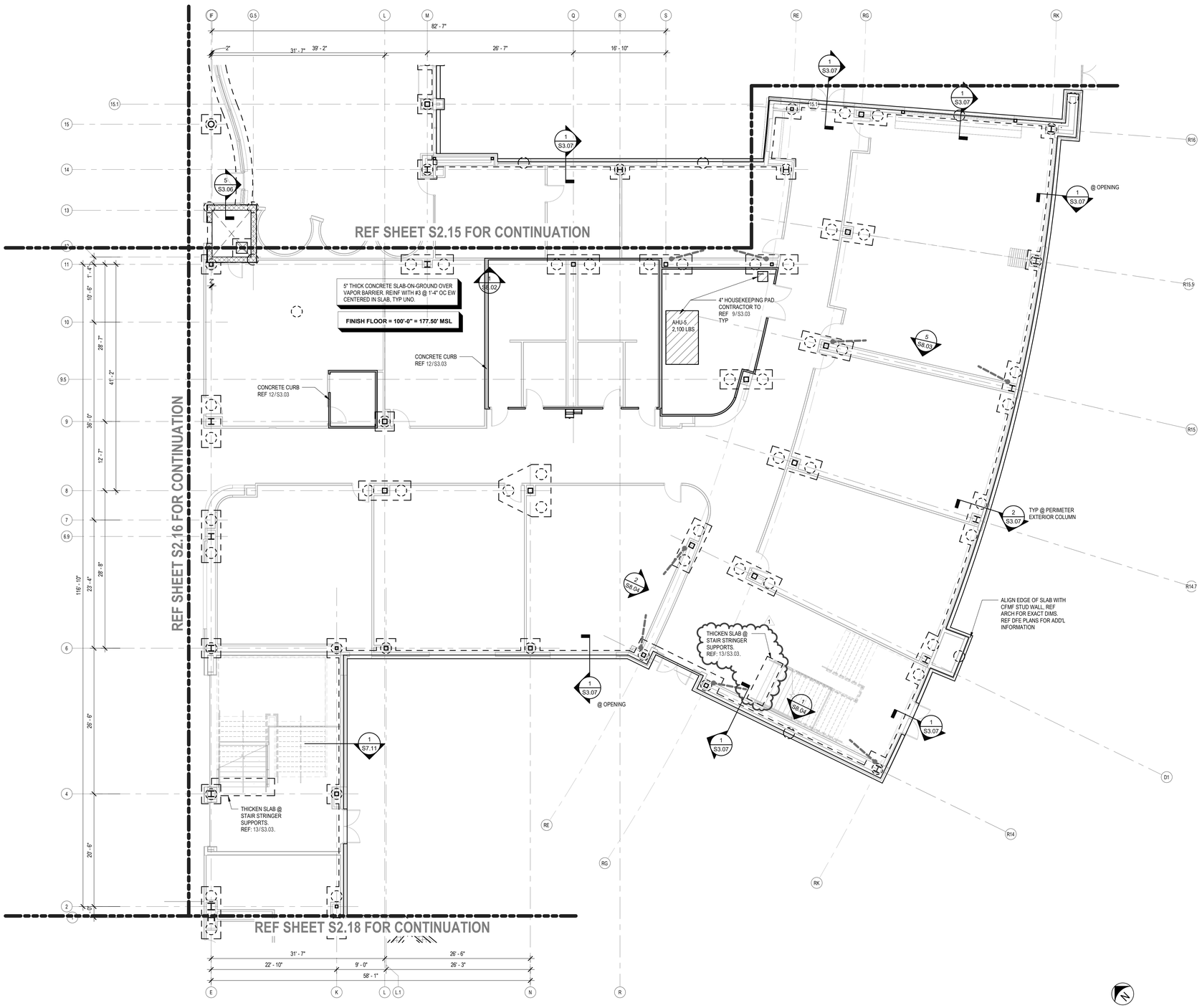

1 FOUNDATION PLAN - AREA E
S2.17 1/8" = 1'-0"

KEY PLAN - 1ST FLOOR
N.T.S.

FOUNDATION LEGEND

- INT NON LOAD-BEARING STUD WALL
- INT NON LOAD-BEARING CMU OR STUD WALL
- LOAD BEARING OR EXTERIOR NON-LOAD BEARING CMU
- BUILDING LINE
- CMU LINTEL SEE TYPICAL DETAILS
- GRADE BEAM
- PILE CAP
- SLAB STEP
- FREEZER SLAB REF ARCH FOR EXTENTS & ADD'L INFO
- OVERBUILD SLAB
- FD FLOOR DRAIN
- FS FLOOR SINK
- T/CONC = XX'-XX" T/SLAB ELEVATION
- STRUCTURAL STEEL COLUMN
- BUILDING LINE
- LOW END BRACE FRAME

FOUNDATION PLAN NOTES

1. FOR GENERAL NOTES, SEE DWG. S0.01.
2. FOR FOUNDATION SECTIONS & DETAILS, SEE S3 SERIES DRAWINGS.
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Revision /	Date	
1	08.07.26	ADDENDUM 02

Project:
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FOUNDATION PLAN - AREA E

VOLUME 01

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00802-04-01	S2.17
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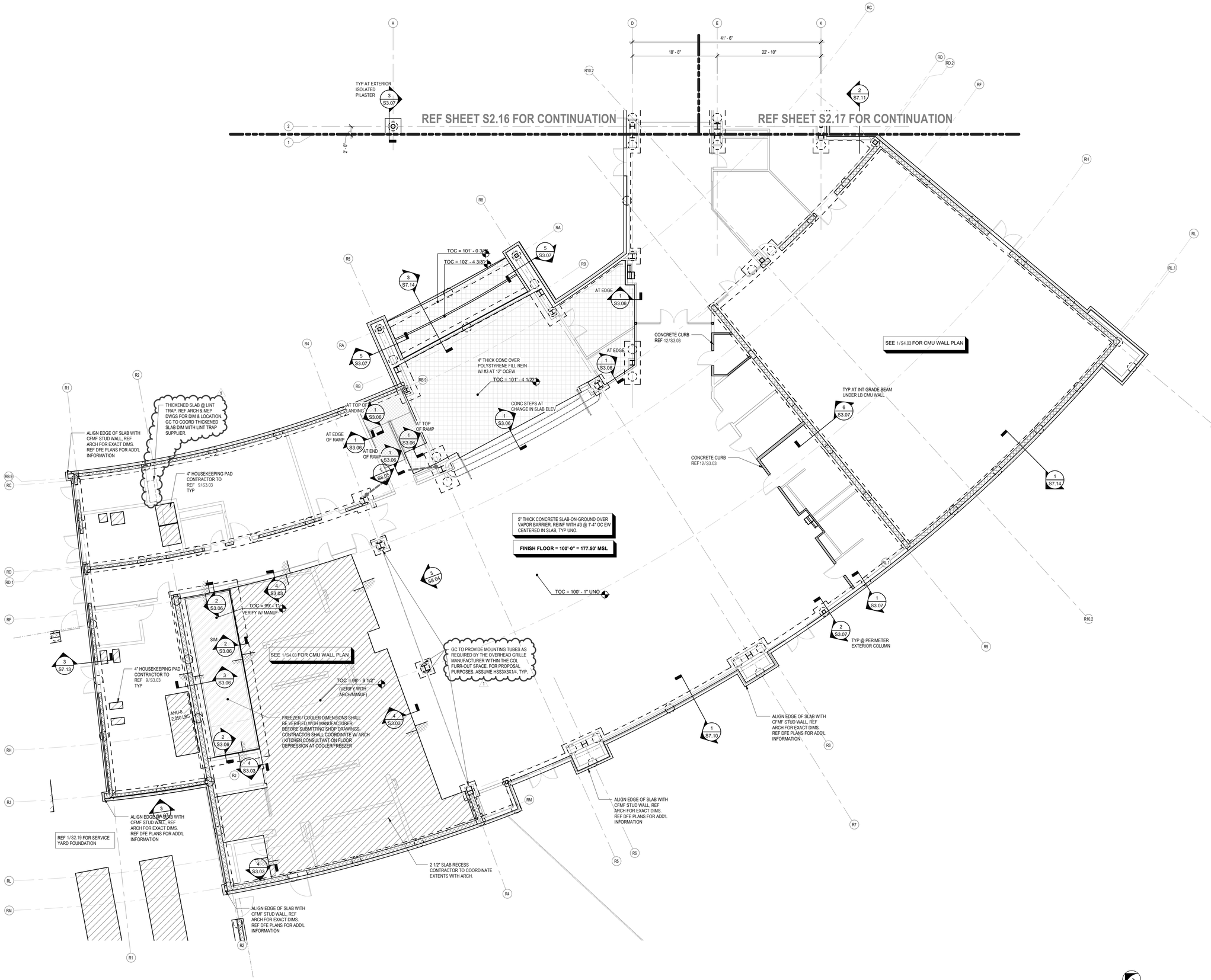

1 FOUNDATION PLAN - AREA F
S2.18 1/8" = 1'-0"

INT NON LOAD-BEARING STUD WALL
INT NON LOAD-BEARING CMU OR STUD WALL
LOAD BEARING OR EXTERIOR NON-LOAD BEARING CMU
BUILDING LINE
CMU LINTEL SEE TYPICAL DETAILS
GRADE BEAM
PILE CAP
SLAB STEP
FREEZER SLAB REF ARCH FOR EXTENTS & ADD'L INFO
OVERBUILD SLAB
FD FLOOR DRAIN
FS FLOOR SINK
T/CONC = XX'-XX" T/SLAB ELEVATION
STRUCTURAL STEEL COLUMN
BUILDING LINE
LOW END BRACE FRAME

FOUNDATION LEGEND

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FOUNDATION PLAN NOTES

KEY PLAN - 1ST FLOOR
N.T.S.

PLAN

Revision /	Date	
1	06.07.26	ADDENDUM 02

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
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TOMBALL, TEXAS

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8.7.2026

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FOUNDATION PLAN - AREA F

VOLUME 01

Job No.	Sheet No.
00802-04-01	S2.18
Drawn By: IEG	
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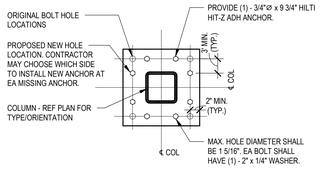
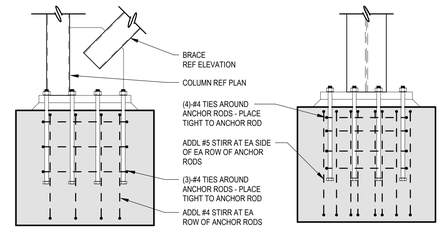


NOTES:
1. THIS DETAIL SHALL NOT BE USED AT BRACED FRAMES OR MOMENT FRAMES. ENGINEER APPROVAL IS REQUIRED PRIOR TO INSTALLATION FOR EA LOCATION W/ DAMAGED ANCHOR BOLTS.
2. CUT AWAY DAMAGED ANCHOR BOLTS AND PROVIDE NEW HOLES FOR ADH ANCHOR.
3. HIT-Z-R ANCHORS SHALL BE USED IN LIEU OF HIT-Z ANCHORS AT COLUMNS EXPOSED TO WEATHER.

9 TYPICAL DETAIL REPAIR AT GRAVITY BASE PLATE HSS
S3.02 3/4" = 1'-0"

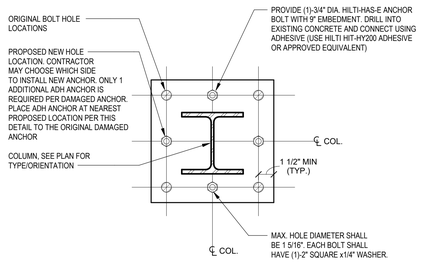
NOTES:
1. MOMENT FRAMES ARE INDICATED ON PLAN BY BEAMS ATTACHING TO COLUMNS WITH MOMENT CONNECTIONS (INDICATED BY ▭▶ OR ▶| ON PLAN).
2. PILASTER REINFORCEMENT NOT SHOWN FOR CLARITY. REF 1/S3.04 FOR TYPICAL PILASTER REINFORCEMENT.



TYPICAL ADDL REINF AT BRACE FRAMES

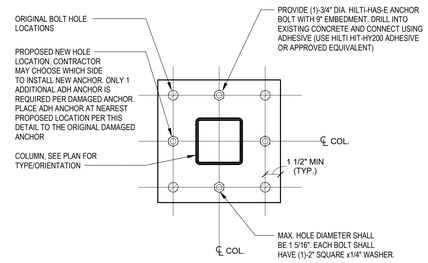
TYPICAL ADDL REINF AT MOMENT FRAMES

8 TYPICAL ADDITIONAL REINFORCEMENT AT BRACED & MOMENT FRAMES
S3.02 3/4" = 1'-0"



NOTES:
1. THIS DETAIL SHALL NOT BE USED AT BRACE FRAMES OR MOMENT FRAMES.
2. ENGINEER APPROVAL IS REQUIRED PRIOR TO INSTALLATION FOR EA. LOCATION WITH DAMAGED ANCHOR BOLTS.
3. CUT AWAY DAMAGED ANCHOR BOLTS AND PROVIDE NEW HOLES FOR ADHESIVE ANCHOR.

TYPICAL DETAIL
REPAIR AT GRAVITY BASE PLATE



NOTES:
1. THIS DETAIL SHALL NOT BE USED AT BRACE FRAMES OR MOMENT FRAMES.
2. ENGINEER APPROVAL IS REQUIRED PRIOR TO INSTALLATION FOR EA. LOCATION WITH DAMAGED ANCHOR BOLTS.
3. CUT AWAY DAMAGED ANCHOR BOLTS AND PROVIDE NEW HOLES FOR ADHESIVE ANCHOR.

TYPICAL DETAIL
REPAIR AT GRAVITY BASE PLATE

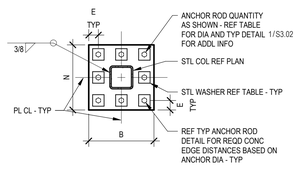
7 TYPICAL ANCHOR BOLT REPAIR DETAIL AT GRAVITY ONLY COLUMNS
S3.02 1 1/2" = 1'-0"

NOTES:
1. FIXED BASE PLATES SHALL BE USED AT MOMENT FRAMES INDICATED BY BEAMS ATTACHING TO COLUMNS WITH MOMENT CONNECTIONS (INDICATED BY ▭▶ OR ▶| OR ○▶ ON PLAN) AS WELL AS ANY CANTILEVERED COLUMNS.
2. FIXED BASE PLATES SHALL BE A992 GRADE 50.

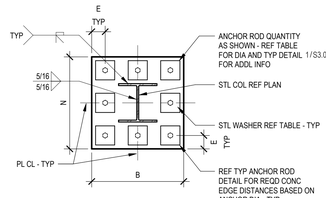
HSS COLUMN FIXED BASE PLATE SCHEDULE				
COL SIZE	"B" (IN)	"N" (IN)	PLATE THICKNESS (IN)	ANCHOR ROD DIA (IN)
≤ HSS6x6	17	17	2	1
HSS7x7	20	20		1 1/4
HSS8x8				
HSS9x9	24	24	2 1/2	1 1/2
HSS10x10				
HSS10.75				
HSS12x12	28	28		1 3/4
HSS12.75				

WIDE FLANGE COLUMN FIXED BASE PLATE SCHEDULE				
COL SIZE	"B" (IN)	"N" (IN)	PLATE THICKNESS (IN)	ANCHOR ROD DIA (IN)
W10	25	25	2 1/2	2
W12	27	27		
W14	28	28		

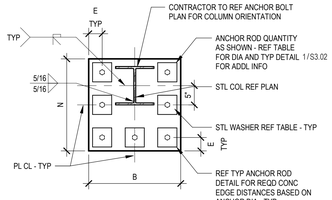
WIDE FLANGE COLUMN OFFSET FIXED BASE PLATE SCHEDULE				
COL SIZE	"B" (IN)	"N" (IN)	PLATE THICKNESS (IN)	ANCHOR ROD DIA (IN)
SBP 1	27	27	2 1/2	2
SBP 2	31	31		



GENERAL INFORMATION



GENERAL INFORMATION

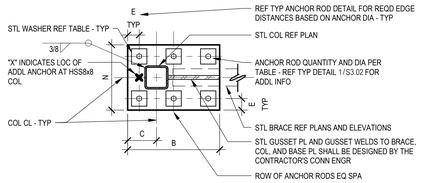


GENERAL INFORMATION

5 TYPICAL FIXED BASE PLATE DETAIL
S3.02 3/4" = 1'-0"

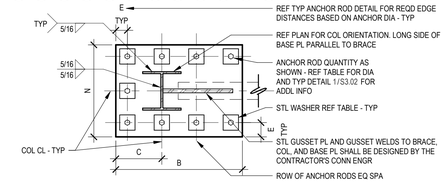
NOTES:
1. BRACED FRAME BASE PLATE SHALL OCCUR AT ALL LOCATIONS WHERE DIAGONAL BRACING OCCURS BETWEEN STEEL COLUMNS AS INDICATED IN PLAN AND/OR IN FRAMING ELEVATIONS.
2. BRACED FRAME BASE PLATES SHALL BE A992 GRADE 50.

HSS COLUMN BRACED FRAME BASE PLATE SCHEDULE						
COL SIZE	"B" (IN)	"N" (IN)	"C" (IN)	PLATE THICKNESS (IN)	ANCHOR ROD DIA (IN)	# OF EQ SPA ANCHOR RODS PER ROW
≤ HSS6x6	24	18	7 1/2	2	1 1/2	3
≥ HSS8x8	33	24	12	2 1/2		4
HSS12.75	36	26	13	2 1/2		AS SHOWN



GENERAL INFORMATION

WIDE FLANGE COLUMN BRACED FRAME BASE PLATE SCHEDULE						
COL SIZE	"B" (IN)	"N" (IN)	"C" (IN)	PLATE THICKNESS (IN)	ANCHOR ROD DIA (IN)	# OF ANCHOR RODS
W10	33	24	12	2 1/2	1 1/2	AS SHOWN
W12	36	26	13			
W14		27	13			

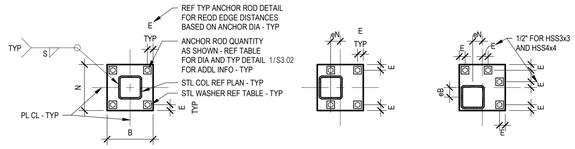


GENERAL INFORMATION

3 TYPICAL BRACED FRAME BASE PLATE DETAIL
S3.02 3/4" = 1'-0"

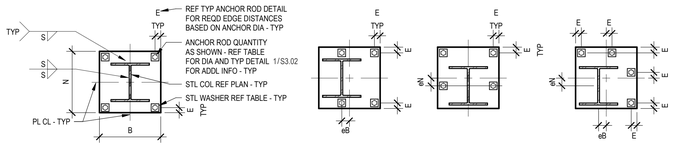
NOTES:
1. THIS DETAIL SHALL APPLY AT ALL HSS AND WIDE FLANGE COLUMNS (UNO) THAT ARE NOT PART OF A MOMENT FRAME, BRACED FRAME, CANTILEVER COLUMN, OR ANY OTHER SPECIAL CONDITION INDICATED ON PLAN OR DETAILED ELSEWHERE IN THE STRUCTURAL DRAWINGS.
2. TYPICAL BASE PLATES SHALL BE A992 GRADE 50.

HSS COLUMN BASE PLATE SCHEDULE							
COL SIZE	"B" (IN)	"N" (IN)	PLATE THICKNESS (IN)	ANCHOR ROD DIA (IN)	COL FILLET WELD SIZE "S" (IN)	"eN" AT EDGE & CORNER COL (IN)	"eB" AT EDGE & CORNER COL (IN)
HSS3x3	9	9	3/4	3/4	3/16	2	2
HSS4x4	10	10					
HSS5x5	11	11	1		1/4	4	4
HSS6x6	12	12					
HSS7x7	13	13					
HSS8x8	18	18	1 1/4	1	5/16		
HSS9x9	19	19					
HSS10x10	20	20	1 1/2	1 1/4			
HSS10.75	20	20					
HSS12x12	22	22					
HSS12.75	22	22					



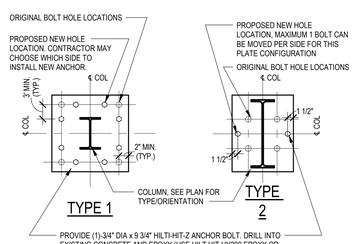
COLUMN CENTERED COLUMN AT EDGE COLUMN AT CORNER

WIDE FLANGE COLUMN BASE PLATE SCHEDULE							
COL SIZE	"B" (IN)	"N" (IN)	PLATE THICKNESS (IN)	ANCHOR ROD DIA (IN)	COL FILLET WELD SIZE "S" (IN)	"eN" AT EDGE & CORNER COL (IN)	"eB" AT EDGE & CORNER COL (IN)
W10	17	17	1 1/2	1	5/16	4	4
W12	22	22					
W14	24	24	2	1 1/4			



COLUMN CENTERED COLUMN AT EDGE COLUMN AT CORNER

2 TYPICAL BASE PLATE DETAILS
S3.02 3/4" = 1'-0"

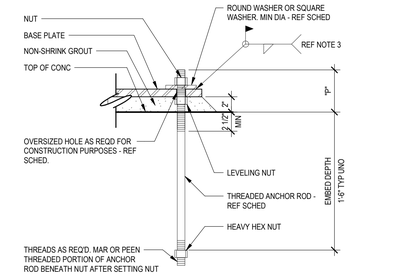


NOTES:
1. THIS DETAIL SHALL NOT BE USED AT BRACE FRAMES OR MOMENT FRAMES. ENGINEER APPROVAL IS REQUIRED PRIOR TO INSTALLATION FOR EA. LOCATION WITH DAMAGED ANCHOR BOLTS.
2. CUT AWAY DAMAGED ANCHOR BOLTS AND PROVIDE NEW HOLES FOR EXPOXY ANCHOR.
3. HIT-Z-R ANCHORS SHALL BE USED IN LIEU OF HIT-Z ANCHORS AT COLUMNS EXPOSED TO WEATHER.

4 TYPICAL DETAIL REPAIR AT GRAVITY BASE PLATE WF
S3.02 3/4" = 1'-0"

NOMINAL ANCHOR BOLT DIA (IN)	PROJECTION "P" (IN)	BOLT STL GRADE	ANCHOR HOLE DIAMETER (IN)	WASHER SIZE (IN)	WASHER THICKNESS (IN)	ANCHOR CENTER LINE DISTANCE, "E" (IN)
3/4	5 1/2	F1554 GRADE 36	1 5/16	2	1/4	1 1/2
1	5 3/4	F1554 GRADE 55	1 7/8	3	3/8	2 1/2
1 1/4	7 1/4		2 1/8	3 1/2	1/2	2 1/2
1 1/2			2 3/8	4	1/2	3
1 3/4			2 7/8	4 1/2	3/4	3 1/2
2			3 1/4	5	3/4	3 1/2

NOTES:
1. ALL BASE PLATE NUTS SHALL BE HEAVY HEX TYPE W/ THE EXCEPTION OF THE LEVELING NUTS. LEVELING NUTS MAY BE GENERAL APPLICATION NUTS AT THE CONTRACTOR'S OPTION.
2. PLATE WASHERS SHALL BE ASTM A572 GRADE 50.
3. PLATE WASHERS SHALL BE WELDED TO BASE PLATE AT BRACED AND MOMENT FRAMES OR WHERE NOTED IN THE TYPICAL BASE PLATE DETAIL OR ON PLAN. FILLET WELD SIZE SHALL BE 1/4" MIN (UNO).
4. ANCHOR RODS SHALL BE PROVIDED WITH SUFFICIENT THREADS TO ALLOW INSTALLATION OF THE BASE PLATE AND FULL NUT ENGAGEMENT. IT IS STRUCTURALLY ACCEPTABLE TO CUT THE EXCESS THREAD EXTENSION ABOVE THE TOP OF THE NUT. CUT SHALL NOT BE LOWER THAN THE TOP OF THE NUT, AND THE ANCHOR ROD THREADS SHALL REMAIN FULLY ENGAGED WITH THE NUT.



1 TYPICAL ANCHOR ROD DETAIL
S3.02 1 1/2" = 1'-0"

Revision / 1 — Date 06.07.26 — ADDENDUM 02

Project: TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT FOR TOMBALL INDEPENDENT SCHOOL DISTRICT TOMBALL, TEXAS

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TYPICAL FOUNDATION DETAILS

VOLUME 01

Job No.	Sheet No.
00802-04-01	S3.02
Drawn By: IEG	
Date: 07.15.26	

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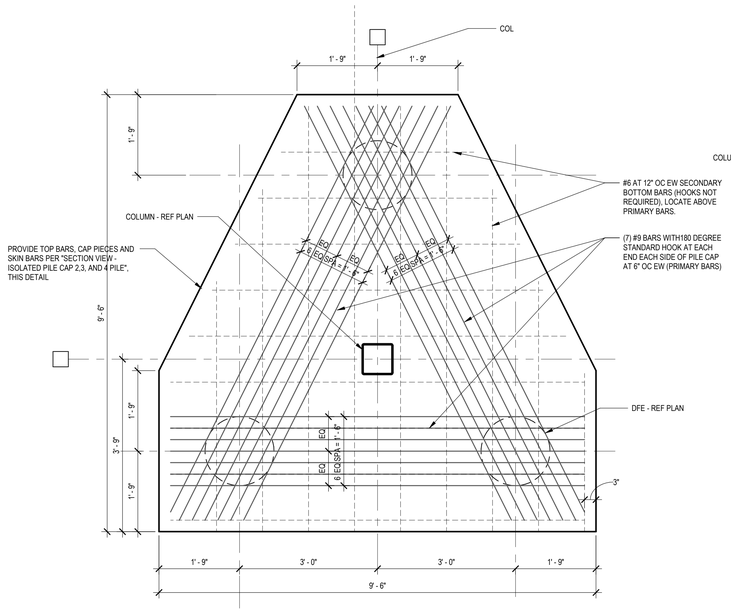
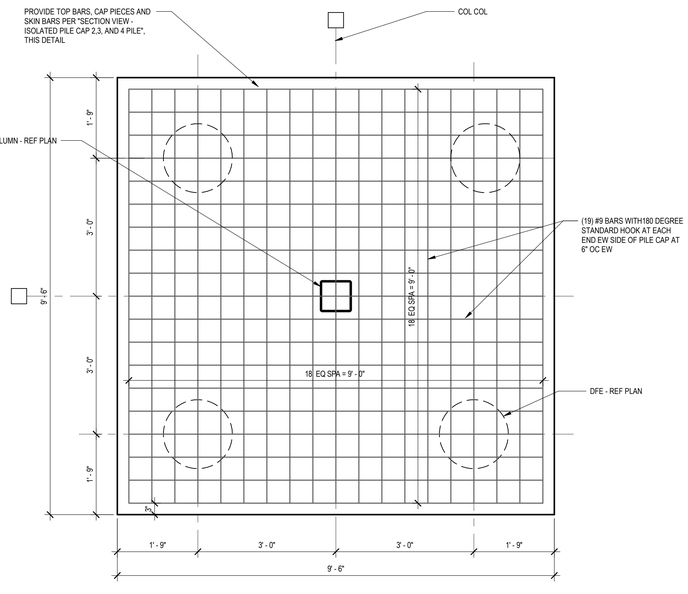
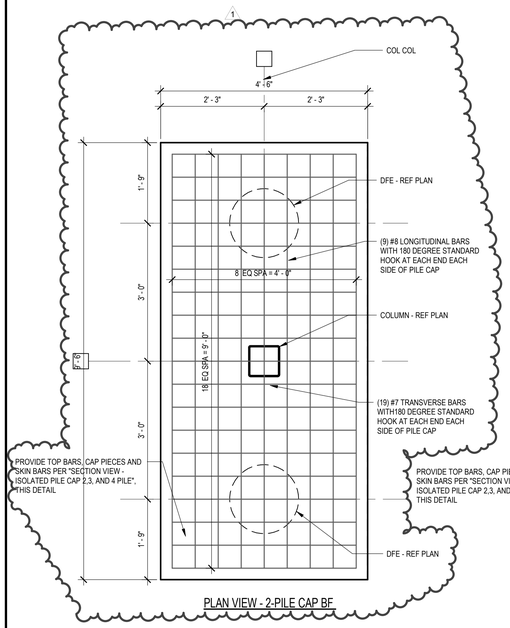


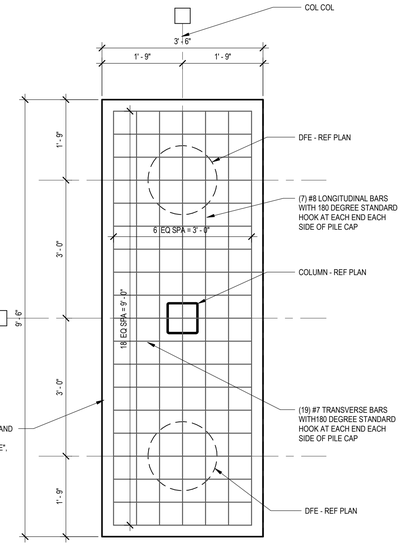
PLAN VIEW - 3-PILE CAP
(BOTTOM REINF LAYOUT)



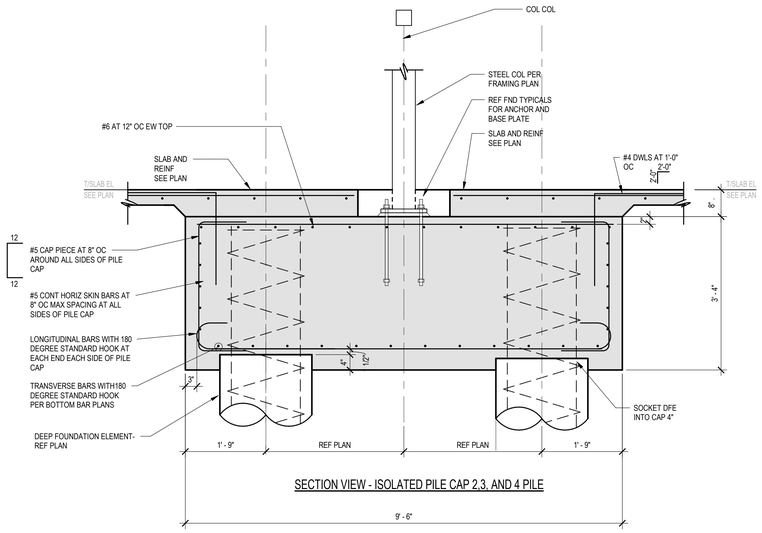
PLAN VIEW - 4-PILE CAP
(BOTTOM REINF LAYOUT)



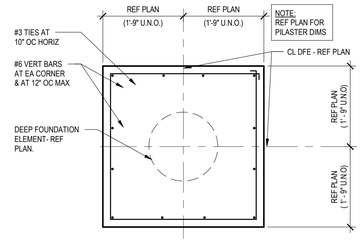
PLAN VIEW - 2-PILE CAP BF



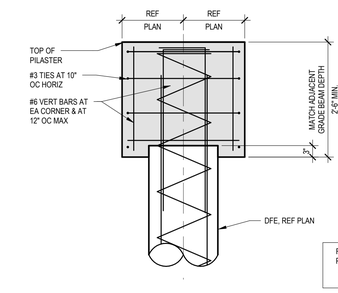
PLAN VIEW - 2-PILE CAP



SECTION VIEW - ISOLATED PILE CAP 2,3, AND 4 PILE



PLAN VIEW - SINGLE PILE PEDESTAL



REFER TYPICAL DFE TO PILASTER CONNECTION DETAIL FOR INFO NOT REPEATED

SECTION VIEW - SINGLE PILE PEDESTAL

1 TYPICAL SECTION AT PILE CAP
S3.05 3/4" = 1'-0"

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Revision / Date
1 06.07.26 ADDENDUM 02

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

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TYPICAL ISOLATED INTERIOR PILE CAP DETAILS

VOLUME 01

Job No. 00802-04-01
Drawn By: IEG
Date: 07.15.26
Sheet No. S3.05

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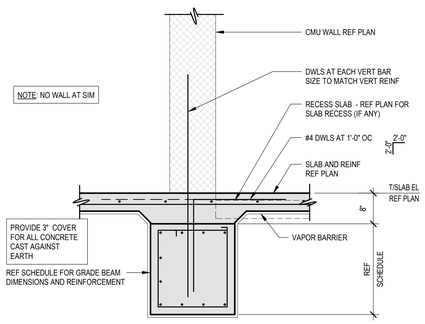
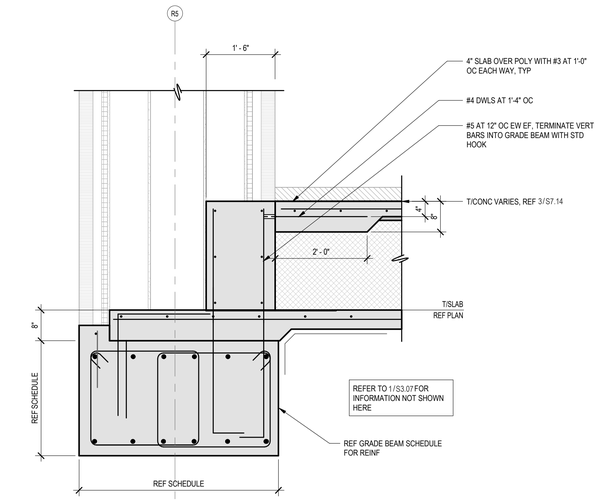
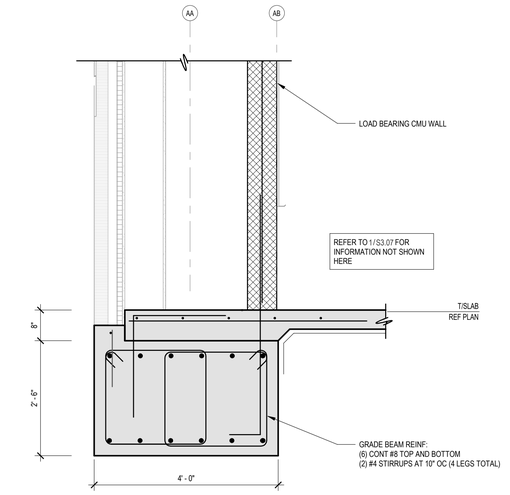


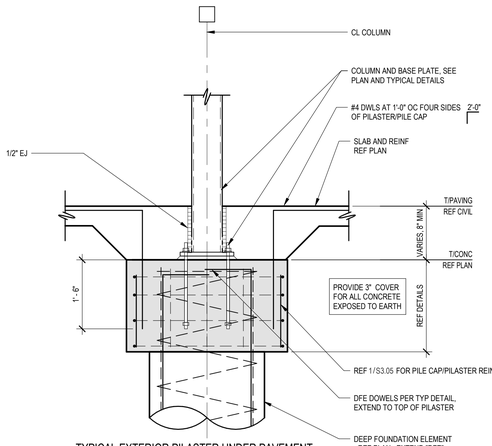
6 SECTION
S3.07 3/4" = 1'-0"



5 SECTION
S3.07 3/4" = 1'-0"

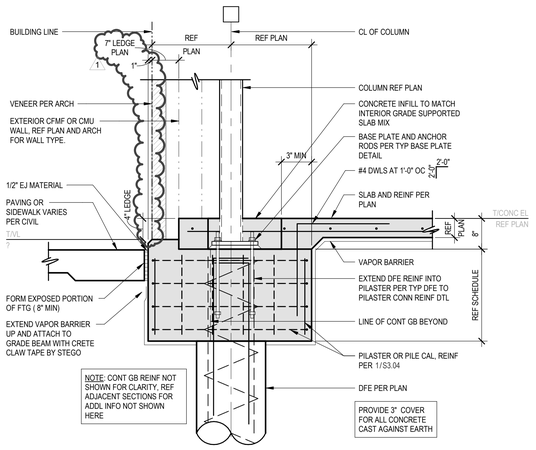


4 SECTION
S3.07 3/4" = 1'-0"

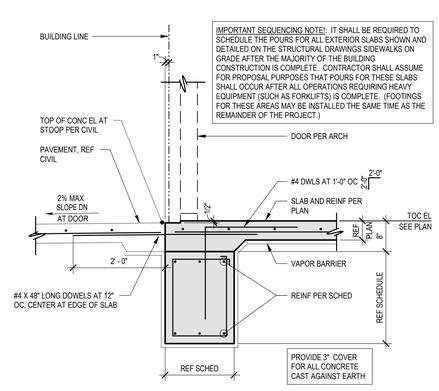


TYPICAL EXTERIOR PILASTER UNDER PAVEMENT WITHOUT MASONRY VENEER

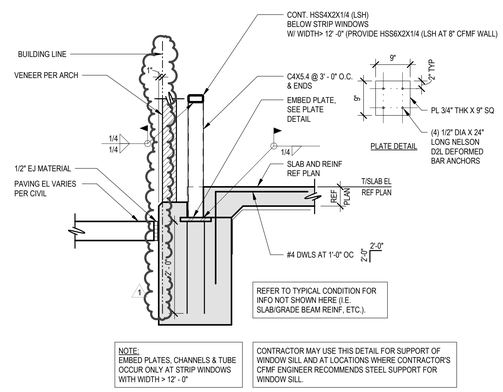
3 TYPICAL SEC EXTERIOR ISOLATED PILASTER OR PILE CAP
S3.07 3/4" = 1'-0"



2 TYPICAL SECTION - PERIMETER COLUMN PEDESTAL OR PILE CAP
S3.07 3/4" = 1'-0"



CONDITION D:PERIMETER GRADE BEAM AT DOOR



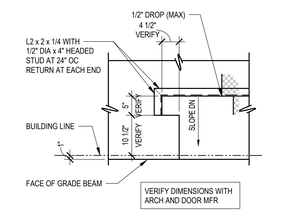
CONDITION E:PERIMETER GRADE BEAM AT LARGE OPENING WITH SILL ABOVE SLAB

COORDINATION OF PERIMETER FOUNDATION DETAILS:

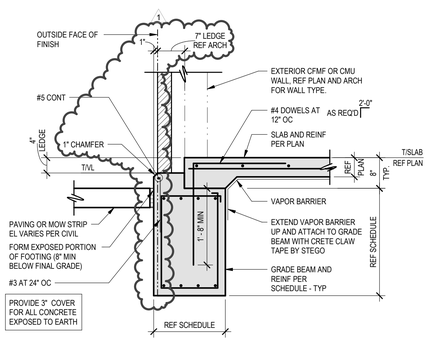
THE DETAILS IN THIS SECTION ARE INTENDED TO COLLECTIVELY DEFINE THE TYPICAL PERIMETER FOUNDATION, SLAB EDGE, DOOR, WALL, AND OPENING CONDITIONS THAT MAY OCCUR AROUND THE BUILDING PERIMETER.

THE CONTRACTOR SHALL COORDINATE THESE DETAILS WITH THE ARCHITECTURAL, STRUCTURAL, AND ALL OTHER CONTRACT DOCUMENTS TO DETERMINE THE LOCATION, LIMITS, AND APPLICABILITY OF EACH DETAIL AND SHALL CONSTRUCT THE WORK ACCORDINGLY.

CONDITIONS NOT EXPLICITLY SHOWN SHALL NOT BE INTERPRETED AT THE CONTRACTOR'S DISCRETION. IF A CONDITION IS ENCOUNTERED THAT IS NOT CLEARLY ADDRESSED BY THE CONTRACT DOCUMENTS OR THESE DETAILS, THE CONTRACTOR SHALL SUBMIT AN RFI TO THE ARCHITECT AND STRUCTURAL ENGINEER AND OBTAIN WRITTEN DIRECTION PRIOR TO PROCEEDING WITH THE WORK.

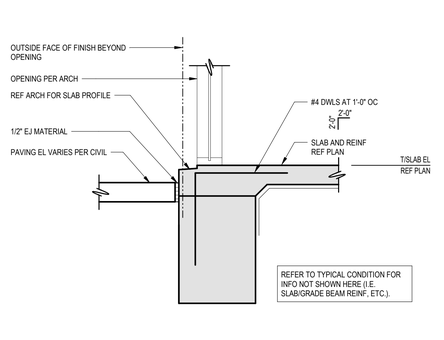


PLAN VIEW AT OVERHEAD DOOR CORNER

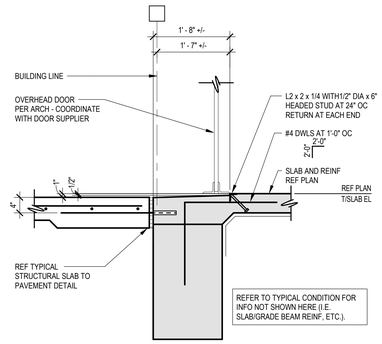


CONDITION A: PERIMETER GRADE BEAM AT CMU OR CFMF WALL WITHOUT OPENING (TYPICAL CONDITION)

1 TYPICAL SECTION - PERIMETER GRADE BEAM WITH MASONRY VENEER
S3.07 3/4" = 1'-0"



CONDITION B:PERIMETER GRADE BEAM AT OPENING EXTENDING TO SLAB



CONDITION C:PERIMETER GRADE BEAM AT OVERHEAD DOOR

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

Revision /	Date	
1	06.07.26	ADDENDUM 02

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FOUNDATION DETAILS

VOLUME 01

Job No.	Sheet No.
00802-04-01	S3.07
Drawn By: IEG	
Date: 07.15.26	

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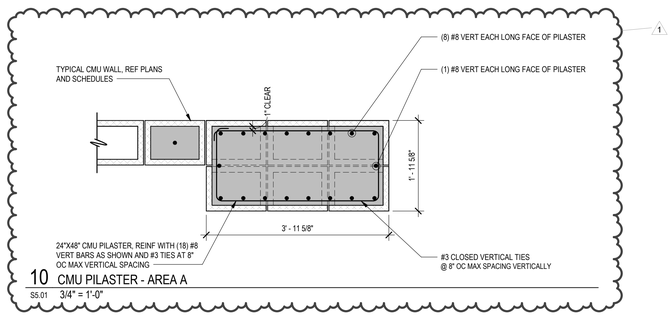
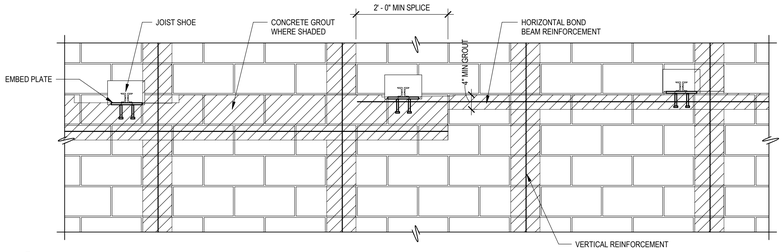
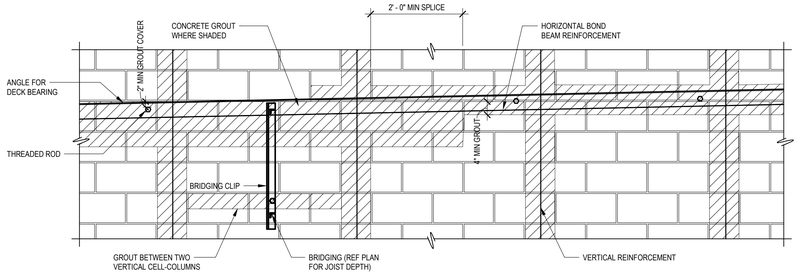


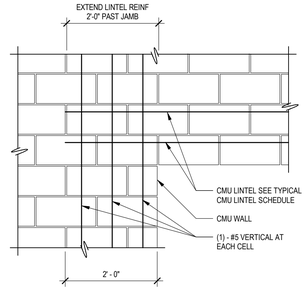
10 CMU PILASTER - AREA A
S5.01 3/4" = 1'-0"



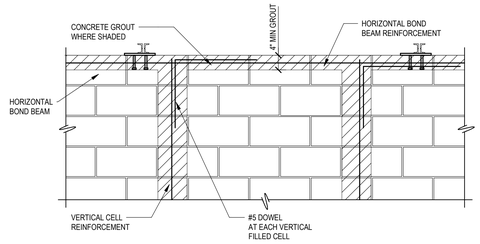
8 TYPICAL SLOPED BOND BEAM FOR JOIST
S5.01 3/4" = 1'-0"



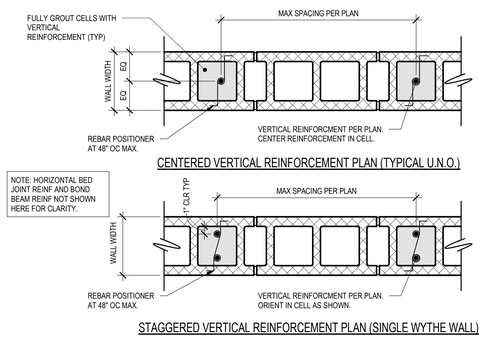
6 TYPICAL SLOPED BOND BEAM FOR ANGLE
S5.01 3/4" = 1'-0"



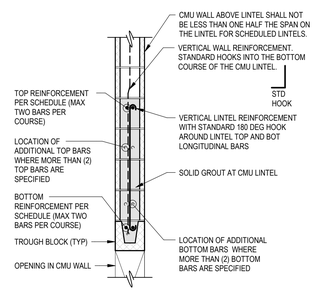
5 TYPICAL LINTEL JAMB
S5.01 3/4" = 1'-0"



4 TYPICAL TOP BOND BEAM WITHOUT PARAPET
S5.01 3/4" = 1'-0"



3 TYPICAL VERTICAL CMU REINFORCEMENT ORIENTATION DETAIL
S5.01 1 1/2" = 1'-0"



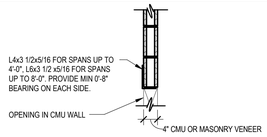
CONCRETE MASONRY UNIT LINTEL SCHEDULE FOR 6, 8, 10, AND 12" CMU

SCHEDULED CMU LINTELS

CLEAR SPAN	DEPTH	TOP REINF	BOTTOM REINF	VERTICAL LINTEL REINFORCEMENT FOR LINTELS SUPPORTING LESS THAN 15'-0" OF MASONRY VENEER	VERTICAL LINTEL REINFORCEMENT FOR LINTELS SUPPORTING MORE THAN 15'-0" OF MASONRY VENEER
UP TO 2'-7"	0'-8"	-	(2)-#5	SAME AS VERT WALL REINF	#4 AT 1'-0" OC
UP TO 6'-7"	1'-4	(2)-#5	(2)-#5	SAME AS VERT WALL REINF	#4 AT 1'-0" OC
UP TO 9'-4"	2'-0"	(2)-#6	(2)-#6	#4 AT 1'-0" OC	#5 AT 1'-0" OC
UP TO 14'-0"	3'-4"	(2)-#6	(2)-#6	#4 AT 1'-0" OC	#5 AT 1'-0" OC
SPL 1	5'-4"	(4)-#6	(4)-#6	#4 AT 1'-0" OC	#5 AT 0'-8" OC
SPL 2	2'-0"	-	(2)-#5	SAME AS VERT WALL REINF	#4 AT 1'-0" OC

CMU LINTEL SCHEDULE NOTES:
1. CMU LINTELS FOR SPANS OVER 12'-0" SHALL BE DETAILED ELSEWHERE.
2. THE TOTAL SPAN OF THE CMU LINTEL SHALL BE THE CLEAR SPAN PLUS THE MINIMUM BEARING ON EACH END OF THE OPENING.
3. A MINIMUM OF 8"-8" BEARING SHALL BE PROVIDED AT EACH END OF CMU LINTELS WHERE THE TOTAL SPAN IS LESS THAN 8'-0".
4. A MINIMUM OF 1'-4" BEARING SHALL BE PROVIDED AT EACH END OF CMU LINTELS WHERE THE TOTAL SPAN IS GREATER THAN OR EQUAL TO 8'-0".
5. ALL CELLS FOR CMU LINTELS SHALL BE GROUTED SOLID
6. MINIMUM DEPTH OF ANY CMU LINTEL SUPPORTING MASONRY VENEER SHALL BE 2'-0". THE FIRST TWO COURSES OF ANY LINTEL SUPPORTING MASONRY VENEER SHALL BE 8" MINIMUM.

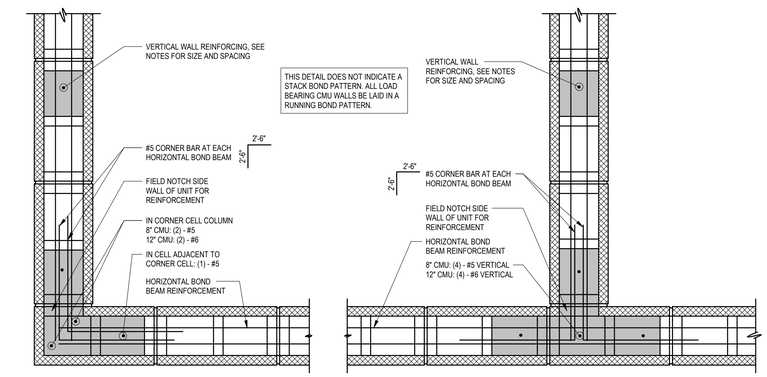
NOTE: THIS DETAIL SHALL APPLY AT ALL LOCATIONS WHERE MASONRY WALLS ARE REQUIRED TO SPAN ACROSS OPENINGS IN 6,8,10, OR 12" LOAD BEARING, EXTERIOR NON-LOAD BEARING, AND NON-LOAD BEARING CMU WALLS.



NOTE:
1. THIS DETAIL SHALL APPLY AT INTERIOR CONDITIONS WHERE SUPPORT IS REQUIRED FOR MASONRY VENEER AND NO CAVITY BETWEEN THE BACKUP CMU AND THE MASONRY VENEER IS SHOWN BY THE ARCHITECT, THE MASONRY VENEER SHALL BE SUPPORTED WITH LOOSE STEEL ANGLE LINTELS AS FOLLOWS:
2. FOR SPANS UP TO 4'-0": L4 x 3 1/2 x 5/16
3. FOR SPANS UP TO 8'-0": L6 x 3 1/2 x 5/16

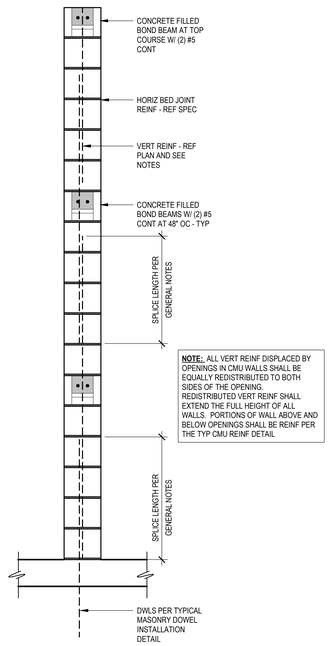
TYPICAL STEEL LINTEL SCHEDULE FOR INTERIOR MASONRY VENEER WHERE COLLAR JOINT IS 3/8" WIDE AND MORTAR FILLED

9 TYPICAL CMU LINTEL
S5.01 3/4" = 1'-0"



CORNER (PLAN VIEW) INTERSECTION (PLAN VIEW)

7 TYPICAL CORNER BAR DETAIL
S5.01 3/4" = 1'-0"



NOTE: ALL VERT REINF DISPLACED BY OPENINGS IN CMU WALLS SHALL BE EQUALLY REDISTRIBUTED TO BOTH SIDES OF THE OPENING. REDISTRIBUTED VERT REINF SHALL EXTEND THE FULL HEIGHT OF ALL WALLS. PORTIONS OF WALL ABOVE AND BELOW OPENINGS SHALL BE REINF PER THE TYP CMU REINF DETAIL

2 TYPICAL CMU REINFORCEMENT DETAIL
S5.01 3/4" = 1'-0"

INTERIOR NON LOAD-BEARING WALL MAXIMUM HEIGHT BASED ON VERTICAL REINFORCEMENT AND WALL THICKNESS

SPECIFIED WALL VERTICALS REINFORCEMENT	NOMINAL WALL THICKNESS			
	0'-6"	0'-8"	0'-10"	1'-0"
#5 AT 120" OC	10'-0"	14'-0"	16'-0"	18'-0"
#5 AT 96" OC	12'-0"	16'-0"	18'-0"	20'-0"
#5 AT 72" OC	14'-0"	18'-0"	20'-0"	22'-0"
#5 AT 48" OC	16'-0"	20'-0"	22'-0"	26'-0"
#5 AT 32" OC	18'-0"	22'-0"	24'-0"	28'-0"
#5 AT 24" OC	20'-0"	24'-0"	26'-0"	30'-0"
#5 AT 16" OC	22'-0"	26'-0"	28'-0"	32'-0"

TYPICAL NON LOAD-BEARING CMU WALL REINFORCEMENT SCHEDULE NOTES:

1. WALL HEIGHT IS DEFINED AS VERTICAL DISTANCE BETWEEN LATERAL SUPPORT OF THE WALLS.
2. PROVIDE MIN (1)#5 VERTICAL REINFORCEMENT IN GROUTED FILLED CELL AT CORNERS, INTERSECTIONS, AND FIRST CELL OF EACH END OF WALLS.
3. PROVIDE BEDJOINT REINFORCEMENT AT 16" ON CENTER.
4. PROVIDE PREFABRICATED TEE AND CORNER BEDJOINT REINFORCEMENT TO MATCH BED JOINT REINFORCEMENT SIZE AND SPACING AT CORNERS AND INTERSECTIONS.
5. AT THE CONNECTION OF INTERSECTING WALLS, AT LEAST HALF OF THE MASONRY UNITS SHALL INTERLOCK OR PROVIDE 1/4" x 1-1/2" x 2'-4" LONG Z SHAPE METAL STRAP CONNECTORS AT 48" OC IN GROUTED CELLS.
6. REFER TO NON LOAD-BEARING WALL BRACING DETAILS FOR BRACING AND SUPPORT REQUIREMENTS.
7. PROVIDE BOND BEAMS AT 8'-0" OC AND REINFORCE WITH (1)-#5 BARS FOR 6" CMU WALLS AND (2)-#5 BARS FOR 8", 10", AND 12" CMU WALLS, UNLESS NOTED OTHERWISE.
8. ALL VERTICAL REINFORCEMENT DISPLACED BY OPENINGS SHALL BE EQUALLY REDISTRIBUTED TO BOTH SIDES OF THE OPENING AND SHALL EXTEND FULL HEIGHT OF WALLS.

1 TYPICAL NON-LOAD BEARING CMU WALL SCHEDULE
S5.01 12" = 1'-0"

Revision / 1
Date 08.07.26
ADDENDUM 02

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

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111569
LICENSED PROFESSIONAL ENGINEER
8.7.2026
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F-5923

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TYPICAL CMU DETAILS
VOLUME 01

Job No. 00802-04-01
Sheet No. S5.01
Drawn By: IEG
Date: 07.15.26

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Revision /	Date	
1	06.07.26	ADDENDUM 02

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

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ENGINEER
8.7.2026

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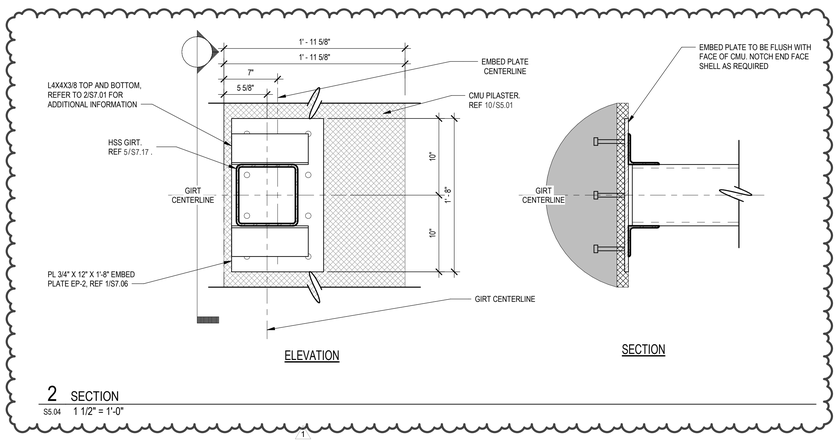
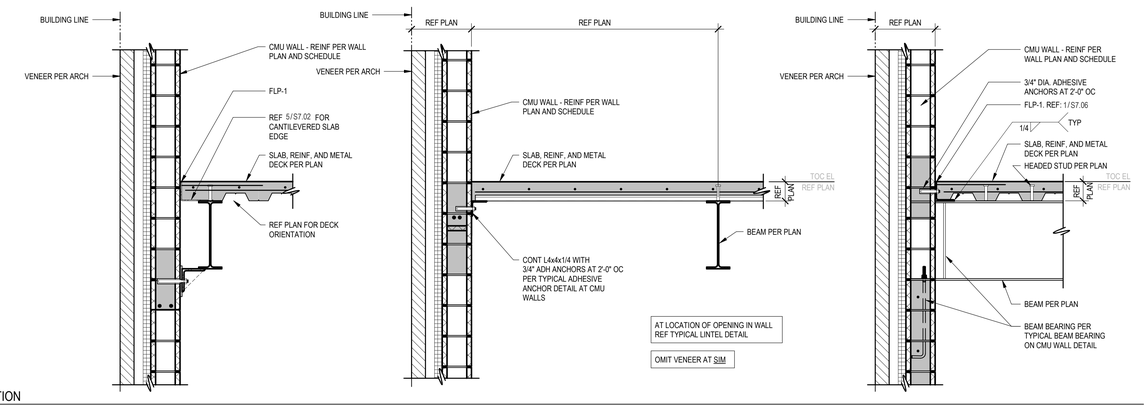
TYPICAL CMU DETAILS

VOLUME 01

Job No.	Sheet No.
00802-04-01	S5.04
Drawn By: IEG	
Date: 07.15.26	



2 SECTION
S5.04 1 1/2" = 1'-0"



1 SECTION
S5.04 3/4" = 1'-0"

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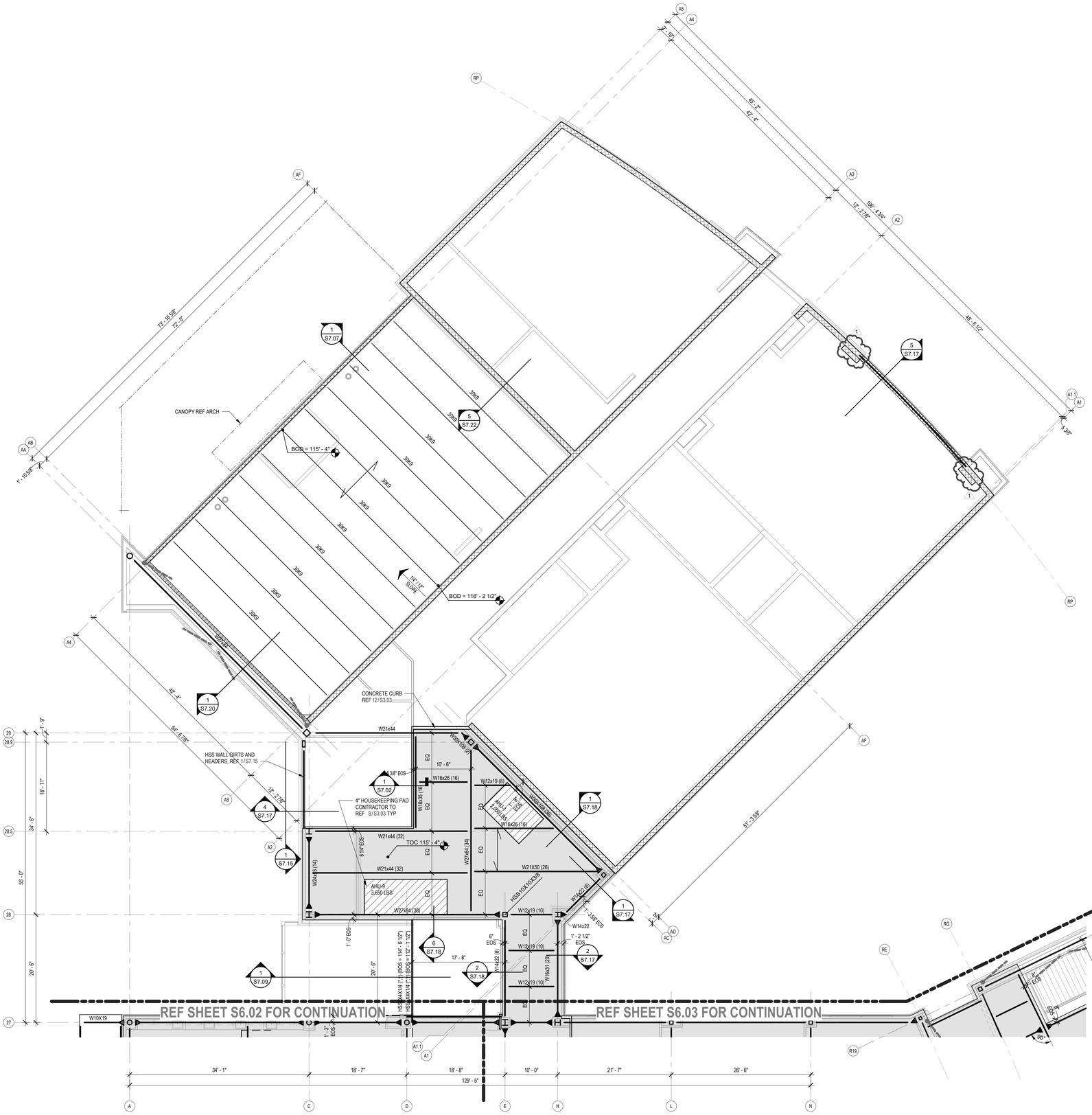
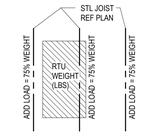


1 FLOOR & LOW ROOF FRAMING - AREA A
S6.01 1/8" = 1'-0"

PLAN

1. FOR GENERAL NOTES, REF DWGS S0.01.
2. BRIDGING FOR ROOF JOISTS IS NOT SHOWN ON THIS PLAN FOR CLARITY. BRIDGING FOR ROOF JOISTS SHALL BE PROVIDED FOR ALL JOISTS PER SJI SPECIFICATIONS.
3. REFERENCE CMU WALL PLAN FOR BOTTOM OF LINTEL ELEVATIONS AT LOAD BEARING WALLS.
4. REFERENCE CMU WALL PLAN FOR ALL TOP OF WALL ELEVATIONS.
5. REF APPROVED MECHANICAL SHOP DRAWINGS FOR EXACT LOCATIONS OF RTU UNITS.
6. REFER TO ROOF DECK NOTES ON S0.01 FOR REQUIRED FRAMING AT OPENINGS IN METAL ROOF DECK. SEE TYPICAL FRAME DETAIL AT A/C UNITS. PROVIDE ANGLE FRAMES AT ALL ROOF DRAINS.
7. STRUCTURAL MEMBERS SHALL BE EQUALLY SPACED (6'-0" OC MAX) BETWEEN MAJOR SUPPORT POINTS SUCH AS COLUMN GRIDS, DFE GRIDS, WALLS, AND GIRDERS UNLESS DIMENSIONED OTHERWISE.
8. JOIST SEAT DEPTHS FOR OPEN WEB STEEL JOIST SHALL BE AS DETERMINED BY THE CONTRACTOR'S JOIST ENGINEER WITH THE FOLLOWING MINIMUM DEPTHS (UNO IN DETAILS):
   A. K-SERIES JOIST: 5 INCHES
   B. LH-SERIES JOIST: 7 ½ INCHES
   C. DLH-SERIES JOIST: 7 ½ INCHES
9. JOISTS SUPPORTING MECHANICAL EQUIPMENT (RTU, ETC) SHALL HAVE ADDITIONAL "ADD LOAD" APPLIED TO THE JOIST DESIGN PER BELOW PARTIAL PLAN. VERIFY WEIGHT WITH APPROVED MECHANICAL SHOP DRAWINGS PRIOR TO CONSTRUCTION.



10. FOR CURVED AREAS, SEE S1 SERIES DRAWINGS FOR EOD AND GRID DIMENSIONS.
11. ROOF DECK IS 1.5B GA 20 METAL DECK UNO - TYP.
12. AT TYPICAL "WEDGE" BAY IN CURVED AREAS, LAYOUT PURLINS PER 2/S1.04 - TYP.
13. MEMBERS MARKED WITH AN ASTERISK (*) ARE SECONDARY FRAMING AND DO NOT REQUIRE FIREPROOFING
14. MEMBERS MARKED WITH A DAGGER (†) ARE SECONDARY MISCELLANEOUS FRAMING. MEMBERS MAY BE SUBSTITUTED WITH COLD-FORMED METAL FRAMING (CFMF) DESIGNED BY THE CONTRACTOR'S DELEGATED CFMF ENGINEER. SUBSTITUTED MEMBERS SHALL PROVIDE EQUIVALENT STRENGTH, STIFFNESS, AND CONNECTIONS, AND SHALL SUPPORT ALL DESIGN LOADS INDICATED IN THE CONTRACT DOCUMENTS.

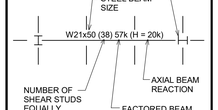
ROOF PLAN NOTES

1. FINISH FLOOR ELEVATIONS VARY FROM 100'-0". SEE FOUNDATION PLAN FOR FINISH FLOOR ELEVATIONS.
2. FOR GENERAL NOTES, SEE DWGS S0.01.
3. FOR FRAMING SECTIONS AND DETAILS, SEE S7 SERIES DRAWINGS.
4. REFER TO FLOOR DECK NOTES ON S0.01 FOR REQUIRED FRAMING AT OPENINGS IN ELEVATED STEEL-FRAMED FLOOR SLABS. SEE TYPICAL FRAME DETAIL AT A/C UNITS. PROVIDE ANGLE FRAMES AT ALL ROOF DRAINS.
5. STRUCTURAL MEMBERS SHALL BE EQUALLY SPACED (10'-0" OC MAX) BETWEEN MAJOR SUPPORT POINTS SUCH AS COLUMN GRIDS, DFE GRIDS, WALLS, AND GIRDERS UNLESS DIMENSIONED OTHERWISE.
6. FOR CURVED AREAS, SEE S1 SERIES DRAWINGS FOR EOD AND GRID DIMENSIONS.
7. COMPOSITE SLAB AND DECK IS 3" NW CONC OVER 2VLI 18 GA METAL DECK (5" TOTAL THICKNESS) REINFORCED W/ #3 AT 1'-0" OC EW UNO.
8. MEMBERS MARKED WITH AN ASTERISK (*) ARE SECONDARY FRAMING AND DO NOT REQUIRE FIREPROOFING
9. MEMBERS MARKED WITH A DAGGER (†) ARE SECONDARY MISCELLANEOUS FRAMING. MEMBERS MAY BE SUBSTITUTED WITH COLD-FORMED METAL FRAMING (CFMF) DESIGNED BY THE CONTRACTOR'S DELEGATED CFMF ENGINEER. SUBSTITUTED MEMBERS SHALL PROVIDE EQUIVALENT STRENGTH, STIFFNESS, AND CONNECTIONS, AND SHALL SUPPORT ALL DESIGN LOADS INDICATED IN THE CONTRACT DOCUMENTS.

FLOOR PLAN NOTES

- INT NON LOAD-BEARING STUD WALL
- INT NON LOAD-BEARING CMU OR STUD WALL
- LOAD BEARING OR EXTERIOR NON-LOAD BEARING CMU
- BUILDING LINE
- CMU LINTEL SEE TYPICAL DETAILS
- STEEL JOIST
- STRUCTURAL STEEL COLUMN
- STEEL BEAM
- STEEL BEAM SPLICE
- MOMENT CONNECTION
- BOL = XXX'-X" — BOT OF LINTEL ELEVATION
- TOW = XXX'-X" — TOP OF WALL ELEVATION
- TOC = XXX'-X" — TOP OF CONCRETE ELEVATION
- DECK SPAN DIRECTION, REF PLAN NOTES FOR TYPE
- FLOOR OPENING
- RTU XXXX# — RTU - REFER TO PLAN AND GENERAL NOTES FOR ADDITIONAL INFORMATION
- BOD = XX'-XX" — BOTTOM OF DECK ELEVATION MARK
- BUILDING LINE

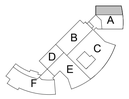
FLOOR FRAMING PLAN LEGEND



STEEL BEAM LEGEND

- INT NON LOAD-BEARING STUD WALL
- INT NON LOAD-BEARING CMU OR STUD WALL
- LOAD BEARING OR EXTERIOR NON-LOAD BEARING CMU
- BUILDING LINE
- CMU LINTEL SEE TYPICAL DETAILS
- STEEL JOIST
- STRUCTURAL STEEL COLUMN
- STEEL BEAM
- STEEL BEAM SPLICE
- MOMENT CONNECTION
- BOL = 107'-4" — BOT OF LINTEL ELEVATION
- TOW = 116'-8" — TOP OF WALL ELEVATION
- DECK SPAN DIRECTION, REF PLAN NOTES FOR TYPE
- RTU 1000# — RTU - REFER TO PLAN AND GENERAL NOTES FOR ADDITIONAL INFORMATION
- BOD = XX'-XX" — BOTTOM OF DECK ELEVATION MARK
- BUILDING LINE

ROOF FRAMING PLAN LEGEND



KEY PLAN - 2ND FLOOR
N.T.S.

Revision /	Date	
1	06.07.26	ADDENDUM 02

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FLOOR & LOW ROOF FRAMING PLAN - AREA A

VOLUME 01

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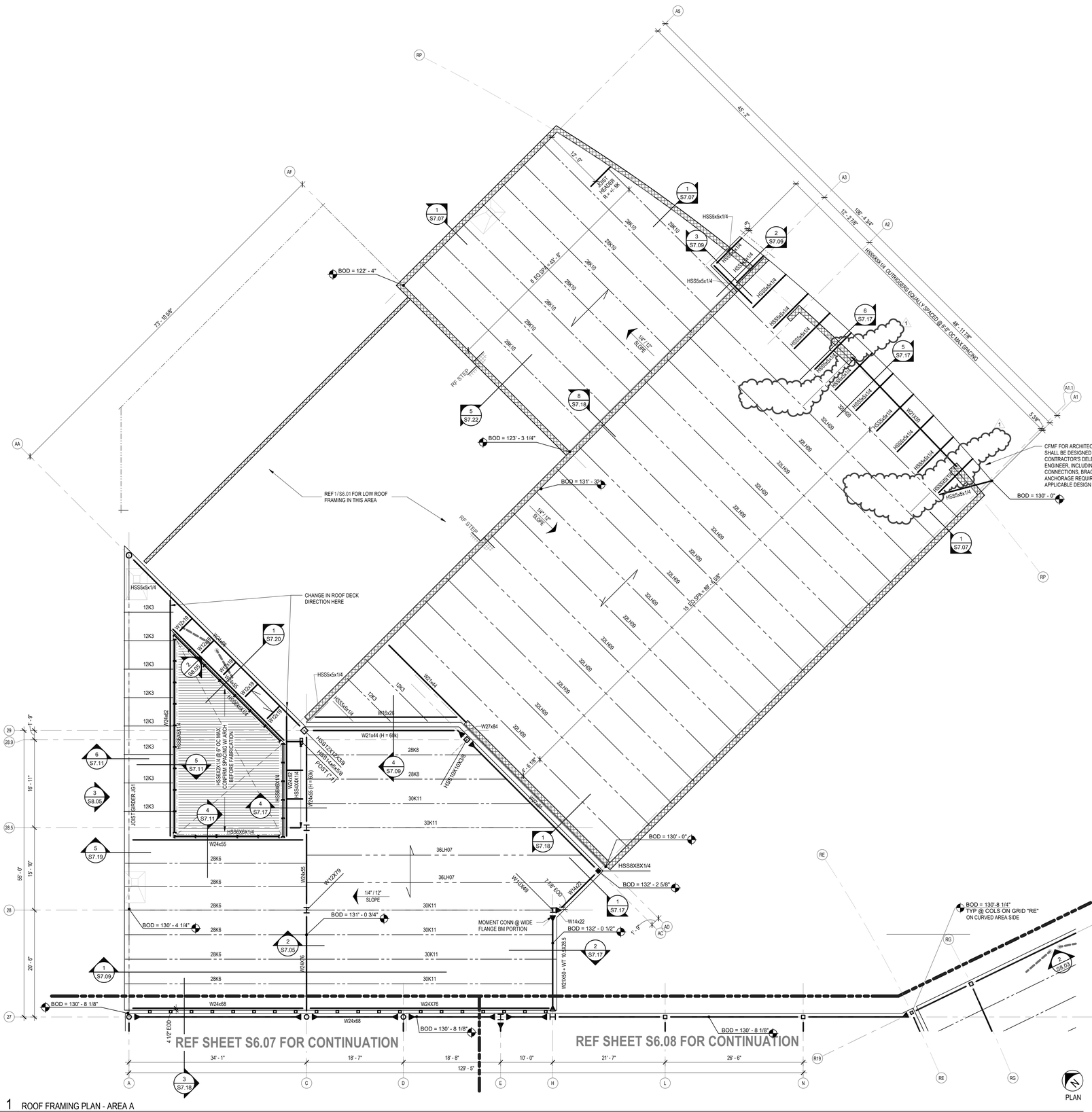
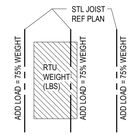


1 ROOF FRAMING PLAN - AREA A
S6.06 1/8" = 1'-0"

1. FOR GENERAL NOTES, REF DWGS S0.01.
2. BRIDGING FOR ROOF JOISTS IS NOT SHOWN ON THIS PLAN FOR CLARITY. BRIDGING FOR ROOF JOISTS SHALL BE PROVIDED FOR ALL JOISTS PER SJI SPECIFICATIONS.
3. REFERENCE CMU WALL PLAN FOR BOTTOM OF LINTEL ELEVATIONS AT LOAD BEARING WALLS.
4. REFERENCE CMU WALL PLAN FOR ALL TOP OF WALL ELEVATIONS.
5. REF APPROVED MECHANICAL SHOP DRAWINGS FOR EXACT LOCATIONS OF RTU UNITS.
6. REFER TO ROOF DECK NOTES ON S0.01 FOR REQUIRED FRAMING AT OPENINGS IN METAL ROOF DECK. SEE TYPICAL FRAME DETAIL AT A/C UNITS. PROVIDE ANGLE FRAMES AT ALL ROOF DRAINS.
7. STRUCTURAL MEMBERS SHALL BE EQUALLY SPACED (6'-0" OC MAX) BETWEEN MAJOR SUPPORT POINTS SUCH AS COLUMN GRIDS, DFE GRIDS, WALLS, AND GIRDERS UNLESS DIMENSIONED OTHERWISE.
8. JOIST SEAT DEPTHS FOR OPEN WEB STEEL JOIST SHALL BE AS DETERMINED BY THE CONTRACTOR'S JOIST ENGINEER WITH THE FOLLOWING MINIMUM DEPTHS (UNO IN DETAILS):
   A. K-SERIES JOIST: 5 INCHES
   B. LH-SERIES JOIST: 7 ½ INCHES
   C. DLH-SERIES JOIST: 7 ½ INCHES
9. JOISTS SUPPORTING MECHANICAL EQUIPMENT (RTU, ETC) SHALL HAVE ADDITIONAL "ADD LOAD" APPLIED TO THE JOIST DESIGN PER BELOW PARTIAL PLAN. VERIFY WEIGHT WITH APPROVED MECHANICAL SHOP DRAWINGS PRIOR TO CONSTRUCTION.



10. FOR CURVED AREAS, SEE S1 SERIES DRAWINGS FOR EOD AND GRID DIMENSIONS.
11. ROOF DECK IS 1.5B GA 20 METAL DECK UNO - TYP.
12. AT TYPICAL "WEDGE" BAY IN CURVED AREAS, LAYOUT PURLINS PER 2/S1.04 - TYP.
13. MEMBERS MARKED WITH AN ASTERISK (*) ARE SECONDARY FRAMING AND DO NOT REQUIRE FIREPROOFING
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ROOF PLAN NOTES

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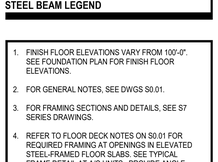
- INT NON LOAD-BEARING CMU OR STUD WALL
- LOAD BEARING OR EXTERIOR NON-LOAD BEARING CMU
- BUILDING LINE
- CMU LINTEL SEE TYPICAL DETAILS
- STEEL JOIST
- STRUCTURAL STEEL COLUMN
- STEEL BEAM
- STEEL BEAM SPLICE
- MOMENT CONNECTION
- BOL = 107'-4" — BOT OF LINTEL ELEVATION
- TOW = 116'-8" — TOP OF WALL ELEVATION
- DECK SPAN DIRECTION, REF PLAN NOTES FOR TYPE
- RTU 1000# — RTU - REFER TO PLAN AND GENERAL NOTES FOR ADDITIONAL INFORMATION
- BOD = XX'-XX" — BOTTOM OF DECK ELEVATION MARK
- BUILDING LINE

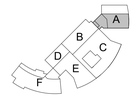
ROOF FRAMING PLAN LEGEND



STEEL BEAM LEGEND

1. FINISH FLOOR ELEVATIONS VARY FROM 100'-0". SEE FOUNDATION PLAN FOR FINISH FLOOR ELEVATIONS.
2. FOR GENERAL NOTES, SEE DWGS S0.01.
3. FOR FRAMING SECTIONS AND DETAILS, SEE S7 SERIES DRAWINGS.
4. REFER TO FLOOR DECK NOTES ON S0.01 FOR REQUIRED FRAMING AT OPENINGS IN ELEVATED STEEL-FRAMED FLOOR SLABS. SEE TYPICAL FRAME DETAIL AT A/C UNITS. PROVIDE ANGLE FRAMES AT ALL ROOF DRAINS.
5. STRUCTURAL MEMBERS SHALL BE EQUALLY SPACED (10'-0" OC MAX) BETWEEN MAJOR SUPPORT POINTS SUCH AS COLUMN GRIDS, DFE GRIDS, WALLS, AND GIRDERS UNLESS DIMENSIONED OTHERWISE.
6. FOR CURVED AREAS, SEE S1 SERIES DRAWINGS FOR EOD AND GRID DIMENSIONS.
7. COMPOSITE SLAB AND DECK IS 3" NW CONC OVER 2VLI 18 GA METAL DECK (5" TOTAL THICKNESS) REINFORCED W/ #3 AT 1'-0" OC EW UNO.
8. MEMBERS MARKED WITH AN ASTERISK (*) ARE SECONDARY FRAMING AND DO NOT REQUIRE FIREPROOFING
9. MEMBERS MARKED WITH A DAGGER (†) ARE SECONDARY MISCELLANEOUS FRAMING. MEMBERS MAY BE SUBSTITUTED WITH COLD-FORMED METAL FRAMING (CFMF) DESIGNED BY THE CONTRACTOR'S DELEGATED CFMF ENGINEER. SUBSTITUTED MEMBERS SHALL PROVIDE EQUIVALENT STRENGTH, STIFFNESS, AND CONNECTIONS, AND SHALL SUPPORT ALL DESIGN LOADS INDICATED IN THE CONTRACT DOCUMENTS.

FLOOR PLAN NOTES



KEY PLAN - 2ND FLOOR
N.T.S.

Revision /	Date	
1	06.07.26	ADDENDUM 02

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ROOF FRAMING PLAN - AREA A

VOLUME 01

Job No.	Sheet No.
00802-04-01	S6.06
Drawn By: IEG	
Date: 07.15.26	

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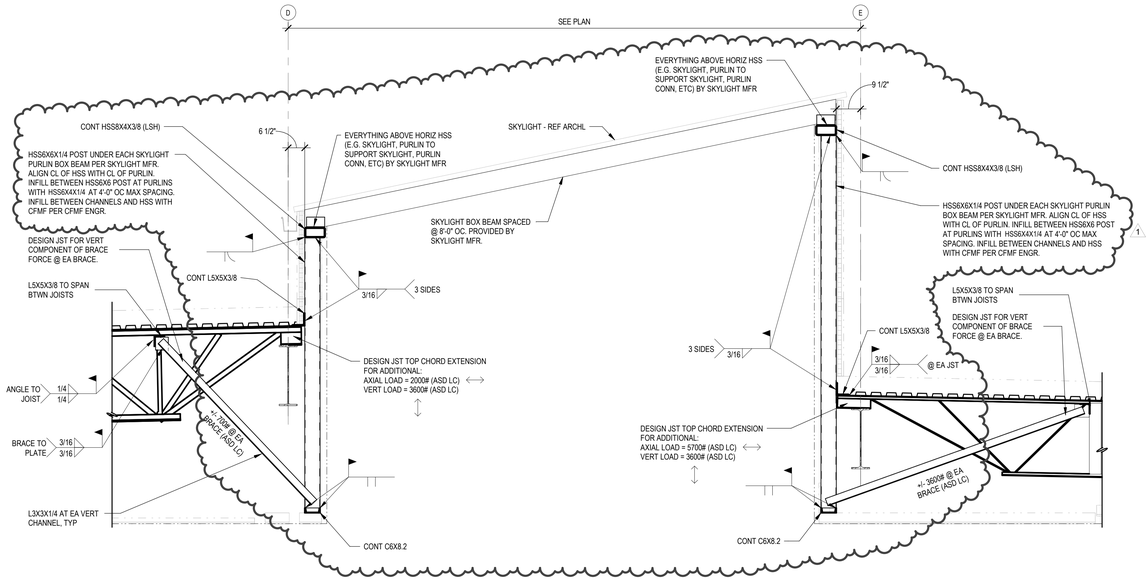

7 SECTION
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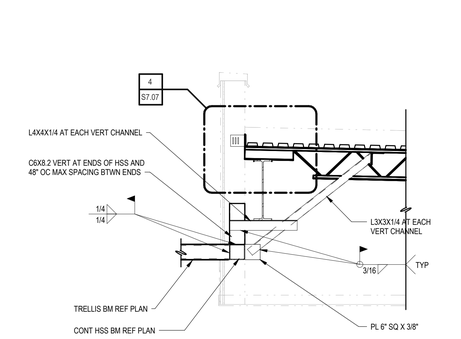
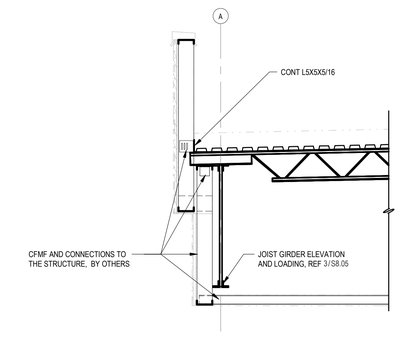


5 SECTION
S7.11 1/2" = 1'-0" BACK REF: S6.06



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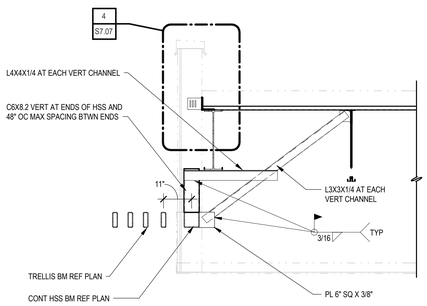
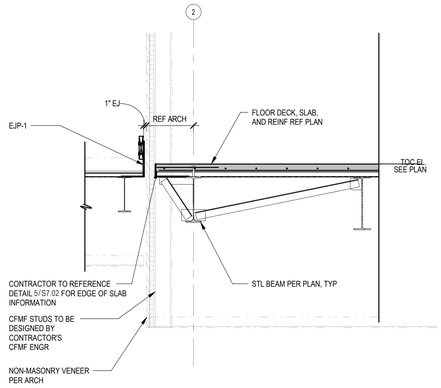


4 SECTION
S7.11 1/2" = 1'-0" BACK REF: S6.06



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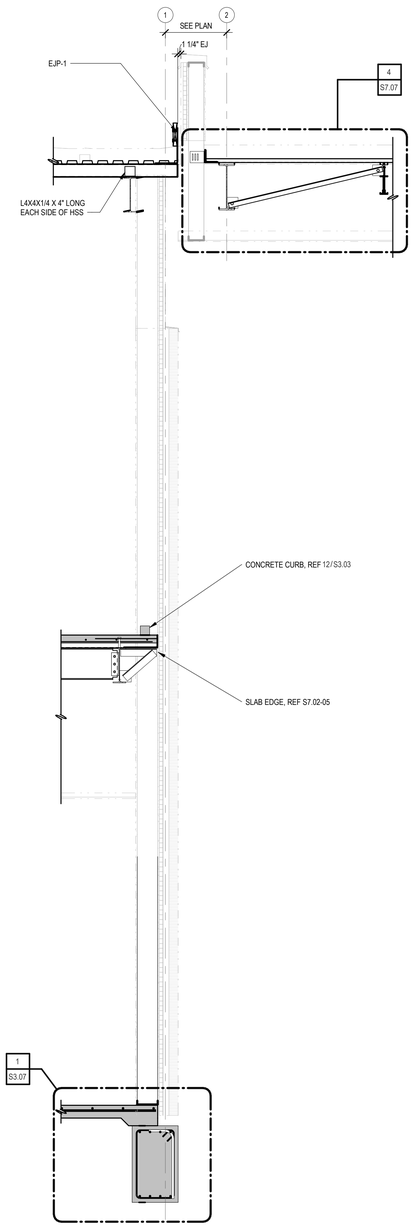

2 SECTION
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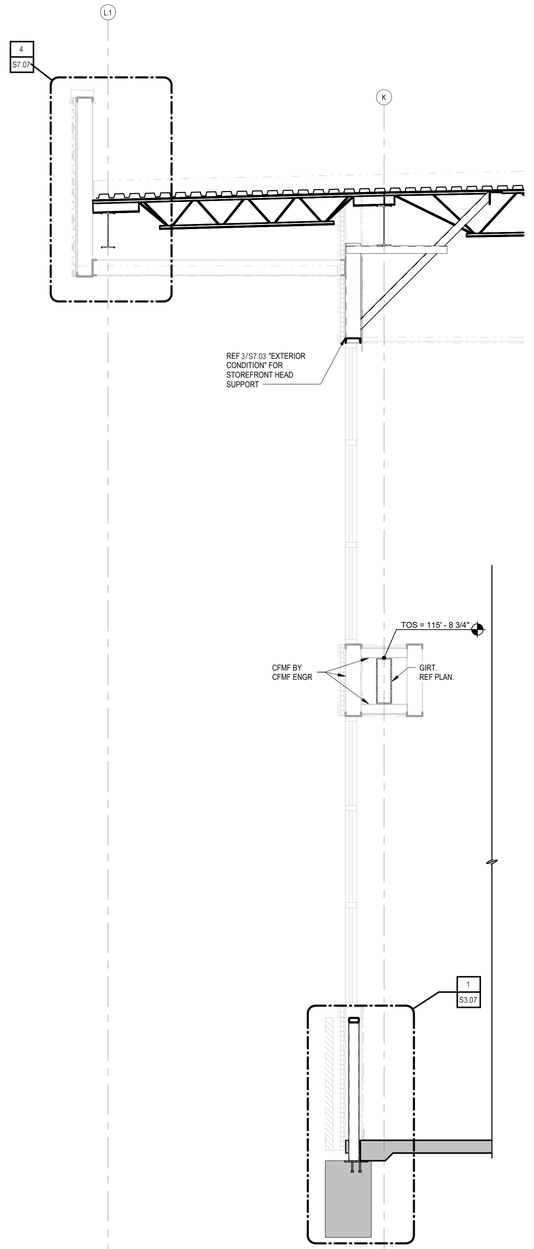

1 SECTION
S7.11 1/2" = 1'-0" BACK REF: S2.17

Revision / 1 — Date 06.07.26 — ADDENDUM 02

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Job No. 00803-04-01
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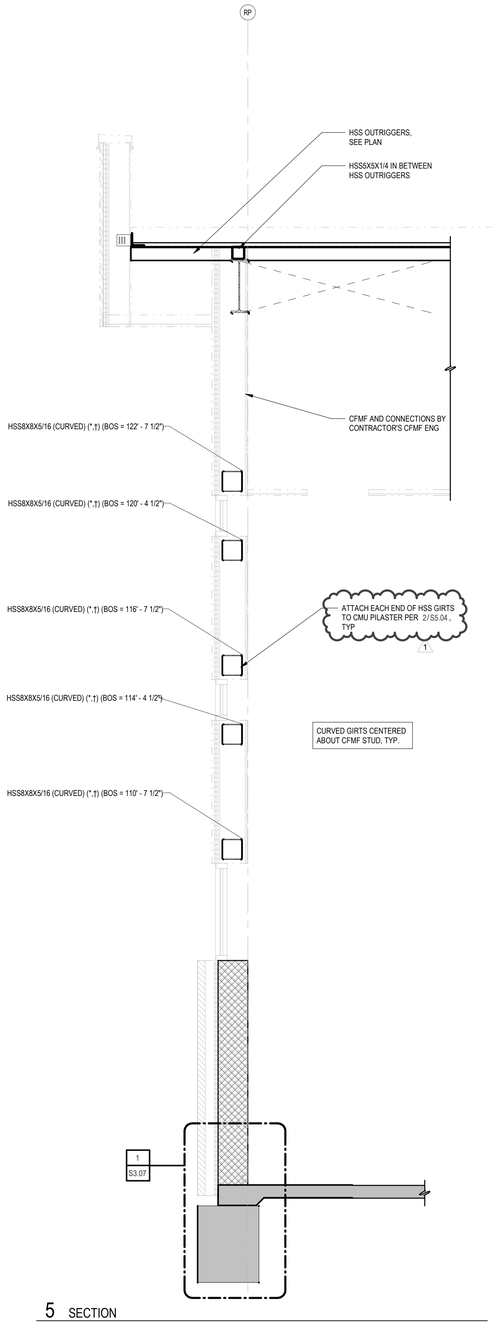
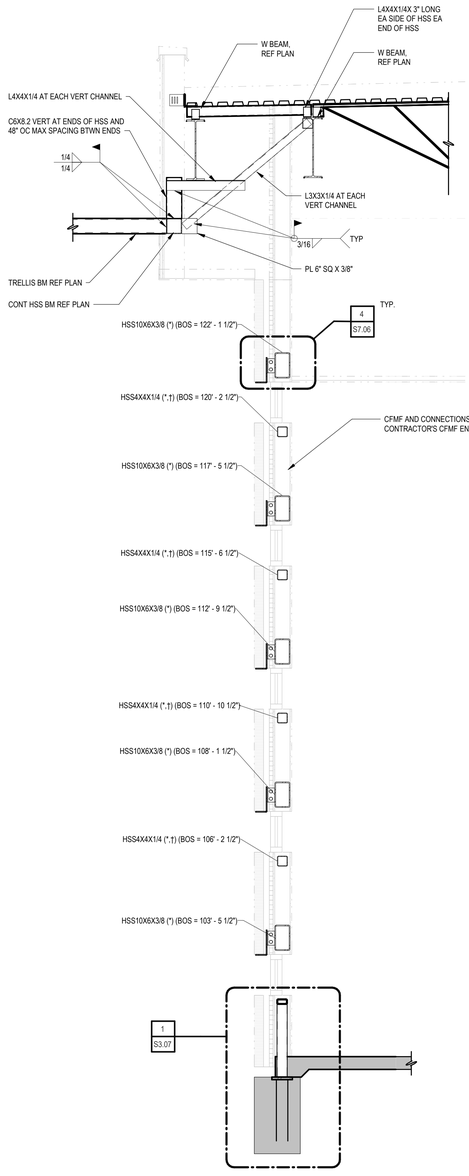


5 SECTION
S7.17 1/2" = 1'-0" BACK REF: S2.13



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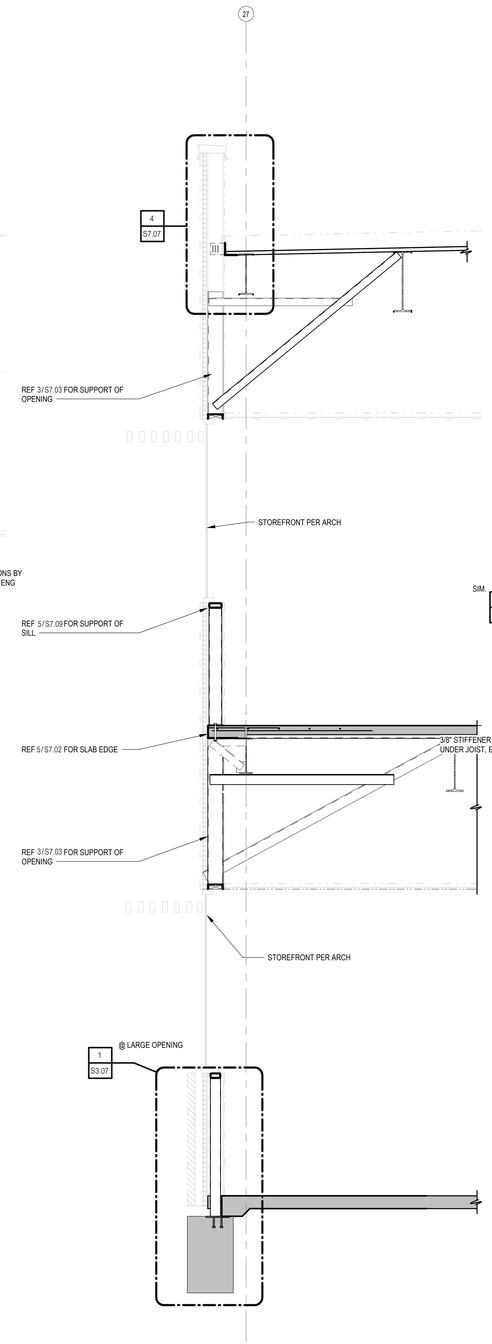
S7.17 1/2" = 1'-0" BACK REF: S2.13



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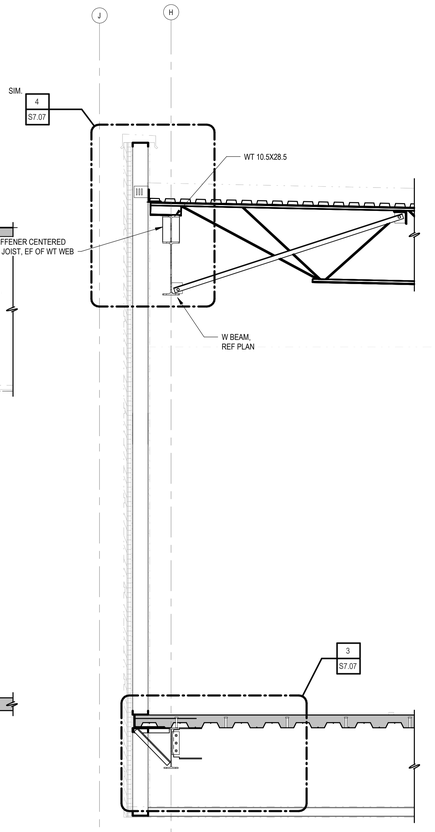
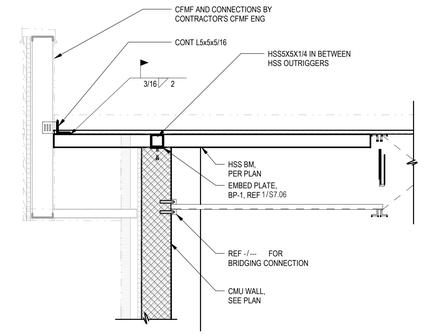
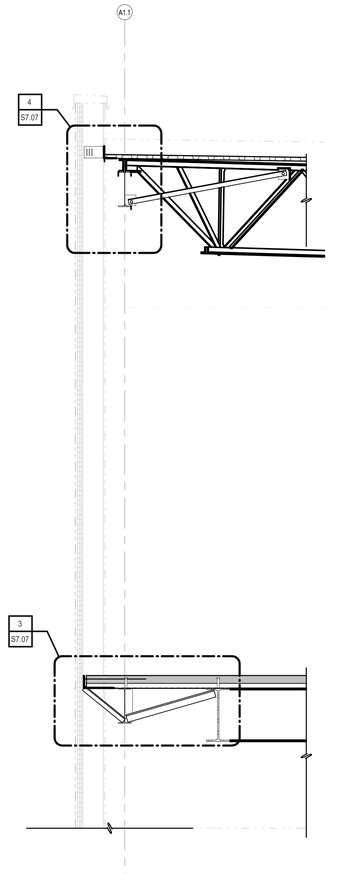


2 SECTION
S7.17 1/2" = 1'-0" BACK REF: S6.01



6 SECTION
S7.17 1/2" = 1'-0" BACK REF: S6.06



1 SECTION
S7.17 1/2" = 1'-0" BACK REF: S6.01

Date 06.07.26 ADDENDUM 02
Revision / 1

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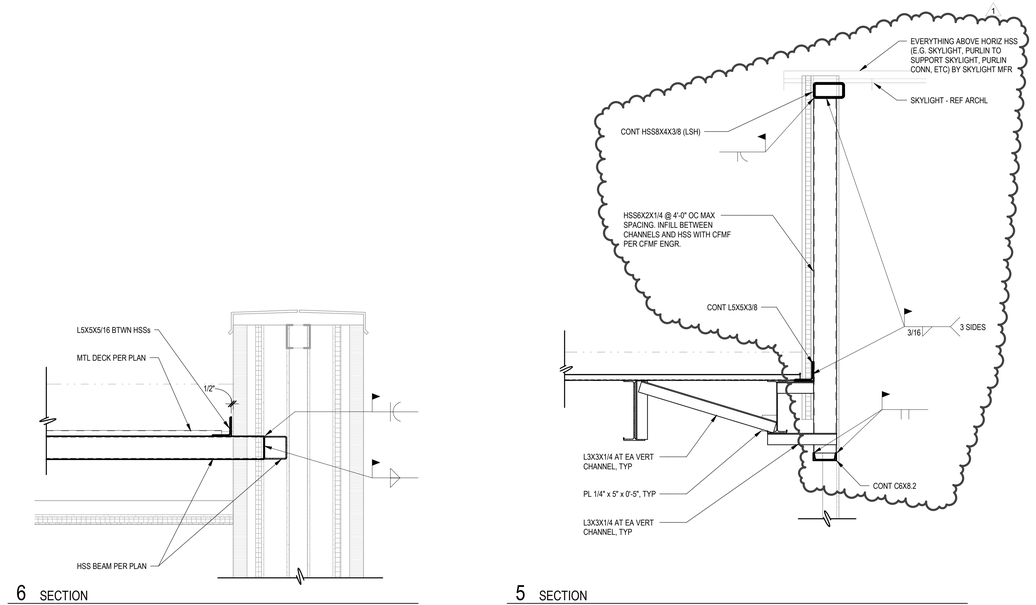
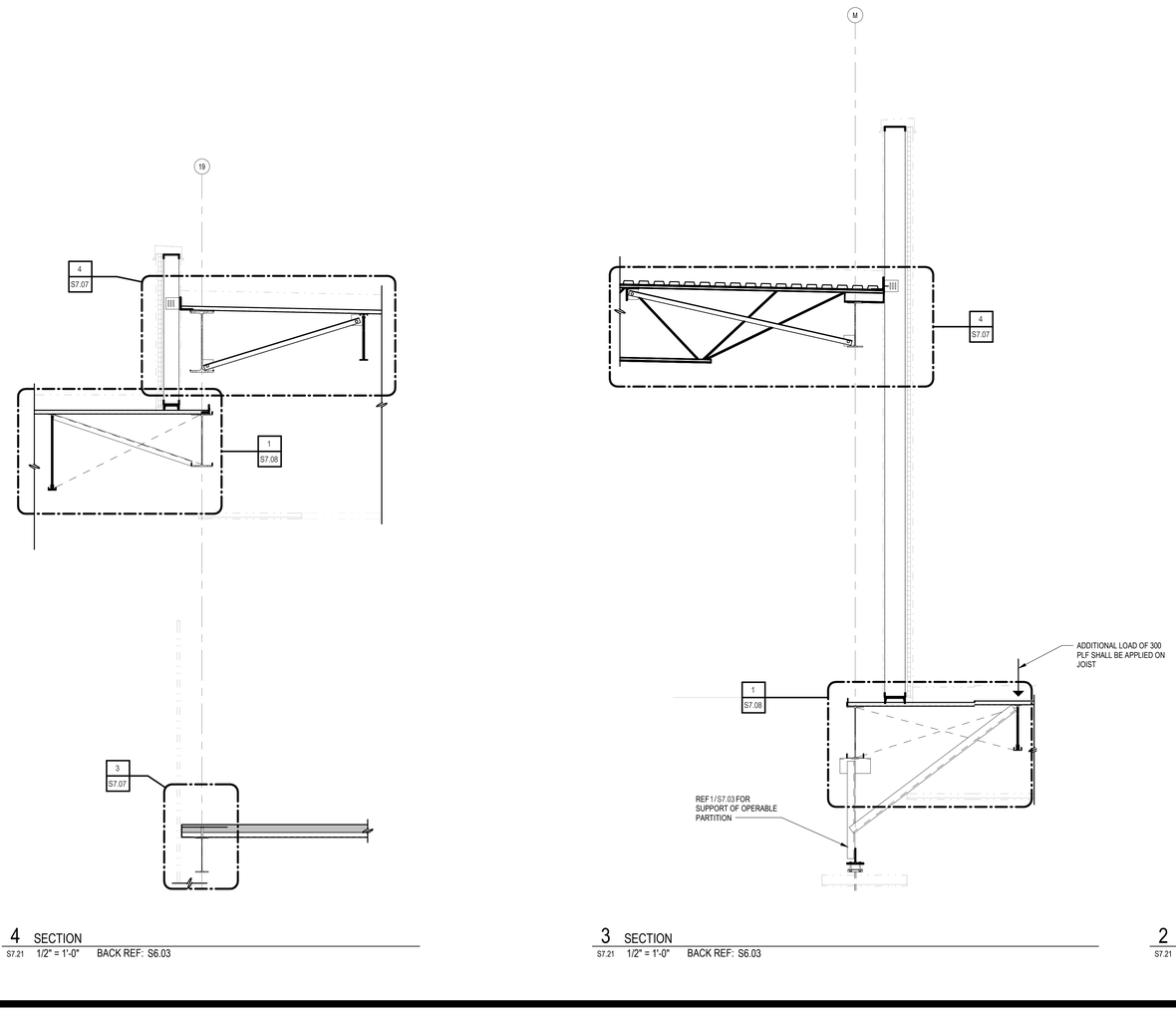


6 SECTION
S7.21 3/4" = 1'-0"

5 SECTION
S7.21 3/4" = 1'-0"



4 SECTION
S7.21 1/2" = 1'-0" BACK REF: S6.03

3 SECTION
S7.21 1/2" = 1'-0" BACK REF: S6.03

2 SECTION
S7.21 1/2" = 1'-0" BACK REF: S2.15

1 SECTION
S7.21 1/2" = 1'-0" BACK REF: S2.15

Revision /	Date	
1	06.07.26	ADDENDUM 02

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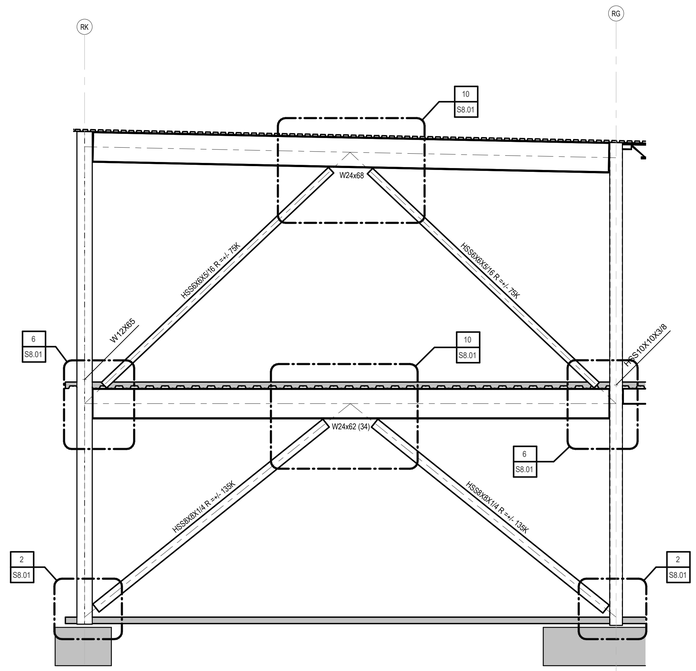
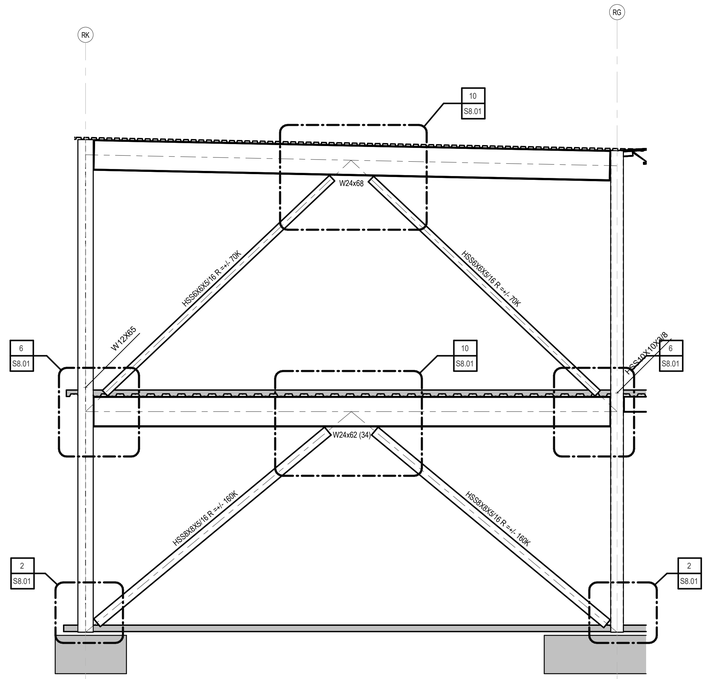
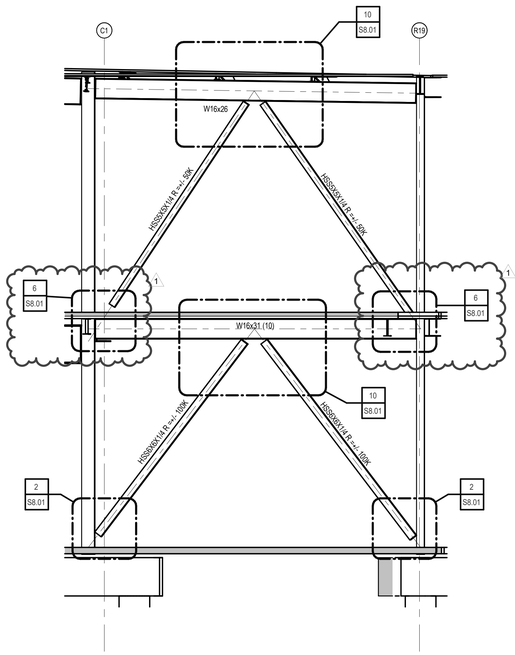


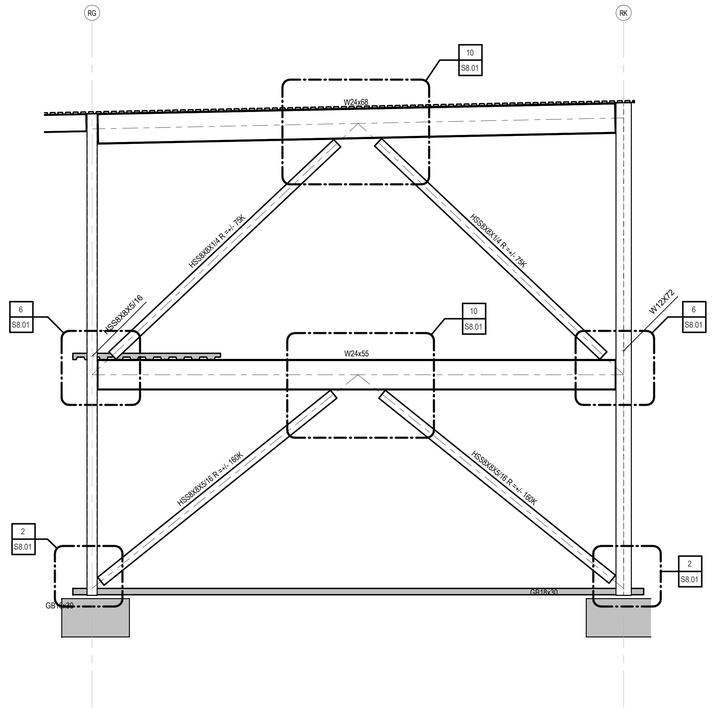
5 BRACE FRAME ELEVATION
S8.03 1/4" = 1'-0"



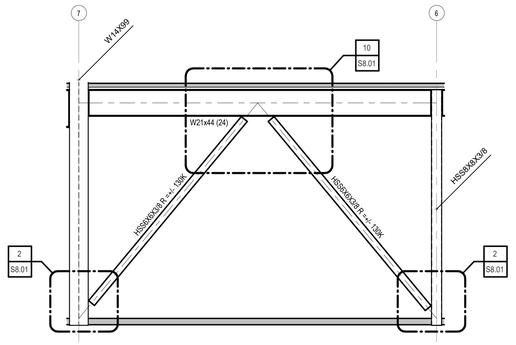
4 BRACE FRAME ELEVATION
S8.03 1/4" = 1'-0" BACK REF: S2.15



3 BRACE FRAME ELEVATION
S8.03 1/4" = 1'-0" BACK REF: S2.13



2 BRACE FRAME ELEVATION
S8.03 1/4" = 1'-0" BACK REF: S2.13



1 BRACE FRAME ELEVATION
S8.03 1/4" = 1'-0" BACK REF: S2.16

Revision / Date
1 ADDENDUM 02 06.07.26

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BRACED FRAME ELEVATIONS

VOLUME 01

Job No. 00802-04-01	Sheet No. S8.03
Drawn By: IEG	
Date: 07.15.26	

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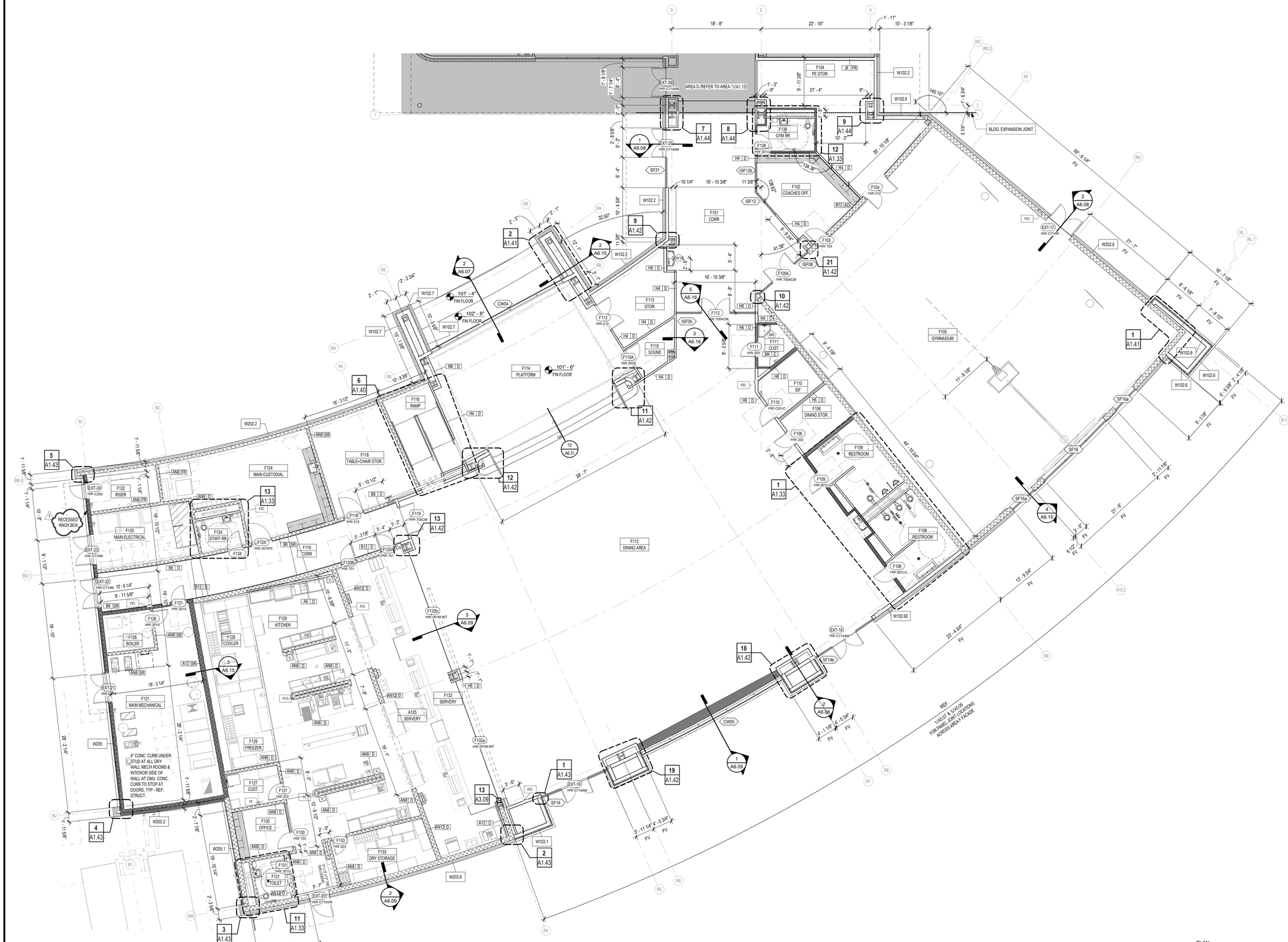
18' - 8"
22' - 10"
1' - 11"
10' - 3 1/8"
AREA D -REFER TO AREA 1/A1.1D
F104 PE STOR.
J6 FR
W102.2
W102.6
F138 GYM RR
F138 HW: 301C
F102 COACHES OFF.
F101 CORR
F104 HW:212
BLDG. EXPANSION JOINT
F105 GYMNASIUM
F106 DINING STOR.
F109 RESTROOM
F108 RESTROOM
F112 DINING AREA
F113 STOR.
F114 PLATFORM
F115 SOUND
F116 RAMP
F118 TABLE+CHAIR STOR
F122 RISER
F124 MAIN CUSTODIAL
F125 MAIN ELECTRICAL
F126 BOILER
F127 CUST.
F128 COOLER
F129 FREEZER
F130 OFFICE
F131 TOILET
F132 SERVERY
F133 DRY STORAGE
F134 STAFF RR
A125 SERVERY
F120 KITCHEN
F121 MAIN MECHANICAL
101' - 4" FIN FLOOR
102' - 8" FIN FLOOR
101' - 6" FIN FLOOR
4" CONC. CURB UNDER STUD AT ALL DRY WALL MECH ROOMS & INTERIOR SIDE OF WALL AT CMU. CONC. CURB TO STOP AT DOORS. TYP - REF. STRUCT.
RECESSED KNOX BOX
REF. 4/A5.07 & 5/A5.08 FOR PANEL JOINT LOCATIONS ACROSS AREA F PACKAGE
EXT-26) HW: C714AM
EXT-25) HW: C714AM
EXT-17 HW: C714M
EXT-18) HW: C714AM
EXT-19) HW: C714AM
EXT-20) HW: C715VW
EXT-21) HW: C714M
EXT-22) HW: C714M
EXT-23) HW: C714M
EXT-24) HW: C206
SF31
SF16
SF16a
SF14
SF14b
ISF12
ISF12b
ISF05
ISF06
W102.6E
W202.6
W202.2
W205
W205.1
W103.1
W102.7
W202.2
1' - 8 1/8"
1'-7 1/4"
6' - 4"
10' 4 3/4"
9' - 11 3/8"
21' - 4"
9"
140.10°
1' - 6 3/4"
5 1/4"
69' - 5 1/4" FV
21' - 1" FV
16' - 7 1/8" FV
5' - 8 1/8" FV
7' - 8 1/2" FV
6' - 5 3/8" FV
2' - 4 1/8" FV
8' - 3 7/8" FV
25' - 10 1/8"
134.36°
41.39°
9' - 9 3/4"
11 3/8"
1.58°
32.52°
10 1/4"
16' - 10 3/8"
16' - 3 1/2"
15' - 1 3/8"
10' - 9 3/8"
16' - 3 1/2"
1' - 11 3/8"
1' - 11 5/8"
2' - 5"
2' - 1"
2' - 2 3/4"
12' - 1"
2' - 1"
10' - 6 1/4"
9' - 11 5/8"
18' - 2 1/4"
28' - 2 1/4"
10' - 10 1/4"
2' - 3 5/8"
12' - 7 5/8"
9' - 7"
38' - 7"
43' - 10 3/4"
11' - 8 1/8"
2' - 8"
2' - 11 7/8"
15' - 9 3/4" FV
23' - 4 3/4" FV
9' - 4 7/8"
9' - 2 5/8"
5' - 10 1/2"
3' - 4"
3' - 7"
5' - 3 7/8"
2' - 0"
3' - 11 1/4"
4' - 0 3/4" FV
1' - 1 1/8" FV
0 3/4" FV
3' - 5"
1' - 1"
2' - 5"
2' - 5 5/8"
1' - 11 5/8"
1' - 11 3/8"
1' - 11 1/4

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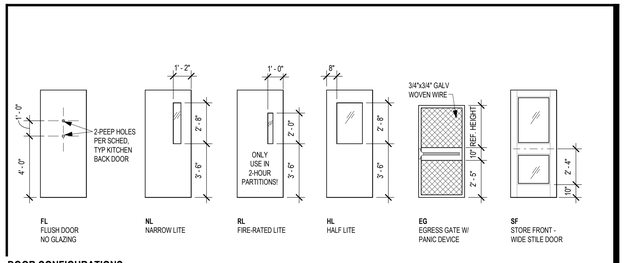


DOOR CONFIGURATIONS

FOLDING PANEL AND OPERABLE GLASS PARTITION SCHEDULE

NUMBER	HARDWARE SET	FRAME TYPE	DOOR DESCRIPTION DR HT	DR WDTH	DOOR MATERIAL	PANEL WIDTH	PANEL QUANTITY	PANIC HARDWARE	PASS DOOR QUANTITY	DETAILS AND NOTES COMMENTS
C108C	001FLD	FP01	9' - 8"	32' - 7 1/2"	MB	3' - 3 1/8"	10			
C112	001FLD	FP02	9' - 2"	22' - 6"	GTC	3' - 7 7/8"	6	Yes	1	
E114C	001FLD	FP01	9' - 8"	32' - 7 1/2"	MB	3' - 3 1/8"	10			

OVERHEAD DOOR SCHEDULE

OPENING NUMBER	OPENING HARDWARE SET	DOOR FRAME TYPE	OPENING FIRE RATING	EXTERIOR	DOOR WIDTH	DOOR HEIGHT	DOOR DR GLAZING	PANIC HARDWARE	SPECIAL NOTES
AREA C									
E117H	001M-EXT	SOH-GL		Yes	20' - 0"	10' - 0"	IGSEF		13
AREA D									
D113	001M-INT	OCD02		No	16' - 1"	12' - 3"			13
AREA E									
E117G	001M-EXT	SOH-GL		Yes	20' - 0"	10' - 0"	IGSEF		13
E121a	001M-INT	OCD01	120 MIN.	No	20' - 4"	25' - 0"			13
E121b	001M-INT	OCD01	120 MIN.	No	8' - 0"	9' - 0"			13
AREA F									
F132a	001M-INT	OCG02		No	26' - 6"	10' - 0"			13
F132b	001M-INT	OCG02		No	26' - 6"	10' - 0"			13

HOLLOW METAL DOOR SCHEDULE - LEVEL 1

OPENING NUMBER	OPENING HARDWARE SET	OPENING FIRE RATING	OPENING EXTERIOR	DOOR WIDTH	DOOR HEIGHT	DOOR TYPE	DOOR DR GLAZING	DOOR PANIC HARDWARE	FRAME MATERIAL	FRAME TYPE	SPECIAL NOTES
AREA A											
A102	301G		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM03	
A103	C201		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	7, 9
A104	801LCG		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
A105	801LCG		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
A106	711EL		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
A108	203		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
A109	301G		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
A110	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01c	
A111A	201	60 MIN.	No	3' - 0"	7' - 0"	SC-NL	GFPR	No	HM	IHM01b	
A111B	201	60 MIN.	No	3' - 0"	7' - 0"	SC-NL	GFPR	No	HM	IHM01b	
A112A	203		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01b	
A112B	203		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01b	
A113	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01c	
A114	203		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01b	
A115	201		No	3' - 0"	7' - 0"	SC-FL		No	HM	IHM01c	
A118	203G		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01b	
A119	203GW		No	4' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01b	
A122	203GS		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01b	
A123	201		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01b	
AREA B											
B102	103		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B103	403		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B104	103		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B105A	CR201		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	7, 9
B105B	C201W		No	4' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	7, 9
B107	203		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
B108	303G		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
B109	303G		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
B111	C201		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	7, 9
B112A	C201		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	7, 9
B112B	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B113	203		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
B114	203		No	3' - 0"	7' - 0"	SC-FL		No	HM	IHM01a	
B115	301G		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
B116	301G		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
B117	C201		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	7, 9
B118	201X	SR	No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	12
B119	200R	SR	No	3' - 0"	7' - 0"	SC-FL (PR)	--	No	HM	IHM01a	12
B122	301G		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
B123	301G		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
B124	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B125	201		No	3' - 0"	7' - 0"	SC-FL		No	HM	IHM01a	
B126	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B127	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B128	103		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B129	103		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B131	103		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B132	103		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B133	103		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B134	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B135	CR207		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	7, 9, 10
AREA C											
C101	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
C102	503S		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
C103	503S		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
C106	503S		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
C107	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
C108A	701		No	3' - 0"	7' - 0"	SC-NL	GTC	Yes	HM	IHM01a	
C108B	701		No	3' - 0"	7' - 0"	SC-NL	GTC	Yes	HM	IHM01a	
C109	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
C111	200		No	3' - 0"	7' - 0"	SC-FL (PR)	--	No	HM	IHM02a	
C113	801LG		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
C114	801LG		No	3' - 0"	7' - 0"	SC-FL		No	HM	IHM01a	
C115	203		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
C116	301G		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
C117	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
C118	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E121	201	120 MIN	No	2' - 8"	7' - 0"	HM-FL	--	No	HM	IHM01a	
AREA D											
D101	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
D103	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
D105	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
D106A	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
D106B	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
D107	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
D108	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
D109	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
D111A	801LG	SR	No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	12
D111B	801LG	SR	No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	12
D112A	503S		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
D112B	503S		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
AREA E											
E101	507		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E102	303G		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
E103	201		No	3' - 0"	7' - 0"	SC-FL		No	HM	IHM01a	
E105	C201		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	7, 9
E106	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E107	801LG		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
E108	301G		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
E109	203		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
E111	801LG		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
E112	200		No	3' - 0"	7' - 0"	SC-FL (PR)	--	No	HM	IHM02a	
E114A	701		No	3' - 0"	7' - 0"	SC-NL	GTC	Yes	HM	IHM01a	
E114B	701		No	3' - 0"	7' - 0"	SC-NL	GTC	Yes	HM	IHM01a	
E115	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E116	503S		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E118	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E119	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E120	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
AREA F											
EXT-17	C714M		Yes	3' - 0"	7' - 0"	HM-FL (PR)	--	Yes	HM	HM02	5, 7, 9
EXT-20	C715VW		Yes	4' - 0"	8' - 0"	HM-FL	--	Yes	HM	HM01	5, 7, 9, 14
EXT-21	C214		Yes	3' - 0"	7' - 0"	HM-FL (PR)	--	No	HM	HM03a	5, 7, 9
EXT-22	C714M		Yes	3' - 0"	7' - 0"	HM-NL (PR)	IGSEF	Yes	HM	HM03a	7, 9
EXT-23	C714M		Yes	3' - 0"	7' - 0"	HM-FL (PR)	--	Yes	HM	HM03a	7, 9
EXT-24	C205		Yes	3' - 0"	7' - 0"	HM-FL	--	No	HM	HM03b	7, 9
F102	103		No	3' - 0"	7' - 0"	SC-NL	GLSA	No	HM	IHM01c	
F104	212		No	3' - 0"	7' - 0"	SC-FL (PR)	--	No	HM	IHM02b	
F106	203		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
F108	801LG		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
F109	801LG		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
F110	C201C		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	7, 9
F111	203		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
F113	212		No	3' - 0"	7' - 0"	SC-FL (PR)	--	No	HM	IHM02a	
F115A	503		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
F118	212		No	4' - 0"	7' - 0"	SC-FL	--	No	HM	IHM02b	
F119	700CM		No	3' - 0"	7' - 0"	SC-NL (PR)	GTC	Yes	HM	IHM02a	
F120A	701		No	3' - 0"	7' - 0"	SC-NL	GTC	Yes	HM	IHM01c	
F120B	701		No	3' - 0"	7' - 0"	SC-NL	GTC	Yes	HM	IHM01c	
F121	201X	SR	No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01c	12
F124	201WX	SR	No	4' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01c	7, 12
F126	201X		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01b	12
F127	203		No	3' - 0"	7' - 0"	HM-FL	--	No	HM	IHM01b	
F130	103		No	3' - 0"	7' - 0"	HM-HL	GTC	No	HM	IHM04	
F131	301G		No	3' - 0"	7' - 0"	HM-FL	--	No	HM	IHM01b	
F133	203		No	3' - 0"	7' - 0"	HM-FL	GTC	No	HM	IHM01b	
F134	301G		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01c	
F138	301G		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01b	

HOLLOW METAL DOOR SCHEDULE - LEVEL 2

OPENING NUMBER	OPENING HARDWARE SET	OPENING FIRE RATING	OPENING EXTERIOR	DOOR WIDTH	DOOR HEIGHT	DOOR TYPE	DOOR DR GLAZING	DOOR PANIC HARDWARE	FRAME MATERIAL	FRAME TYPE	SPECIAL NOTES
AREA B											
B201	701X		No	3' - 0"	7' - 0"	SC-NL	GTC	Yes	HM	IHM01a	
B203	C201C		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	7, 9
B204A	201X		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B204B	201X		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B205	701X		No	3' - 0"	7' - 0"	SC-NL	GTC	Yes	HM	IHM01a	
B206	701X		No	3' - 0"	7' - 0"	SC-NL	GTC	Yes	HM	IHM01a	
B207	711EL		No	3' - 0"	7' - 0"	SC-FL	--	Yes	HM	IHM01a	
B208A	201X		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B208B	201X		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
B209	701X		No	3' - 0"	7' - 0"	SC-NL	GTC	Yes	HM	IHM01a	
B211	701X		No	3' - 0"	7' - 0"	SC-NL	GTC	Yes	HM	IHM01a	
AREA C											
C201	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
C202	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
C203	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
C206	503S		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
C207	503S		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
C208	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
C209	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
C211	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
C212	200		No	3' - 0"	7' - 0"	SC-FL (PR)	--	No	HM	IHM02a	
C213	801LG		No	3' - 0"	7' - 0"	SC-FL		No	HM	IHM01a	
C214	801LG		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
C215	203		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
C216	301G		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
C217	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
C220	700M		No	3' - 0"	7' - 0"	SC-FL (PR)	--	Yes	HM	IHM02a	
AREA D											
D201A	201X		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
D201B	201X		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
D202	C201C		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	7, 9
D203	701X		No	3' - 0"	7' - 0"	SC-NL	GTC	Yes	HM	IHM01a	
D204	701X		No	3' - 0"	7' - 0"	SC-NL	GTC	Yes	HM	IHM01a	
D206	711EL		No	3' - 0"	7' - 0"	SC-FL	--	Yes	HM	IHM01a	
D207A	201X		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
D207B	201X		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
D208	701X		No	3' - 0"	7' - 0"	SC-NL	GTC	Yes	HM	IHM01a	
AREA E											
E205	503S		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E206	801LG		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
E207	801LG		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
E208	301G		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
E209	203		No	3' - 0"	7' - 0"	SC-FL	--	No	HM	IHM01a	
E210	200		No	3' - 0"	7' - 0"	SC-FL (PR)	--	No	HM	IHM02a	
E212	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E213	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E214	503S		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E215	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E216	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E218	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E219	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E220	503		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E221	200		No	3' - 0"	7' - 0"	SC-FL (PR)	--	No	HM	IHM02a	
E222	738RW	120 MIN	No	4' - 0"	9' - 0"	HM-NL (PR)	GFPR	Yes	HM	IHM02a	1
E225	700CM		No	3' - 0"	7' - 0"	SC-FL (PR)	--	Yes	HM	IHM02a	
E226	700CM		No	3' - 0"	7' - 0"	SC-FL (PR)	--	Yes	HM	IHM02a	
E231	103		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E232A	103		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E232B	103		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E233	103		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	
E234	103		No	3' - 0"	7' - 0"	SC-NL	GTC	No	HM	IHM01a	

ALUMINUM DOOR SCHEDULE - LEVEL 1 & 2

OPENING NUMBER	OPENING HARDWARE SET	OPENING FIRE RATING	OPENING EXTERIOR	DOOR WIDTH	DOOR HEIGHT	DOOR TYPE	DOOR DR GLAZING	DOOR PANIC HARDWARE	FRAME MATERIAL	FRAME TYPE	SPECIAL NOTES
LEVEL 01											
AREA A											
A101A	CR207A		No	3' - 0"	7' - 0"	AL-SF	GSEF	No	AL	ISF02	7, 9, 10
A101B	CR710AMV		No	3' - 0"	7' - 0"	AL-SF (PR)	GSEF	Yes	AL	ISF01	7, 9
EXT-01	CR714AM		Yes	3' - 0"	7' - 0"	AL-SF (PR)	IGSEF	Yes	AL	CW06	7, 9, 10
EXT-02	C205A		Yes	3' - 0"	7' - 0"	AL-SF	IGSEF	No	AL	SF	7, 9
EXT-03	C205A		Yes	3' - 0"	7' - 0"	AL-SF	IGSEF	No	AL	SF	7, 9
EXT-04	C714AM		Yes	3' - 0"	7' - 0"	AL-SF (PR)	IGSEF	Yes	AL	SF05	7, 9
EXT-05	C715A		Yes	3' - 0"	7' - 0"	AL-SF	IGSEF	Yes	AL	SF07	7, 9
AREA B											
B101	CR207A		No	3' - 0"	7' - 0"	AL-SF	GTC	No	AL	ISF01	10
AREA C											
C119A	700ACM		No	3' - 0"	7' - 0"	AL-SF (PR)	GTC	Yes	AL	ICW01	
C119B	701AC		No	3' - 0"	7' - 0"	AL-SF	GTC	Yes	AL	ICW01	
EXT-06	C714AM		Yes	3' - 0"	7' - 0"	AL-SF (PR)	IGSEF	Yes	AL	SF32	7, 9
EXT-07	C714AM		Yes	3' - 0"	7' - 0"	AL-SF (PR)	IGSEF	Yes	AL	SF10	7, 9
EXT-09	C714AM		Yes	3' - 0"	7' - 0"	AL-SF (PR)	IGSEF	Yes	AL	SF33	7, 9
EXT-10	C715A		Yes	3' - 0"	7' - 0"	AL-SF	IGSEF	Yes	AL	SF39	7, 9
EXT-11	C715A		Yes	3' - 0"	7' - 0"	AL-SF	IGSEF	Yes	AL	CW02	7, 9
AREA D											
EXT-26	C714AM		Yes	3' - 0"	7' - 0"	AL-SF (PR)	IGSEF	Yes	AL	SF30	7, 9
AREA E											
E104	503		No	3' - 0"	7' - 0"	AL-SF	GTC	No	AL	ISF04	
EXT-12	C714AM		Yes	3' - 0"	7' - 0"	AL-SF (PR)	IGSEF	Yes	AL	SF33	7, 9
EXT-14	C714AM		Yes	3' - 0"	7' - 0"	AL-SF (PR)	IGSEF	Yes	AL	SF10	7, 9
EXT-15	C714AM		Yes	3' - 0"	7' - 0"	AL-SF (PR)	IGSEF	Yes	AL	SF32	7, 9
EXT-16	C714AM		Yes	3' - 0"	7' - 0"	AL-SF (PR)	IGSEF	Yes	AL	SF19	7, 9
AREA F											
EXT-18	C714AM		Yes	3' - 0"	7' - 0"	AL-SF (PR)	IGSEF	Yes	AL	SF14b	7, 9
EXT-19	C714AM		Yes	3' - 0"	7' - 0"	AL-SF (PR)	IGSEF	Yes	AL	SF14	7, 9
EXT-25	C714AM		Yes	3' - 0"	7' - 0"	AL-SF (PR)	IGSEF	Yes	AL	SF31	7, 9
F105A	700ACM		No	3' - 0"	7' - 0"	AL-SF (PR)	GLSA	Yes	AL	ISF06	
F112	700ACM		No	3' - 0"	7' - 0"	AL-SF (PR)	GTC	Yes	AL	ISF05	
LEVEL 02											
AREA C											
C218	501A		No	3' - 0"	7' - 0"	AL-SF	GTC	No	AL	ISF07	

ACOUSTIC DOOR SCHEDULE (STC 50)

OPENING NUMBER	OPENING HARDWARE SET	OPENING FIRE RATING	OPENING EXTERIOR	DOOR WIDTH	DOOR HEIGHT	DOOR DR TYPE	DOOR DR GLAZING	DOOR PANIC HARDWARE	FRAME MATERIAL	FRAME TYPE	SPECIAL NOTES
AREA A											
A107	S503		No	4' - 0"	7' - 0"	AC-WL	SCWA	No	HM	AC02	3
A116A	S701		No	3' - 0"	7' - 0"	AC-NL	SCWA	No	HM	AC01	3
A116B	S701		No	3' - 0"	7' - 0"	AC-NL	SCWA	No	HM	AC01	3
A117A	S701		No	4' - 0"	7' - 0"	AC-NL	SCWA	No	HM	AC01	3
A117B	S701		No	3' - 0"	7' - 0"	AC-NL	SCWA	No	HM	AC01	3
A120	S503		No	4' - 0"	7' - 0"	AC-WL	SCWA	No	HM	AC01	3
A121A	S701		No	4' - 0"	7' - 0"	AC-NL	SCWA	No	HM	AC01	3
A121B	S701		No	3' - 0"	7' - 0"	AC-NL	SCWA	No	HM	AC01	3

DEFAULT DOORS

IF A DOOR ASSEMBLY APPEARS ON THE FLOOR PLANS BUT IS NOT IDENTIFIED BY A SCHEDULE NUMBER, THE DOOR SHALL BE INCLUDED IN THE BID AS LISTED BELOW. THE CONTRACTOR SHALL REQUEST CLARIFICATION FROM THE ARCHITECT TO DETERMINE WHAT THE ACTUAL DOOR AND FRAME TYPE AND HARDWARE REQUIREMENTS WILL BE. ADJUSTMENTS IN CONTRACT PRICE WILL BE BASED ON THE DIFFERENCE BETWEEN ACTUAL REQUIREMENTS AND THE DEFAULT DOOR VALUE.

THE DEFAULT EXTERIOR DOOR SHALL BE A TYPE "HM-FL" (SINGLE OR PAIR PER PLAN) WITH DEFAULT HARDWARE PER SPECIFICATIONS AND FRAME DETAILING PER TYPICAL DETAILS FOR EXTERIOR DOORS.

THE DEFAULT INTERIOR DOOR SHALL BE A TYPE "SC-FL" (SINGLE OR PAIR PER PLAN) IN A TYPE "HM01" FRAME WITH DEFAULT HARDWARE PER SPECIFICATIONS AND FRAME DETAILING PER TYPICAL DETAILS FOR INTERIOR DOORS.

TYPICAL NOTES

A. DOOR TYPES ARE INDICATED AS A MATERIAL-CONFIGURATION CODE. THE MATERIAL CODE DESIGNATES MATERIALS AND FINISHES AS SPECIFIED. REFER TO SPECIAL NOTES FOR NON-TYPICAL FINISHES. THE CONFIGURATION CODE REFERS TO TYPICAL OR SPECIAL CONFIGURATIONS AS DRAWN.

B. DOOR ASSEMBLIES ARE NUMBERED BY ASSEMBLY. MULTIPLE SETS OF DOORS MAY OCCUR IN THE SAME FRAME ASSEMBLY (REFER TO SCHEDULE AND PLAN FOR QUANTITY). DOORS MAY OCCUR IN PAIRS (REFER TO SCHEDULE AND PLAN FOR INCIDENCE).

C. FRAME CONFIGURATION IS DIAGRAMMATIC AND NOMINAL DIMENSIONS SHALL BE ADJUSTED TO ACCOMMODATE DOOR SIZES AS SCHEDULED. WITHIN ANY HOLLOW METAL ASSEMBLY, THE WIDTH OF SIDELITES SHALL BE EQUAL AND SHALL NOT EXCEED 2'-0" U.N.O.

D. ALTERNATE FINISHES CAN SOMETIMES HAVE AN IMPACT ON DETAILING (E.G. HALF OR OFFSET SADDLES EMPLOYED IN LIEU OF STANDARD SADDLES WHEN ADJACENT TO THICKER FLOOR FINISHES SUCH AS TERRAZZO OR QUARRY TILE). COORDINATE DETAILS WITH FINAL FINISH SELECTIONS.

E. GLAZED FRAMES ASSOCIATED WITH 20-MINUTE, 45-MINUTE AND/OR 60-MINUTE FIRE-RATED DOORS SHALL BE FIRE-RATED 1-HOUR. GLAZED FRAMES ASSOCIATED WITH 90-MINUTE FIRE-RATED DOORS SHALL BE FIRE-RATED 2-HOUR. GLAZING MUST MEET CODE REQUIREMENTS, INCLUDING SIZE LIMITATIONS, IN FIRE-RATED FRAMES. REF. IBC TABLE 716.1 (2).

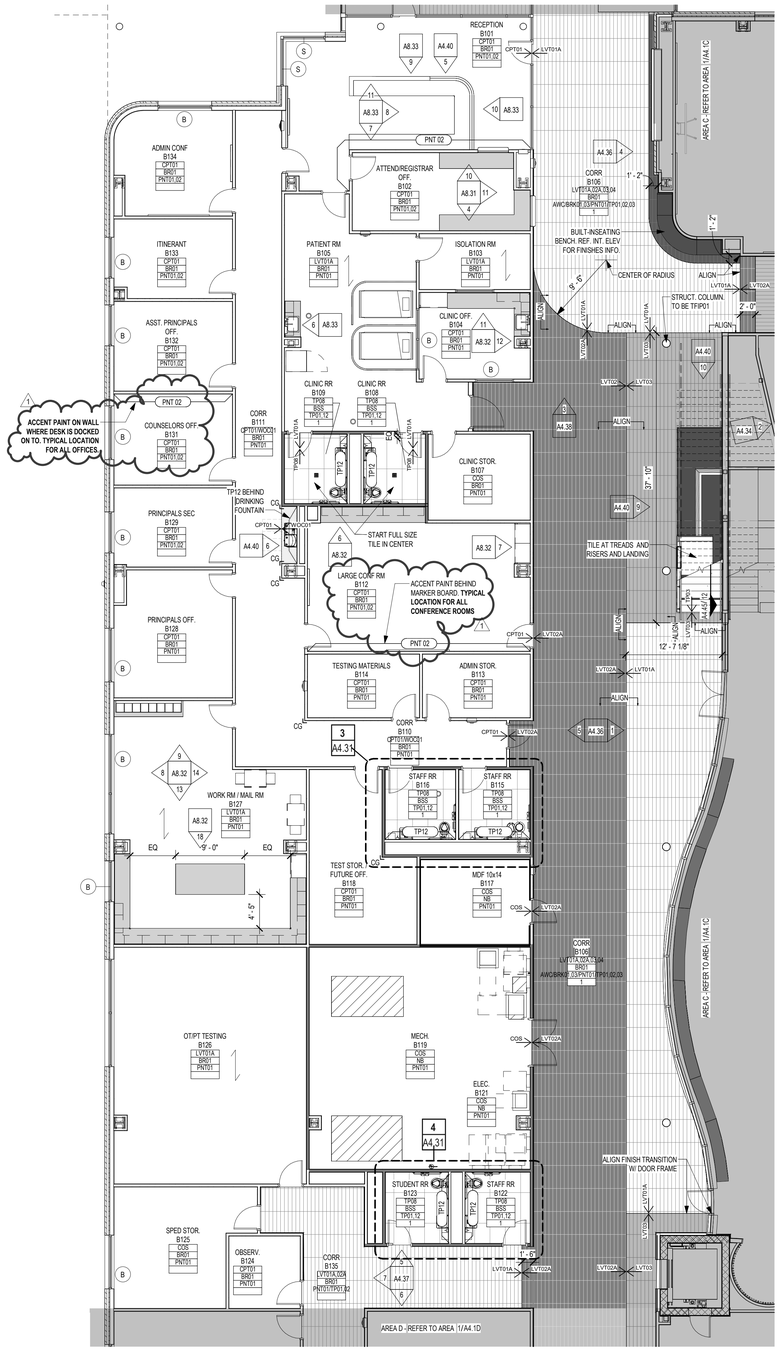
F. PROVIDE 2x WOOD BLOCKING @ CFMF STUD WALLS FOR WALL MOUNTED ITEMS LIKE WALL STOPS, HOLD OPENS, ETC.

G. REFER TO FLOOR PLANS AND EXTERIOR ELEVATIONS FOR ALUMINUM FRAME LOCATIONS.

H. OVERHEAD COILING DOORS ARE MOTORIZED UNLESS NOTED OTHERWISE.

SPECIAL NOTES:

1. MAGNETIC HOLD OPEN - REF. FIRE ALARM SHEETS.
2. MANUAL HOLD OPEN.
3. SOUND CONTROL DOOR ASSEMBLY (STC 50).
4. ACOUSTICALLY TREATED OPENING. PROVIDE CONTINUOUS PERIMETER FRAME SEALS, FLAT THRESHOLD, AND A COMPRESSION-TYPE DOOR BOTTOM SEAL, WHERE DOOR TYPE INDICATE GLAZING, PROVIDE SOUND CONTROL WINDOW ASSEMBLY (



1 FINISH PLAN - LEVEL 01 - AREA B
1/8" = 1'-0"

PLAN N

FINISH PLAN LEGEND

APPLIES TO SECTION PLANS

- ELEVATION REFERENCE
- CALLOUT REFERENCE
- SIM
- WALL SECTION REFERENCE
- B - HORIZONTAL BLINDS
  S - WINDOW SHADES
  SB - WINDOW SHADES - BLACKOUT
  SM - MOTORIZED SHADES
  SMB - MOTORIZED SHADES - BLACKOUT
- FLOOR INSTALLATION DIRECTION
- FLOOR TRANSITION
- WALL FINISH TAG
- EQUIPMENT TAG

FINISH REMARKS

NOTES APPLY TO ROOMS AS NOTED IN THE ROOM FINISH TAGS. SEE TAG LAYOUT ABOVE.

1. REF. INTERIOR ELEVATIONS FOR ADDITIONAL WALL FINISHES INFORMATION.
2. FRP PANEL BEHIND MOPSINK. REF. SHEET A1.31

FINISH PLAN GENERAL NOTES

1. ALL DIMENSIONS SHOW ON FINISH FLOOR PLAN DRAWINGS ARE FROM FACE OF FINISH, U.N.O.
2. PROVIDE **PNT** AND **TP** (WAINSCOT) WALL FINISHES AS DEFINED ABOVE AND DETAILED ON INTERIOR ELEVATIONS.
3. PROVIDE 3/8" MIN SEALANT JOINT WHERE FULL HT TILE MEETS GYP CLG (MATCH CLG COLOR) OR LAY-IN GRID (WHITE)
4. PROVIDE SEALANT JTS @ INSIDE CORNERS OF TILED WALLS
5. VERIFY EXACT FLOOR TILE PATTERN FOR ALL TOILET ROOMS. COORDINATE WITH ARCHITECT.
6. FLOOR FINISH TRANSITION TO BE LOCATED AT THE MIDDLE OF THE DOOR THRESHOLD.
7. WALLS BEARING THIS DESIGNATION SHALL HAVE CONCRETE CURBS IN LOCATIONS AS SHOWN ON THE PLAN. REF 15/A9.01 AND 16/A9.01 FOR DETAILS.
8. PROVIDE CORNER GUARDS AT ALL MAIN CORRIDOR WALKWAYS AT GYP BD CORNERS. REF. DTL. 18/A4.44 INSTALL RUBBER BASE CONTINUOUS OVER THE BOTTOM OF CORNER GUARDS.
9. PROVIDE CORNER GUARDS AT ALL TILED WALL OUTSIDE CORNERS. REF. DTL. 17/A4.44
10. AT ALL BLIND LOCATIONS PROVIDE PUSHPULL OPERATED, PROVIDE ADDITIONAL BLINDS AT ANY HORIZONTAL MULLION.
11. PROVIDE MOISTURE BASE GUARD TRIM AT ALL INTERIOR GYPSUM WALLS. REF. DTL. 11/A4.45
12. REFER TO DTL. 21/A4.44 AND 23/A4.44 FOR FLOOR TRANSITION THRESHOLD

ALL SCHEDULED WALL FINISH DIRECTIONS ARE DIRECTIONS PER PLAN NORTH OF THE FINISH PLANS, NOT TRUE NORTH OF THE PROJECT SITE

FINISH KEY

REFER TO G5.01 FOR ADDITIONAL INFORMATION REGARDING FINISH MATERIALS AND PAINT FINISH CODES.

CLASSROOM — ROOM NAME
025 — ROOM NUMBER

TYP FLOOR FINISH	LVT01
WALL BASE FINISH	BR01
TYP WALL FINISH	PNT01
REMARKS	1

*REMARKS NUMBERS COORDINATED WITH FINISH REMARKS LEGEND LOCATED ON ALL FINISH FLOOR PLAN SHEETS

REFER TO PROJECT SPECIFICATIONS SECTION 01 6210 FOR ADDITIONAL INFORMATION REGARDING FINISH MATERIALS AND PAINT FINISH CODES.

XY (MATERIAL TYPE) ## (FINISH COLOR AND MATERIAL SIZE AS NOTED IN SPEC. SECTION 01 6210)

ACMU - ARCHITECTURAL CONCRETE MASONRY UNIT
ACB - ACOUSTICAL CEILING BAFFLE
AL - ALUMINUM
AP - ACOUSTICAL PANELS
AWB - ACOUSTICAL WALL BAFFLE
AWC - ACOUSTICAL WALLCOVERING
BP - BASE, PORCELAIN TILE
BRES - BASE, RESINOUS INTEGRAL
BRK - BRICK
BR - BASE, RUBBER
BRV - BASE, RUBBER VENTED
BTC - BASE, TILE, CERAMIC
BTZ - BASE, TERRAZZO PRECAST
BWD - BASE, WOOD
CCPS - CERAMIC CLADDING PANEL SYSTEM
CDAP - CUSTOM DIGITALLY PRINTED ACOUSTIC PANEL
CDW - CUSTOM DIGITAL WALLCOVERINGS
CG - CORNER GUARD
COP - CONCRETE POLISHED
COS - CONCRETE SEALED
CPT - CARPET, SHEET
CS - CAST STONE
CSM - CONCRETE STONE MASONRY
CT - CARPET, TILED
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EPNT - EPOXY PAINT
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GFRC - GLASS FIBER REINFORCED CONCRETE
GRF - GROUND FACE CMU (BURNISHED)
LVT - LUXURY VINYL TILE
LWS - LINEAR WALL SYSTEM
MB - MARKER BOARD
MCM - METAL COMPOSITE MATERIAL
MP - METAL WALL PANEL
MS - METAL SOFFIT
NB - NO BASE
NS - NATURAL STONE
PL - PLASTIC LAMINATE
PLP - PLASTIC LAMINATE PANEL SYSTEM
PNT - PAINT
QTZ - QUARTZ SURFACING
RAFF - RESILIENT ATHLETIC FLUID FLOORING
RAFP - RESILIENT ATHLETIC FLOORING POLYURETHANE
RAFS - RUBBER FLOORING SHEET
RAFV - RESILIENT ATHLETIC FLOORING VINYL
RES - RESINOUS FLOORING
RT - RUBBER TILE
RTR - RUBBER TREADS
SPEC - SPECIAL FINISHES, REF. ROOM FINISH SCHEDULE & INTERIOR ELEVATIONS
SPF - SPLIT-FACE CONCRETE MASONRY UNIT
SSM - SOLID SURFACE MATERIAL
STG - STAGE CURTAIN
SVT - SOLID VINYL TILE
TB - TACK BOARD
TC - TILE, CERAMIC
TP - TILE, PORCELAIN
TQ - TILE, QUARRY
TS - TACKABLE SURFACE
TZ - TERRAZZO
TZP - TERRAZZO, PRECAST STAIR TREADS AND RISERS
TZT - TERRAZZO TILE
UP - UPHOLSTERY
VCT - TILE, VINYL, COMPOSITION
VSF - VINYL SHEET FLOORING
WMP - WOOD (MAPLE) STRIP AND PLANK FLOORING
WMS - MASONITE WOOD FLOORING
WOC - WALK-OFF CARPET
WP - WALL PADDING

(NOT ALL ABBREVIATIONS MAY BE USED)

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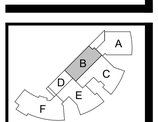
Revision / Date
1 08/07/26 ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

KEY PLAN - LEVEL 1
N.T.S.



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FINISH PLAN - LEVEL 01 - AREA B

VOLUME 01

Job No. 00802-04-01	Sheet No. A4.1B
Drawn By: MA, AS	
Date: 07.15.26	

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1 FINISH PLAN - LEVEL 01 - AREA E
1/8" = 1'-0"

FINISH PLAN LEGEND

APPLIES TO SECTION PLANS

- A1.1 / 1 — ELEVATION REFERENCE
- 1 / A1.1 — CALLOUT REFERENCE
- 1 / A101 — SIM WALL SECTION REFERENCE
- B — B - HORIZONTAL BLINDS; S - WINDOW SHADES; SB - WINDOW SHADES - BLACKOUT; SM - MOTORIZED SHADES; SMB - MOTORIZED SHADES - BLACKOUT
- FLOOR INSTALLATION DIRECTION
- FLOOR TRANSITION
- FINISH — WALL FINISH TAG
- 8' MB — EQUIPMENT TAG

FINISH REMARKS

NOTES APPLY TO ROOMS AS NOTED IN THE ROOM FINISH TAGS. SEE TAG LAYOUT ABOVE.

1. REF. INTERIOR ELEVATIONS FOR ADDITIONAL WALL FINISHES INFORMATION.
2. FRP PANEL BEHIND MOPSINK. REF. SHEET A1.31

FINISH PLAN GENERAL NOTES

1. ALL DIMENSIONS SHOW ON FINISH FLOOR PLAN DRAWINGS ARE FROM FACE OF FINISH, U.N.O.
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8. PROVIDE CORNER GUARDS AT ALL MAIN CORRIDOR WALKWAYS AT GYP BD CORNERS. REF. DTL. 18/A4.44 INSTALL RUBBER BASE CONTINUOUS OVER THE BOTTOM OF CORNER GUARDS.
9. PROVIDE CORNER GUARDS AT ALL TILED WALL OUTSIDE CORNERS. REF. DTL. 17/A4.44
10. AT ALL BLIND LOCATIONS PROVIDE PUSH/PULL OPERATED. PROVIDE ADDITIONAL BLINDS AT ANY HORIZONTAL MULLION.
11. PROVIDE MOISTURE BASE GUARD TRIM AT ALL INTERIOR GYPSUM WALLS. REF. DTL. 11/A4.45
12. REFER TO DTL. 21/A4.44 AND 23/A4.44 FOR FLOOR TRANSITION THRESHOLD

ALL SCHEDULED WALL FINISH DIRECTIONS ARE DIRECTIONS PER PLAN NORTH OF THE FINISH PLANS, NOT TRUE NORTH OF THE PROJECT SITE

REFER TO G5.01 FOR ADDITIONAL INFORMATION REGARDING FINISH MATERIALS AND PAINT FINISH CODES.

CLASSROOM — ROOM NAME
025 — ROOM NUMBER
TYP FLOOR FINISH — LVT01
WALL BASE FINISH — BR01
TYP WALL FINISH — PNT01
REMARKS — 1

*REMARKS NUMBERS COORDINATED WITH FINISH REMARKS LEGEND LOCATED ON ALL FINISH FLOOR PLAN SHEETS

REFER TO PROJECT SPECIFICATIONS SECTION 01 6210 FOR ADDITIONAL INFORMATION REGARDING FINISH MATERIALS AND PAINT FINISH CODES.

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AL - ALUMINUM

AP - ACOUSTICAL PANELS

AWB - ACOUSTICAL WALL BAFFLE

AWC - ACOUSTICAL WALLCOVERING

BP - BASE, PORCELAIN TILE

BRES - BASE, RESINOUS INTEGRAL

BRK - BRICK

BR - BASE, RUBBER

BRV - BASE, RUBBER VENTED

BTC - BASE, TILE, CERAMIC

BTZ - BASE, TERRAZZO PRECAST

BWD - BASE, WOOD

CCPS - CERAMIC CLADDING PANEL SYSTEM

CDAP - CUSTOM DIGITALLY PRINTED ACOUSTIC PANEL

CDW - CUSTOM DIGITAL WALLCOVERINGS

CG - CORNER GUARD

COP - CONCRETE POLISHED

COS - CONCRETE SEALED

CPT - CARPET, SHEET

CS - CAST STONE

CSM - CONCRETE STONE MASONRY

CT - CARPET, TILED

CWF - CUSTOM WINDOW FILM

EBWS - EPOXY BASED WALL SYSTEM

EPNT - EPOXY PAINT

FRP - FIBERGLASS REINFORCED PLASTIC PANEL SYSTEM

GFRC - GLASS FIBER REINFORCED CONCRETE

GRF - GROUND FACE CMU (BURNISHED)

LVT - LUXURY VINYL TILE

LWS - LINEAR WALL SYSTEM

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MP - METAL WALL PANEL

MS - METAL SOFFIT

NB - NO BASE

NS - NATURAL STONE

PL - PLASTIC LAMINATE

PLP - PLASTIC LAMINATE PANEL SYSTEM

PNT - PAINT

QTZ - QUARTZ SURFACING

RAFF - RESILIENT ATHLETIC FLUID FLOORING

RAFP - RESILIENT ATHLETIC FLOORING POLYURETHANE

RAFS - RUBBER FLOORING SHEET

RAFV - RESILIENT ATHLETIC FLOORING VINYL

RES - RESINOUS FLOORING

RT - RUBBER TILE

RTR - RUBBER TREADS

SPEC - SPECIAL FINISHES, REF. ROOM FINISH SCHEDULE & INTERIOR ELEVATIONS

SPF - SPLIT-FACE CONCRETE MASONRY UNIT

SSM - SOLID SURFACE MATERIAL

STG - STAGE CURTAIN

SVT - SOLID VINYL TILE

TB - TACK BOARD

TC - TILE, CERAMIC

TP - TILE, PORCELAIN

TQ - TILE, QUARRY

TS - TACKABLE SURFACE

TZ - TERRAZZO

TZP - TERRAZZO, PRECAST STAIR TREADS AND RISERS

TZT - TERRAZZO TILE

UP - UPHOLSTERY

VCT - TILE, VINYL COMPOSITION

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WOC - WALK-OFF CARPET

WP - WALL PADDING

(NOT ALL ABBREVIATIONS MAY BE USED)

FINISH KEY

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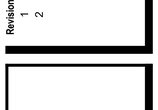
Revision /	Date	
1	07/24/26	ADDENDUM 01
2	08/07/26	ADDENDUM 02

Project:

TOMBALL INTERMEDIATE SCHOOL REPLACEMENT FOR TOMBALL INDEPENDENT SCHOOL DISTRICT TOMBALL, TEXAS

KEY PLAN - LEVEL 1
N.T.S.



08/07/2026

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FINISH PLAN - LEVEL 01 - AREA E

VOLUME 01

Job No.	Sheet No.
00802-04-01	A4.1E
Drawn By: MA, AS	
Date: 07.15.26	

PLAN
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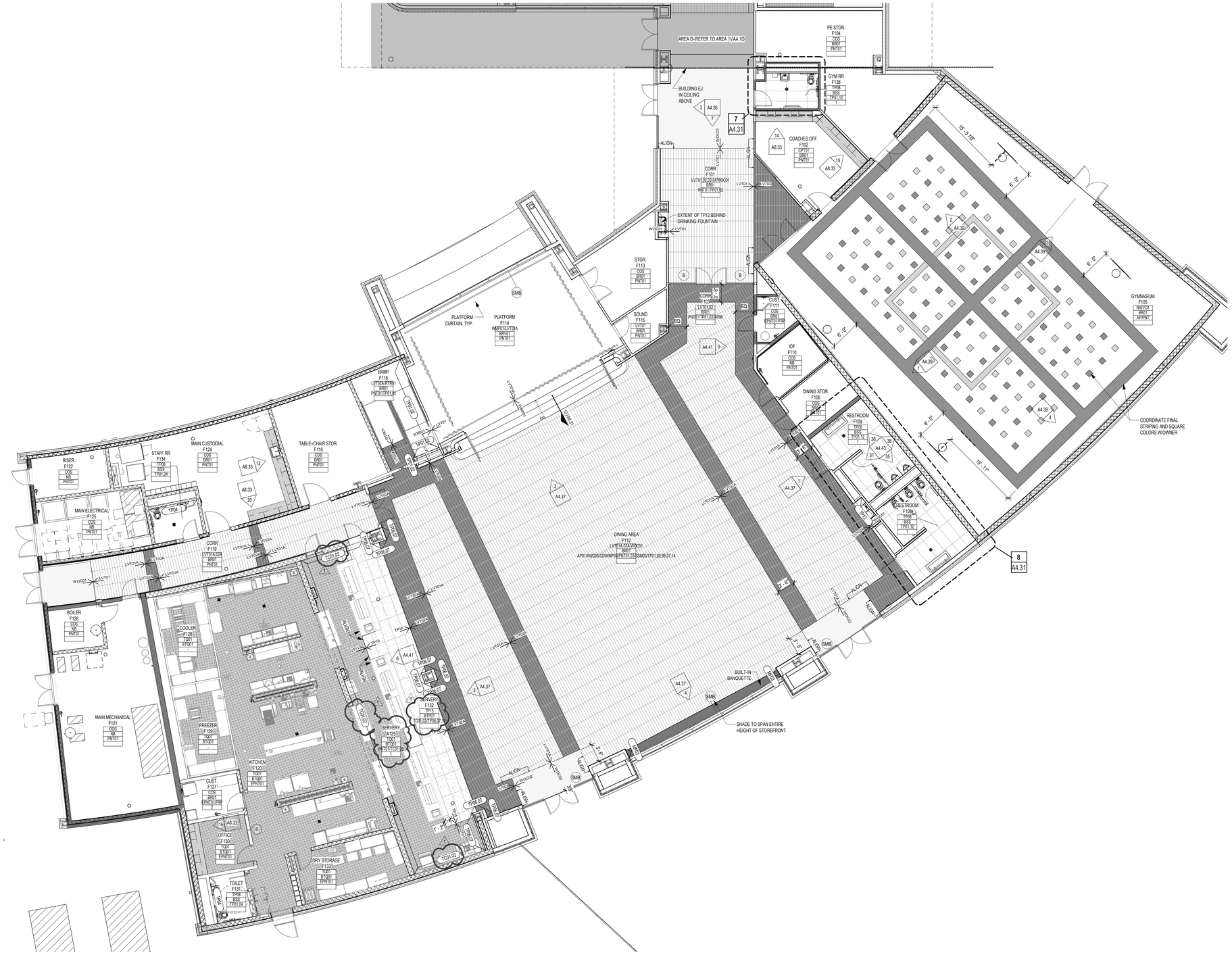

1 FINISH PLAN - LEVEL 01 - AREA F
1/8" = 1'-0"

PLAN NORTH

FINISH PLAN LEGEND

APPLIES TO SECTION PLANS

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- 1 / A1.1 — CALLOUT REFERENCE
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FINISH REMARKS

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MB - MARKER BOARD
MCM - METAL COMPOSITE MATERIAL
MP - METAL WALL PANEL
MS - METAL SOFFIT
NB - NO BASE
NS - NATURAL STONE
PL - PLASTIC LAMINATE
PLP - PLASTIC LAMINATE PANEL SYSTEM
PNT - PAINT
QTZ - QUARTZ SURFACING
RAFF - RESILIENT ATHLETIC FLUID FLOORING
RAFP - RESILIENT ATHLETIC FLOORING POLYURETHANE
RAFS - RUBBER FLOORING SHEET
RAFV - RESILIENT ATHLETIC FLOORING VINYL
RES - RESINOUS FLOORING
RT - RUBBER TILE
RTR - RUBBER TREADS
SPEC - SPECIAL FINISHES, REF. ROOM FINISH SCHEDULE & INTERIOR ELEVATIONS
SPF - SPLIT-FACE CONCRETE MASONRY UNIT
SSM - SOLID SURFACE MATERIAL
STG - STAGE CURTAIN
SVT - SOLID VINYL TILE
TB - TACK BOARD
TC - TILE, CERAMIC
TP - TILE, PORCELAIN
TQ - TILE, QUARRY
TS - TACKABLE SURFACE
TZ - TERRAZZO
TZP - TERRAZZO, PRECAST STAIR TREADS AND RISERS
TZT - TERRAZZO TILE
UP - UPHOLSTERY
VCT - TILE, VINYL COMPOSITION
VSF - VINYL SHEET FLOORING
WMP - WOOD (MAPLE) STRIP AND PLANK FLOORING
WMS - MASONITE WOOD FLOORING
WOC - WALK-OFF CARPET
WP - WALL PADDING

(NOT ALL ABBREVIATIONS MAY BE USED)

Revision /	Date	
1	08/07/26	ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

KEY PLAN - LEVEL 1
N.T.S.

REGISTERED ARCHITECT — CAITLIN MUNSON — STATE OF TEXAS — 33915
08/07/2026

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800.687.1229

FINISH PLAN - LEVEL 01 - AREA F

VOLUME 01

Job No.	Sheet No.
0/0802-04-01	A4.1F
Drawn By: MA, AS	
Date: 07.15.26	

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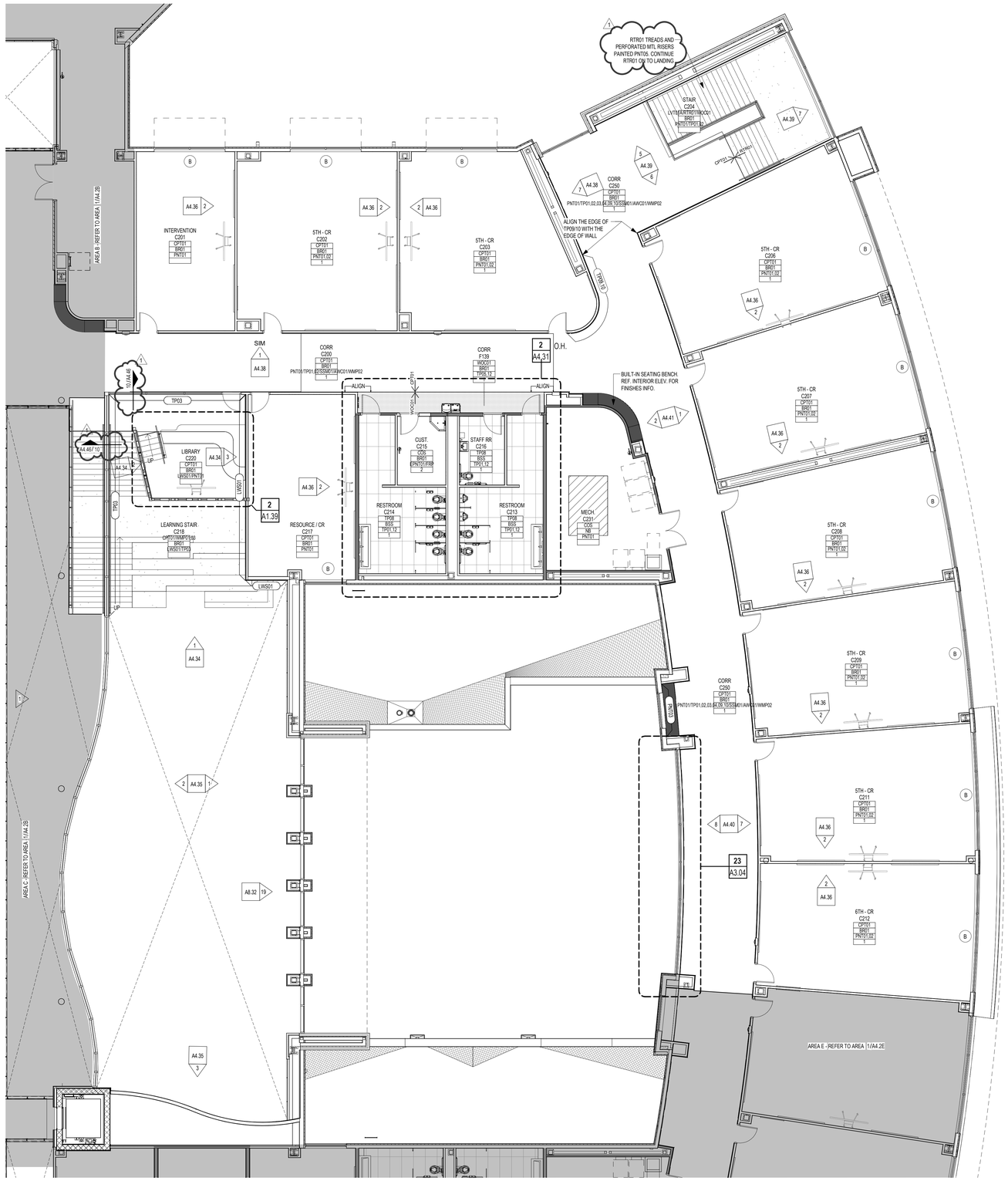

1 FINISH PLAN - LEVEL 02 - AREA C
1/8" = 1'-0"

PLAN N

FINISH PLAN LEGEND

APPLIES TO SECTION PLANS

- A1.1 / 1 — ELEVATION REFERENCE
- 1 / A1.1 — CALLOUT REFERENCE
- SIIM 1 / A101 — WALL SECTION REFERENCE
- B — B - HORIZONTAL BLINDS; S - WINDOW SHADES; SB - WINDOW SHADES - BLACKOUT; SM - MOTORIZED SHADES; SMB - MOTORIZED SHADES - BLACKOUT
- FLOOR INSTALLATION DIRECTION
- FLOOR TRANSITION
- FINISH — WALL FINISH TAG
- 8' MB — EQUIPMENT TAG

FINISH REMARKS

NOTES APPLY TO ROOMS AS NOTED IN THE ROOM FINISH TAGS. SEE TAG LAYOUT ABOVE.

1. **REF. INTERIOR ELEVATIONS FOR ADDITIONAL WALL FINISHES INFORMATION.**
2. **FRP PANEL BEHIND MOPSINK. REF. SHEET A1.31**

FINISH PLAN GENERAL NOTES

1. ALL DIMENSIONS SHOW ON FINISH FLOOR PLAN DRAWINGS ARE FROM FACE OF FINISH, U.N.O.
2. PROVIDE **PNT** AND **TP** (WAINSCOT) WALL FINISHES AS DEFINED ABOVE AND DETAILED ON INTERIOR ELEVATIONS.
3. PROVIDE 3/8" MIN SEALANT JOINT WHERE FULL HT TILE MEETS GYP CLG (MATCH CLG COLOR) OR LAY-IN GRID (WHITE)
4. PROVIDE SEALANT JTS @ INSIDE CORNERS OF TILED WALLS
5. VERIFY EXACT FLOOR TILE PATTERN FOR ALL TOILET ROOMS. COORDINATE WITH ARCHITECT.
6. FLOOR FINISH TRANSITION TO BE LOCATED AT THE MIDDLE OF THE DOOR THRESHOLD.
7. WALLS BEARING THIS DESIGNATION SHALL HAVE CONCRETE CURBS IN LOCATIONS AS SHOWN ON THE PLAN. REF 15/A9.01 AND 16/A9.01 FOR DETAILS.
8. PROVIDE CORNER GUARDS AT ALL MAIN CORRIDOR WALKWAYS AT GYP BD CORNERS. REF. DTL. 18/A4.44 INSTALL RUBBER BASE CONTINUOUS OVER THE BOTTOM OF CORNER GUARDS.
9. PROVIDE CORNER GUARDS AT ALL TILED WALL OUTSIDE CORNERS. REF. DTL. 17/A4.44
10. AT ALL BLIND LOCATIONS PROVIDE PUSH/PULL OPERATED. PROVIDE ADDITIONAL BLINDS AT ANY HORIZONTAL MULLION.
11. PROVIDE MOISTURE BASE GUARD TRIM AT ALL INTERIOR GYPSUM WALLS. REF. DTL. 11/A4.45
12. REFER TO DTL. 21/A4.44 AND 23/A4.44 FOR FLOOR TRANSITION THRESHOLD

ALL SCHEDULED WALL FINISH DIRECTIONS ARE DIRECTIONS PER PLAN NORTH OF THE FINISH PLANS, NOT TRUE NORTH OF THE PROJECT SITE

FINISH KEY

REFER TO G5.01 FOR ADDITIONAL INFORMATION REGARDING FINISH MATERIALS AND PAINT FINISH CODES.

CLASSROOM — ROOM NAME
025 — ROOM NUMBER
TYP FLOOR FINISH — LVT01
WALL BASE FINISH — BR01
TYP WALL FINISH — PNT01
REMARKS — 1

*REMARKS NUMBERS COORDINATED WITH FINISH REMARKS LEGEND LOCATED ON ALL FINISH FLOOR PLAN SHEETS

REFER TO PROJECT SPECIFICATIONS SECTION 01 6210 FOR ADDITIONAL INFORMATION REGARDING FINISH MATERIALS AND PAINT FINISH CODES.

XY ## — XY: MATERIAL TYPE; ##: FINISH COLOR AND MATERIAL SIZE AS NOTED IN SPEC. SECTION 01 6210

ACMU - ARCHITECTURAL CONCRETE MASONRY UNIT
ACB - ACOUSTICAL CEILING BAFFLE
AL - ALUMINUM
AP - ACOUSTICAL PANELS
AWB - ACOUSTICAL WALL BAFFLE
AWC - ACOUSTICAL WALLCOVERING
BP - BASE, PORCELAIN TILE
BRES - BASE, RESINOUS INTEGRAL
BRK - BRICK
BR - BASE, RUBBER
BRV - BASE, RUBBER VENTED
BTC - BASE, TILE, CERAMIC
BTZ - BASE, TERRAZZO PRECAST
BWD - BASE, WOOD
CCPS - CERAMIC CLADDING PANEL SYSTEM
CDAP - CUSTOM DIGITALLY PRINTED ACOUSTIC PANEL
CDW - CUSTOM DIGITAL WALLCOVERINGS
CG - CORNER GUARD
COP - CONCRETE POLISHED
COS - CONCRETE SEALED
CPT - CARPET, SHEET
CS - CAST STONE
CSM - CONCRETE STONE MASONRY
CT - CARPET, TILED
CWF - CUSTOM WINDOW FILM
EBWS - EPOXY BASED WALL SYSTEM
EPNT - EPOXY PAINT
FRP - FIBERGLASS REINFORCED PLASTIC PANEL SYSTEM
GFRC - GLASS FIBER REINFORCED CONCRETE
GRF - GROUND FACE CMU (BURNISHED)
LVT - LUXURY VINYL TILE
LWS - LINEAR WALL SYSTEM
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VCT - TILE, VINYL, COMPOSITION
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WOC - WALK-OFF CARPET
WP - WALL PADDING

(NOT ALL ABBREVIATIONS MAY BE USED)

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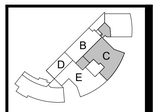
Revision / 1 — Date 08/07/26 — ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS



KEY PLAN - LEVEL 2
N.T.S.

REGISTERED ARCHITECT CURTIS MUNN STATE OF TEXAS 29161
08/07/2026

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FINISH PLAN - LEVEL 02 - AREA C

VOLUME 01

Job No. 00802-04-01	Sheet No. A4.2C
Drawn By: MA, AS	
Date: 07.15.26	

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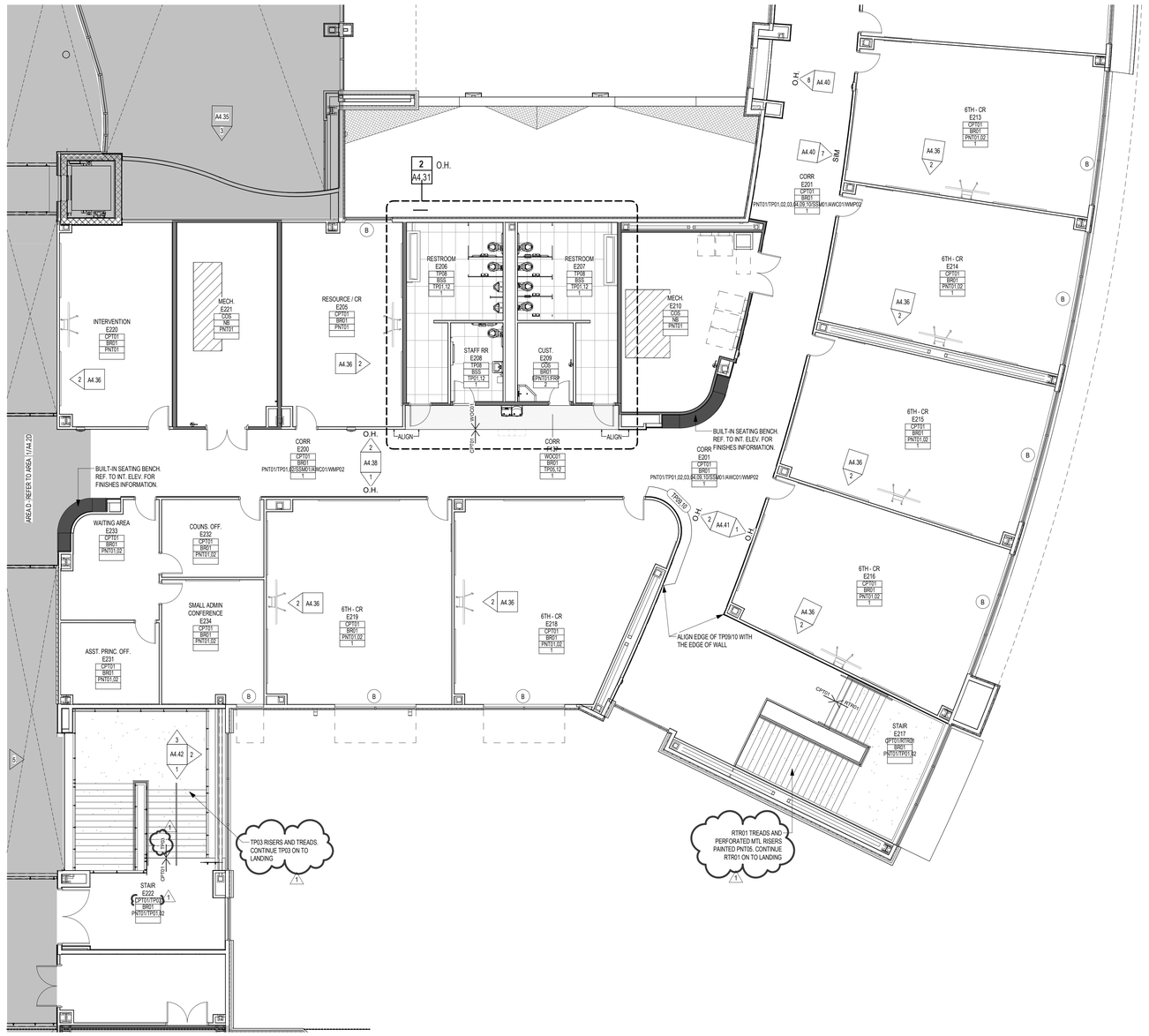

1 FINISH PLAN - LEVEL 02 - AREA E
1/8" = 1'-0"

A1.1 1 ELEVATION REFERENCE

1 A1.1 CALLOUT REFERENCE

SIM

1 A101 WALL SECTION REFERENCE

B
B - HORIZONTAL BLINDS
S - WINDOW SHADES
SB - WINDOW SHADES - BLACKOUT
SM - MOTORIZED SHADES
SMB - MOTORIZED SHADES - BLACKOUT

FLOOR INSTALLATION DIRECTION

FLOOR TRANSITION

FINISH WALL FINISH TAG

8' MB EQUIPMENT TAG

FINISH PLAN LEGEND

APPLIES TO SECTION PLANS

NOTES APPLY TO ROOMS AS NOTED IN THE ROOM FINISH TAGS. SEE TAG LAYOUT ABOVE.

1. **REF. INTERIOR ELEVATIONS FOR ADDITIONAL WALL FINISHES INFORMATION.**
2. **FRP PANEL BEHIND MOPSINK. REF. SHEET A1.31**

FINISH REMARKS

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WALL BASE FINISH — BR01
TYP WALL FINISH — PNT01
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— FINISH COLOR AND MATERIAL SIZE AS NOTED IN SPEC. SECTION 01 6210

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WOC - WALK-OFF CARPET
WP - WALL PADDING

(NOT ALL ABBREVIATIONS MAY BE USED)

FINISH KEY

PLAN N

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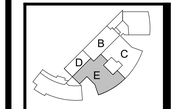
Revision / 1 — Date 08/07/26 — ADDENDUM 02

Project: TOMBALL INTERMEDIATE SCHOOL REPLACEMENT FOR TOMBALL INDEPENDENT SCHOOL DISTRICT TOMBALL, TEXAS

KEY PLAN - LEVEL 2
N.T.S.



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FINISH PLAN - LEVEL 02 - AREA E

VOLUME 01

Job No.	Sheet No.
00802-04-01	A4.2E
Drawn By: MA, AS	
Date: 07.15.26	

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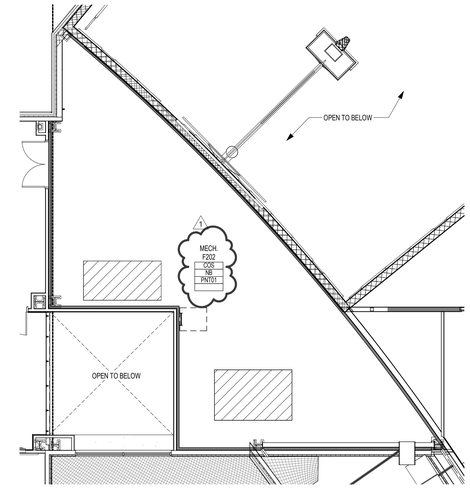
Revision /	Date	
1	08/07/26	ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS



1 FINISH PLAN - LEVEL 02 - AREA F EQUIPMENT PLAN
1/8" = 1'-0"

REGISTERED ARCHITECT
CAITLIN MUNCH
29951
STATE OF TEXAS
08/07/2026

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FINISH PLAN - EQUIPMENT PLATFORMS

VOLUME 01

Job No.	Sheet No.
00802-04-01	A4.30
Drawn By: MA, AS	
Date: 07.15.26	

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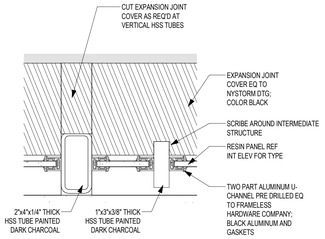
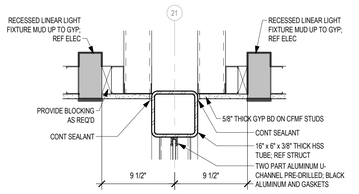
XXX **EQUIPMENT NUMBER**
REF. SCHEDULE ON A6 SHTS. FOR DESCRIPTION

COMMENTS:
1. REF. A6 EQUIPMENT PLANS FOR ALL EQUIPMENT TYPES AND SCHEDULES.

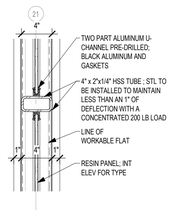
INTERIOR ELEVATION LEGEND



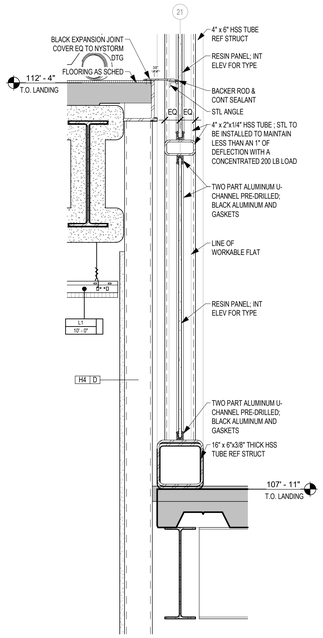
10 PLAN DETAIL - EXPANSION COVER AT SCREEN
3" = 1'-0" BACK REF: A1.39



9 DETAIL - SCREEN AT HEADER
1 1/2" = 1'-0" BACK REF: A4.34



8 SECTION DETAIL - HORIZONTAL MULLION
1 1/2" = 1'-0" BACK REF: A4.34



7 DETAIL- SLAB AT SCREEN
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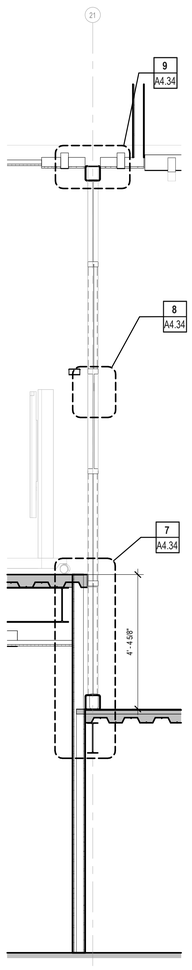
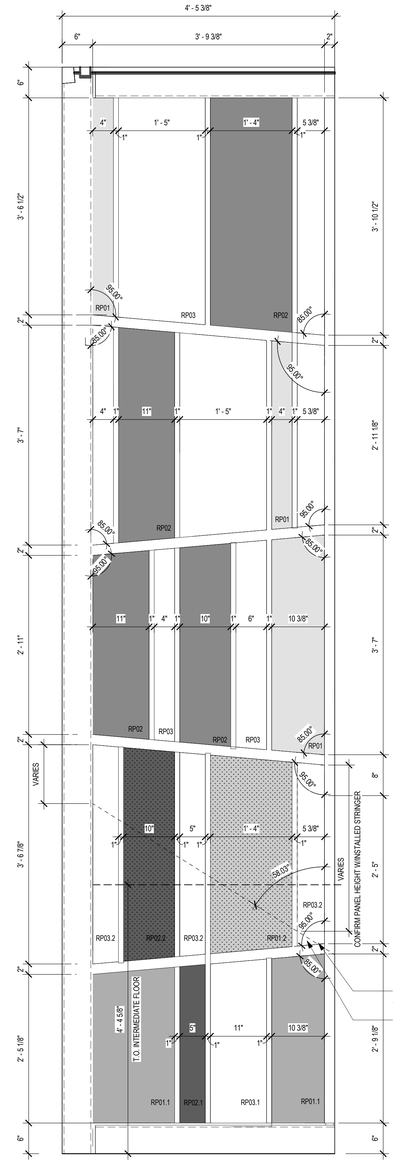
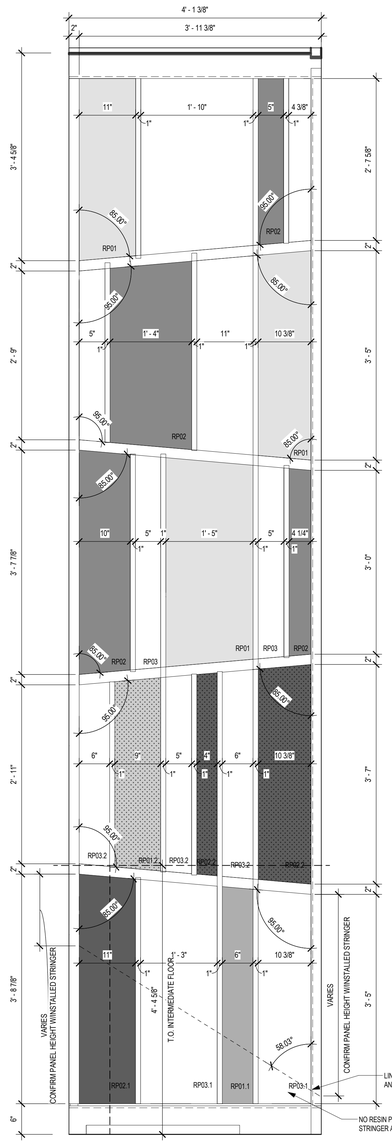


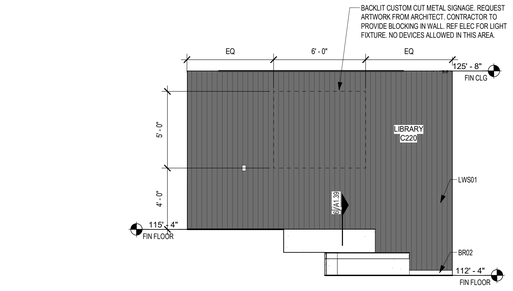
6 WALL SECTION AT SCREEN
1/2" = 1'-0"



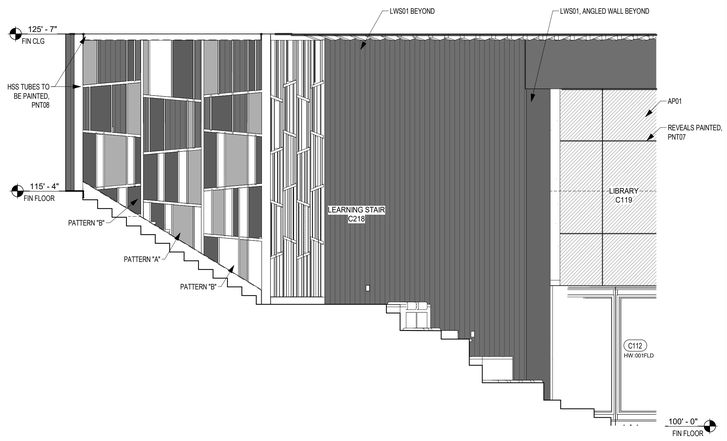
5 ENLARGED SCREEN PATTERN A
1" = 1'-0"



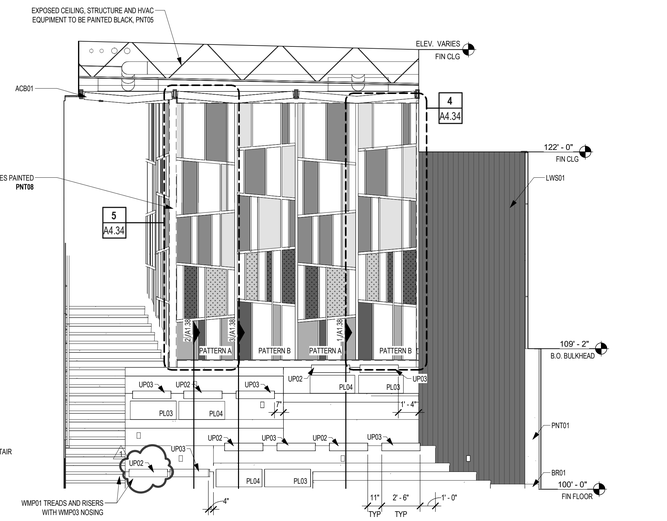
4 ENLARGED SCREEN PATTERN B
1" = 1'-0"



3 INTERIOR ELEVATION
1/4" = 1'-0"



2 INTERIOR ELEVATION
1/4" = 1'-0"



1 INTERIOR ELEVATION - LIBRARY - NORTH
1/4" = 1'-0"

Revision /	1
Date	08/07/26
	ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

REGISTERED ARCHITECT
CAITLIN MUNOZ
29453
STATE OF TEXAS
08/07/2026

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INTERIOR ELEVATIONS
VOLUME 01

Job No. 00802-04-01	Sheet No. A4.34
Drawn By: MA	
Date: 07.15.26	

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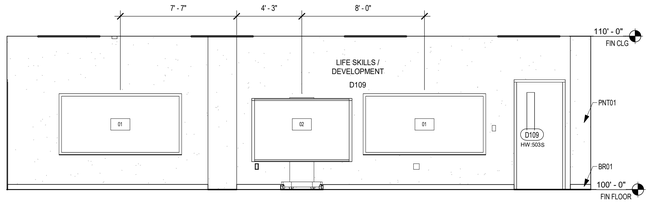
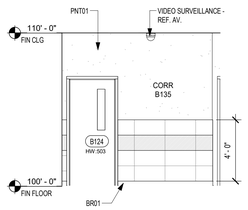
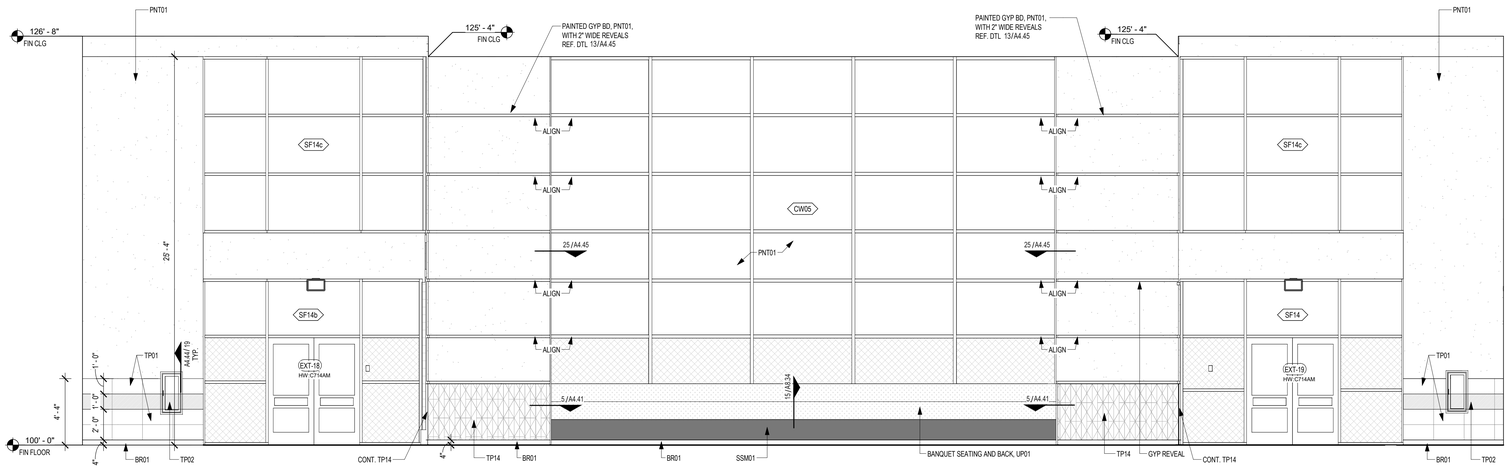


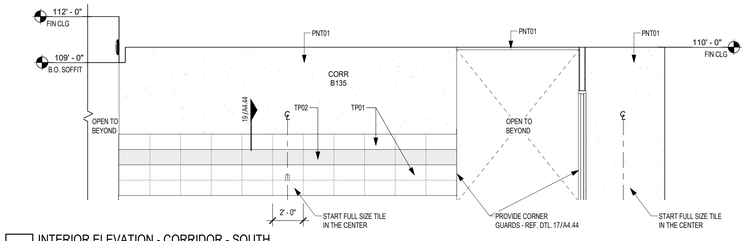
8 INTERIOR ELEVATION - TEACHING WALL
1/4" = 1'-0"



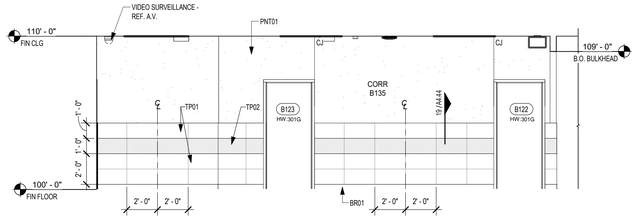
7 INTERIOR ELEVATION - CORRIDOR - WEST
1/4" = 1'-0"



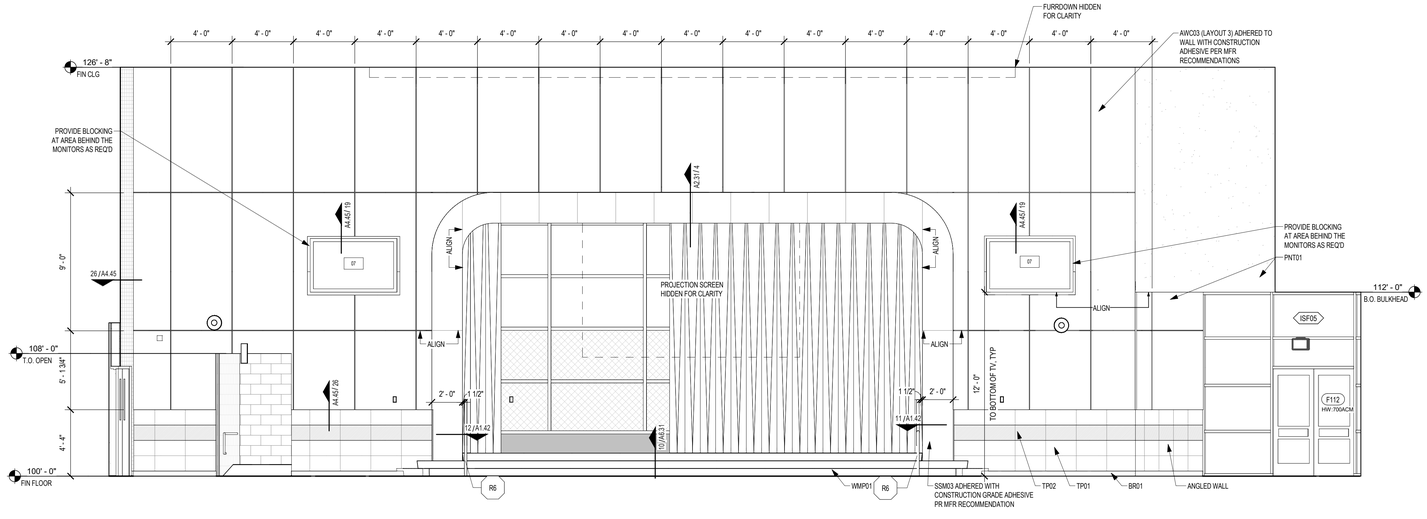
4 INTERIOR ELEVATION - DINING - SOUTH
1/4" = 1'-0"



6 INTERIOR ELEVATION - CORRIDOR - SOUTH
1/4" = 1'-0"



5 INTERIOR ELEVATION - CORRIDOR - NORTH
1/4" = 1'-0"



3 INTERIOR ELEVATION - DINING AT STAGE
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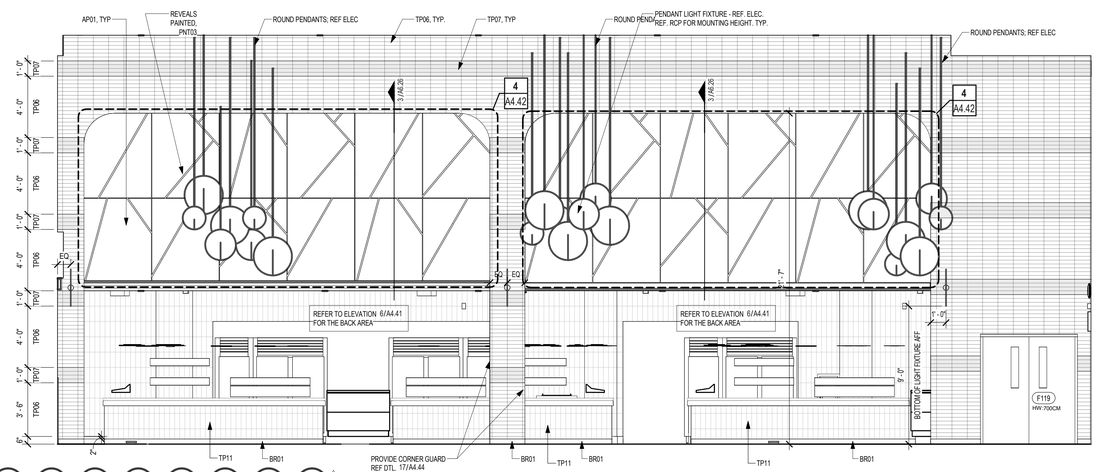
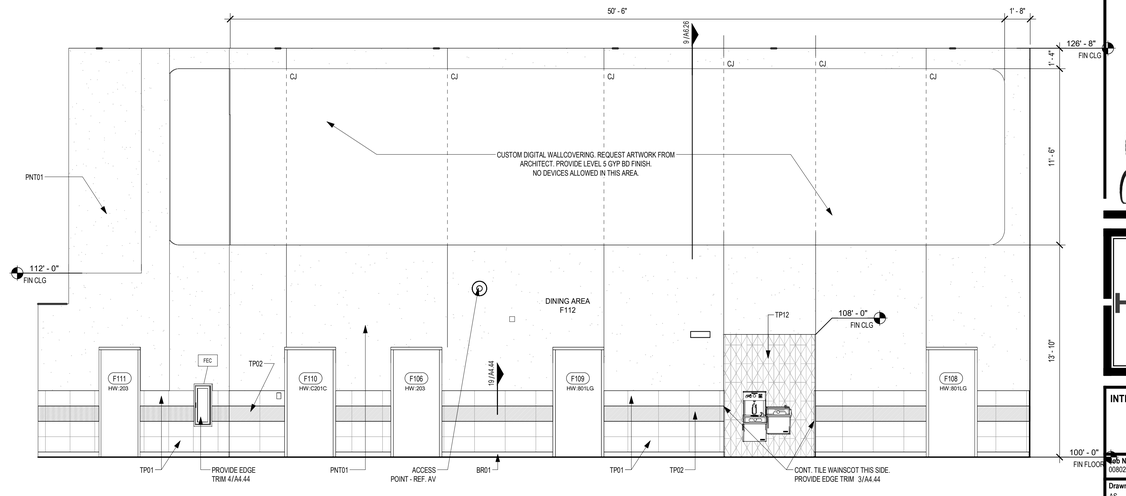


2 INTERIOR ELEVATION - DINING AT SERVING LINE
1/4" = 1'-0"



1 INTERIOR ELEVATION - DINING - EAST
1/4" = 1'-0"

Revision / 1 — Date 08/07/26 — ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

REGISTERED ARCHITECT
CAITLIN MUNSON
STATE OF TEXAS
08/07/2026

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INTERIOR ELEVATIONS
VOLUME 01

Huck No. 20802-04-01
Drawn By: AS
Date: 07.15.26
Sheet No. A4.37

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Autodesk Docs://TOMBALL ISD - IS REPLACEMENT/20802-04-01 Tomball ISD IS Replacement_ARCH.rvt

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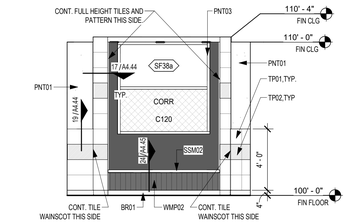
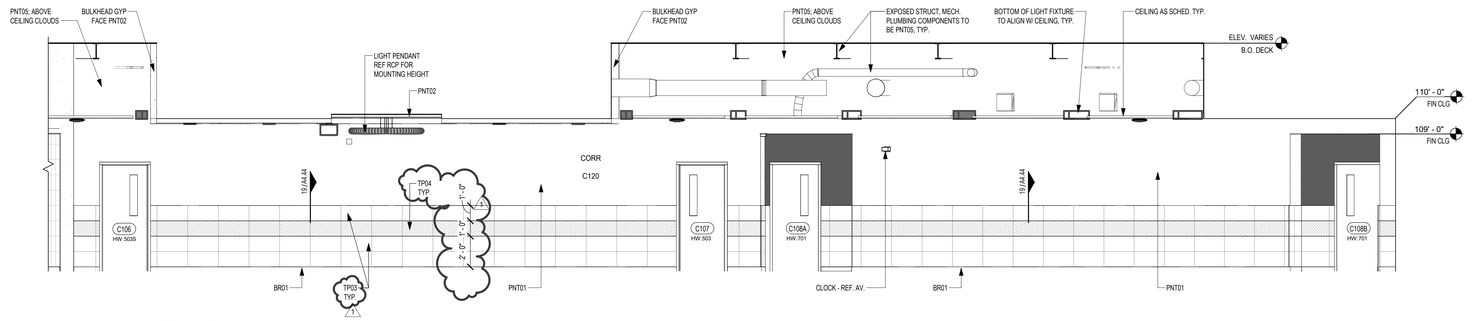
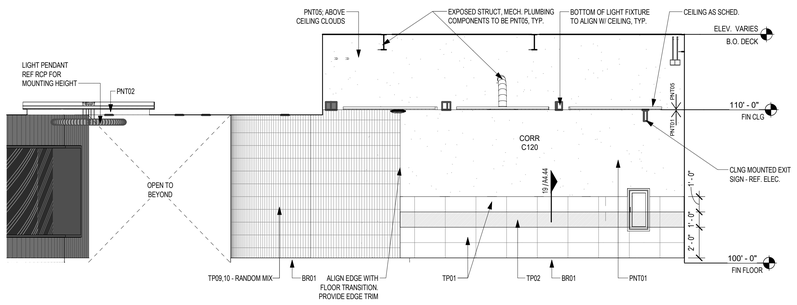


9 INTERIOR ELEVATION - BENCH AT CORRIDOR
1/4" = 1'-0"



8 INTERIOR ELEVATION - CORRIDOR - EAST
1/4" = 1'-0"



7 INTERIOR ELEVATION - CORRIDOR - WEST
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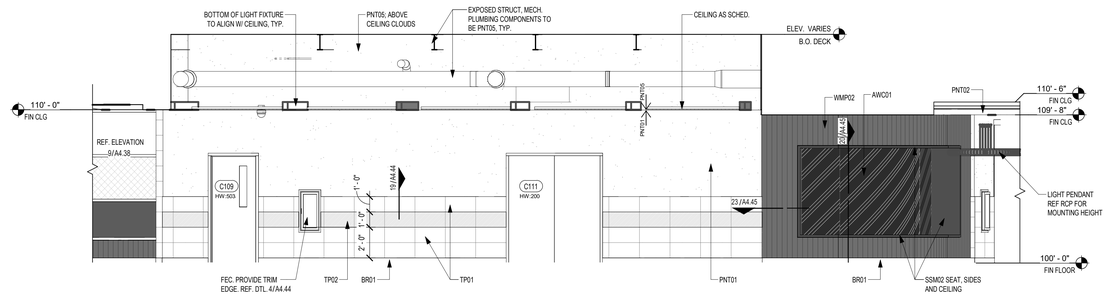
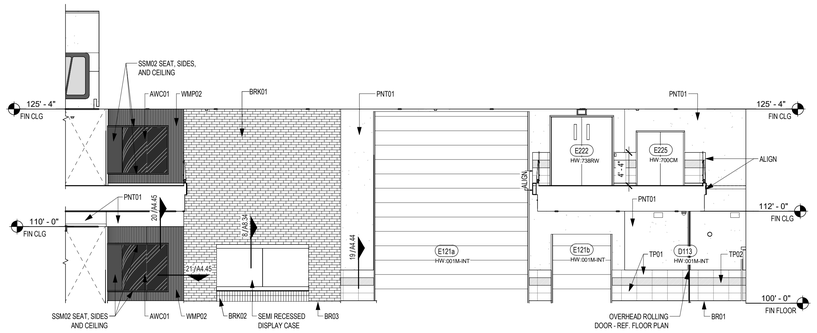
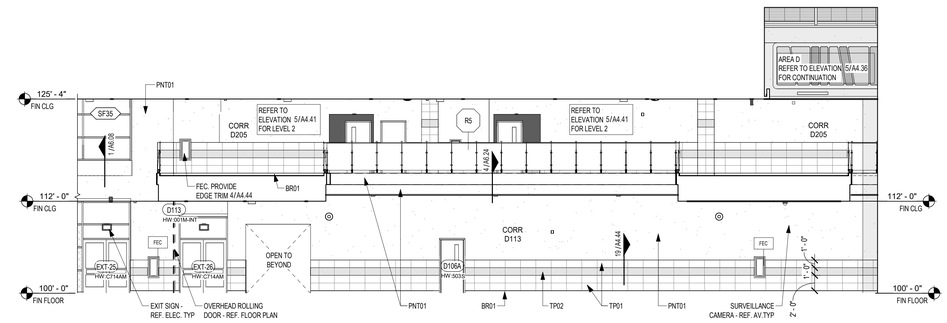


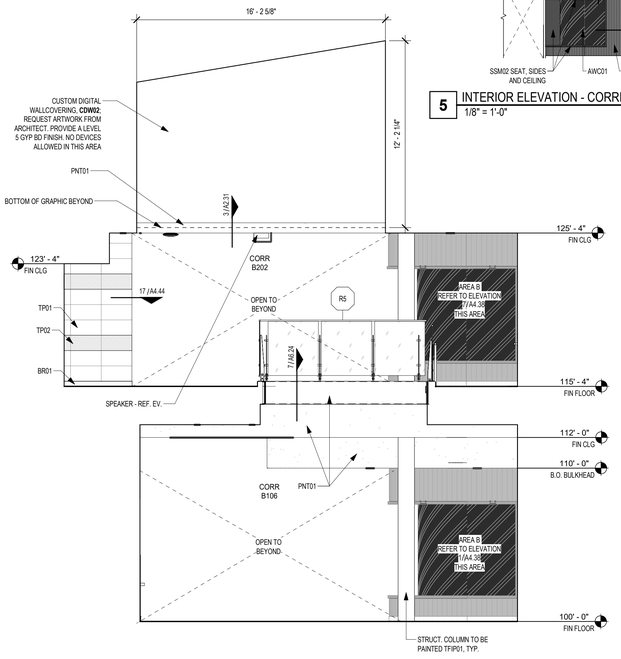
6 INTERIOR ELEVATION - CORRIDOR - EAST
1/4" = 1'-0"



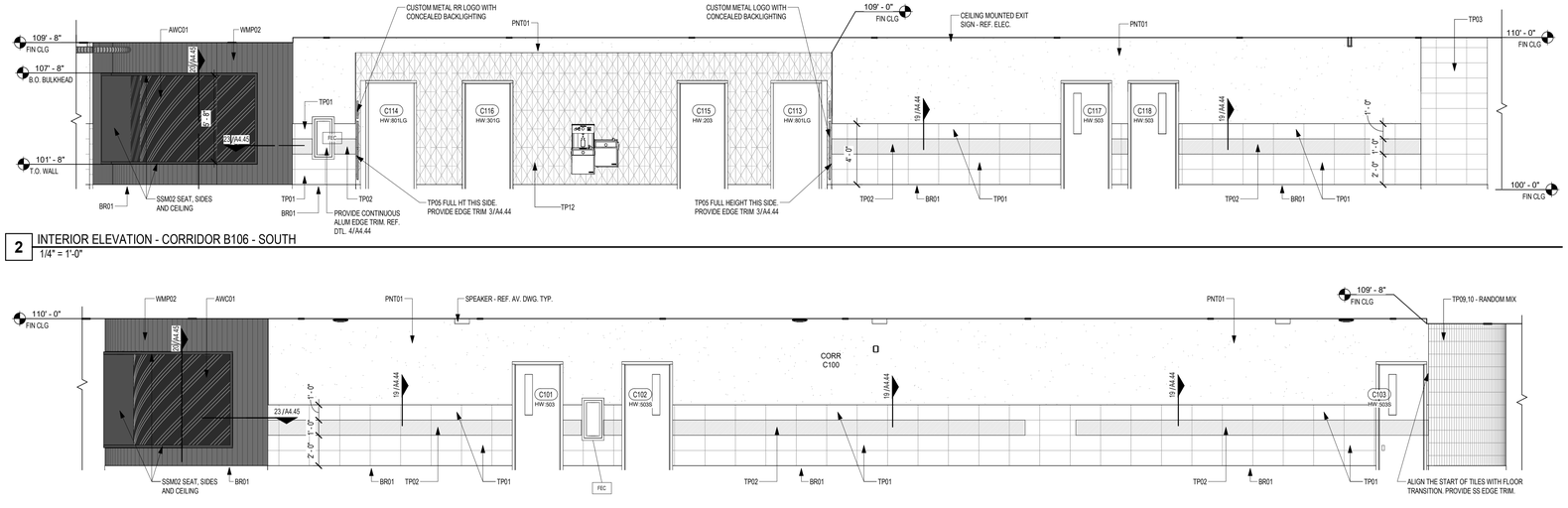
5 INTERIOR ELEVATION - CORRIDOR - EAST
1/8" = 1'-0"



4 INTERIOR ELEVATION - CORRIDOR - WEST
1/8" = 1'-0"



3 INTERIOR ELEVATION - CORRIDOR - NORTH
1/4" = 1'-0"



2 INTERIOR ELEVATION - CORRIDOR B106 - SOUTH
1/4" = 1'-0"

1 INTERIOR ELEVATION - CORRIDOR 106 - NORTH
1/4" = 1'-0"

Revision / Date
1 08/07/26 ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

REGISTERED ARCHITECT
CAITLIN M. HUDSON
29154
STATE OF TEXAS
08/07/2026

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INTERIOR ELEVATIONS
VOLUME 01

Job No. 03802-04-01	Sheet No. A4.38
Drawn By: AS	
Date: 07.15.26	

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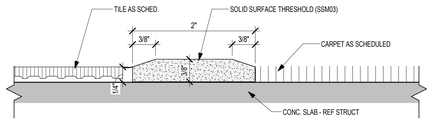
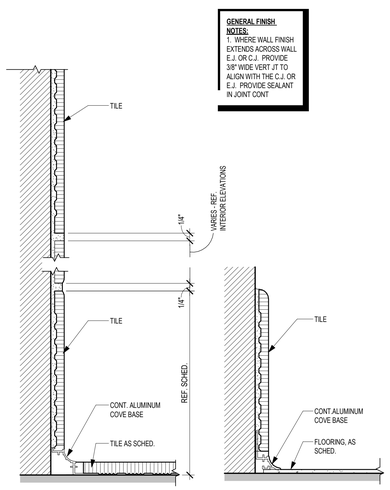
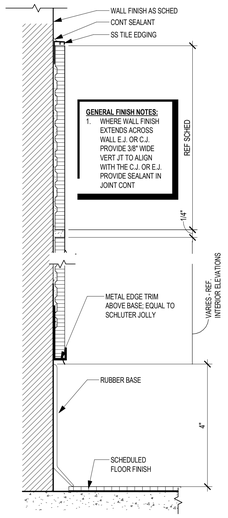


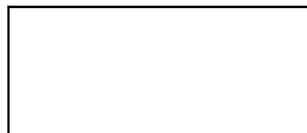
23 TRANSITION - SOLID SURFACE THRESHOLD - TILE TO RESILIENT
12" = 1'-0"



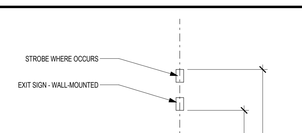
20 TYP. TILE ALUMINUM COVE BASE
6" = 1'-0"



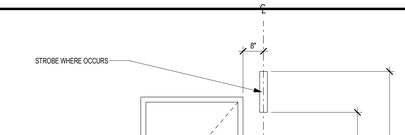
19 RUBBER BASE W/ TILE WAINSCOT
6" = 1'-0"



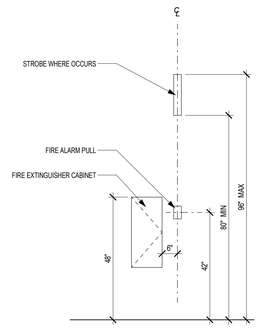
LOCATIONS AT CORNERS



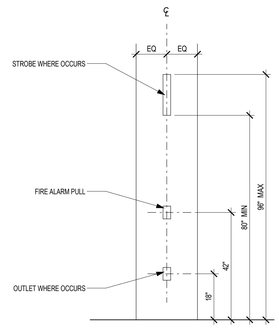
LOCATIONS AT WALL-MOUNTED EXIT SIGNS



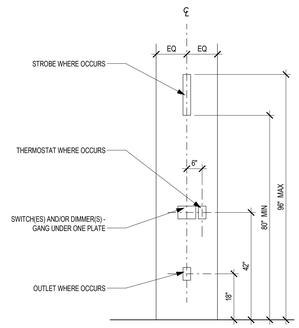
LOCATIONS AT DOOR JAMB - CARD READERS, ETC.



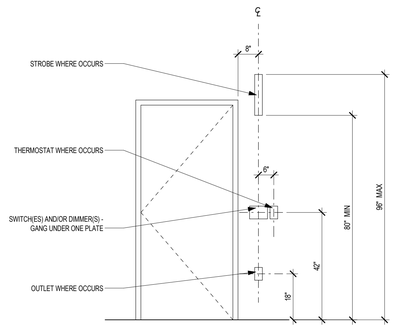
LOCATIONS AT FIRE EXTINGUISHER CABINET



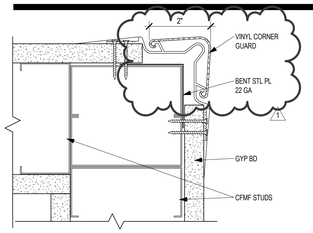
LOCATIONS AT COLUMNS & BETWEEN DOORS - FIRE ALARM PULLS



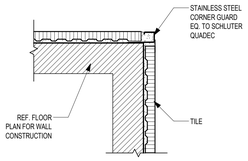
LOCATIONS AT COLUMNS & BETWEEN DOORS - SWITCHES



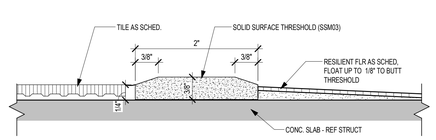
LOCATIONS AT DOOR JAMB - SWITCHES



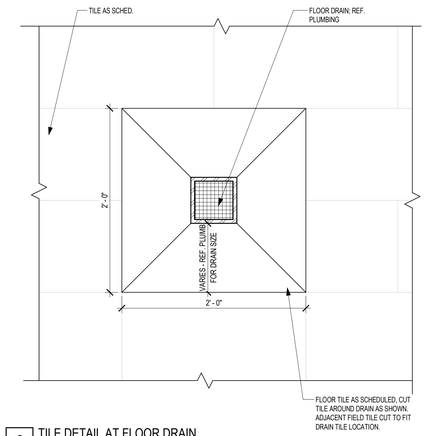
18 VINYL CORNER GUARD - FLUSH
6" = 1'-0"



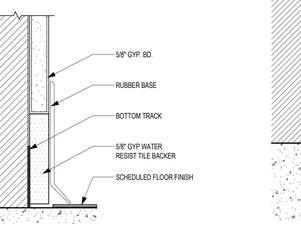
17 TYP TILE CORNER DETAIL
6" = 1'-0"



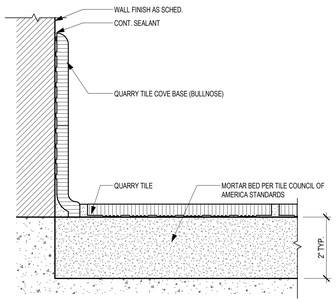
21 TRANSITION - SOLID SURFACE THRESHOLD - TILE TO RESILIENT
12" = 1'-0"



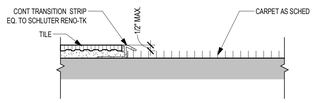
6 TILE DETAIL AT FLOOR DRAIN
1 1/2" = 1'-0"



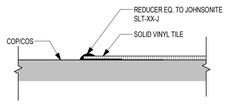
16 TYPICAL DRYWALL DETAIL @ BASE
6" = 1'-0"



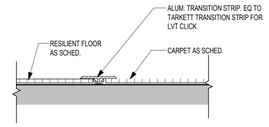
15 TYP QUARRY TILE BASE - THICK SET
6" = 1'-0"



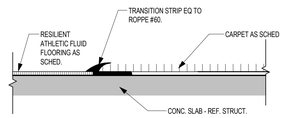
14 TRANSITION - CARPET TO TILE
6" = 1'-0"



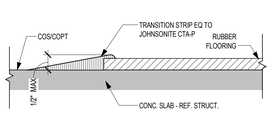
13 TRANSITION - VINYL TILE TO CONC
6" = 1'-0"



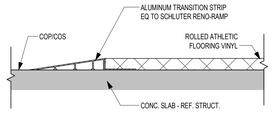
12 ALUMINUM TRANSITION - CARPET TO RESILIENT
6" = 1'-0"



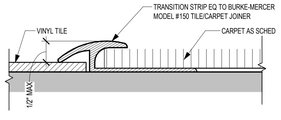
9 RUBBER TRANSITION - CARPET TO RESILIENT
6" = 1'-0"



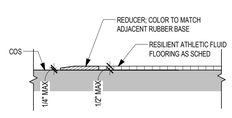
11 TRANSITION - RUBBER TO CONC
6" = 1'-0"



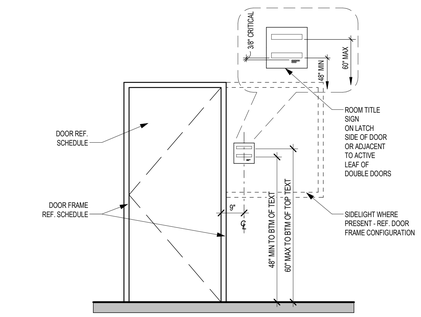
10 TRANSITION - RAFV TO CONC
6" = 1'-0"



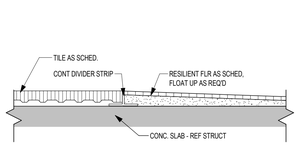
8 TRANSITION - CARPET TO VINYL TILE
6" = 1'-0"



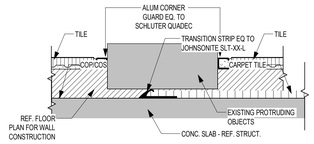
7 TRANSITION - RESILIENT TO CONC
6" = 1'-0"



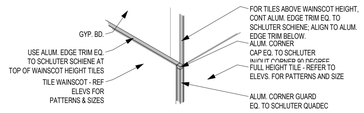
1 TYP SIGNAGE LOCATION
1/2" = 1'-0"



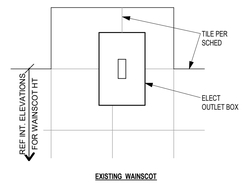
5 TRANSITION STRIP - TILE TO RESILIENT
12" = 1'-0"



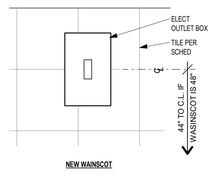
4 TYP TILE DETAIL @ EXIST PROTRUDING OBJECTS
6" = 1'-0"



3 TYP. ISOMETRIC OF ALUM. TRIM @ WAINSCOT TILE TO FULL HEIGHT TILE
1 1/2" = 1'-0"



EXISTING WAINSCOT



NEW WAINSCOT

2 TYP OUTLET @ WAINSCOT
3" = 1'-0"

Date 08/07/26
Revision / 1 ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

REGISTERED ARCHITECT CAITLIN MUNN 29161 STATE OF TEXAS
08/07/2026

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INTERIOR DETAILS AND TYPICAL INTERIOR FINISH DETAILS

VOLUME 01

Job No. 00802-04-01
Sheet No. A4.44
Drawn By: MA, AS
Date: 07.15.26

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Autodesk Docs://TOMBALL ISD - IS REPLACEMENT/00802-04-01 Tomball ISD IS Replacement_ARCH.rvt

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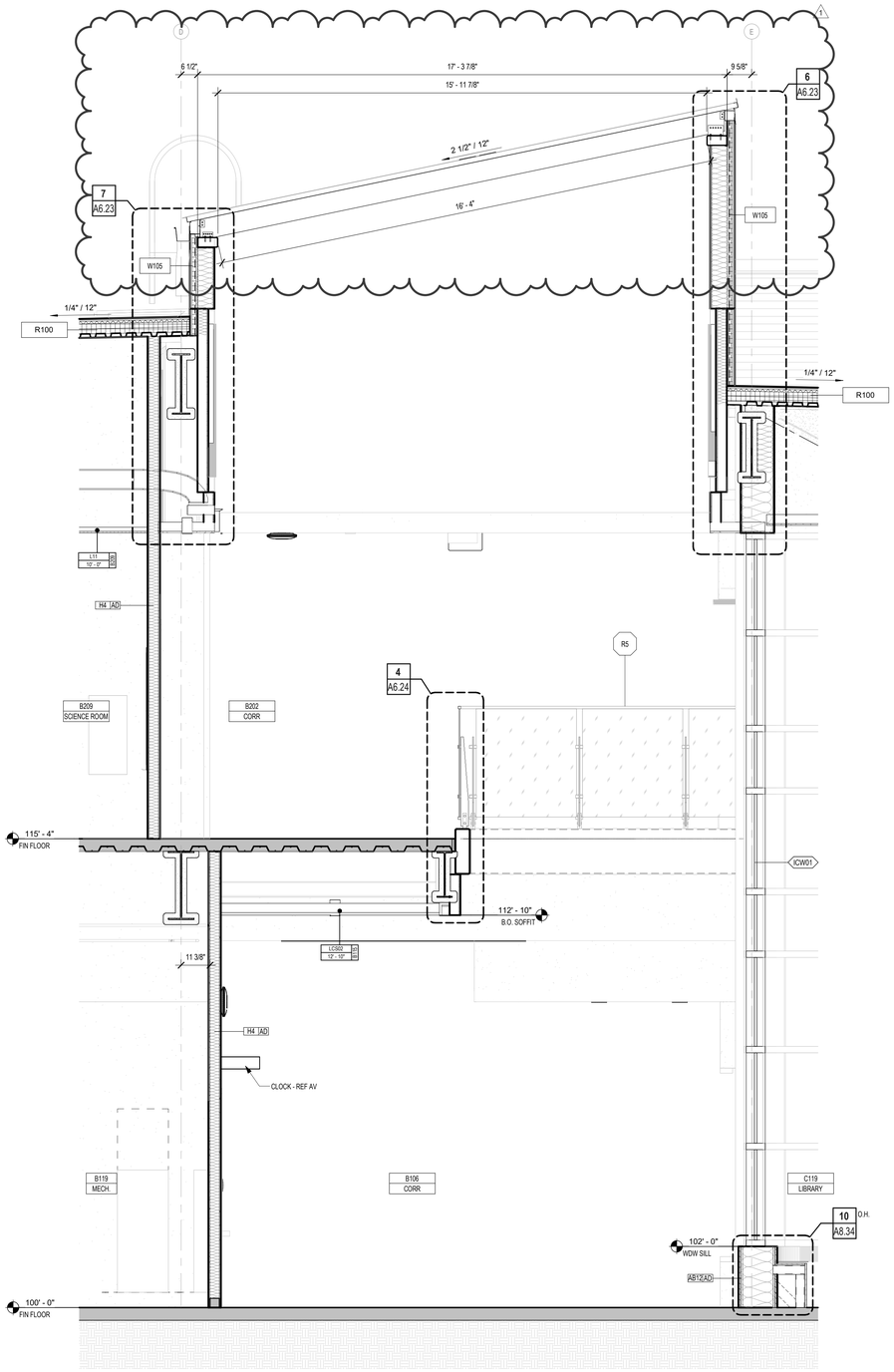
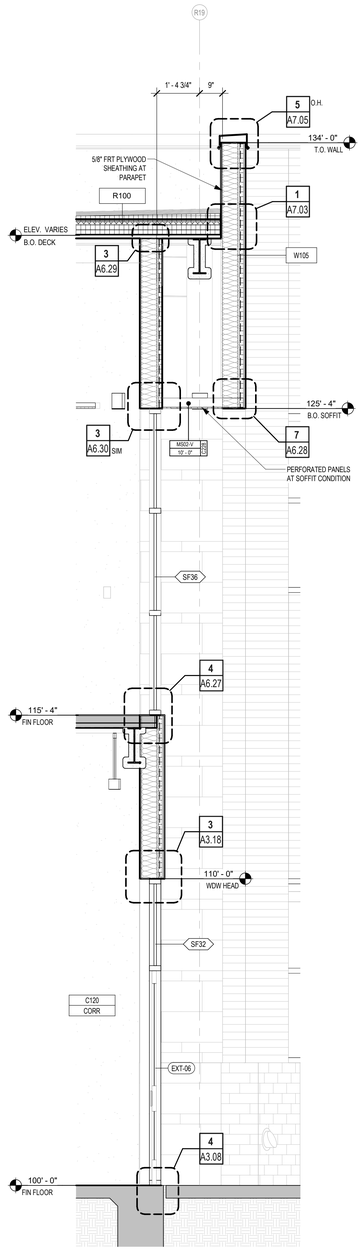
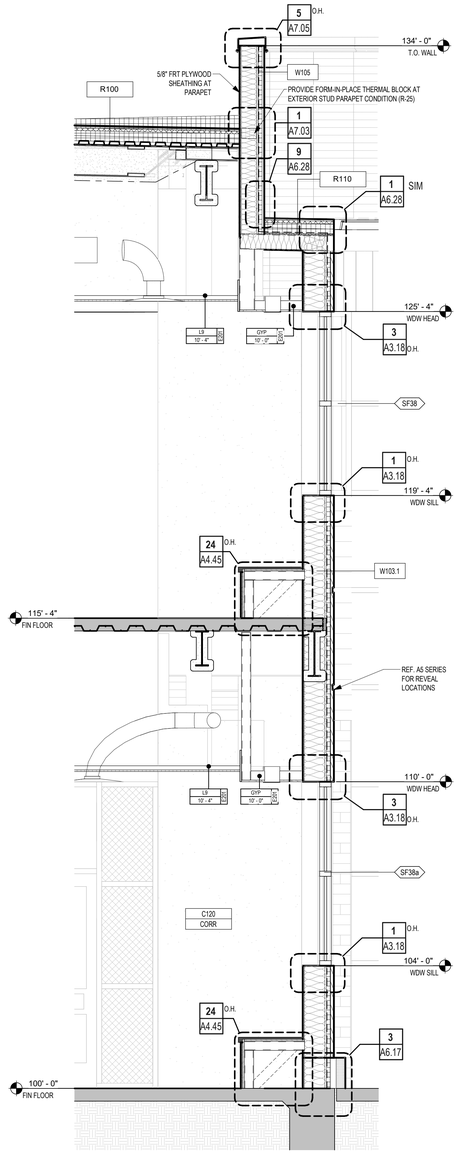


3 WALL SECTION
1/2" = 1'-0" BACK REF: A1.1B



2 WALL SECTION
1/2" = 1'-0" BACK REF: A1.1C



1 WALL SECTION
1/2" = 1'-0" BACK REF: A1.1C

1. REFER ALSO TO G3 SHTS FOR WALL CONSTRUCTION DETAILS. TYPICAL DETAILS APPLY, AS NEEDED, TO ALL WALL SECTIONS U.N.O.
2. REINFORCING IN CONCRETE BEAMS, FOOTINGS, & PIERS HAS NOT BEEN INDICATED FOR CLARITY. REFER TO STRUCTURAL DRAWINGS FOR THIS REINFORCING.
3. CONTRACTOR SHALL VERIFY THE DIMENSIONAL CONDITIONS BETWEEN ALL STRUCTURAL ELEMENTS & THE ARCHITECTURAL ELEMENTS FOR CONFLICTS. IF DISCREPANCIES ARE ENCOUNTERED, NOTIFY THE ARCHITECT IMMEDIATELY.
4. AT ALL EXTERIOR WALLS, PLACE WEATHER BARRIER AT THE EXTERIOR FACE OF CMU OR SHEATHING. CONTRACTOR TO VERIFY CHEMICAL COMPATIBILITY OF WEATHER BARRIER & SELF-ADHESIVE FLASHING.
5. PROVIDE 3 STACKED BRICK HEADERS OR ONE SOLID BRICK AT ALL SOLDIER OUTSIDE CORNERS. (4"x4"X3 5/8")
6. PROVIDE A WEATHERED MORTAR JOINT AT ALL EXTERIOR CONDITIONS WHERE THE MASONRY COURSE BELOW THE JOINT PROJECTS BEYOND THE COURSE ABOVE.
7. WHERE CMU IS SHOWN SHADED, FILL CELL SOLID WITH GROUT UNLESS NOTED IN DETAILS AS MORTAR. COORDINATE ALL LOCATIONS WITH STRUCTURAL DRAWINGS. IN CASES OF APPARENT CONFLICT, STRUCTURAL DRAWINGS SHALL GOVERN DESIGN. GROUT
8. FILL ALL OPEN CELLS OF CMU SOLID WITH FOAM INSULATION AT ALL EXTERIOR CONDITIONS WHERE RIGID INSULATION IS NOT APPLIED IN THE CAVITY WALL.
9. PROVIDE THERMAL BATT INSULATION AT ALL EXTERIOR STUD WALLS & ACOUSTICAL BATT INSULATION AT INTERIOR STUD WALLS AS DESCRIBED IN SECTION 07 2100 OF THE SPECIFICATIONS.
10. REFER TO STRUCTURAL DRAWINGS FOR VERTICAL WALL REINFORCING.
11. ALL MASONRY WALLS SHALL BE REINFORCED WITH CONTINUOUS HORIZONTAL BED JOINT REINFORCING AS SPECIFIED, AT 16" VERTICAL SPACING. AT VENEER CONDITIONS PROVIDE TIES AS SPECIFIED AT 16" O.C.E.W.
12. INFORMATION SHOWN BEYOND IN WALL SECTIONS IS PROVIDED FOR INFORMATION ONLY & SHALL NOT LIMIT THE SCOPE OF WORK REQUIRED IN THIS PROJECT.
13. SMALLER SCALE DRAWINGS MAY NOT SHOW ALL CONNECTIONS & FINISHES. ALWAYS REFER TO ENLARGED DETAILS, WHERE PROVIDED, FOR ADDITIONAL INFORMATION. IN CASES OF APPARENT CONFLICT, THE LARGER SCALED DETAIL SHALL APPLY.
14. INTERIOR WALL FINISHES ARE NOT SHOWN ON WALL SECTIONS TO AVOID VISUAL CLUTTER. REFER TO A4 SHEETS FINISH SCHED & INTERIOR ELEVATIONS FOR REQUIRED MATERIALS & MATERIAL PATTERNS.

TYPICAL WALL SECTION NOTES

APPLICABLE TO ALL A6 SHEETS

LETTER INDICATES EXTERIOR WALL

W200 — WALL ASSEMBLY IN SECTION VIEW

NUMBER INDICATES BACKUP CONSTRUCTION AS FOLLOWS:
100 - CFMF
200 - CMU

REF. SHT. G3.01 FOR SPECIFIC WALL TYPES

EXTERIOR WALL TYPE LEGEND

LETTER INDICATES TYPE

NUMBER INDICATES CONSTRUCTION AS FOLLOWS:

R100 - BUILT-UP, INSUL., MTL. DECK
R102 - SINGLE PLY, INSUL., MTL. DECK
R103 - SINGLE PLY, MTL. DECK
R110 - SINGLE PLY, INSUL., FRT PLY., CFMF
R111 - SINGLE PLY, MTL. DECK

REF. SHT. G3.01 FOR ROOF CONSTRUCTION TYPES

R100 — ROOF ASSEMBLY IN SECTION VIEW

ROOF TYPE LEGEND

REF. TYP. CONST. DTLS. FOR ADDITIONAL INFO.

- MASONRY VENEER
- STANDARD CMU
- ARCHITECTURAL CMU (ACMU)
- CFMF PARTITION

PARTITION TYPE TAGS

A3 D — WALL ASSEMBLY IN PLAN VIEW

LETTERS TO THE RIGHT INDICATE PARTITION HEIGHT, FIRE RATING AND ACOUSTICAL PROPERTIES.

D	WALL TO DECK / STRUCTURE
C	WALL TO 6" (MIN.) ABOVE CEILING
FR	FIRE RATED WALL TO DECK
AD	ACOUSTICAL WALL TO DECK
AC	ACOUSTICAL WALL TO 6" (MIN.) ABOVE CEILING
AR	ACOUSTICAL RATED WALL TO DECK
GD	GYP WALL ABOVE TO DECK
SR	SMOKE RESISTANT PARTITION TO DECK / STRUCTURE

LETTER & NUMBER TO THE LEFT INDICATE PARTITION TYPE & STUD OR CMU SIZE AS FOLLOWS:
1 - 7/8" HAT CHANNEL
2 - 1 5/8" CFMF
3 - 2 1/2" CFMF
4 - 3 5/8" CFMF OR CMU
6 - 6" CFMF OR 5 5/8" CMU
8 - 8" CFMF OR 7 5/8" CMU
10 - 9 5/8" CMU
12 - 11 5/8" CMU

PARTITION NOTES:

1. ALL INTERIOR WALL/PARTITIONS NOT OTHERWISE DESCRIBED BY A WALL SECTION ARE IDENTIFIED BY A SYMBOL WITH AN ALPHANUMERIC CODE INDICATING MATERIALS (BY LETTER), NOMINAL THICKNESS OF STRUCTURE (BY NUMBER) AND AN ALPHANUMERIC CODE REPRESENTING HEIGHT, FIRE RATING AND ACOUSTICAL PROPERTIES.
2. **UNTAGGED WALL/PARTITIONS AND COLUMN FURRINGS** SHALL BE ASSUMED TO BE **"TYPICAL"**, AS FOLLOWS, FOR BIDDING PURPOSES:
   GYP BOARD (EXTENDS TO 6" ABOVE CEILING U.N.O.)
   WALLS/PARTITIONS - TYPE **H4**, ACOUSTICAL
   COLUMN FURRING - **M4**, NON-ACOUSTICAL
   ANY UNTAGGED PARTITIONS WHICH APPEAR INCONSISTENT WITH THE DESCRIPTIONS ABOVE SHALL BE VERIFIED WITH THE ARCHITECT PRIOR TO BIDDING.
   REF. G3 SHEETS FOR EXTERIOR WALL TYPES AND INTERIOR PARTITION TYPE ASSEMBLIES.

PARTITION LEGEND

Revision /	Date	
1	08/07/26	ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

REGISTERED ARCHITECT CAITLIN MUNKEN STATE OF TEXAS 29615
08/07/2026

Huckabee
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WALL SECTIONS

VOLUME 01

Job No.	Sheet No.
0/2602-04-01	A6.14
Drawn By: MF	
Date: 07.15.26	

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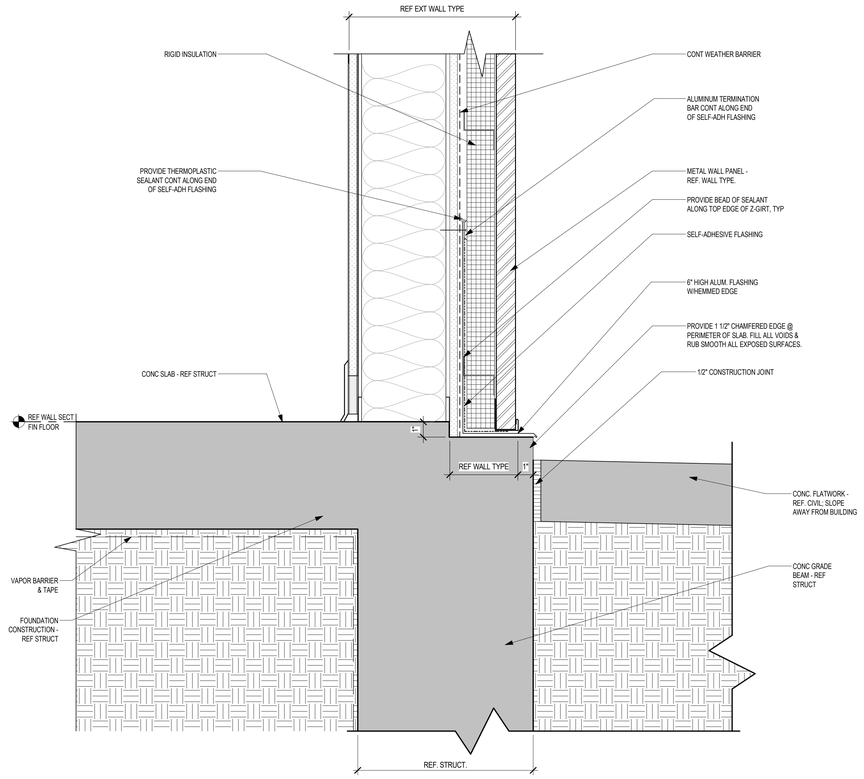
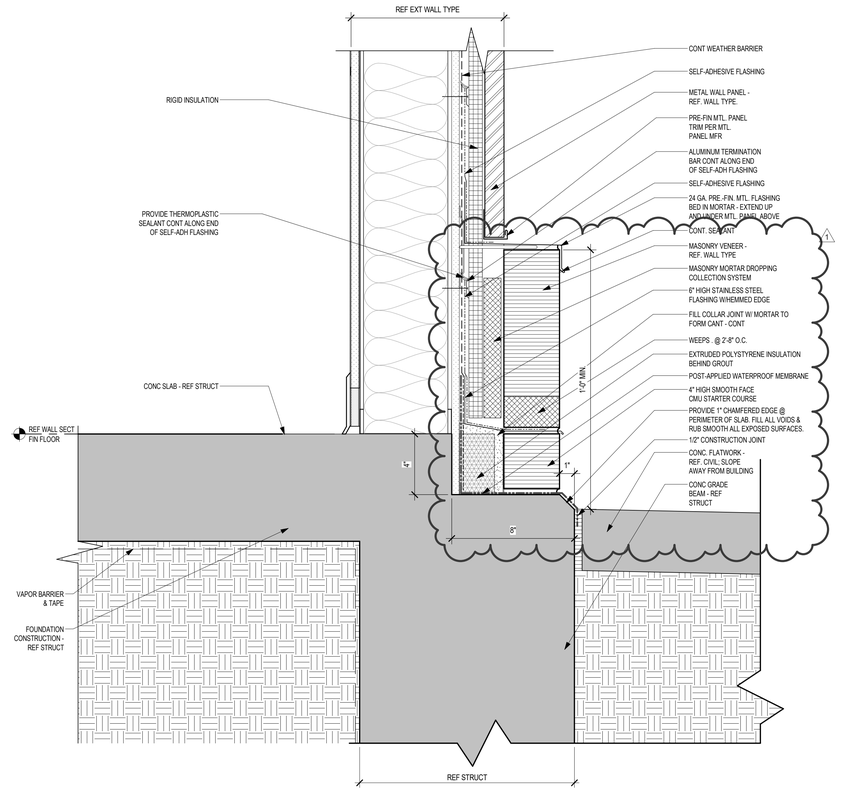
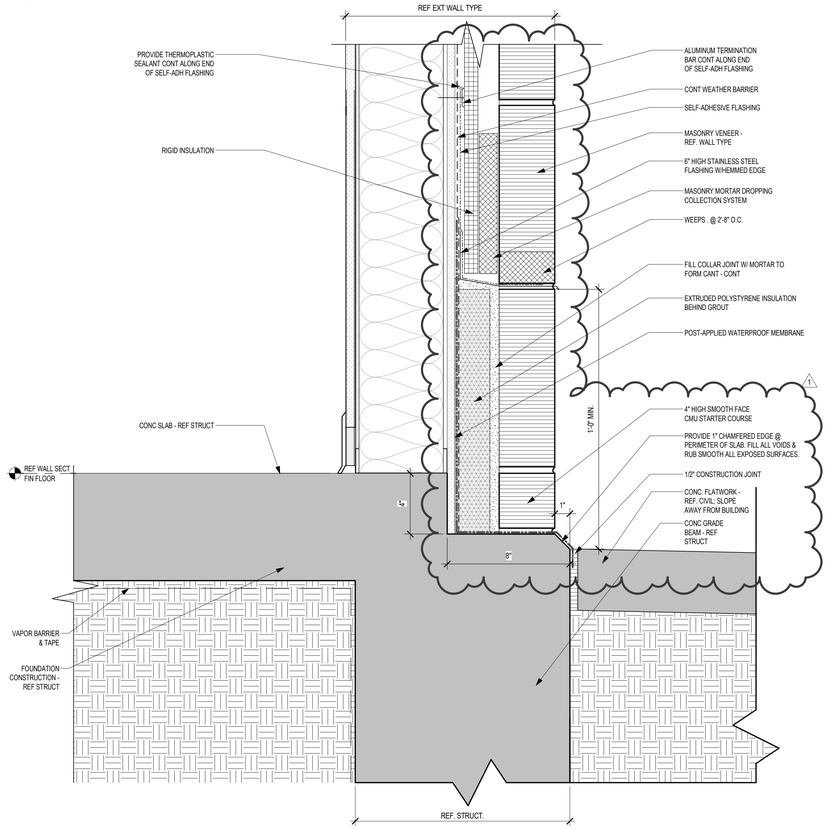


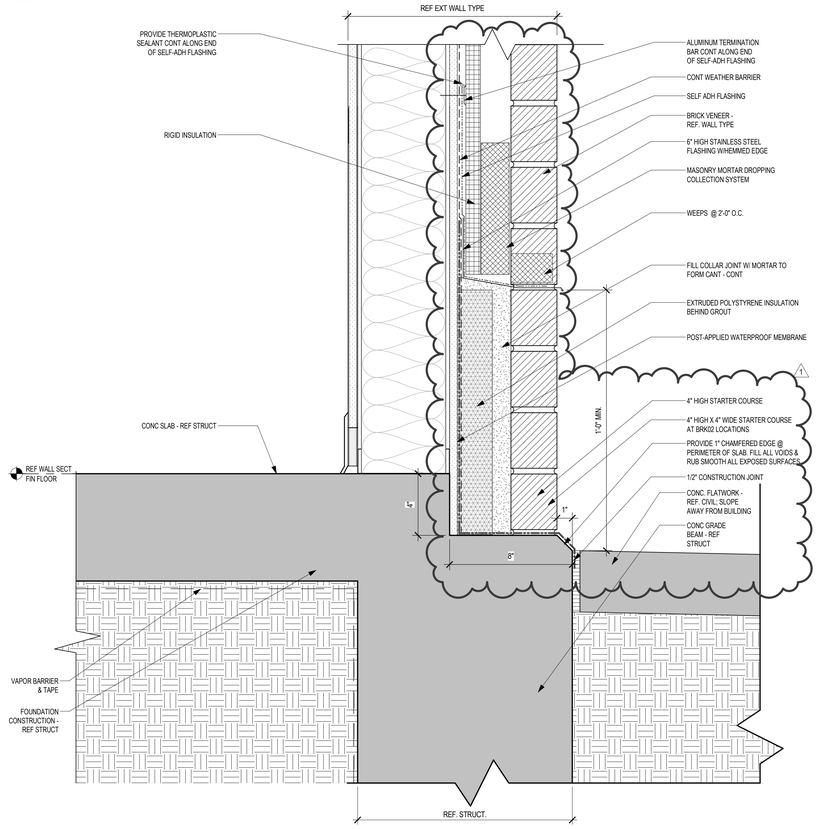
4 FOUNDATION DETAIL @ METAL PANEL & MTL. STUD WALL ON FLATWORK
3" = 1'-0"



3 FOUNDATION DETAIL @ METAL PANEL & SMOOTH FACE CMU & MTL. STUD WALL ON FLATWORK
3" = 1'-0"



2 FOUNDATION DETAIL @ SMOOTH FACE CMU & MTL. STUD WALL ON FLATWORK
3" = 1'-0"



1 FOUNDATION DETAIL @ BRICK & METAL STUD WALL ON FLATWORK
3" = 1'-0"

Revision / Date
1 ADDENDUM 02 08/07/26

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

REGISTERED ARCHITECT
CURTIS MUNSON
29151
STATE OF TEXAS
08/07/2026

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FOUNDATION DETAILS

VOLUME 01

Job No.	Sheet No.
00802-04-01	A6.17
Drawn By: MF	
Date: 07.15.26	

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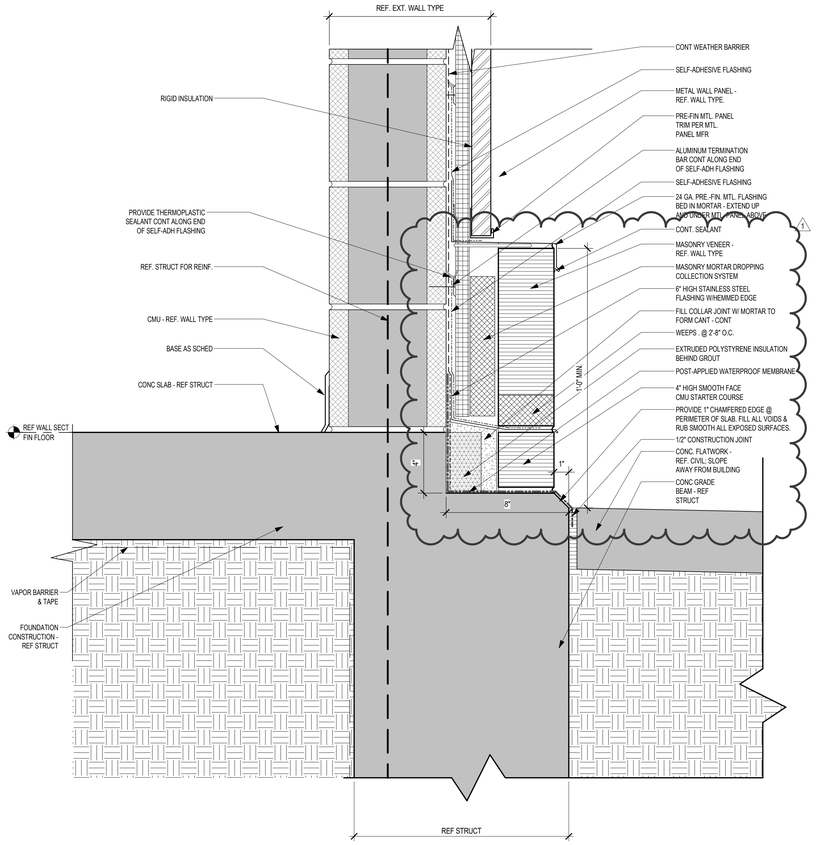
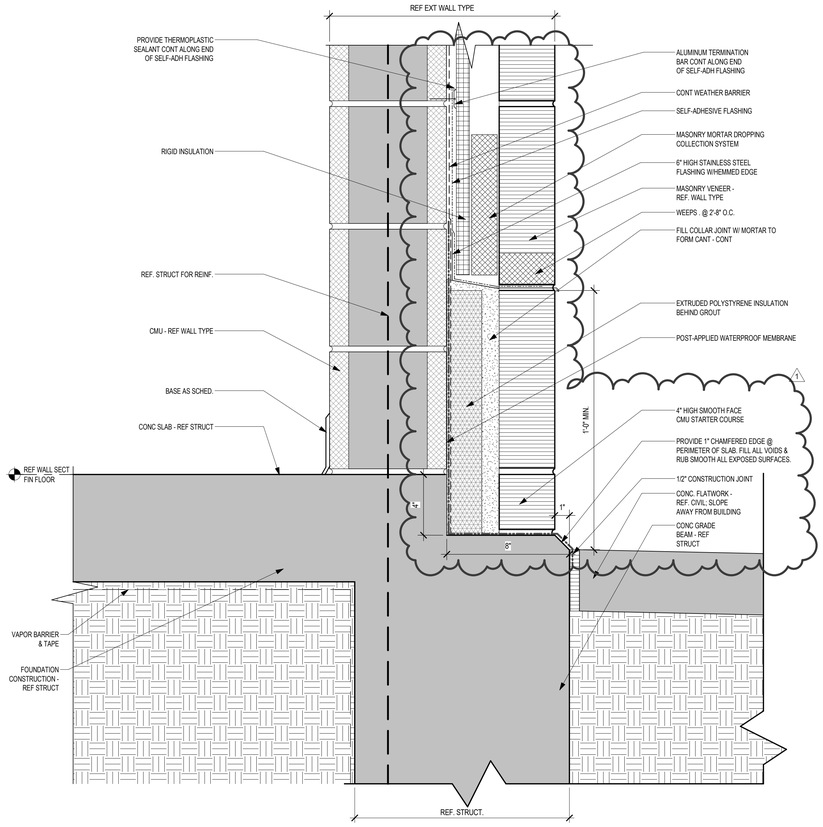
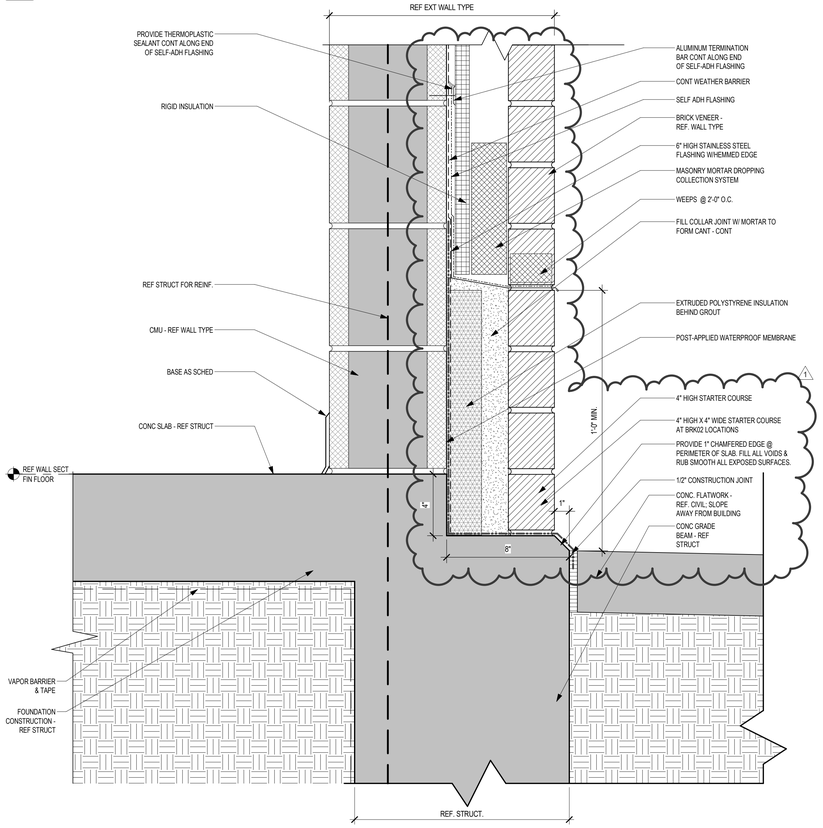


3 FOUNDATION DETAIL @ METAL PANEL & SMOOTH FACE CMU & CMU WALL ON FLATWORK
3" = 1'-0"



2 FOUNDATION DETAIL @ SMOOTH FACE CMU & CMU WALL ON FLATWORK
3" = 1'-0"



1 FOUNDATION DETAIL @ BRICK & CMU WALL ON FLATWORK
3" = 1'-0"

Revision /	Date	
1	06/07/26	ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

REGISTERED ARCHITECT
CURTIS MUNSON
29161
STATE OF TEXAS
08/07/2026

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FOUNDATION DETAILS

VOLUME 01

Job No.	Sheet No.
00802-04-01	A6.18
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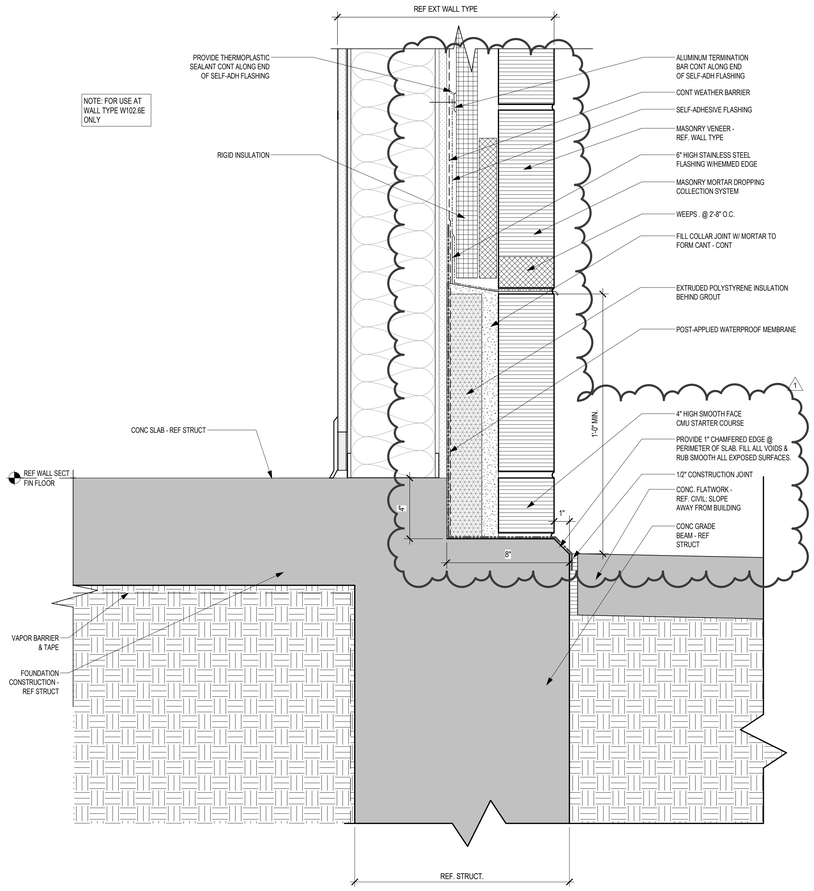
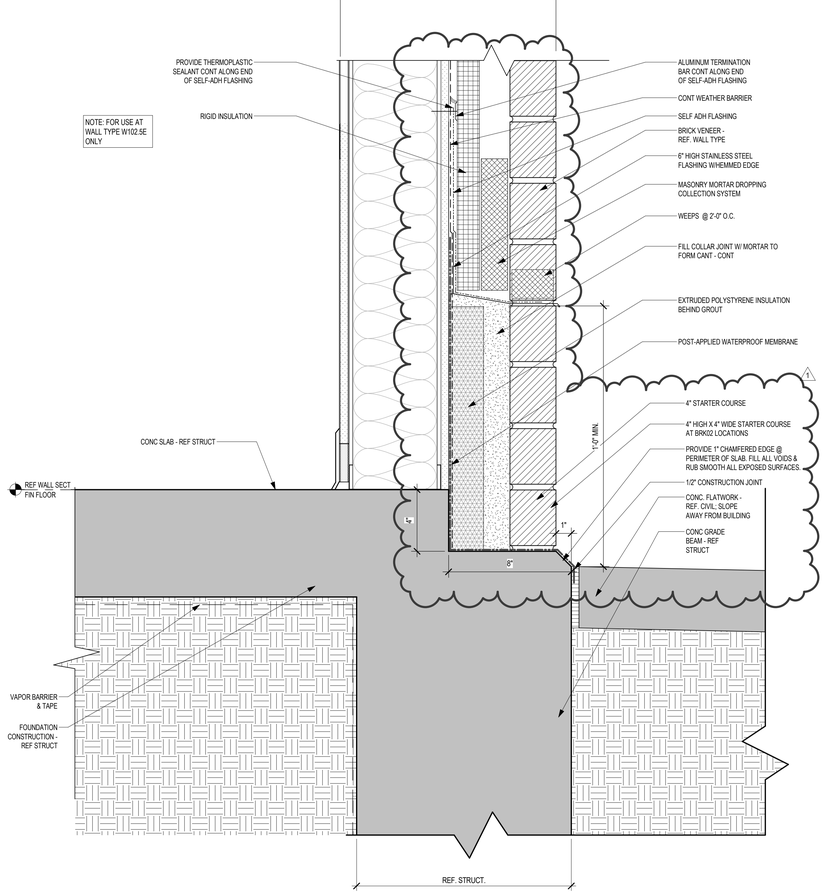
Revision /	Date	
1	08/07/26	ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS



2 FOUNDATION DETAIL @ SMOOTH FACE CMU & MTL. STUD WALL ON FLATWORK (ALTERNATE)
3" = 1'-0"



1 FOUNDATION DETAIL @ BRICK & METAL STUD WALL ON FLATWORK (ALTERNATE)
3" = 1'-0"

REGISTERED ARCHITECT
CAITLIN MUNCH
STATE OF TEXAS
29285
08/07/2026

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FOUNDATION DETAILS

VOLUME 01

Job No.	Sheet No.
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Date: 07.15.26	

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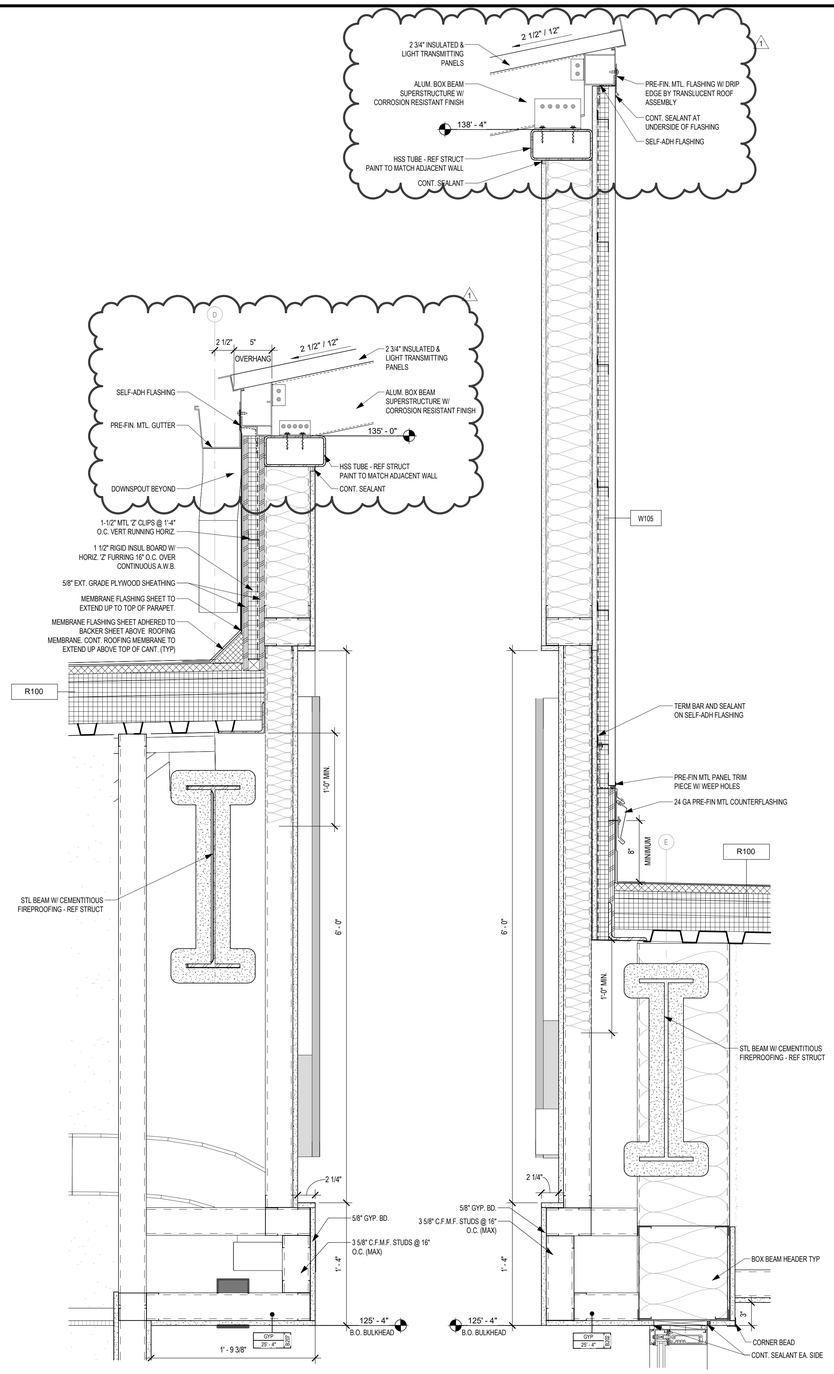
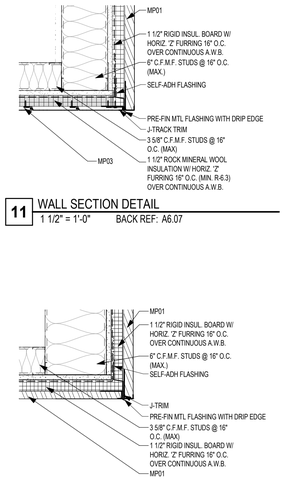


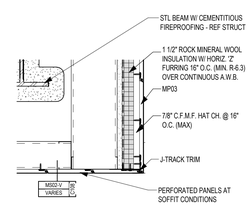
7 WALL SECTION DETAIL
1 1/2" = 1'-0" BACK REF: A6.14

6 WALL SECTION DETAIL
1 1/2" = 1'-0" BACK REF: A3.05

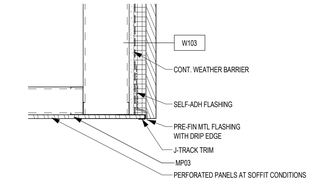


11 WALL SECTION DETAIL
1 1/2" = 1'-0" BACK REF: A6.07

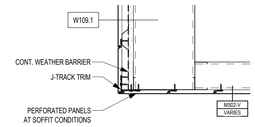
10 WALL SECTION DETAIL
1 1/2" = 1'-0" BACK REF: A6.22



5 WALL SECTION DETAIL
1 1/2" = 1'-0" BACK REF: A6.12

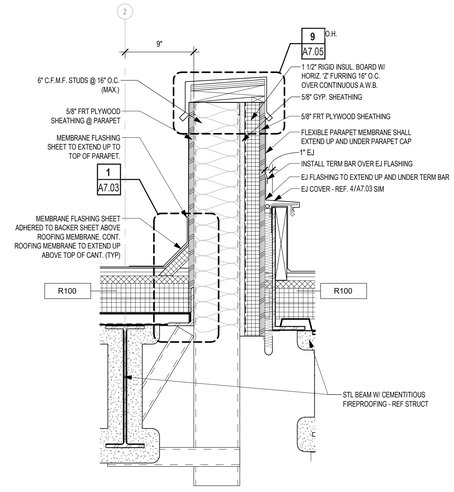


13 WALL SECTION DETAIL
1 1/2" = 1'-0" BACK REF: A6.06

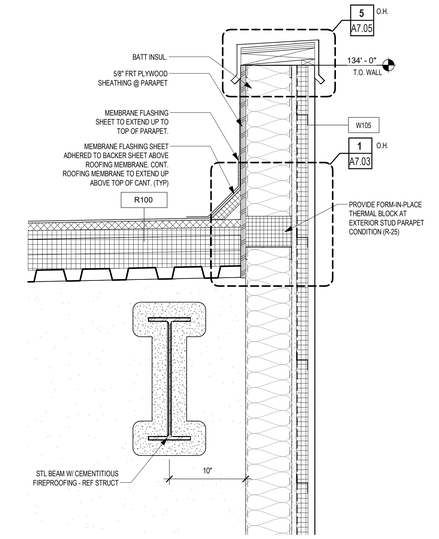


NOTE: W108 WALL ASSEMBLY WITH RIGID INSULATION AT SIM COND.

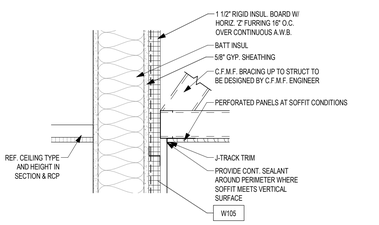
12 WALL SECTION DETAIL
1 1/2" = 1'-0" BACK REF: A6.02



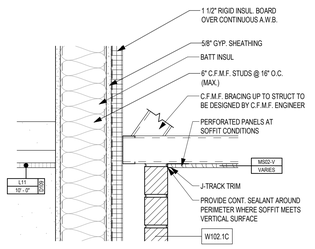
9 WALL SECTION DETAIL
1 1/2" = 1'-0" BACK REF: A6.13



8 WALL SECTION DETAIL
1 1/2" = 1'-0" BACK REF: A6.12



4 WALL SECTION DETAIL
1 1/2" = 1'-0" BACK REF: A6.04



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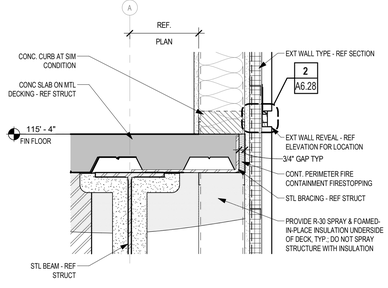

2 WALL SECTION DETAIL
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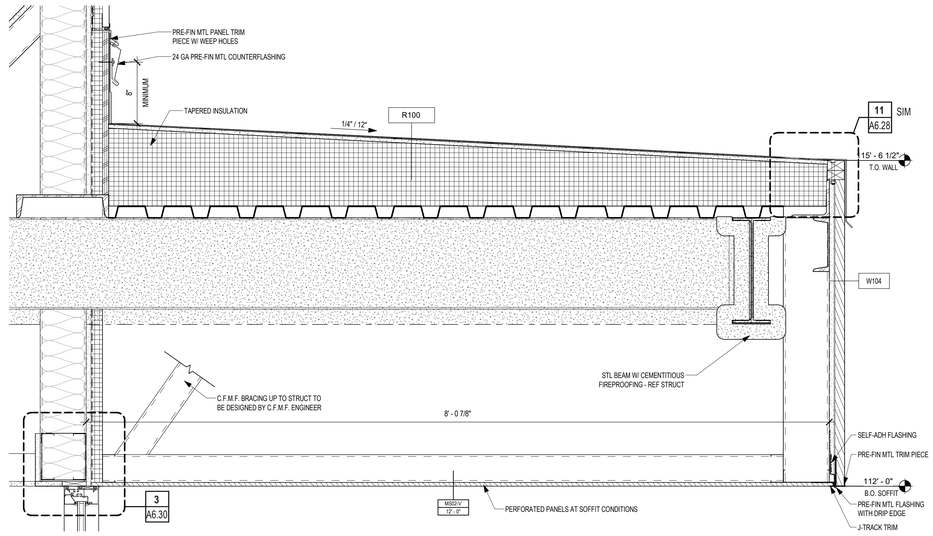

1 WALL SECTION DETAIL
1 1/2" = 1'-0" BACK REF: A6.08

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Revision /	Date	
1	08/07/26	ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

REGISTERED ARCHITECT CARTLIN MUNOZ 29363 STATE OF TEXAS
08/07/2026

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WALL SECTION DETAILS
VOLUME 01

Job No.	Sheet No.
00802-04-01	A6.23
Drawn By: MF	
Date: 07.15.26	

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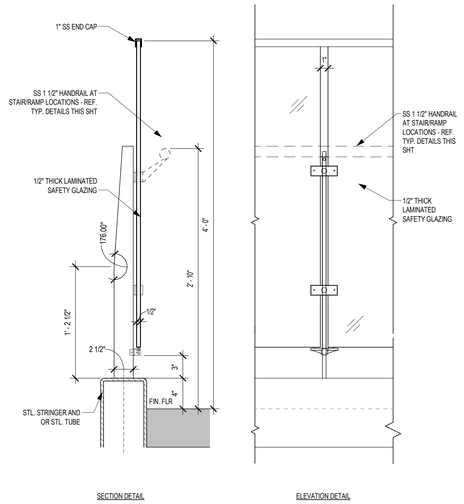
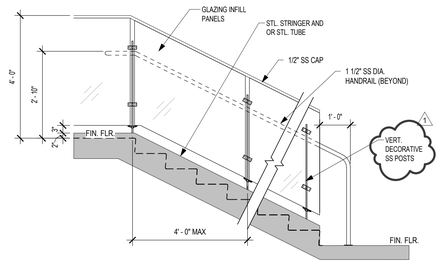
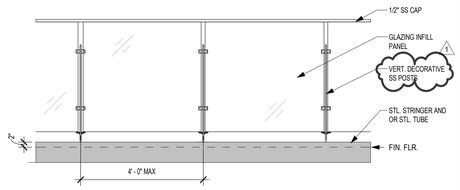


12 RAIL SECTION & ELEVATION
1 1/2" = 1'-0"

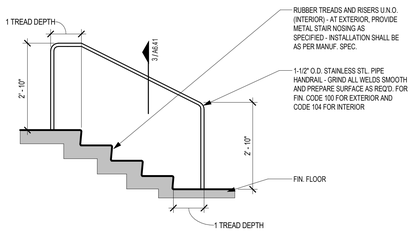


11 RAIL ELEVATION
1/2" = 1'-0"



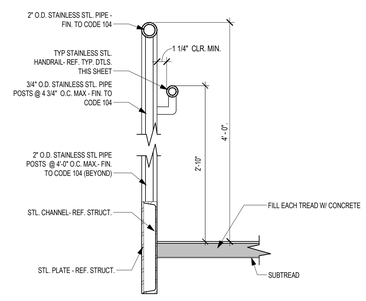
10 RAIL ELEVATION
1/2" = 1'-0"

RAIL TYPE 'R5'



13 RAIL ELEVATION
1/2" = 1'-0"

RAIL TYPE 'R6'



9 RAIL SECTION
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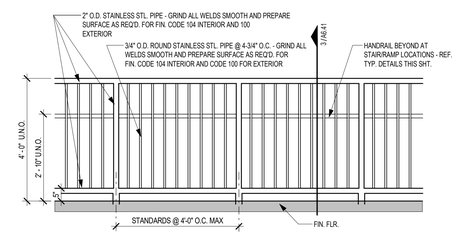
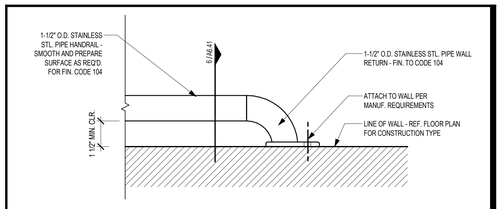
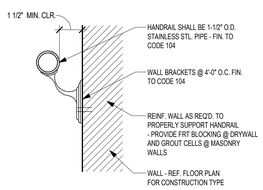


8 RAIL ELEVATION
1/2" = 1'-0"

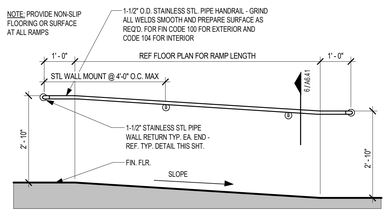
RAIL TYPE 'R3'



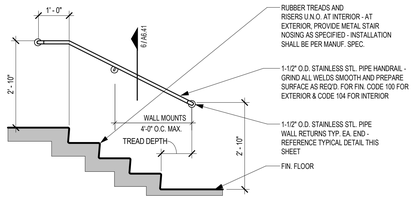
7 RAIL WALL RETURN DETAIL
3" = 1'-0"



6 RAIL SECTION
3" = 1'-0"

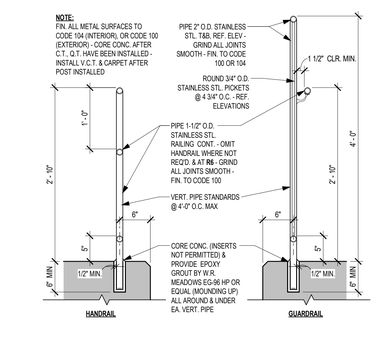


5 RAIL ELEVATION
1/2" = 1'-0"

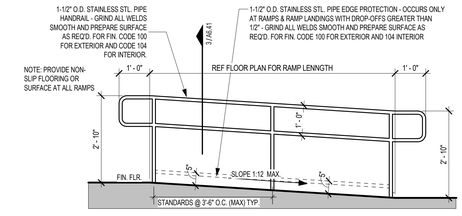


4 RAIL ELEVATION
1/2" = 1'-0"

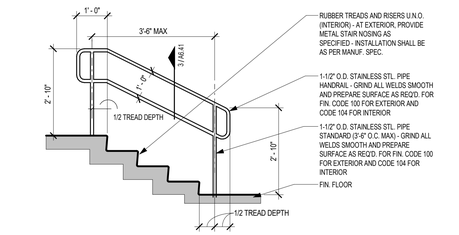
RAIL TYPE 'R2'



3 RAIL SECTION
1" = 1'-0"



2 RAIL ELEVATION
1/2" = 1'-0"



1 RAIL ELEVATION
1/2" = 1'-0"

RAIL TYPE 'R1'

Revision / 1 — Date 08/07/26 — ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

REGISTERED ARCHITECT — CURTIS LYN MUNSON — 29967 — STATE OF TEXAS
08/07/2026

Huckabee
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RAILING TYPES AND DETAILS

VOLUME 01

Job No. 00802-04-01
Sheet No. A6.41
Drawn By: ME
Date: 07.15.26

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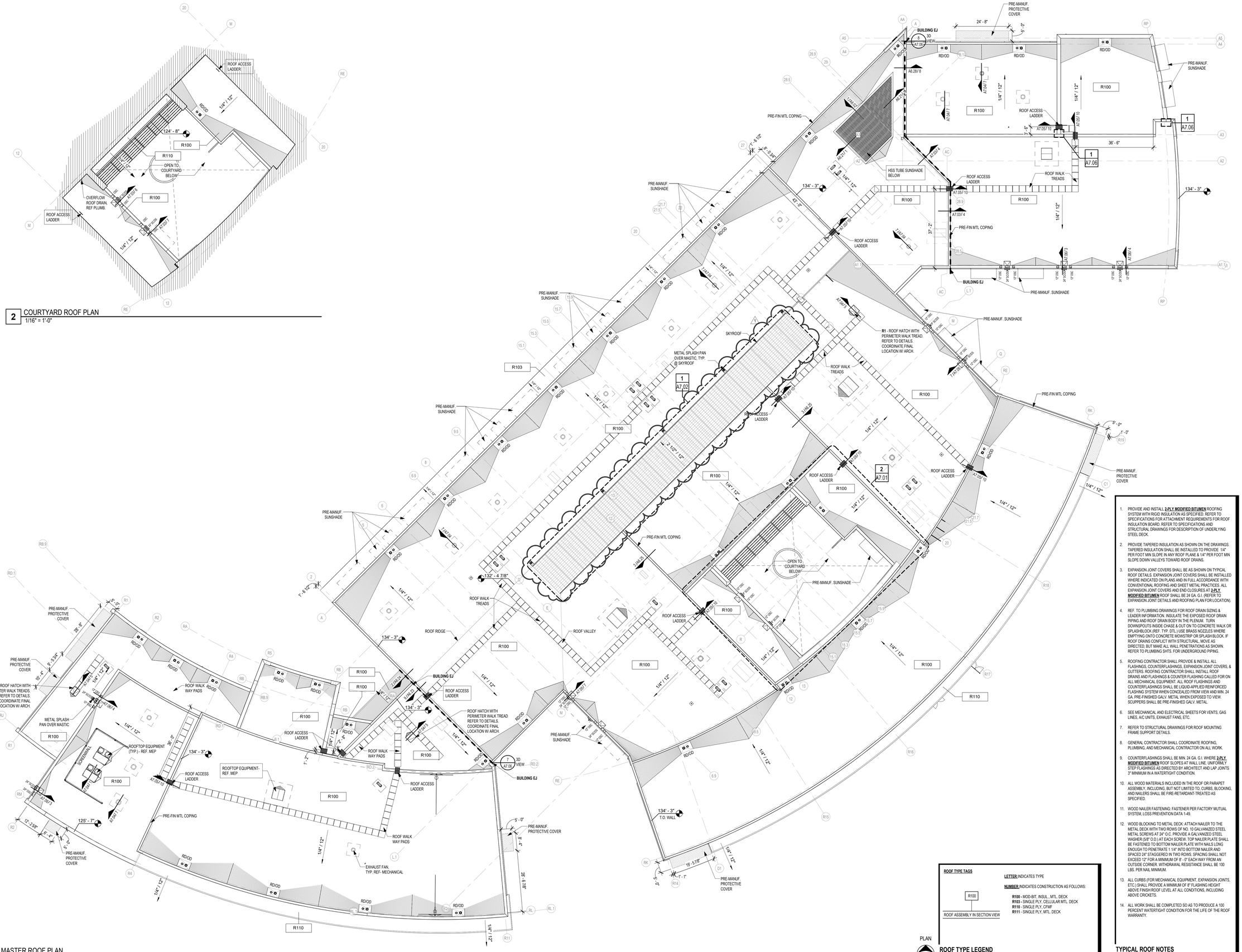
2 COURTYARD ROOF PLAN
1/16" = 1'-0"



1 MASTER ROOF PLAN
1/16" = 1'-0"

ROOF TYPE TAGS

R100
ROOF ASSEMBLY IN SECTION VIEW

LETTER INDICATES TYPE

NUMBER INDICATES CONSTRUCTION AS FOLLOWS:

R100 - MOD-BIT, INSUL., MTL. DECK
R103 - SINGLE PLY, CELLULAR MTL. DECK
R110 - SINGLE PLY, CFMF
R111 - SINGLE PLY, MTL DECK

PLAN N

ROOF TYPE LEGEND

TYPICAL ROOF NOTES

1. PROVIDE AND INSTALL **2-PLY MODIFIED BITUMEN** ROOFING SYSTEM WITH RIGID INSULATION AS SPECIFIED. REFER TO SPECIFICATIONS FOR ATTACHMENT REQUIREMENTS FOR ROOF INSULATION BOARD. REFER TO SPECIFICATIONS AND STRUCTURAL DRAWINGS FOR DESCRIPTION OF UNDERLYING STEEL DECK.
2. PROVIDE TAPERED INSULATION AS SHOWN ON THE DRAWINGS. TAPERED INSULATION SHALL BE INSTALLED TO PROVIDE 1/4" PER FOOT MIN SLOPE IN ANY ROOF PLANE & 1/4" PER FOOT MIN SLOPE DOWN VALLEYS TOWARD ROOF DRAINS.
3. EXPANSION JOINT COVERS SHALL BE AS SHOWN ON TYPICAL ROOF DETAILS. EXPANSION JOINT COVERS SHALL BE INSTALLED WHERE INDICATED ON PLANS AND IN FULL ACCORDANCE WITH CONVENTIONAL ROOFING AND SHEET METAL PRACTICES. ALL EXPANSION JOINT COVERS AND END CLOSURES AT **2-PLY MODIFIED BITUMEN** ROOF SHALL BE 24 GA. G.I. (REFER TO EXPANSION JOINT DETAILS AND ROOFING PLAN FOR LOCATION).
4. REF. TO PLUMBING DRAWINGS FOR ROOF DRAIN SIZING & LEADER INFORMATION. INSULATE THE EXPOSED ROOF DRAIN PIPING AND ROOF DRAIN BODY IN THE PLENUM. TURN DOWNSPOUTS INSIDE CHASE & OUT ON TO CONCRETE WALK OR SPLASHBLOCK (REF. TYP. DTL.) USE BRASS NOZZLES WHERE EMPTYING ONTO CONCRETE MOWSTRIP OR SPLASH BLOCK. IF ROOF DRAINS CONFLICT WITH STRUCTURAL, MOVE AS DIRECTED, BUT MAKE ALL WALL PENETRATIONS AS SHOWN. REFER TO PLUMBING SHTS. FOR UNDERGROUND PIPING.
5. ROOFING CONTRACTOR SHALL PROVIDE & INSTALL ALL FLASHINGS, COUNTERFLASHINGS, EXPANSION JOINT COVERS, & GUTTERS. ROOFING CONTRACTOR SHALL INSTALL ROOF DRAINS AND FLASHINGS & COUNTER FLASHING CALLED FOR ON ALL MECHANICAL EQUIPMENT. ALL ROOF FLASHINGS AND COUNTERFLASHINGS SHALL BE LIQUID-APPLIED REINFORCED FLASHING SYSTEM WHEN CONCEALED FROM VIEW AND MIN. 24 GA. PRE-FINISHED GALV. METAL WHEN EXPOSED TO VIEW. SCUPPERS SHALL BE PRE-FINISHED GALV. METAL.
6. SEE MECHANICAL AND ELECTRICAL SHEETS FOR VENTS, GAS LINES, A/C UNITS, EXHAUST FANS, ETC.
7. REFER TO STRUCTURAL DRAWINGS FOR ROOF MOUNTING FRAME SUPPORT DETAILS.
8. GENERAL CONTRACTOR SHALL COORDINATE ROOFING, PLUMBING, AND MECHANICAL CONTRACTOR ON ALL WORK.
9. COUNTERFLASHINGS SHALL BE MIN. 24 GA. G.I. WHERE **2-PLY MODIFIED BITUMEN** ROOF SLOPES AT WALL LINE. UNIFORMLY STEP FLASHINGS AS DIRECTED BY ARCHITECT AND LAP JOINTS 3" MINIMUM IN A WATERTIGHT CONDITION.
10. ALL WOOD MATERIALS INCLUDED IN THE ROOF OR PARAPET ASSEMBLY, INCLUDING, BUT NOT LIMITED TO, CURBS, BLOCKING, AND NAILERS SHALL BE FIRE-RETARDANT-TREATED AS SPECIFIED.
11. WOOD NAILER FASTENING: FASTENER PER FACTORY MUTUAL SYSTEM, LOSS PREVENTION DATA 1-49.
12. WOOD BLOCKING TO METAL DECK: ATTACH NAILER TO THE METAL DECK WITH TWO ROWS OF NO. 10 GALVANIZED STEEL METAL SCREWS AT 24" O.C. PROVIDE A GALVANIZED STEEL WASHER (5/8" O.D.) AT EACH SCREW. TOP NAILER PLATE SHALL BE FASTENED TO BOTTOM NAILER PLATE WITH NAILS LONG ENOUGH TO PENETRATE 1 1/4" INTO BOTTOM NAILER AND SPACED 24" STAGGERED IN TWO ROWS. SPACING SHALL NOT EXCEED 12" FOR A MINIMUM OF 8' - 0" EACH WAY FROM AN OUTSIDE CORNER. WITHDRAWAL RESISTANCE SHALL BE 100 LBS. PER NAIL MINIMUM.
13. ALL CURBS (FOR MECHANICAL EQUIPMENT, EXPANSION JOINTS, ETC.) SHALL PROVIDE A MINIMUM OF 8" FLASHING HEIGHT ABOVE FINISH ROOF LEVEL AT ALL CONDITIONS, INCLUDING ABOVE CRICKETS.
14. ALL WORK SHALL BE COMPLETED SO AS TO PRODUCE A 100 PERCENT WATERTIGHT CONDITION FOR THE LIFE OF THE ROOF WARRANTY.

Revision /	Date	
1	08/07/26	ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

REGISTERED ARCHITECT — CAITLIN MARION — STATE OF TEXAS — 29154
08/07/2026

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ROOF PLAN

VOLUME 01

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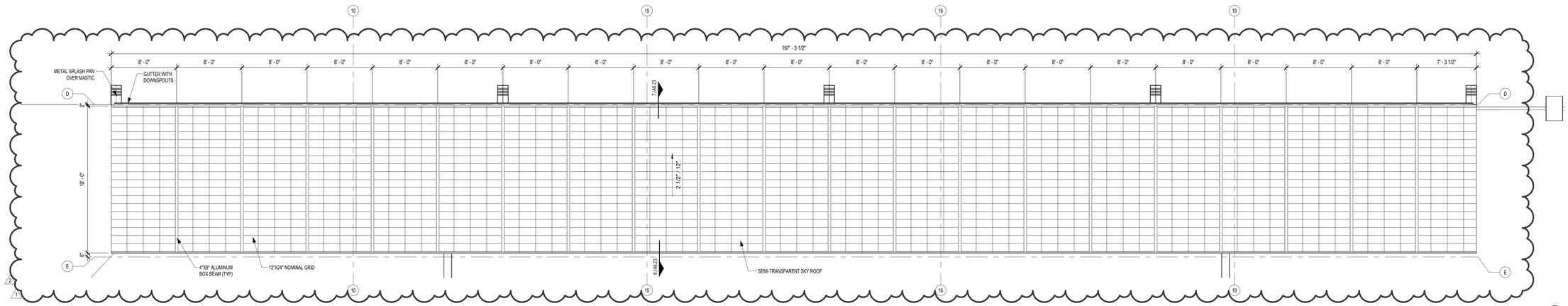
Revision /	Date	
1	07/24/26	ADDENDUM 01
2	08/07/26	ADDENDUM 02

Project:
TOMBALL INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS



1 FLOOR PLAN - MAIN CLERESTORY
3/16" = 1'-0"

PLAN
N
TRUE

REGISTERED ARCHITECT
CAITLIN MUNN
29363
STATE OF TEXAS
08/07/2026

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ENLARGED PLAN - SKYLIGHT

VOLUME 01

Job No.	Sheet No.
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Date: 07.15.26	

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PLUMBING FIXTURE SCHEDULE

MARK	DESCRIPTION	ROUGH-IN (MINIMUM) WASTE	VENT	DCW	DHW	ELEC	MANUFACTURER & MODEL NUMBER	ADA/TAS
WC1	WATERCLOSET, WALL MOUNT, FLUSHOMETER VALVE, TOP SPUD, ELONGATED, SIPHON ACTION JETTED BOWL, RATED FOR 1,000 LB STATIC LOAD, VITREOUS CHINA, WHITE, ASME A112.19.2M, 2" FULLY GLAZED TRAPWAY, 1.28 GPF.	4"	2"	-	-	-	AMERICAN STANDARD - 2257.101; OR EQUAL IN KOHLER OR SLOAN	
	FLUSHOMETER VALVE, 1.28 GPF, EXPOSED DIAPHRAGM TYPE, CHROME PLATED, 1 1/2" TOP SPUD, SPUD COUPLING AND FLANGE, OSCILLATING NON-HOLDING OPEN HANDLE, CHROME PLATED ANGLE STOP WITH STOP CAP, VACUUM BREAKER FLUSH CONNECTION, CAST WALL FLANGE WITH SET SCREW, ANSI/ASME 112.19.6. PROVIDE TRAP PRIMER ACCESSORY FOR FLUSH VALVES SERVING FLOOR DRAIN..	-	-	1-1/2"	-	-	SLOAN - 111-1.28-TP; OR EQUAL IN ZURN OR CHICAGO	
	SEAT, EXTRA HEAVY WEIGHT, POSTURE MOLDED SOLID PLASTIC, ELONGATED, OPEN FRONT, LESS..	-	-	-	-	-	CHURCH - 9500SSCT; OR EQUAL IN BEMIS OR OLSONITE	
	FIXTURE CARRIER, ADJ HEIGHT, FOOT/ANCHOR LEG SUPPORT, VERTICAL DISCHARGE, SINGLE/BACK TO BACK, RATED FOR 1000 LB STATIC LOAD	-	-	-	-	-	WATTS - ISCA-132/ISCA-132-D; ZURN - Z1202-N-XB/Z1202-ND-XB	
WC2	WATERCLOSET, WALL MOUNT, ACCESSIBLE MOUNTING HEIGHT, FLUSHOMETER VALVE, TOP SPUD, ELONGATED, SIPHON ACTION JETTED BOWL, RATED FOR 1,000 LB STATIC LOAD, VITREOUS CHINA, WHITE, ASME A112.19.2M, 2" FULLY GLAZED TRAPWAY, 1.28 GPF.	4"	2"	-	-	-	AMERICAN STANDARD - 2257.101; OR EQUAL IN KOHLER OR SLOAN	
	FLUSHOMETER VALVE, 1.28 GPF, EXPOSED DIAPHRAGM TYPE, CHROME PLATED, 1 1/2" TOP SPUD, SPUD COUPLING AND FLANGE, OSCILLATING NON-HOLDING OPEN HANDLE, CHROME PLATED ANGLE STOP WITH STOP CAP, VACUUM BREAKER FLUSH CONNECTION, CAST WALL FLANGE WITH SET SCREW, ANSI/ASME 112.19.6. PROVIDE TRAP PRIMER ACCESSORY FOR FLUSH VALVES SERVING FLOOR DRAIN..	-	-	1-1/2"	-	-	SLOAN - 111-1.28-TP; OR EQUAL IN ZURN OR CHICAGO	X
	SEAT, EXTRA HEAVY WEIGHT, POSTURE MOLDED SOLID PLASTIC, ELONGATED, OPEN FRONT, LESS..	-	-	-	-	-	CHURCH - 9500SSCT; OR EQUAL IN BEMIS OR OLSONITE	
	FIXTURE CARRIER, ADJ HEIGHT, FOOT/ANCHOR LEG SUPPORT, VERTICAL DISCHARGE, SINGLE/BACK TO BACK, RATED FOR 1000 LB STATIC LOAD	-	-	-	-	-	WATTS - ISCA-132/ISCA-132-D; ZURN - Z1202-N-XB/Z1202-ND-XB	
U1	URINAL, 0.125 GPF, WALL MOUNT, VITREOUS CHINA, 14" EXTENDED FLUSHING RIM, WASHOUT FLUSHING ACTION, 3/4" INLET SPUD, INLET AND OUTLET SPUDS AND HANGERS, ASME/ANSI A112.19.2. REFER TO ARCHITECTURAL DRAWING FOR MOUNTING HEIGHT.	2"	2"	-	-	-	AMERICAN STANDARD - 6590.001; ZURN - Z5755-U	
	FLUSHOMETER VALVE, 0.5 GPF, EXPOSED DIAPHRAGM-TYPE, CHROME PLATED, 3/4" TOP SPUD, SPUD COUPLING AND FLANGE, NON-HOLD OPEN HANDLE, CHROME PLATED ANGLE STOP WITH STOP CAP, VACUUM BREAKER FLUSH CONNECTION, CAST WALL FLANGE WITH SET SCREW, ANSI/ASME 112.19.6. PROVIDE TRAP PRIMER ACCESSORY FOR FLUSH VALVES SERVING FLOOR DRAIN TRAP (REFER TO FLOOR PLANS FOR EXACT LOCATION/QUANTITY).	-	-	3/4"	-	-	SLOAN, 186-0.5-TP; OR EQUAL IN ZURN OR CHICAGO	X
	FIXTURE CARRIER, HANGER AND BEARING PLATES, ADJ. SUPPORTING RODS, UPRIGHTS, WELDED FEET	-	-	-	-	-	JOSAM - 17560-UR; OR EQUAL IN WATTS OR ZURN	
L1	LAVATORY, 20"X18" VITREOUS CHINA WALL MOUNT, 4" CENTER FAUCET HOLES, FRONT OVERFLOW, CONCEALED ARM CARRIER SYSTEM, DECK MOUNTED FAUCET, INTEGRAL 4" BACKSPLASH, ANSI A112.19.2. REFER TO ARCHITECTURAL DRAWING FOR MOUNTING HEIGHT.	2"	1 1/2"	-	-	-	AMERICAN STANDARD, 0355.012; KOHLER, K-2005	
	FAUCET, DECK MOUNT, BATTERY PROXIMITY WITH DUAL BEAM INFRARED SENSOR, CHROME PLATED FINISH, CAST BRASS SPOUT, SINGLE CENTER HOLE INSTALLATION, CONCEALED INTERNAL TEMPERATURE CONTROL MIXER	-	-	-	1/2"	-	SLOAN SF-2350-EAF-15; OR EQUAL IN ZURN OR CHICAGO	
	SUPPLY AND STOPS, LOOSE KEY, CHROME PLATED BRASS VALVES AND CHROME PLATED COPPER RISERS, LEAD FREE.	-	-	-	-	-	MCGUIRE - LF2165CCLK; OR EQUAL IN T&S BRASS OR BRASSCRAFT	X
	P-TRAP, CHROME PLATED CAST BRASS BODY WITH CLEANOUT, SEAMLESS WALL BEND, 17 GA.	-	-	-	-	-	MCGUIRE - 8902C; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	OFFSET TAILPIECE AND STRAINER, CHROME PLATED CAST BRASS	-	-	-	-	-	MCGUIRE - 155WC; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	FIXTURE CARRIER, CONCEALED ARMS, LEVELING AND SECURING SCREWS, UPRIGHTS, WELDED FEET	-	-	-	-	-	JOSAM - 17100; OR EQUAL IN WATTS OR ZURN	
	THERMOSTATIC MIXING VALVE, 0.25 GPM MINIMUM FLOW, INTEGRAL INLET CHECK VALVES AND STRAINER, SET TEMPERATURE TO 105°, ASSE 1070.	-	-	1/2"	1/2"	-	WATTS - LFUSG-B; LEONARD - 270-LF; OR APPROVED EQUAL	
WS1	WALL MOUNTED LAVATORY SYSTEM, 2-STATION, SOLID SURFACE SINK, COORDINATE FINISH WITH ARCHITECT PRIOR TO ORDERING	2"	1 1/2"	-	-	-	SLOAN - SLOANSTONE ELRF-82000	
	DECK MOUNTED FAUCET, AUTOMATIC, HARDWIRED-POWERED, .5 GPM	-	-	-	1/2"	110V	SLOAN - EAF-100	
	SUPPLY AND STOPS, LOOSE KEY, CHROME PLATED BRASS VALVES AND CHROME PLATED COPPER RISERS, LEAD FREE	-	-	-	-	-	MCGUIRE - LF2165CCLK; OR EQUAL IN T&S BRASS OR BRASSCRAFT	X
	P-TRAP, CHROME PLATED CAST BRASS BODY WITH CLEANOUT, SEAMLESS WALL BEND, 17 GA.	-	-	-	-	-	MCGUIRE - 8902C; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	OFFSET TAILPIECE AND STRAINER, CHROME PLATED CAST BRASS	-	-	-	-	-	MCGUIRE - 155WC; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	THERMOSTATIC MIXING VALVE, 0.25 GPM MINIMUM FLOW, INTEGRAL INLET CHECK VALVES AND STRAINER, SET TEMPERATURE TO 105°, ASSE 1070.	-	-	1/2"	1/2"	-	WATTS - LFUSG-B; LEONARD - 270-LF; OR APPROVED EQUAL	
WS2	WALL MOUNTED LAVATORY SYSTEM, 3-STATION, SOLID SURFACE SINK, COORDINATE FINISH WITH ARCHITECT PRIOR TO ORDERING	2"	1 1/2"	-	-	-	SLOAN - SLOANSTONE ELRF-83000	
	DECK MOUNTED FAUCET, AUTOMATIC, HARDWIRED-POWERED, .5 GPM	-	-	-	1/2"	110V	SLOAN - EAF-100	
	SUPPLY AND STOPS, LOOSE KEY, CHROME PLATED BRASS VALVES AND CHROME PLATED COPPER RISERS, LEAD FREE	-	-	-	-	-	MCGUIRE - LF2165CCLK; OR EQUAL IN T&S BRASS OR BRASSCRAFT	X
	P-TRAP, CHROME PLATED CAST BRASS BODY WITH CLEANOUT, SEAMLESS WALL BEND, 17 GA.	-	-	-	-	-	MCGUIRE - 8902C; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	OFFSET TAILPIECE AND STRAINER, CHROME PLATED CAST BRASS	-	-	-	-	-	MCGUIRE - 155WC; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	THERMOSTATIC MIXING VALVE, 0.25 GPM MINIMUM FLOW, INTEGRAL INLET CHECK VALVES AND STRAINER, SET TEMPERATURE TO 105°, ASSE 1070.	-	-	1/2"	1/2"	-	WATTS - LFUSG-B; LEONARD - 270-LF; OR APPROVED EQUAL	
S1	CHROMIUM PLATED BRASS ANGLE SUPPLY WITH 1/2" OD X 12" FLEXIBLE RISER, 3/8" IPS X 1/2" OD QUARTER TURN STOP, ESCUTCHEON; CHROMIUM PLATE ALL METAL PARTS	2"	1 1/2"	-	-	-	ELKAY - 14-1C16X20-0X; OR APPROVED EQUAL	
	FAUCET, CHROME PLATED SWING SPOUT, 1/2" IPS INLETS, 6" WRIST BLADES	-	-	1/2"	1/2"	-	T&S BRASS - 0331-BWH6; OR APPROVED EQUAL	
	CHROMIUM PLATED BRASS ANGLE SUPPLY WITH 1/2" OD X 12" FLEXIBLE RISER, 3/8" IPS X 1/2" OD QUARTER TURN STOP, ESCUTCHEON; CHROMIUM PLATE ALL METAL PARTS	-	-	-	-	-	MCGUIRE - LFBV02; OR EQUAL IN T&S BRASS OR BRASSCRAFT	X
	P-TRAP, CHROME PLATED CAST BRASS BODY WITH CLEANOUT, 17 GA., END-OUTLET CONTINUOUS WASTE	-	-	-	-	-	MCGUIRE - 8912C/111C16G20; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	TAILPIECE AND FORGED STAINLESS STEEL BASKET STRAINER	-	-	-	-	-	JUST - J-ADA-35; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	THERMOSTATIC MIXING VALVE, 0.25 GPM MINIMUM FLOW, INTEGRAL INLET CHECK VALVES AND STRAINER, SET TEMPERATURE TO 105°, ASSE 1070.	-	-	1/2"	1/2"	-	WATTS, LFUSG-B; LEONARD, 270-LF; OR APPROVED EQUAL	
	PLASTER TRAP, CAST IRON, 2-INCH INLET AND OUTLET, SCREENED OUTLET	-	-	-	-	-	ZURN - Z1180; OR APPROVED EQUAL	
S2	SINK, SINGLE COMPARTMENT, 25"x19-1/2"x6", ACCESSIBLE, DROP-IN, #18 GAUGE TYPE 304 STAINLESS STEEL, VERTICAL AND HORIZONTAL RADIUS BASIN CORNERS, BOTTOM SOUND DEADENING PADS, ANSI A112.19.3M, REAR CENTER DRAIN	2"	1 1/2"	-	-	-	ELKAY - LFRAD251960; OR EQUAL IN JUST MFG	
	FAUCET, DECK MOUNT, CHROME PLATED BRASS, RIGID SWING GOOSENECK SPOUT, TWO-HANDLE, 1/4 TURN 4" WRIST BLADE HANDLES, 4" CENTERS, NSF 61 COMPLIANT, ANSI A112.18.1M, 2.2 GPM MAX. FLOW RATE	-	-	1/2"	1/2"	-	T&S BRASS - B-0892; OR APPROVED EQUAL	
	SUPPLY AND STOPS, LOOSE KEY, CHROME PLATED BRASS VALVES AND CHROME PLATED COPPER RISERS, LEAD FREE	-	-	-	-	-	MCGUIRE - LFH2167CCLK; OR EQUAL IN T&S BRASS OR BRASSCRAFT	X
	P-TRAP, CHROME PLATED CAST BRASS BODY WITH CLEANOUT, 17 GA., END-OUTLET CONTINUOUS WASTE	-	-	-	-	-	MCGUIRE - 8912C/111C16G20; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	TAILPIECE AND FORGED STAINLESS STEEL BASKET STRAINER	-	-	-	-	-	JUST - J-ADA-35; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	THERMOSTATIC MIXING VALVE, 0.25 GPM MINIMUM FLOW, INTEGRAL INLET CHECK VALVES AND STRAINER, SET TEMPERATURE TO 105°, ASSE 1070.	-	-	1/2"	1/2"	-	WATTS - LFUSG-B; LEONARD - 270-LF; OR APPROVED EQUAL	
	PLASTER TRAP, CAST IRON, 2-INCH INLET AND OUTLET, SCREENED OUTLET	-	-	-	-	-	ZURN - Z1180; OR APPROVED EQUAL	
S3	SINK, SINGLE COMPARTMENT, 25"x19-1/2"x6", ACCESSIBLE, DROP-IN, #18 GAUGE TYPE 304 STAINLESS STEEL, VERTICAL AND HORIZONTAL RADIUS BASIN CORNERS, BOTTOM SOUND DEADENING PADS, ANSI A112.19.3M, REAR CENTER DRAIN	2"	1 1/2"	-	-	-	ELKAY - LFRAD251960; OR EQUAL IN JUST MFG	
	FAUCET, DECK MOUNT, CHROME PLATED BRASS, RIGID SWING GOOSENECK SPOUT, TWO-HANDLE, 1/4 TURN 4" WRIST BLADE HANDLES, 4" CENTERS, NSF 61 COMPLIANT, ANSI A112.18.1M, 2.2 GPM MAX. FLOW RATE	-	-	1/2"	1/2"	-	T&S BRASS - B-0892; OR APPROVED EQUAL	
	SUPPLY AND STOPS, LOOSE KEY, CHROME PLATED BRASS VALVES AND CHROME PLATED COPPER RISERS, LEAD FREE	-	-	-	-	-	MCGUIRE - LFH2167CCLK; OR EQUAL IN T&S BRASS OR BRASSCRAFT	X
	P-TRAP, CHROME PLATED CAST BRASS BODY WITH CLEANOUT, 17 GA., END-OUTLET CONTINUOUS WASTE	-	-	-	-	-	MCGUIRE - 8912C/111C16G20; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	TAILPIECE AND FORGED STAINLESS STEEL BASKET STRAINER	-	-	-	-	-	JUST - J-ADA-35; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	THERMOSTATIC MIXING VALVE, 0.25 GPM MINIMUM FLOW, INTEGRAL INLET CHECK VALVES AND STRAINER, SET TEMPERATURE TO 105°, ASSE 1070.	-	-	1/2"	1/2"	-	WATTS - LFUSG-B; LEONARD - 270-LF; OR APPROVED EQUAL	
S4	SINK, DOUBLE COMPARTMENT, 29"x22"x6", ACCESSIBLE, DROP-IN, #18 GAUGE TYPE 304 STAINLESS STEEL, VERTICAL AND HORIZONTAL RADIUS BASIN CORNERS, BOTTOM SOUND DEADENING PADS, 3-FAUCET HOLES, 8-INCH CENTERS, ANSI A112.19.3M, REAR CENTER DRAIN	2"	1 1/2"	-	-	-	ELKAY - LRADD292260; OR EQUAL IN JUST MFG	
	FAUCET, DECK MOUNT, CHROME PLATED BRASS, RIGID SWING GOOSENECK SPOUT, TWO-HANDLE, 1/4 TURN 4" WRIST BLADE HANDLES, 4" CENTERS, NSF 61 COMPLIANT, ANSI A112.18.1M, 2.2 GPM MAX. FLOW RATE	-	-	1/2"	1/2"	-	T&S BRASS - B-0892; OR APPROVED EQUAL	
	SUPPLY AND STOPS, LOOSE KEY, CHROME PLATED BRASS VALVES AND CHROME PLATED COPPER RISERS, LEAD FREE	-	-	-	-	-	MCGUIRE - LFH2167CCLK; OR EQUAL IN T&S BRASS OR BRASSCRAFT	X
	P-TRAP, CHROME PLATED CAST BRASS BODY WITH CLEANOUT, 17 GA., END-OUTLET CONTINUOUS WASTE	-	-	-	-	-	MCGUIRE - 8912C/111C16G20; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	TAILPIECE AND FORGED STAINLESS STEEL BASKET STRAINER	-	-	-	-	-	JUST - J-ADA-35; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	THERMOSTATIC MIXING VALVE, 0.25 GPM MINIMUM FLOW, INTEGRAL INLET CHECK VALVES AND STRAINER, SET TEMPERATURE TO 105°, ASSE 1070.	-	-	1/2"	1/2"	-	WATTS - LFUSG-B; LEONARD - 270-LF; OR APPROVED EQUAL	
S5	SINK, SINGLE COMPARTMENT, 25"x19-1/2"x6", ACCESSIBLE, DROP-IN, #18 GAUGE TYPE 304 STAINLESS STEEL, VERTICAL AND HORIZONTAL RADIUS BASIN CORNERS, BOTTOM SOUND DEADENING PADS, ANSI A112.19.3M, REAR CENTER DRAIN	2"	1 1/2"	-	-	-	ELKAY - LFRAD251960; OR EQUAL IN JUST MFG	
	MIXING FAUCET, DECK MOUNT, CHROME PLATED BRASS, 6" RIGID SWING GOOSENECK SPOUT, TWO-HANDLE, 1/4-TURN 4" WRIST BLADE HANDLES, VACUUM BREAKER, ASME A112.18.1M	-	-	1/2"	1/2"	-	WATER SAVER - LF414VB-BH	
	SUPPLY AND STOPS, LOOSE KEY, CHROME PLATED BRASS VALVES AND CHROME PLATED COPPER RISERS, LEAD FREE	-	-	-	-	-	MCGUIRE - LFH2167CCLK; OR EQUAL IN T&S BRASS OR BRASSCRAFT	X
	P-TRAP, CHROME PLATED CAST BRASS BODY WITH CLEANOUT, 17 GA., END-OUTLET CONTINUOUS WASTE	-	-	-	-	-	MCGUIRE - 8912C/111C16G20; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	TAILPIECE AND FORGED STAINLESS STEEL BASKET STRAINER	-	-	-	-	-	JUST - J-ADA-35; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	THERMOSTATIC MIXING VALVE, 0.25 GPM MINIMUM FLOW, INTEGRAL INLET CHECK VALVES AND STRAINER, SET TEMPERATURE TO 105°, ASSE 1070.	-	-	1/2"	1/2"	-	WATTS - LFUSG-B; LEONARD - 270-LF; OR APPROVED EQUAL	
MSB1	MOP SINK BASIN, ONE PIECE-PRECAST TERRAZZO 32"x32"x12" NEO-CORNER SINK (1 1/4" WALL THICKNESS WITH MINIMUM 9.75" INSIDE DEPTH), 6" DROP FRONT, STAINLESS STEEL WALL GUARDS, STAINLESS STEEL DRAIN ASSEMBLY AND STRAINER PLATE	3"	2"	-	-	-	FIAT - TSBC1611; OR APPROVED EQUAL	
	FAUCET, EXPOSED YOKE, WALL MOUNTED UTILITY FAUCET, VACUUM BREAKER, 6"THREADED SPOUT	-	-	3/4"	3/4"	-	FIAT - 830-AA; OR APPROVED EQUAL	
	24"x3" STAINLESS STEEL MOP BRACKET WITH THREE RUBBER TOOL GRIPS	-	-	-	-	-	FIAT - 889-CC; OR APPROVED EQUAL	
	30" RUBBER HOSE (5/8"), CHROME COUPLING 1 END, 5"x3" STAINLESS STEEL BRACKET W/ RUBBER GRIP	-	-	-	-	-	FIAT - 832-AA; OR APPROVED EQUAL	
	ALUMINUM BUMPER GUARD ON LEADING EDGE OF MOP SINK BASIN	-	-	-	-	-	FIAT - E-77-AA; OR APPROVED EQUAL	
MSB2	MOP SINK BASIN, ONE PIECE-PRECAST TERRAZZO 24"x24"x12" (1 1/4" WALL THICKNESS WITH MINIMUM 9.75" INSIDE DEPTH) 6" DROP FRONT, STAINLESS STEEL EDGE CAPS ON ALL SIDES, STAINLESS STEEL WALL GUARDS, CAST BRASS DRAIN WITH STAINLESS STEEL STRAINER	3"	2"	-	-	-	FIAT - TSB3000; OR APPROVED EQUAL	
	FAUCET, EXPOSED YOKE, WALL MOUNTED UTILITY FAUCET, VACUUM BREAKER, 6"THREADED SPOUT	-	-	1/2"	1/2"	-	FIAT - 830-AA; OR APPROVED EQUAL	
	24"x3" STAINLESS STEEL MOP BRACKET WITH THREE RUBBER TOOL GRIPS	-	-	-	-	-	FIAT - 889-CC; OR APPROVED EQUAL	
	30" RUBBER HOSE (5/8"), CHROME COUPLING 1 END, 5"x3" STAINLESS STEEL BRACKET W/ RUBBER GRIP	-	-	-	-	-	FIAT - 832-AA; OR APPROVED EQUAL	
	ALUMINUM BUMPER GUARD ON LEADING EDGE OF MOP SINK BASIN	-	-	-	-	-	FIAT - E-77-AA; OR APPROVED EQUAL	
EWS1	EMERGENCY EYEWASH/SHOWER COMBINATION, RECESSED, BARRIER FREE, WALL MOUNTED WITH EXPOSED SHOWER HEAD, DRAIN PAN WITH DIRECT DRAIN, TSMV, SCHEDULE 40 GALVANIZED STEEL PIPING AND FITTINGS, 10" DIA. STAINLESS STEEL DELUGE SHOWER HEAD, STAINLESS STEEL EYEWASH BOWL, PULL ROD OPERATED, ANTI SQUIRT EYEWASH HEADS, PUSH FLAG, STAY OPEN BALL VALVES, ELECTRIC LIGHT AND ALARM HORN.	-	-	1 1/4"	1"	-	GUARDIAN - GBF2170-G6044-AP250-018SS-AP280-235; OR APPROVED EQUAL	X
	TSMV INSTALLED IN RECESS MOUNTED STAINLESS STEEL CABINET	-	-	-	-	-	GUARDIAN - G6044	
HS1	COMMERCIAL HAND SINK, WALL MOUNTED, 14"X10"X5", STAINLESS STEEL WITH BASKET DRAIN, GOOSENECK FAUCET	2"	1 1/2"	3/4"	3/4"	-	ADVANCE TABCO - 7-PS-54; OR APPROVED EQUAL	

1

PLUMBING FIXTURE SCHEDULE

MARK	DESCRIPTION	ROUGH-IN (MINIMUM) WASTE	VENT	DCW	DHW	ELEC	MANUFACTURER & MODEL NUMBER	ADA/TAS
EWC1	TWO STATION WATER COOLER WITH BOTTLE FILLER ON LOW SIDE, INDOOR BI-LEVEL WALL MOUNTED, SELF CONTAINED ELECTRIC REFRIGERATION, STAINLESS STEEL BASIN AND CABINET WITH ANTI-SPLASH RIDGE, INTEGRAL DRAIN STRAINER, NON-SQUIRT BUBBLER, PUSH BAR ACTIVATION ON FRONT AND SIDES OF WATER COOLER. REFRIGERATION SYSTEM SERVING BOTH BI-LEVELS TO INCLUDE HIGH EFFICIENCY COMPRESSOR, R-134A, FULLY INSULATED STAINLESS STEEL TANK, 8 GPH WITH 50°F SUPPLY TEMPERATURE AND 80°F AMBIENT, 115VOLT. ANSI 117.1, NFS/ANSI 61, ARI STANDARD 1010	2"	1-1/2"	1/2"	-	120V	HALSEY TAYLOR - HTHBHVRBBL; OR APPROVED EQUAL	
	ACCESSIBLE APRON, MOLDED STAINLESS STEEL SKIRT KIT FOR INSTALLATION ON THE HIGH UNIT	-	-	-		-	ELKAY - 98324C; OR APPROVED EQUAL	X
	FIXTURE CARRIER, STEEL TOP AND BOTTOM PLATES W/ ADJ. HOLES, CHROME PLATED CAP NUTS/WASHERS	-	-	-	-	-	ELKAY - MLP200; OR APPOVED EQUAL	
	SUPPLY AND STOP, LOOSE KEY, CHROME PLATED BRASS VALVE AND 12-INCH STAINLESS STEEL BRAIDED RISER, LEAD FREE	-	-	-	-	-	MCGUIRE - LF2165CCLKSS12; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
	P-TRAP, CHROME PLATED CAST BRASS BODY WITH CLEANOUT, SEAMLESS WALL BEND, 17 GA.	-	-	-	-	-	MCGUIRE - 8902C; OR EQUAL IN T&S BRASS OR BRASSCRAFT	
WMB1	WASHING MACHINE CONNECTION BOX, STAINLESS STEEL WITH CENTER DRAIN, 1/2" HALF TURN VALVES	2"	1-1/2"	-	-	-	GUY GRAY - SSWB; OR APPROVED EQUAL	
IMB1	ICE MACHINE BOX, 1/4 TURN BALL VALVE, PROVIDE FIRE RATED OUTLET BOX IF PLACING IN FIRE RATED WALL	-	-	1/2"	-	-	OATEY ICE MAKER OUTLET BOXES; OR APPROVED EQUAL	
HB	HOSE BIBB, BRASS WITH CHROME FINISH, VACUUM BREAKER, 3/4" MALE N.H.T. OUTLET, WALL FLANGE, METAL HANDLE	-	-	3/4"	-	-	WOODFORD - 24; OR EQUAL IN ZURN, JOSAM, OR MIFAB	
NFWH1	NON-FREEZE WALL HYDRANT, CONCEALED WALL TYPE, CHROME FINISH ON BRASS CASTINGS, VACUUM BREAKER, LOOSE KEY HANDLE. 3/4" MALE HOSE THREAD NOZZLE. PROVIDE SAMPLES OF MATERIAL AND FINISHES FOR THE EXTERIOR HOSE CONNECTION FOR ARCHITECTURAL SELECTION OF FINISH.	-	-	3/4"	-	-	WOODFORD - B67; OR EQUAL IN ZURN, JOSAM, OR MIFAB	
NFWH2	NON-FREEZE WALL HYDRANT, HOT & COLD WATER SERVICE, CONCEALED WALL TYPE, CHROME FINISH ON BRASS CASTINGS, VACUUM BREAKER, LOOSE KEY HANDLE. 3/4" MALE HOSE THREAD NOZZLE. PROVIDE SAMPLES OF MATERIAL AND FINISHES FOR THE EXTERIOR HOSE CONNECTION FOR ARCHITECTURAL SELECTION OF FINISH.	-	-	3/4"	3/4"	-	WOODFORD - B22; OR EQUAL IN ZURN, JOSAM, OR MIFAB	
NFRH1	NON-FREEZE ROOF HYDRANT, BACKFLOW PROTECTED ASSE 1052 APPROVED, VARIABLE FLOW, AUTOMATIC DRAINING, FREEZELESS, SELF-CLOSING	-	-	3/4"	-	-	WOODFORD - SRH-MS; OR EQUAL IN ZURN, JOSAM, OR MIFAB	
FD1	FLOOR DRAIN, CAST IRON BODY, ANCHOR FLANGE, WEEPHOLES FOR DOUBLE DRAINAGE, 5" SQUARE STAINLESS STEEL FLAT STRAINER. ADJUSTABLE DRAIN HEAD W/ MACHINED INTEGRAL BODY THREADS, ASME A112.21.1	3"	2"	-	-	-	JOSAM - 30000-SS-SS; OR EQUAL IN ZURN OR MIFAB	
FD2	FLOOR DRAIN, CAST IRON BODY, ANCHOR FLANGE, WEEPHOLES FOR DOUBLE DRAINAGE, 5" ROUND STAINLESS STEEL FLAT STRAINER. ADJUSTABLE DRAIN HEAD W/ MACHINED INTEGRAL BODY THREADS, ASME A112.21.1	4"	3"	-	-	-	JOSAM - 30000-5A-SS; OR EQUAL IN ZURN OR MIFAB	
	FUNNEL ASSEMBLY, ROUND	-	-	-	-	-	JOSAM - F6; OR EQUAL IN ZURN OF MIFAB	
FS1	FLOOR SINK, 12"x12"x8", CI BODY, DBL DRAINAGE FLANGE, STAINLESS STEEL DOME STRAINER, 3/4 GRATE, NON-PUNCTURING FLASHING COLLAR, PORCELAIN ENAMEL OR EPOXY COATED INTERIOR, REMOVABLE SEDIMENT BUCKET	4"	3"	-	-	-	JOSAM - 49340-4-33; OR EQUAL IN ZURN OR MIFAB	
FS2	FLOOR SINK, 12"x12"x8", CI BODY, DBL DRAINAGE FLANGE, STAINLESS STEEL DOME STRAINER, 3/4 GRATE, NON-PUNCTURING FLASHING COLLAR, PORCELAIN ENAMEL OR EPOXY COATED INTERIOR, REMOVABLE SEDIMENT BUCKET	3"	2"	-	-	-	JOSAM - 49340-4-33; OR EQUAL IN ZURN OR MIFAB	
FD3	TRAP PRIMER (PROVIDED FOR ALL FLOOR DRAINS), DIAPHRAGM OPERATED BASED ON PRESSURE SPIKES OR PRESSURE DROPS. OPERATING RANGE BETWEEN 30 TO 70 PSIG. PROVIDE WITH DISTRIBUTION UNIT SERVING MULTIPLE DRAINS (UP TO 4). PROVIDE ACCESS PANEL FOR TRAP PRIMER MAINTENANCE.	-	-	1/2"	-	-	PPP - CPO-500; OR APPROVED EQUAL	
TP2	TRAP PRIMER (PROVIDED FOR ALL FLOOR DRAINS), DIAPHRAGM OPERATED BASED ON PRESSURE SPIKES OR PRESSURE DROPS. OPERATING RANGE BETWEEN 30 TO 70 PSIG. PROVIDE WITH DISTRIBUTION UNIT SERVING MULTIPLE DRAINS (UP TO 13-20). PROVIDE ACCESS PANEL FOR TRAP PRIMER MAINTENANCE.	-	-	1/2"	-	120V	PPP - PT-1320; OR APPROVED EQUAL	
LT	STAINLESS STEEL LINT TROUGH, TYPE 304, 4-FEET LONG, REMOVABLE PRIMARY AND SECONDARY STAINLESS STEEL FILTER SCREENS, PERFORATED STAINLESS STEEL DOME BOTTOM STRAINER, 4-INCH NO-HUB BOTTOM OUTLET.	4"	-	-	-	-	WATTS - LI-LT; OR APPROVED EQUAL	
WCO	WALL CLEANOUT, CI BODY, RECESSED, THREADED BRASS PLUG, STAINLESS STEEL ACCESS COVER	-	-	-	-	-	JOSAM - 56680-5-26-VP; OR EQUAL IN ZURN OR MIFAB	
FCO	FLOOR CLEANOUT, COATED CAST IRON BODY, COMBINATION ADJUSTABLE ROUND STAINLESS STEEL COVER AND PLUG TOP ASSEMBLY, GASKET SEAL, ASME 112.36.2	-	-	-	-	-	JOSAM - 58360; OR EQUAL IN ZURN OR MIFAB	
GCO	GRADE CLEANOUT, HEAVY DUTY COATED CAST IRON ACCESS BODY WITH ANCHOR FLANGES, HEAVY DUTY DUCTILE IRON ACCESS COVER WITH VANDAL RESISTANT STAINLESS STEEL SCREWS	-	-	-	-	-	JOSAM - 56680-5-26-VP; OR EQUAL IN ZURN OR MIFAB	
DCO	2-WAY GRADE CLEANOUT, TWO-RISER CLEANOUT BODY WITH HEAVY DUTY COATED CAST IRON ACCESS BODY WITH ANCHOR FLANGES, HEAVY DUTY DUCTILE IRON ACCESS COVER WITH VANDAL RESISTANT STAINLESS STEEL SCREWS	-	-	-	-	-	JOSAM - 56680-5-26-VP; OR EQUAL IN ZURN OR MIFAB	
RD1	ROOF DRAIN: LARGE GALVANIZED CAST IRON BODY, DECK CLAMP; SIZE AS INDICATED ON DRAWINGS	-	-	-	-	-	ZURN - Z100F-G; OR EQUAL BY SMITH, WATTS	
OD1	OVERFLOW DRAIN: SAME AS ROOF DRAIN RD1 WITH 2-INCH OVERFLOW DAM	-	-	-	-	-	ZURN - Z100F-G-89; OR EQUAL BY SMITH, WATTS	
DSN	DOWNSPOUT NOZZLE, 2-PIECE, BRONZE, WALL FLANGE AND THREADED INLET. PROVIDE SAMPLES OF MATERIAL AND FINISHES FOR EXTERIOR DOWNSPOUT NOZZLE FOR ARCHITECTURAL SELECTION OF FINISH.	-	-	-	-	-	JOSAM - 25010; OR EQUAL IN ZURN OR MIFAB	

NOTES:
1. CONTRACTOR SHALL FURNISH AND INSTALL SUPPLIES, STOPS, TRAPS, TAILPIECES AND ALL APPURTENANCES NECESSARY FOR A COMPLETE INSTALLATION OF ALL FIXTURES.
2. ALL ACCESSIBLE SINKS AND LAVATORIES SHALL BE EQUIPPED WITH TRUEBRO #103 UNDER SINK PROTECTIVE PIPE COVERS WHERE NOT CONCEALED BY MILLWORK.
3. PLUMBING CONTRACTOR SHALL PROVIDE PLUMBING FIXTURES WITH FLUSH VALVE HANDLES LOCATED ON THE WIDE SIDE OF EACH STALL OR ROOM.
4. CONTRACTOR SHALL VERIFY FIXTURE SUPPLIES AND APPURTENANCES FOR EACH FIXTURE PRIOR TO BIDDING AND PURCHASING.
5. ALL FLOOR MOUNTED WATER CLOSETS SHALL HAVE 10" ROUGH-IN UNLESS OTHERWISE NOTED.
6. CONTRACTOR SHALL VERIFY PLUMBING FIXTURES PROVIDED COMPLY WITH HANDICAPPED ACCESSIBILITY STANDARDS INCLUDING HEIGHT AND CLEARANCE REQUIREMENTS.
7. COMPLY WITH THE PROVISIONS OF THE AMERICANS WITH DISABILITIES ACT (ADA) AND THE TEXAS ACCESSIBILITY'S STANDARD (TAS).

GAS-FIRED D

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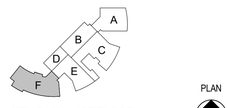
NOTES BY SYMBOL

1 REFER TO CIVIL FOR CONTINUATION.

1 PLUMBING PLAN - BELOW SLAB - AREA F
1/8" = 1'-0"



KEY PLAN - 1ST FLOOR
N.T.S.

PLAN N

Revision /	Date	
1	08/07/26	ADDENDUM 2

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL ISD
TOMBALL, TEXAS

IEG
Innovative Engineering Group
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817.410.2858
TBPELS Firm No. F-5923

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PLUMBING PLAN - BELOW SLAB - AREA F

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NOTES BY SYMBOL

1 RUN PIPING BELOW SECOND FLOOR, WITHIN THE BUILDING/SOFFIT.

2 3/4-INCH DOMESTIC COLD WATER UP TO HOSE BIBB ON SECOND FLOOR.

3 6-INCH STORM DRAIN DOWN TO BELOW GRADE.

4 PROVIDE DRAIN PAN BELOW ALL PIPING OVER IDF ROOM. PROVIDE WATER SENSING DISK IN BOTTOM OF PAN INTEGRATED INTO BAS SYSTEM TO SIGNAL ALARM IF WATER IS SENSED IN DRAIN PAN.

5 PROVIDE FIXTURE FLUSH VALVE WITH OPTIONAL TRAP PRIMER ACCESSORY. EXTEND PIPING FROM TRAP PRIMER TAP TO FLOOR DRAIN TAP.

1 2 6 3/4-INCH CONDENSATE PUMPED ABOVE CEILING AND GRAVITY DRAINED TO POINT OF DISCHARGE.

7 CONDENSATE DOWN TO BRANCH TAILPIECE CONNECTION AT LAV/SINK. REFER TO DETAIL 9/P6.02 FOR ADDITIONAL INFORMATION.

1 PLUMBING PLAN - LEVEL 01 - AREA A
1/8" = 1'-0"

KEY PLAN - 1ST FLOOR
N.T.S.

PLAN N

Revision /	Date	
1	07/24/26	ADDENDUM 1
2	08/07/26	ADDENDUM 2

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PLUMBING PLAN - LEVEL 01 - AREA A

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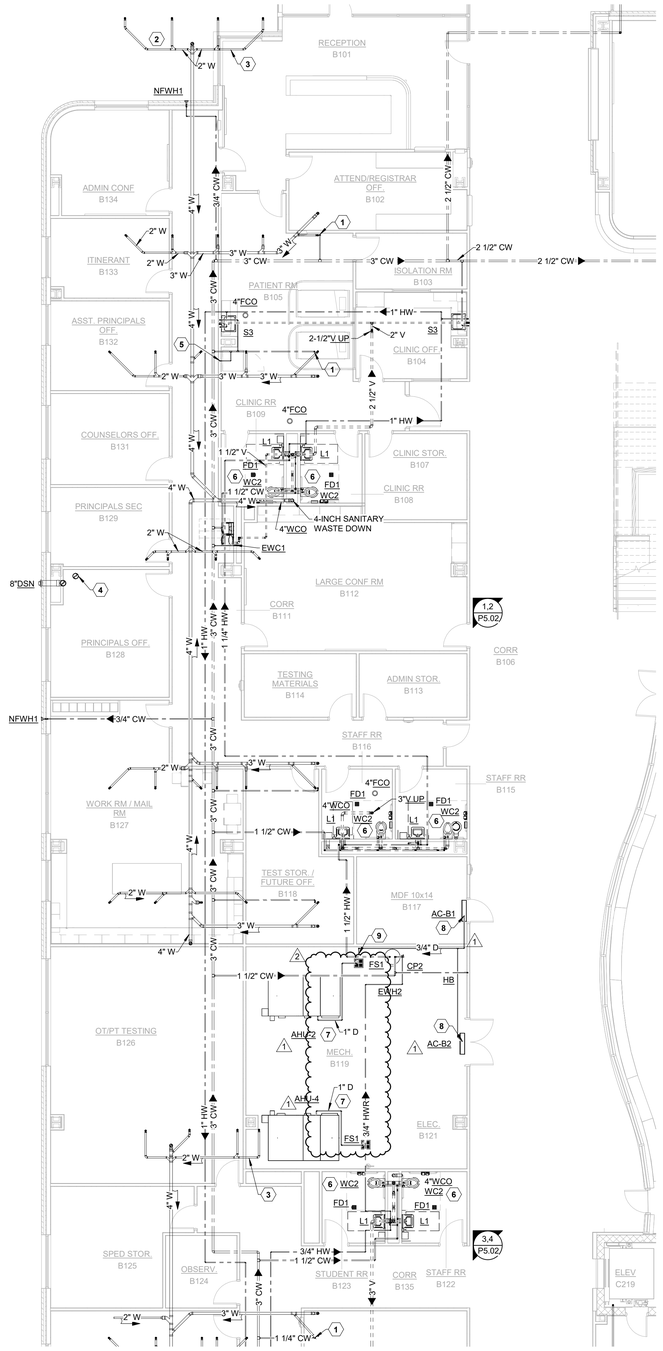
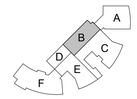
NOTES BY SYMBOL

1. 1-1/4-INCH DOMESTIC COLD WATER UP TO EMERGENCY EYEWASH STATIONS ON SECOND FLOOR.
2. RUN PIPING BELOW SECOND FLOOR, WITHIN THE BUILDING/SOFFIT.
3. PENETRATION OF STRUCTURE APPROXIMATELY AS LOCATED ABOVE CEILING. COORDINATE WITH STRUCTURAL.
4. 8-INCH STORM DRAIN DOWN TO BELOW GRADE.
5. 1/2-INCH DOMESTIC COLD WATER SUPPLY TO REFRIGERATOR.
6. PROVIDE FIXTURE FLUSH VALVE WITH OPTIONAL TRAP PRIMER ACCESSORY. EXTEND PIPING FROM TRAP PRIMER TAP TO FLOOR DRAIN TAP.
7. RUN CONDENSATE PIPING FROM AHU UNIT TO NEAREST FLOOR SINK. POSITION FLOOR SINK AS CLOSE TO DISCHARGE AREA OF UNIT TO REDUCE TRIPPING HAZARDS.
8. 3/4-INCH CONDENSATE PUMPED ABOVE CEILING AND GRAVITY DRAINED TO POINT OF DISCHARGE.
9. CONDENSATE DOWN TO FLOOR SINK.



1 PLUMBING PLAN - LEVEL 01 - AREA B
1/8" = 1'-0"



KEY PLAN - 1ST FLOOR
N.T.S.

PLAN

Revision /	Date	
1	07/24/26	ADDENDUM 1
2	08/07/26	ADDENDUM 2

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PLUMBING PLAN - LEVEL 01 - AREA B

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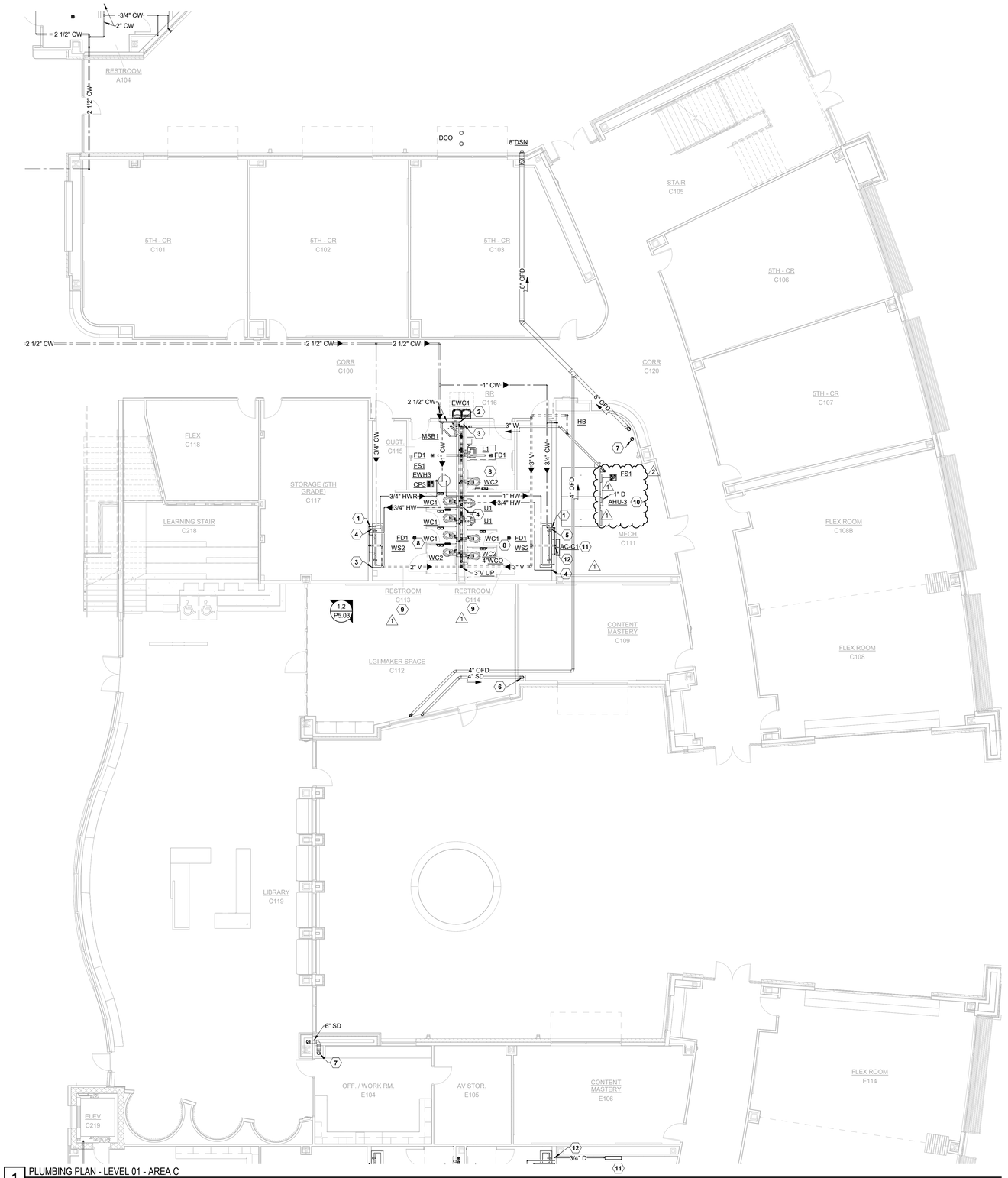
NOTES BY SYMBOL

1. 3/4-INCH DOMESTIC COLD WATER UP TO SECOND FLOOR.
2. 2-INCH DOMESTIC COLD WATER UP TO SECOND FLOOR.
3. 3/4-INCH DOMESTIC HOT WATER UP TO SECOND FLOOR.
4. 3/4-INCH DOMESTIC HOT WATER DOWN TO FIRST FLOOR.
5. 1-INCH DOMESTIC HOT WATER UP TO SECOND FLOOR.
6. 4-INCH STORM DRAIN DOWN TO BELOW GRADE.
7. 6-INCH STORM DRAIN DOWN TO BELOW GRADE.
8. PROVIDE FIXTURE FLUSH VALVE WITH OPTIONAL TRAP PRIMER ACCESSORY. EXTEND PIPING FROM TRAP PRIMER TAP TO FLOOR DRAIN TAP.
9. SECOND FLOOR WS2 SANITARY PLUMBING NOT SHOWN FOR DRAWING CLARITY. REFER TO SCHEDULE FOR WS2 INFORMATION.
10. RUN CONDENSATE PIPING FROM AHU UNIT TO NEAREST FLOOR SINK. POSITION FLOOR SINK AS CLOSE TO DISCHARGE AREA OF UNIT TO REDUCE TRIPPING HAZARDS.
11. 3/4-INCH CONDENSATE PUMPED ABOVE CEILING AND GRAVITY DRAINED TO POINT OF DISCHARGE.
12. CONDENSATE DOWN TO BRANCH TAILPIECE CONNECTION AT LAV/SINK. REFER TO DETAIL 9/P6.02 FOR ADDENDUM INFORMATION.



1 PLUMBING PLAN - LEVEL 01 - AREA C
1/8" = 1'-0"

KEY PLAN - 1ST FLOOR
N.T.S.

PLAN N

Revision /	Date	
1	07/24/26	ADDENDUM 1
2	08/07/26	ADDENDUM 2

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL ISD
TOMBALL, TEXAS

IEG
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www.iegengineers.com
817.410.2858
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PLUMBING PLAN - LEVEL 01 - AREA C

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NOTES BY SYMBOL

1. 3/4-INCH DOMESTIC COLD WATER UP TO SECOND FLOOR.
2. 2-INCH DOMESTIC COLD WATER UP TO SECOND FLOOR.
3. 3/4-INCH DOMESTIC HOT WATER UP TO SECOND FLOOR.
4. 3/4-INCH DOMESTIC HOT WATER DOWN TO FIRST FLOOR.
5. 1-INCH DOMESTIC HOT WATER UP TO SECOND FLOOR.
6. 8-INCH STORM DRAIN DOWN TO BELOW GRADE.
7. 6-INCH STORM DRAIN DOWN TO BELOW GRADE.
8. REFER TO DETAIL 8/P6.02 FOR DISHWASHER CONNECTION DETAILS.
9. 1/2-INCH DOMESTIC COLD WATER SUPPLY TO REFRIGERATOR.
10. PROVIDE FIXTURE FLUSH VALVE WITH OPTIONAL TRAP PRIMER ACCESSORY. EXTEND PIPING FROM TRAP PRIMER TAP TO FLOOR DRAIN TAP.
11. SECOND FLOOR WS2 SANITARY PLUMBING NOT SHOWN FOR DRAWING CLARITY. REFER TO SCHEDULE FOR WS2 INFORMATION.
12. RUN CONDENSATE PIPING FROM AHU UNIT TO NEAREST FLOOR SINK. POSITION FLOOR SINK AS CLOSE TO DISCHARGE AREA OF UNIT TO REDUCE TRIPPING HAZARDS.
13. 3/4-INCH CONDENSATE PUMPED ABOVE CEILING AND GRAVITY DRAINED TO POINT OF DISCHARGE.
14. CONDENSATE DOWN TO BRANCH TAILPIECE CONNECTION AT LAV/SINK. REFER TO DETAIL 9/P6.02 FOR ADDITIONAL INFORMATION.

1 PLUMBING PLAN - LEVEL 01 - AREA E
1/8" = 1'-0"

Revision /	Date	
1	07/24/26	ADDENDUM 1
2	08/07/26	ADDENDUM 2

Project:
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TOMBALL, TEXAS

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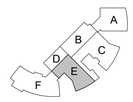

KEY PLAN - 1ST FLOOR
N.T.S.

PLAN
N

PLUMBING PLAN - LEVEL 01 - AREA E

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NOTES BY SYMBOL

1. 2-1/2-INCH DOMESTIC COLD WATER UP TO SECOND FLOOR TO SUPPLY SCIENCE LABS.
2. 6-INCH STORM DRAIN DOWN TO BELOW GRADE.
3. 4-INCH STORM DRAIN DOWN TO BELOW GRADE.
4. PROVIDE DRAIN PAN BELOW ALL PIPING OVER IDF ROOM. PROVIDE WATER SENSING DISK IN BOTTOM OF PAN INTEGRATED INTO BAS SYSTEM TO SIGNAL ALARM IF WATER IS SENSED IN DRAIN PAN.
5. 1-INCH MAKE-UP WATER TO HEATING WATER LOOP. REF MECHANICAL DRAWING AND PLUMBING DETAIL 6/P6.01.
6. 1-INCH MAKE-UP WATER TO CHILLED WATER LOOP. REF MECHANICAL DRAWING AND PLUMBING DETAIL 6/P6.01.
7. PROVIDE WATER METER INTEGRATED INTO BMS SYSTEM TO RECORD WATER USAGE IN KITCHEN.
8. 1/2-INCH DOMESTIC COLD WATER SUPPLY TO REFRIGERATOR.
9. 3-INCH GAS UP TO ROOF. LOCATE APPROXIMATELY AS SHOWN. PROVIDE GAS TEST PORT 18-INCHES ABOVE FINISHED FLOOR.
10. PROVIDE FIXTURE FLUSH VALVE WITH OPTIONAL TRAP PRIMER ACCESSORY. EXTEND PIPING FROM TRAP PRIMER TAP TO FLOOR DRAIN TAP.
11. RUN CONDENSATE PIPING FROM AHU UNIT TO NEAREST FLOOR SINK. POSITION FLOOR SINK AS CLOSE TO DISCHARGE AREA OF UNIT TO REDUCE TRIPPING HAZARDS.
12. 3/4-INCH CONDENSATE PUMPED ABOVE CEILING AND GRAVITY DRAINED TO POINT OF DISCHARGE.
13. CONDENSATE DOWN TO BRANCH TAILPIECE CONNECTION AT LAV/SINK. REFER TO DETAIL 9/P6.02 FOR ADDITIONAL INFORMATION.
14. CONDENSATE DOWN TO FLOOR SINK.

Revision /	Date	
1	07/24/26	ADDENDUM 1
2	08/07/26	ADDENDUM 2

Project:
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PLUMBING PLAN - LEVEL 01 - AREA F

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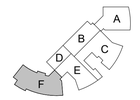
1 PLUMBING PLAN - LEVEL 01 - AREA F
1/8" = 1'-0"



KEY PLAN - 1ST FLOOR
N.T.S.

PLAN N

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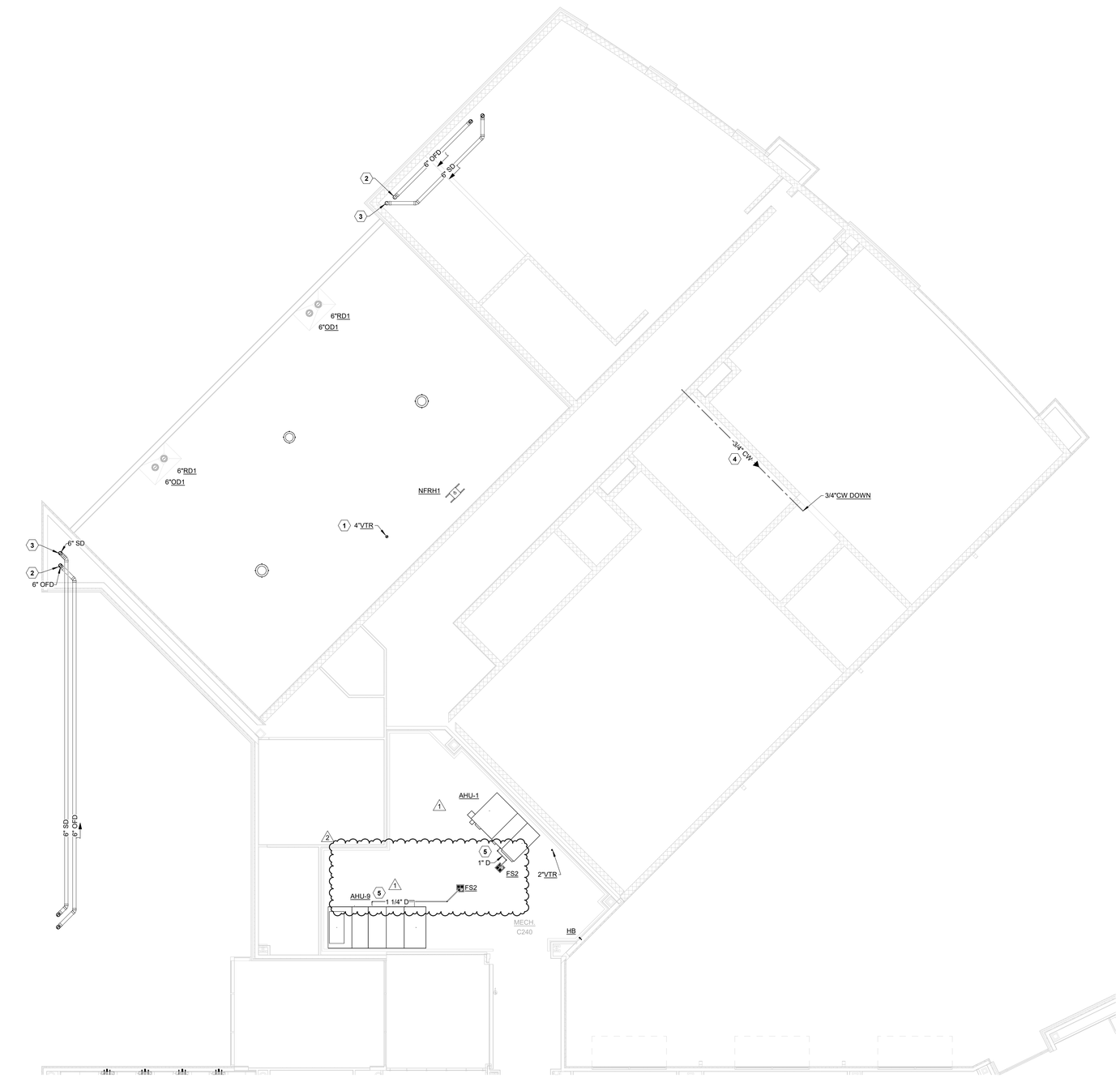
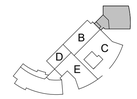
NOTES BY SYMBOL

1. MAINTAIN A MINIMUM OF 10-FOOT FROM VENT THRU ROOF TO FRESH AIR INTAKES.
2. 6-INCH OVERFLOW DRAIN DOWN TO FIRST FLOOR.
3. 6-INCH STORM DRAIN DOWN TO BELOW GRADE.
4. RUN DOMESTIC COLD WATER PIPING WITHIN PLENUM, ABOVE RAISED CEILING.
5. RUN CONDENSATE PIPING FROM AHU UNIT TO NEAREST FLOOR SINK. POSITION FLOOR SINK AS CLOSE TO DISCHARGE AREA OF UNIT TO REDUCE TRIPPING HAZARDS.



1 PLUMBING PLAN - LEVEL 02 - AREA A
1/8" = 1'-0"



KEY PLAN - 2ND FLOOR
N.T.S.

PLAN
N

Revision /	Date	
1	07/24/26	ADDENDUM 1
2	08/07/26	ADDENDUM 2

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PLUMBING PLAN - LEVEL 02 - AREA A

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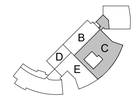
NOTES BY SYMBOL

1. 3/4-INCH DOMESTIC COLD WATER UP TO SECOND FLOOR.
2. 2-INCH DOMESTIC COLD WATER UP TO SECOND FLOOR.
3. 3/4-INCH DOMESTIC HOT WATER UP TO SECOND FLOOR.
4. 3/4-INCH DOMESTIC HOT WATER DOWN TO FIRST FLOOR.
5. 1-INCH DOMESTIC HOT WATER UP TO SECOND FLOOR.
6. 6-INCH STORM DRAIN DOWN TO BELOW GRADE.
7. 6-INCH OVERFLOW DRAIN DOWN TO FIRST FLOOR.
8. 1-INCH DOMESTIC COLD WATER LINE UP TO NON-FREEZE ROOF HYDRANT.
9. 6-INCH STORM DRAIN DOWN TO FIRST FLOOR PLENUM.
10. CONDENSATE DOWN TO FLOOR SINK.
11. PROVIDE FIXTURE FLUSH VALVE WITH OPTIONAL TRAP PRIMER ACCESSORY. EXTEND PIPING FROM TRAP PRIMER TAP TO FLOOR DRAIN TAP.
12. RUN CONDENSATE PIPING FROM AHU UNIT TO NEAREST FLOOR SINK. POSITION FLOOR SINK AS CLOSE TO DISCHARGE AREA OF UNIT TO REDUCE TRIPPING HAZARDS.

1 PLUMBING PLAN - LEVEL 02 - AREA C
1/8" = 1'-0"



KEY PLAN - 2ND FLOOR
N.T.S.

PLAN
N

Revision /	Date	
1	07/24/26	ADDENDUM 1
2	08/07/26	ADDENDUM 2

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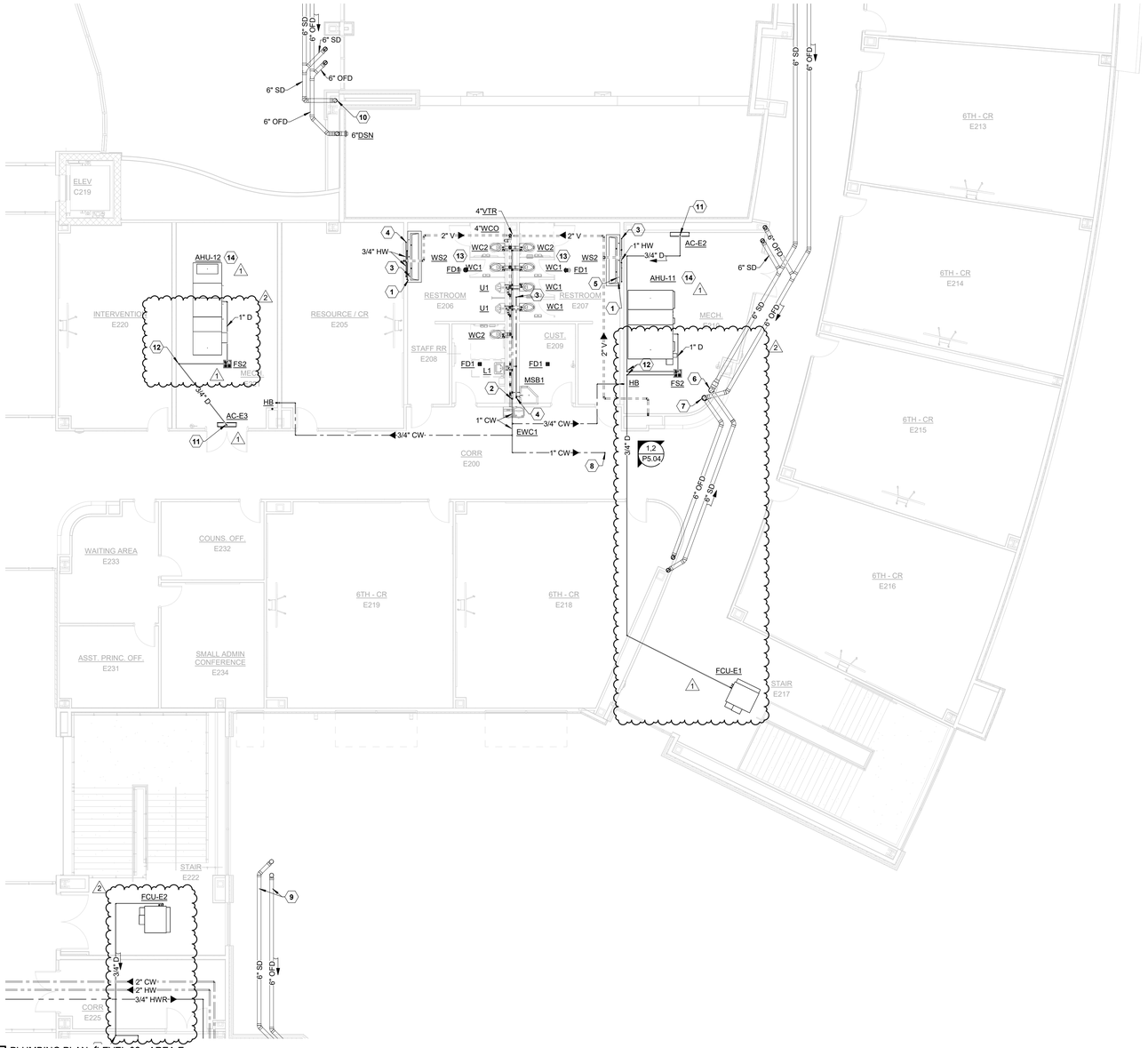
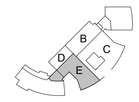
NOTES BY SYMBOL

1. 3/4-INCH DOMESTIC COLD WATER UP TO SECOND FLOOR.
2. 2-INCH DOMESTIC COLD WATER UP TO SECOND FLOOR.
3. 3/4-INCH DOMESTIC HOT WATER DOWN TO FIRST FLOOR.
4. 3/4-INCH DOMESTIC HOT WATER UP TO SECOND FLOOR.
5. 1-INCH DOMESTIC HOT WATER UP TO SECOND FLOOR.
6. 8-INCH STORM DRAIN DOWN TO BELOW GRADE.
7. 8-INCH OVERFLOW DRAIN DOWN TO FIRST FLOOR.
8. 1-INCH DOMESTIC COLD WATER LINE UP TO NON-FREEZE ROOF HYDRANT.
9. PENETRATION OF STRUCTURE WILL BE REQUIRED IN ORDER TO PLUMB INTERNAL ROOF DRAINS.
10. 6-INCH STORM DRAIN DOWN TO FIRST FLOOR PLENUM.
11. 3/4-INCH CONDENSATE PUMPED ABOVE CEILING AND GRAVITY DRAINED TO POINT OF DISCHARGE.
12. CONDENSATE DOWN TO FLOOR SINK.
13. PROVIDE FIXTURE FLUSH VALVE WITH OPTIONAL TRAP PRIMER ACCESSORY. EXTEND PIPING FROM TRAP PRIMER TAP TO FLOOR DRAIN TAP.
14. RUN CONDENSATE PIPING FROM AHU UNIT TO NEAREST FLOOR SINK. POSITION FLOOR SINK AS CLOSE TO DISCHARGE AREA OF UNIT TO REDUCE TRIPPING HAZARDS.

1



1 PLUMBING PLAN - LEVEL 02 - AREA E
1/8" = 1'-0"



KEY PLAN - 2ND FLOOR
N.T.S.

PLAN N

Revision /	Date	
1	07/24/26	ADDENDUM 1
2	08/07/26	ADDENDUM 2

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PLUMBING PLAN - LEVEL 02 - AREA E

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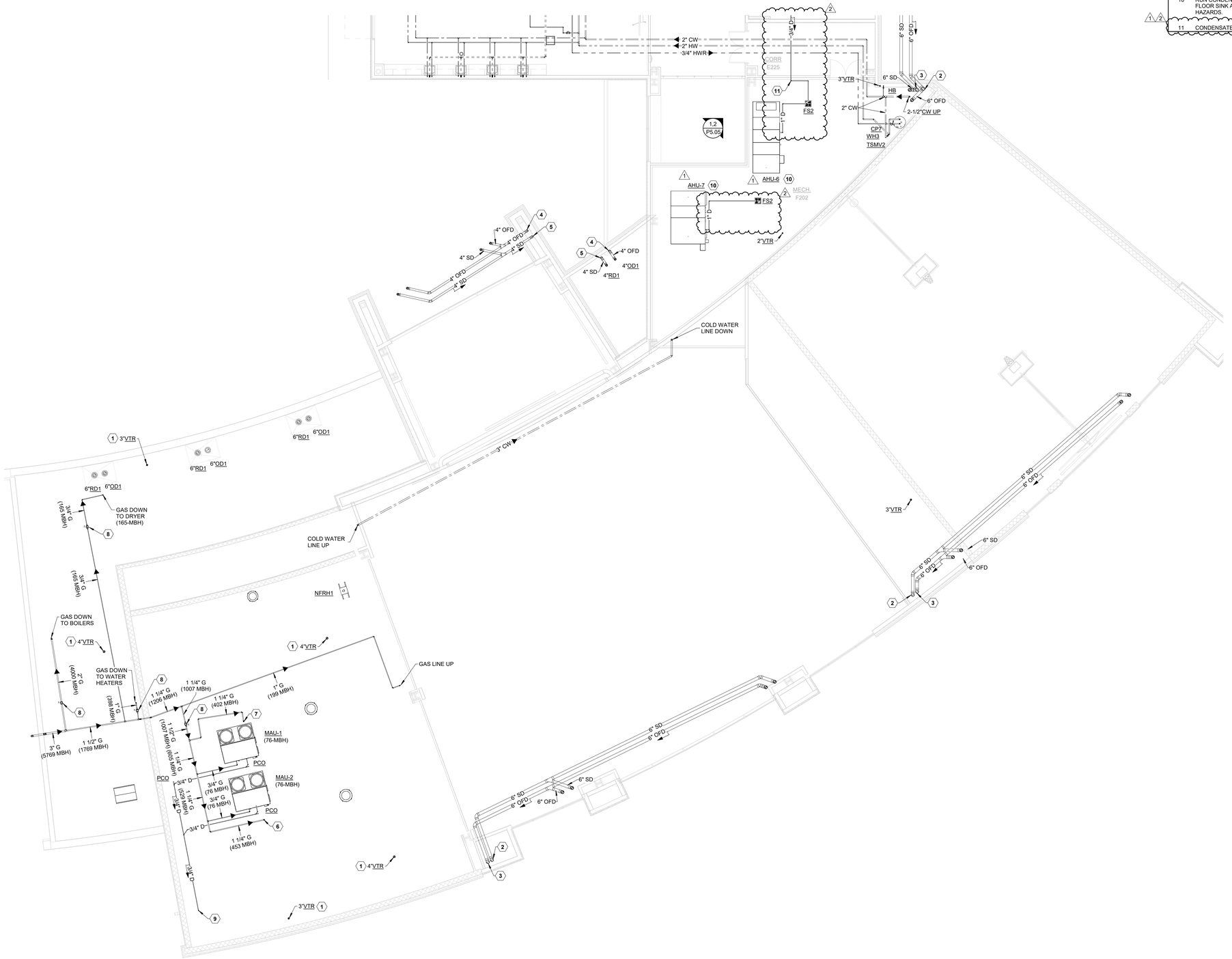
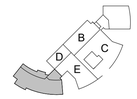
NOTES BY SYMBOL

1. MAINTAIN A MINIMUM OF 10-FOOT FROM VENT THRU ROOF TO FRESH AIR INTAKES.
2. 6-INCH STORM DRAIN DOWN TO BELOW GRADE.
3. 6-INCH OVERFLOW DRAIN DOWN TO FIRST FLOOR.
4. 4-INCH OVERFLOW DRAIN DOWN TO FIRST FLOOR.
5. 4-INCH STORM DRAIN DOWN TO BELOW GRADE.
6. 1-1/4-INCH NATURAL GAS DOWN INTO KITCHEN.
7. 1-INCH NATURAL GAS DOWN INTO KITCHEN.
8. 5-PSI TO <2-PSI REGULATOR. CONTRACTOR TO SET DISCHARGE PRESSURE AT REGULATOR, AS REQUIRED, TO ENSURE GAS PRESSURE IS DELIVERED TO ALL GAS-FIRE EQUIPMENT BEING SERVED PER MANUFACTURER'S PUBLISHED IOM.
9. 3/4-INCH CONDENSATE DOWN THRU ROOF.
10. RUN CONDENSATE PIPING FROM AHU UNIT TO NEAREST FLOOR SINK. POSITION FLOOR SINK AS CLOSE TO DISCHARGE AREA OF UNIT TO REDUCE TRIPPING HAZARDS.
11. CONDENSATE DOWN TO FLOOR SINK.



1 PLUMBING PLAN - LEVEL 02 - AREA F
1/8" = 1'-0"



KEY PLAN - 2ND FLOOR
N.T.S.

PLAN

Revision /	Date	
1	07/24/26	ADDENDUM 1
2	08/07/26	ADDENDUM 2

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
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TOMBALL, TEXAS

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PLUMBING PLAN - LEVEL 02 - AREA F

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GENERAL KITCHEN NOTES

1. PLUMBING CONTRACTOR TO PROVIDE FINAL CONNECTIONS TO ALL EQUIPMENT/FIXTURES.
2. PLUMBING CONTRACTOR TO PROVIDE AND INSTALL ALL INDIRECT WASTE PIPING FROM FIXTURES/EQUIPMENT TO FLOOR SINKS VIA AIR GAP. REFER TO FOOD SERVICE PLANS FOR ADDITIONAL INFORMATION.
3. PROVIDE POINT OF USE THERMOSTATIC MIXING VALVES AT ALL DOMESTIC HOT WATER CONNECTIONS THAT DO NOT REQUIRE 140-DEGREE HOT WATER. LEONARD 270-LF OR APPROVED EQUAL.
   A. ALL HAND WASH SINKS AND LAVATORIES SHALL BE TEMPERED TO 105-DEGREES (110-DEGREES MAX).
   B. ALL OTHER SINKS/FAUCETS SHALL BE TEMPERED PER FOOD SERVICE CONSULTANTS SPECIFICATIONS. REFER TO FOOD SERVICE PLANS FOR ADDITIONAL INFORMATION.
4. PROVIDE QUICK-DISCONNECTS AND BALL VALVE W/UNION FITTINGS AT EACH GAS CONNECTION TO EQUIPMENT.
5. PROVIDE SOLENOID VALVE IN GAS LINE AHEAD OF COOKING EQUIPMENT FOR AUTO GAS SHUTOFF. SEE HOOD FIRE SUPPRESSION DRAWINGS FOR INTERLOCK REQUIREMENTS. COORDINATE REQUIREMENTS WITH FIRE ALARM CONTRACTOR.
6. ALL DOMESTIC WATER CONNECTIONS TO FOOD SERVICE EQUIPMENT TO BE PROVIDED WITH INLINE BACKFLOW PREVENTION DEVICE ANSI/ASSE RATED FOR INTENDED USE AS REQUIRED BY CODE.
7. PROVIDE SUPPLY STOPS FOR ALL DOMESTIC COLD AND HOT WATER CONNECTIONS TO KITCHEN FIXTURES/EQUIPMENT.
8. PROVIDE INLINE BOOSTER PUMP ON UPSTREAM SIDE OF WATER FILTERS SERVING KITCHEN EQUIPMENT AS REQUIRED BY FOOD SERVICE CONSULTANT.

NOTES BY SYMBOL

1. 1-1/4-INCH NATURAL GAS DOWN INTO KITCHEN.
2. PROVIDE FIXTURE FLUSH VALVE WITH OPTIONAL TRAP PRIMER ACCESSORY. EXTEND PIPING FROM TRAP PRIMER TAP TO FLOOR DRAIN TAP.
3. 3/4-INCH CONDENSATE DOWN THRU ROOF.
4. CONDENSATE DOWN TO BRANCH TAILPIECE CONNECTION AT LAV/SINK. REFER TO DETAIL 9/P6.02 FOR ADDITIONAL INFORMATION.

1 ENLARGED KITCHEN PLUMBING PLAN - LEVEL 01 - AREA F
1/4" = 1'-0" BACK REF: P2.1F

Revision /	Date	
1	07/24/26	ADDENDUM 1
2	08/07/26	ADDENDUM 2

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TOMBALL, TEXAS

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PLUMBING ENLARGED PLAN - KITCHEN

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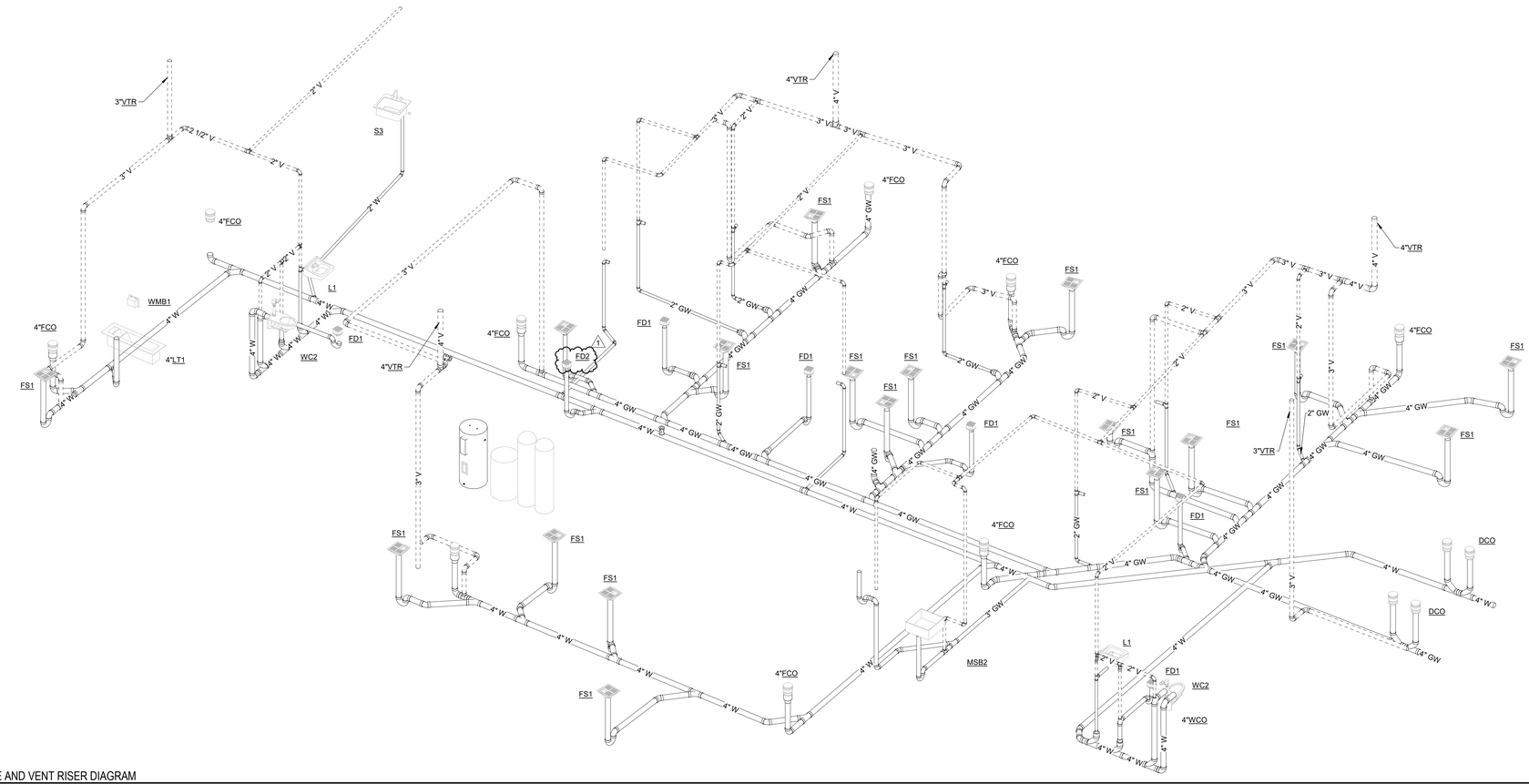
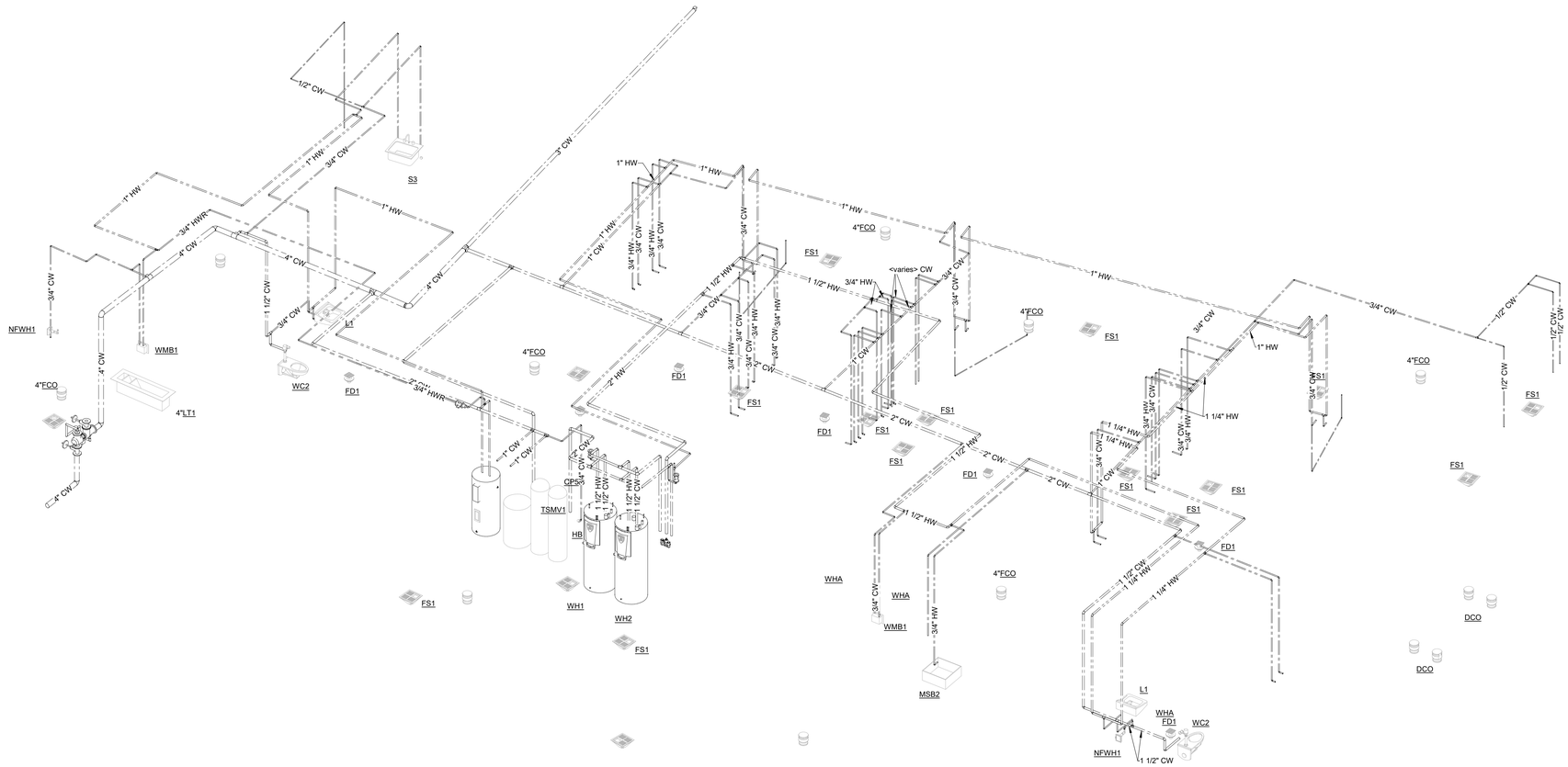


1 SANITARY WASTE AND VENT RISER DIAGRAM
N.T.S.



2 DOMESTIC WATER SUPPLY DIAGRAM
N.T.S.

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PLUMBING RISER DIAGRAMS

VOLUME 02

Job No.	Sheet No.
00802-04-01	P5.06
Drawn By: VD	
Date: 07.15.2026	

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Revision /	Date	
1	08/07/26	Addendum 02

Project:

TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL ISD
TOMBALL, TEXAS

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MECHANICAL PLAN - LEVEL 01 - AREA B

VOLUME 2

Job No. 2508.401

Sheet No. M2.1B

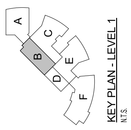
Drawn By: MBP

Date: 07.15.2026

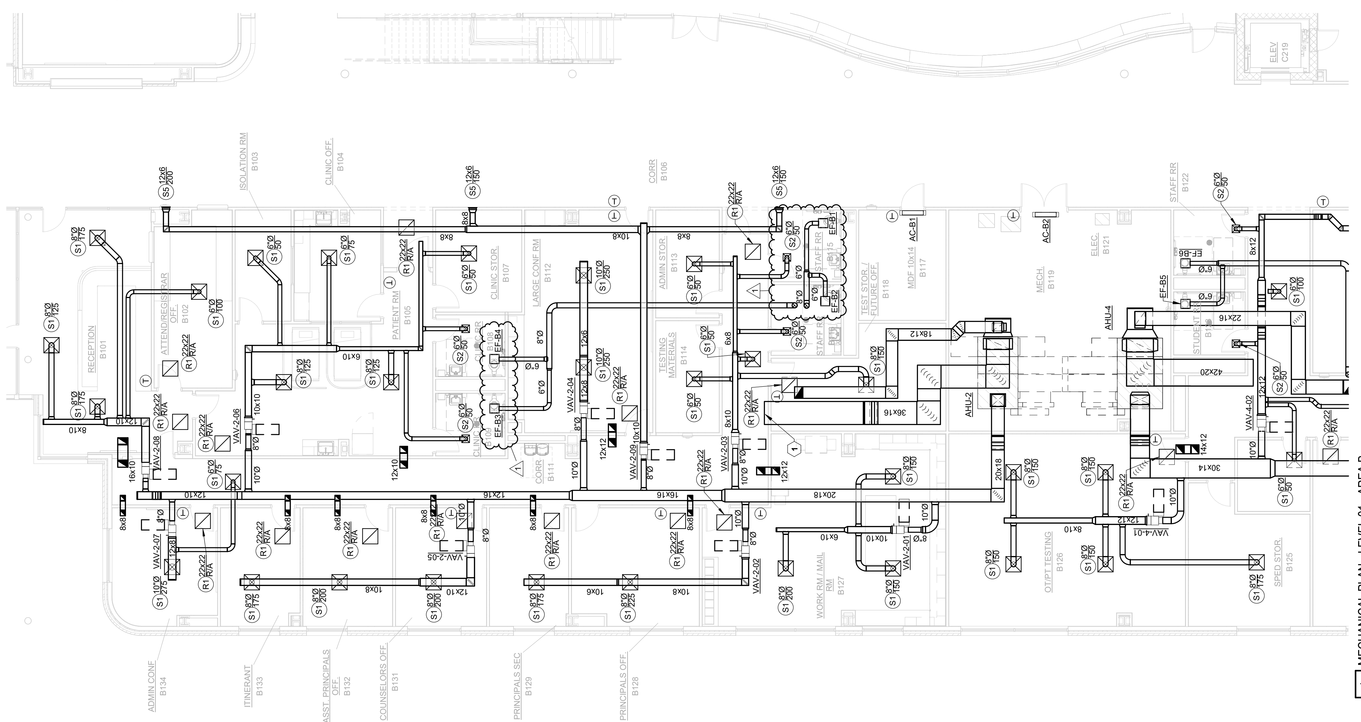
NOTES BY SYMBOL

1 RETURN AIR DUCT TERMINATED WITHIN PLENUM. COVER DUCT OPENING WITH 1/4" BY 1/4" WIRE MESH.

PLAN N



KEY PLAN - LEVEL 1
NTS



1 MECHANICAL PLAN - LEVEL 01 - AREA B
M2.1B
1/8" = 1'-0"

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NOTES BY SYMBOL

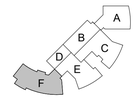
1. TERMINATE DUCTWORK INTO HOODED WALL CAP. PROVIDE WITH BACKDRAFT DAMPER. COORDINATE ELEVATION OF TERMINATION WITH ARCHITECTURAL ELEVATIONS.
2. PROVIDE CO AND NATURAL GAS MONITORING SYSTEM INTERLOCKED WITH BOILERS. AGS MINI-MERLIN OR EQUAL.
3. TERMINATE DUCTWORK INTO HOODED WALL CAP. PROVIDE WITH BACKDRAFT DAMPER AND INSECT SCREEN. COORDINATE ELEVATION OF TERMINATION WITH ARCHITECTURAL ELEVATIONS.
4. BRANCH AND RUNOUT DUCTWORK ROUTED THROUGH JOIST OPENINGS. COORDINATE EXACT ROUTING WITH JOIST MANUFACTURER AND BIM COORDINATED SHOP DRAWINGS.
5. MAIN TRUNK DUCTWORK ROUTED WITHIN JOIST BAY. COORDINATE EXACT ROUTING WITH JOIST MANUFACTURER AND BIM COORDINATED SHOP DRAWINGS.
6. TRANSFER DUCT BETWEEN ABOVE CEILING KITCHEN AND ADJACENT MECHANICAL ROOM. COVER ENDS OF DUCT WITH 1/4" BY 1/4" WIRE MESH.
7. SUPPLY TAP DOWN TO KITCHEN HOOD COLLAR CONNECTION. MANUALLY BALANCE TO 625 CFM. COORDINATE EXACT LOCATION WITH FOOD SERVICE PLANS AND SPECIFIC EQUIPMENT ORDERED.
8. GREASE DUCT TAP DOWN TO KITCHEN HOOD COLLAR CONNECTION. MANUALLY BALANCE TO 1313 CFM. COORDINATE EXACT LOCATION WITH FOOD SERVICE DRAWINGS AND SPECIFIC EQUIPMENT ORDERED.
9. SUPPLY TAP DOWN TO KITCHEN HOOD COLLAR CONNECTION. MANUALLY BALANCE TO 638 CFM. COORDINATE EXACT LOCATION WITH FOOD SERVICE PLANS AND SPECIFIC EQUIPMENT ORDERED.
10. GREASE DUCT TAP DOWN TO KITCHEN HOOD COLLAR CONNECTION. MANUALLY BALANCE TO 1339 CFM. COORDINATE EXACT LOCATION WITH FOOD SERVICE DRAWINGS AND SPECIFIC EQUIPMENT ORDERED.

NOTES BY SYMBOL

11. EXHAUST DUCT TURNED DOWN TO WAREWASH BELOW. COORDINATE EXACT DUCT SIZE AND CONNECTION LOCATION WITH SPECIFIC EQUIPMENT ORDERED. BALANCE PER FOOD SERVICE DRAWINGS.
12. PROVIDE BLANKED OFF SLOTS TO MAINTAIN CONTINUOUS SLOT AT CEILING PERIMETER. COORDINATE WITH ARCHITECTURAL RCP.
13. WATER HEATER FLUE AND COMBUSTION AIR DUCTS TURNED UP THROUGH ROOF. REFER TO WATER HEATER MANUFACTURER'S GUIDELINES ON SPECIFIC TERMINATION REQUIREMENTS. PROVIDE WITH MANUFACTURERS ROOF TERMINATION KIT.
14. DRYER EXHAUST DUCT FROM DRYER UP THROUGH ROOF. TERMINATE EXHAUST DUCT AT ROOF WITH GOOSENECK. INSTALL PER DRYER MANUFACTUER'S INSTALLATION INSTRUCTIONS. REFER TO DRYER MANUFACTURER'S MAXIMUM ALLOWABLE DUCT LENGTH AND TRANSITION EXHAUST DUCT WHERE REQUIRED.
15. GREASE EXHAUST DUCT UP THROUGH ROOF. PROVIDE WITH RECTANGULAR RADIAL ELBOW. TRANSITION TO FULL SIZE CONNECTION AT EQUIPMENT AS REQUIRED.
16. INTERLOCK SETPOINTS OF ALL (4) CAFETERIA THERMOSTATS. VAV BOXES SHALL OPERATE INDEPENDENTLY TO MAINTAIN COLLECTIVE SETPOINT.
17. EXTEND FULL SIZE RETURN TO ALLOW FOR FILTER SECTION AND TERMINATE WITH 1/4" BY 1/4" WIRE MESH.
18. AIR DEVICES WITHIN GYP CEILING SHALL BE WHITE IN COLOR/FINISH. COORDINATE WITH ARCHITECTURAL RCP PRIOR TO ORDER/INSTALLATION.
19. AIR DEVICES WITHIN WOOD CEILING SHALL BE BLACK IN COLOR/FINISH. COORDINATE WITH ARCHITECTURAL RCP PRIOR TO ORDER/INSTALLATION.
20. PROVIDE 1" INTERNALLY LINED DUCT FROM VAV TERMINAL BOX THROUGH THE FIRST TWO DUCT TAPS ON THIS BRANCH.
21. BOILER FLUE AND COMBUSTION AIR DUCTS TURNED UP THROUGH ROOF. REFER TO BOILER MANUFACTURER'S GUIDELINES ON SPECIFIC TERMINATION REQUIREMENTS. PROVIDE WITH MANUFACTURERS ROOF TERMINATION KIT.

1 M4.1

1 M2.1F MECHANICAL PLAN - LEVEL 01 - AREA F
1/8" = 1'-0"



KEY PLAN - LEVEL 1
N.T.S.

PLAN N

Revision /	Date	
1	08/07/26	Addendum 02

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FOR
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MECHANICAL PLAN - LEVEL 01 - AREA F

VOLUME 2

Job No.	Sheet No.
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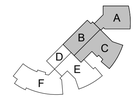
NOTES BY SYMBOL

1 EXHAUST DISCHARGE TERMINATED WITH COOK PR HOOD OR EQUALIVALENT GRAVITY VENTILATOR. MAINTAIN CODE REQUIRED 10' FROM ALL FRESH AIR INTAKES.

2 OUTSIDE AIR INTAKE TERMINATED IN COOK PR HOOD OR SIMILAR. MAINTAIN CODE REQUIRED 10' FROM ALL EXHAUST/VENT DISCHARGE.

1 MECHANICAL PLAN - ROOF - AREA A, B, C
M2.3A 1/16" = 1'-0"



KEY PLAN - LEVEL 1
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PLAN N

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1	08/07/26	Addendum 02

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MECHANICAL PLAN - ROOF - AREA A, B, C

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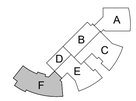
GENERAL HYDRONIC PIPING NOTE

ALL PIPING CONNECTIONS TO VAV BOXES AND FAN COILS ARE 3/4" UNLESS OTHERWISE NOTED. REFER TO M4.2 & M4.3 FOR ADDITIONAL INFORMATION.

NOTES BY SYMBOL

1 M3.1F MECHANICAL PIPING PLAN - LEVEL 01 - AREA F
1/8" = 1'-0"



KEY PLAN - LEVEL 1
N.T.S.

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1	08/07/26	Addendum 02

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MECHANICAL PIPING PLAN - LEVEL 01 - AREA F

VOLUME 2

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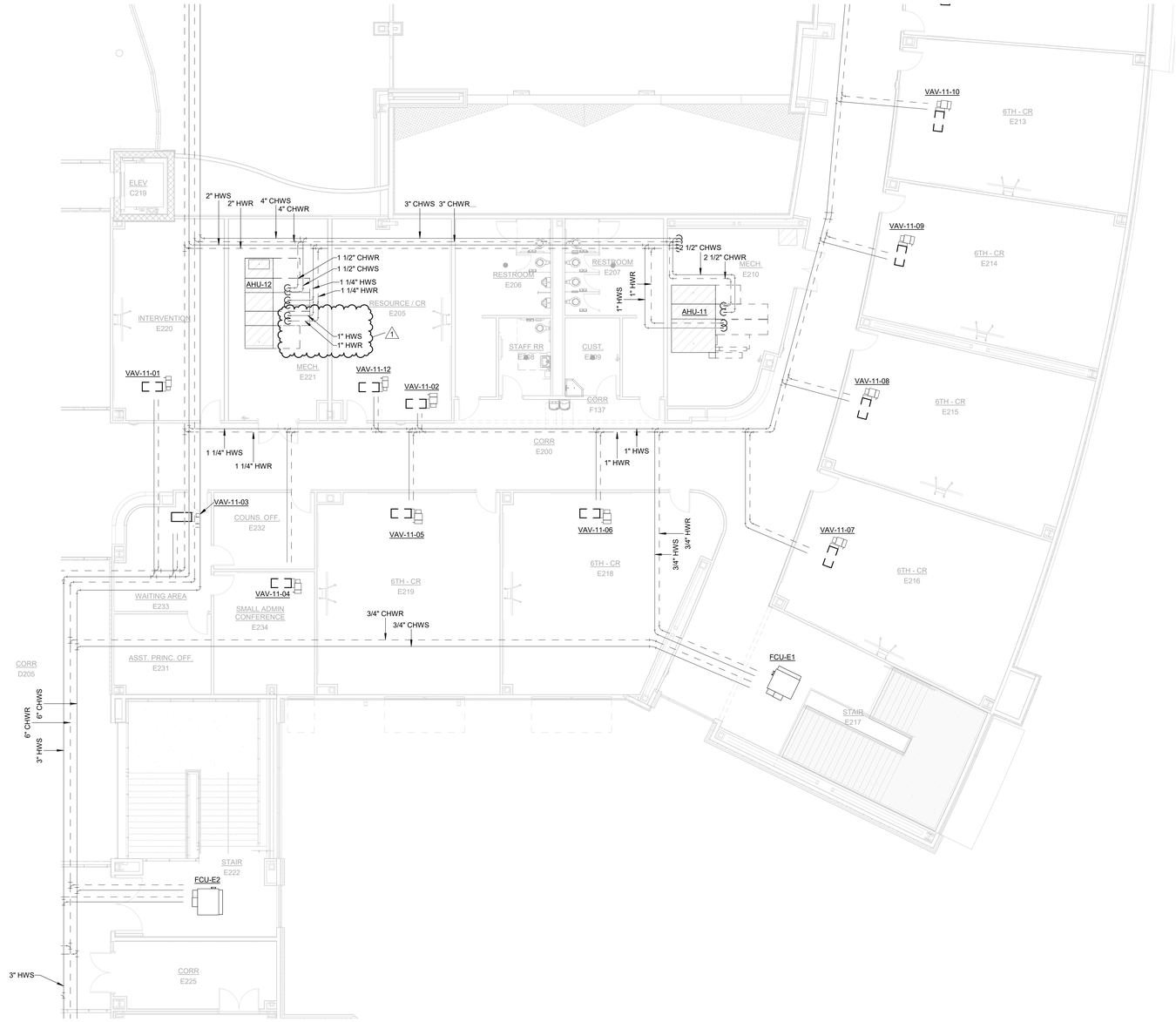
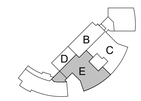
NOTES BY SYMBOL



1 M3.2E MECHANICAL PIPING PLAN - LEVEL 02 - AREA E
1/8" = 1'-0"



KEY PLAN - LEVEL 2
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MECHANICAL PIPING PLAN - LEVEL 02 - AREA E

VOLUME 2

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GENERAL HYDRONIC PIPING NOTE

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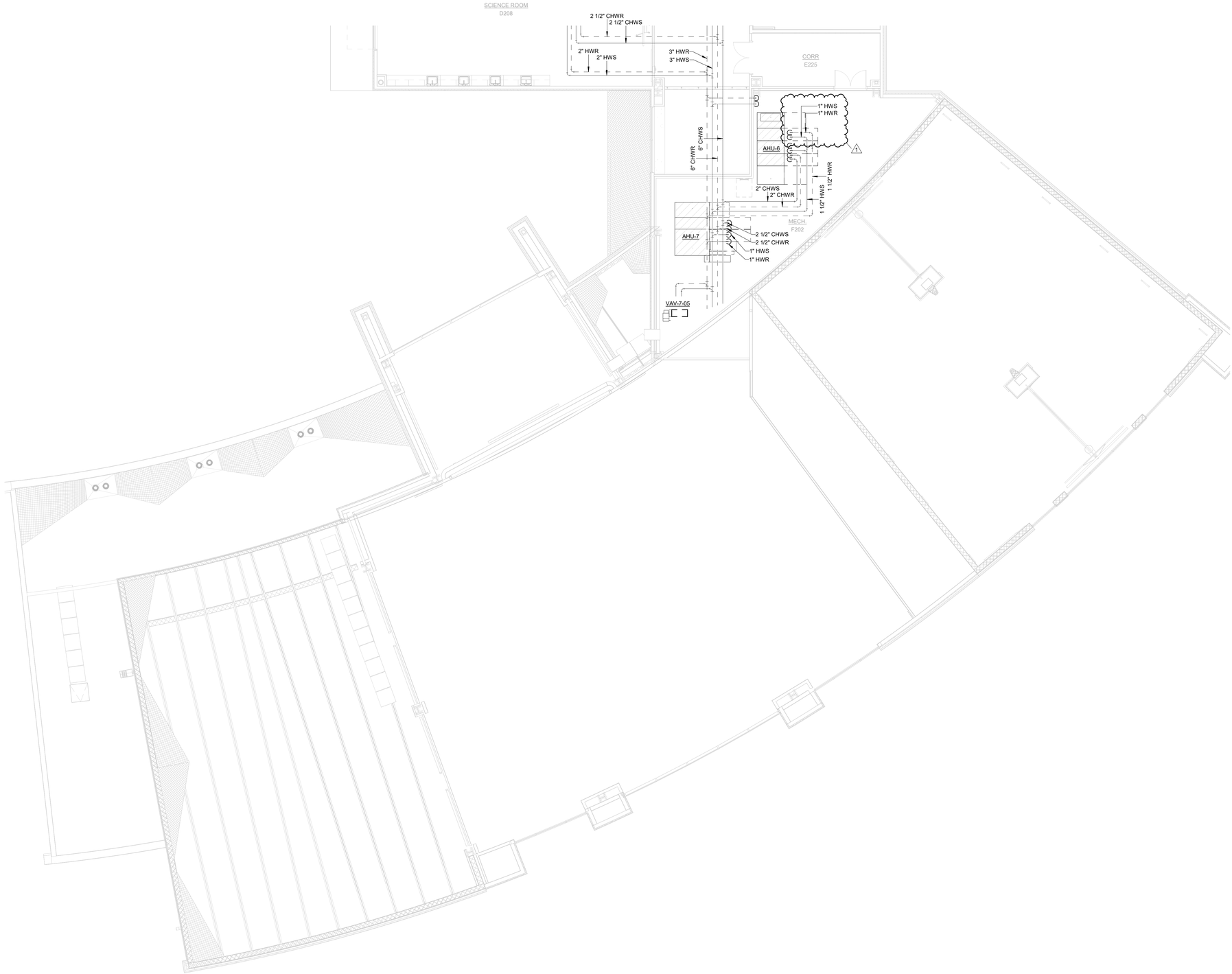
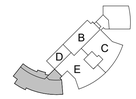
NOTES BY SYMBOL



1 MECHANICAL PIPING PLAN - LEVEL 02 - AREA F
M3.2F 1/8" = 1'-0"



KEY PLAN - LEVEL 2
N.T.S.

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1 08/07/26 Addendum 02

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MECHANICAL PIPING PLAN - LEVEL 02 - AREA F

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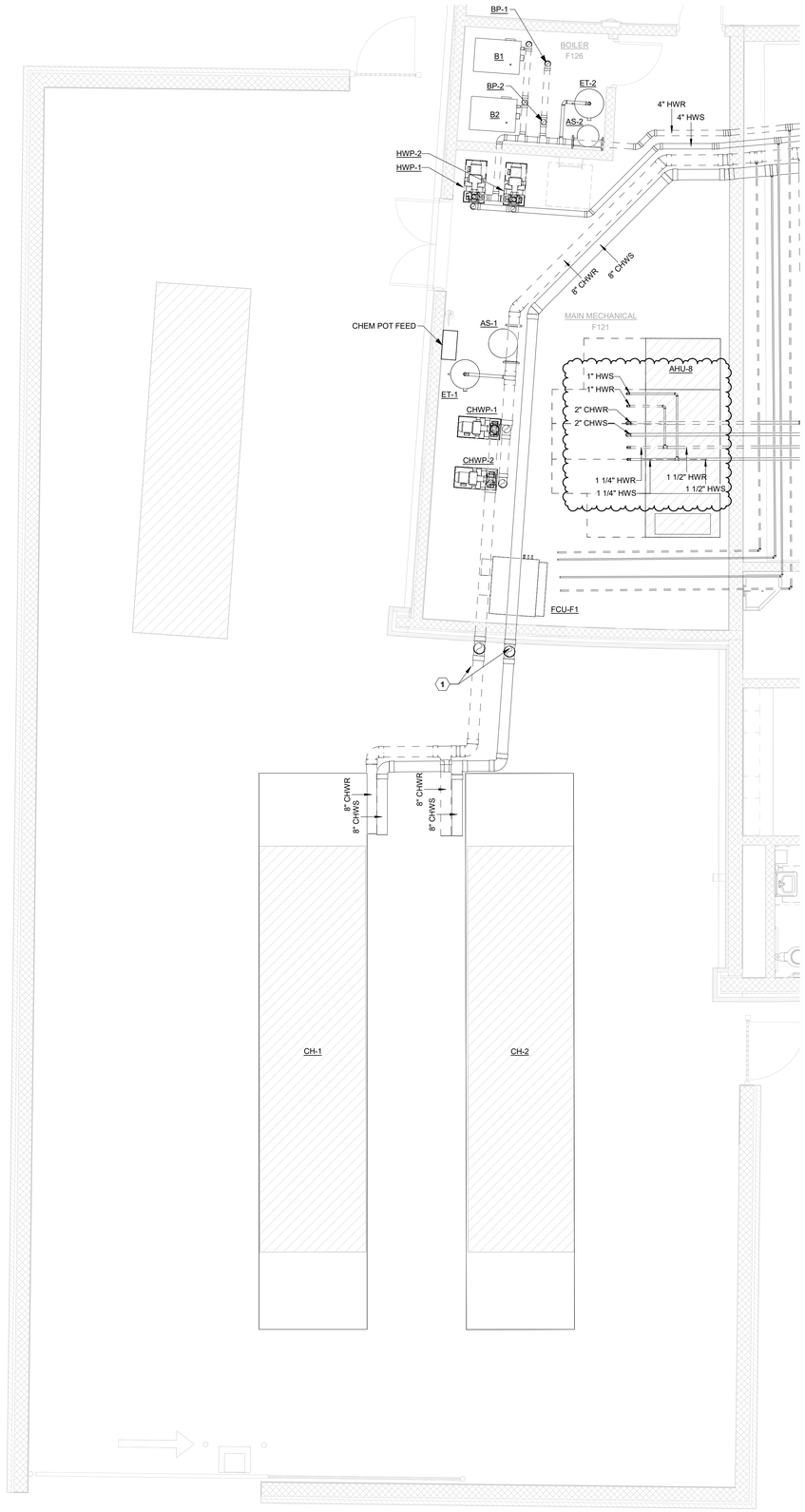
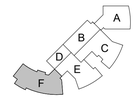
NOTES BY SYMBOL

1 HYDRONIC PIPING TURNED DOWN EXTERIOR WALL TO APPROXIMATELY 18" AFF. PROVIDE HEAT TRACE PER 1/M6.3.



1 MECHANICAL SERVICE YARD
M4.1 1/4" = 1'-0"



KEY PLAN - LEVEL 1
N.T.S.

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1	08/07/26	Addendum 02

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MECHANICAL SERVICE YARD
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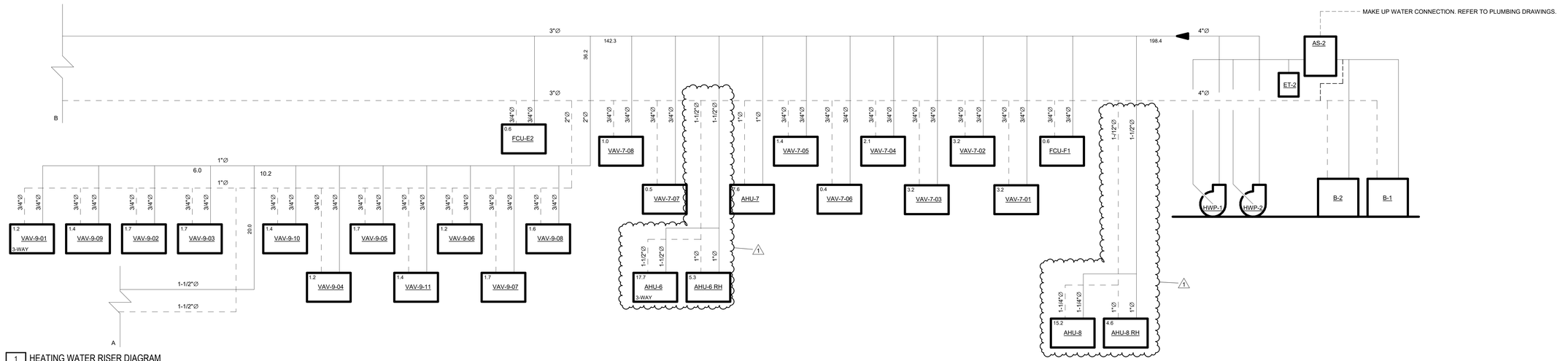
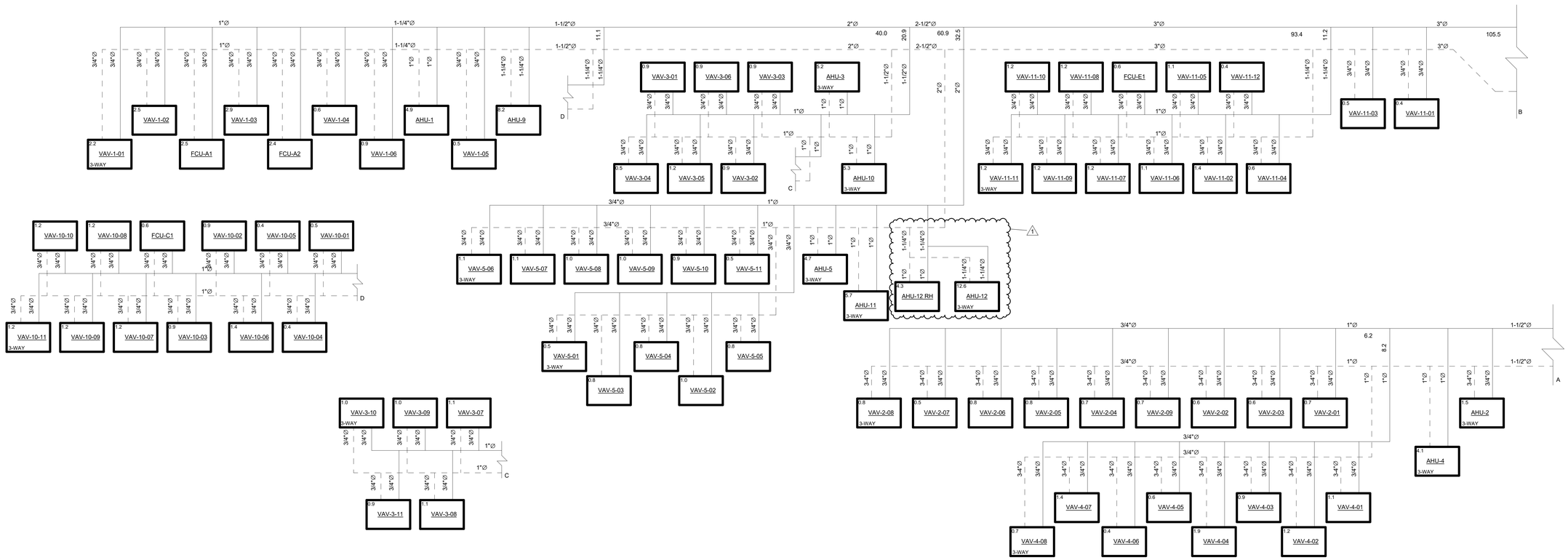
GENERAL NOTES

1. ALL CONNECTIONS TO VAV BOXES TO BE 3/4"Ø UNLESS NOTED OTHERWISE.
2. RISER DIAGRAM IS DIAGRAMMATIC IN NATURE AND DOES NOT DEPICT ALL REQUIRED COMPONENTS FOR A FULLY OPERATIONAL SYSTEM. CONTRACTOR TO REFER TO DETAIL SHEETS AND SPECIFICATIONS FOR ALL SYSTEM REQUIREMENTS.
3. ALL VALVES TO BE TWO-WAY UNLESS NOTED OTHERWISE. (*PROVIDE THREE-WAY VALVE WHERE INDICATED)



1 M4.3 HEATING WATER RISER DIAGRAM
N.T.S.



2 M4.3 HOT WATER RISER DIAGRAM CONT
N.T.S.

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MECHANICAL PIPING RISER DIAGRAMS

VOLUME 2

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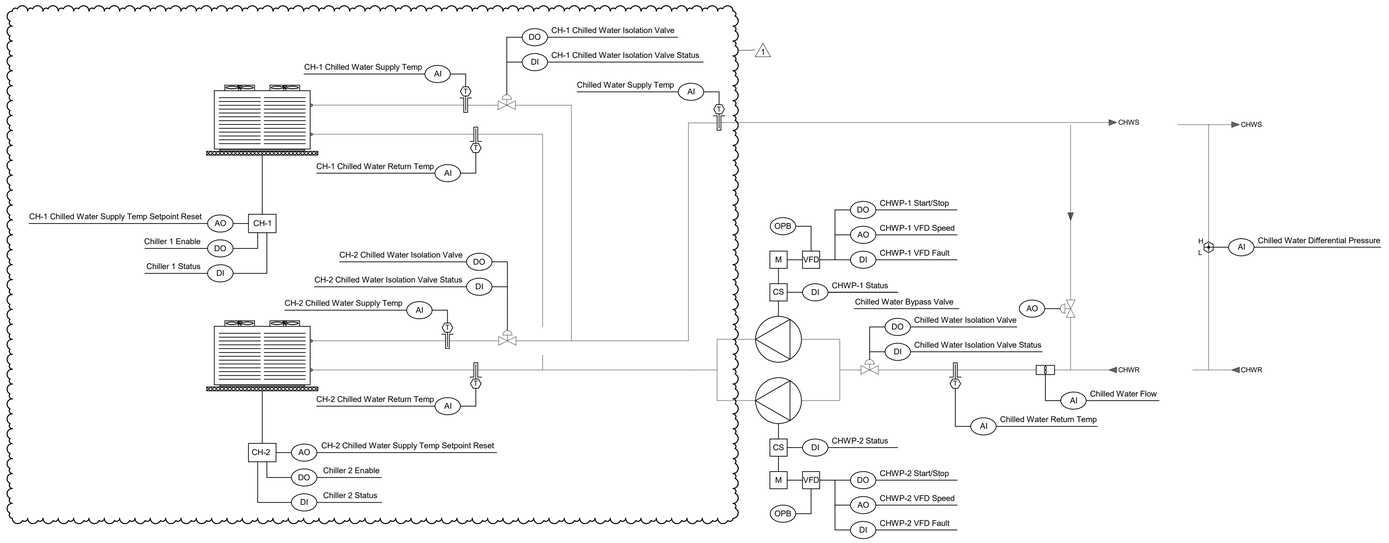


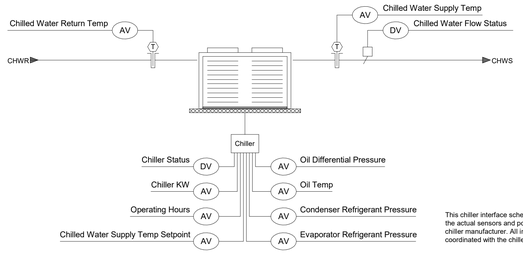
AIR COOLED CHILLER WITH VARIABLE PRIMARY PUMPS SEQUENCE OF OPERATIONS

AIR COOLED CHILLER WITH VARIABLE PRIMARY PUMPS SEQUENCE OF OPERATIONS

1. Chiller Run Conditions
   - 1.a. The chiller shall be enable to run whenever:
     - 1.a.1. A definable number of chilled water coils need cooling
   - 1.b. To prevent short cycling, the chiller shall run for and be off for minimum adjustable times (both user definable), unless shutdown on safeties or outside air conditions.
   - 1.c. The chiller shall run subject to its own internal safeties and controls.
2. Emergency Shutdown
   - 2.a. The chiller shall shut down and an alarm generated upon receiving an emergency shutdown signal status
3. Chilled Water Isolation Valve
   - 3.a. The valve shall open anytime the chiller is called to run. The valve shall also open whenever the chilled water pump runs for freeze protection.
   - 3.b. The valve shall open prior to the chiller being enabled and shall close only after the chiller is disabled. The valve shall therefore have:
     - 3.b.1. A user adjustable delay on start.
     - 3.b.2. AND a user adjustable delay on stop.
   - 3.c. The delay times shall be set appropriately to allow for orderly chilled water system start-up, shutdown and sequencing.
   - 3.d. Alarms shall be provided as follows:
     - 3.d.1. Chilled Water Isolation Valve Failure: Valve commanded open but the status indicates closed.
     - 3.d.2. Chilled Water Isolation Valve Open in Hand: Valve commanded closed but the status indicates open.
     - 3.d.3. Chilled Water Isolation Valve Runtime Exceeded: Valve status runtime exceeds a user-definable limit.
4. Chilled Water Pump Lead/Standby Operation:
   - 4.a. The two chilled water pumps shall run anytime the chiller is called to run. The chilled water pump shall also run for freeze protection whenever the outside air temperature is less than a user definable setpoint (adj.).
   - 4.b. The lead pump shall start prior to the chilled being enabled and shall stop only after the chiller is disabled. The pump(s) shall therefore have:
     - 4.b.1. A user adjustable delay on start.
     - 4.b.2. AND a user adjustable delay on stop.
   - 4.c. The delay times shall be set appropriately to allow for orderly chilled water system start-up, shutdown and sequencing.
   - 4.d. The two pumps shall operate in a lead/standby fashion.
     - 4.d.1. The lead pump shall run first.
     - 4.d.2. On failure of the lead pump, the standby pump shall run and the lead pump shall turn off.
   - 4.e. The designated lead pump shall rotate upon one of the following conditions (user selectable):
     - 4.e.1. manually through a software switch
     - 4.e.2. if pump runtime (adj.) is exceeded
     - 4.e.3. daily
     - 4.e.4. weekly
     - 4.e.5. monthly
   - 4.f. Alarms shall be provided as follows:
     - 4.f.1. Chilled Water Pump 1
       - 4.f.1.1. Failure: Commanded on, but the status is off.
       - 4.f.1.2. Running in Hand: Commanded off, but the status is on.
       - 4.f.1.3. Runtime Exceeded: Status runtime exceeds a user definable limit.
       - 4.f.1.4. VFD Fault
     - 4.f.2. Chilled Water Pump 2
       - 4.f.2.1. Failure: Commanded on, but the status is off.
       - 4.f.2.2. Running in Hand: Commanded off, but the status is on.
       - 4.f.2.3. Runtime Exceeded: Status runtime exceeds a user definable limit.
       - 4.f.2.4. VFD Fault
5. Chilled Water Differential Pressure Control:
   - 5.a. The controller shall measure chilled water differential pressure and modulate the lead chilled water pump VFD to maintain its chilled water differential pressure setpoint. The following setpoints are recommended values. All setpoints shall be field adjusted during the commissioning period to meet the requirements of actual field conditions.

     The controller shall modulate chilled water pump speed to maintain a chilled water differential pressure of 12 psi (adj.). The VFD minimum speed shall not drop below 10% (adj.).
   - 5.b. Alarms shall be provided as follows:
     - 5.b.1. High Chilled Water Differential Pressure: If the chilled water differential pressure is 25% (adj.) greater than setpoint.
     - 5.b.2. Low Chilled Water Differential Pressure: If the chilled water differential pressure is 25% (adj.) less than setpoint.
6. Chillers:
   - 6.a. The chillers shall be enabled at a user adjustable time after pump status are proven on. The chiller shall therefore have a user adjustable delay on start.
   - 6.b. The delay time shall be set appropriately to allow for orderly chilled water system start-up, shutdown and sequencing.
   - 6.c. The chiller shall run subject to its own internal safeties and controls.
   - 6.d. Lead Lag Chiller control staging
     - 6.d.1. The lead chiller shall operate until the system is continuing to call for cooling and the lead chiller is operating at 85% of it's capacity (adj.). At this point, the lag chiller shall be commanded on and run in unison with the lead chiller.
     - 6.d.2. If both the lead and lag chiller are operating at 30% capacity (adj.), the lag chiller shall be commanded off and the lead chiller shall operate solely.
   - 6.e. Alarms shall be provided as follows:
     - 6.e.1. Chiller Failure: Commanded on, but the status is off.
     - 6.e.2. Chiller Running in Hand: Commanded off, but the status is on.
     - 6.e.3. Chiller Runtime Exceeded: Status runtime exceeds a user definable limit.
7. Chilled Water Supply Temperature Setpoint:
   - 7.a. The chilled water supply temperature setpoint shall reset based on outside air temperature.
   - 7.b. As outside air temperature drops from 75°F (adj.) to 50°F (adj.) the chilled water supply temperature setpoint shall reset upwards by adding from 0°F (adj.) to 5°F (adj.) to the current setpoint.
8. Chilled Water Temperature Monitoring:
   - 8.a. The following temperatures shall be monitored:
     - 8.a.1. Chilled water supply
     - 8.a.2. Chilled water return
   - 8.b. Alarms shall be provided as follows:
     - 8.b.1. High Chilled Water Supply Temp: If the chilled water supply temperature is greater than 55°F (adj.)
     - 8.b.2. Low Chilled Water Supply Temp: If the chilled water supply temperature is less than 38°F (adj.)

1 CONTROL DIAGRAM - CHILLER
M5.1 N.T.S.



This chiller interface schematic may not reflect the actual sensors and points as supplied by the chiller manufacturer. All interface points shall be coordinated with the chiller supplier.

2 CONTROL DIAGRAM - CHILLER - MANUFACTURER INTERFACE
M5.1 N.T.S.

SYMBOL LIST

SYMBOL	DESCRIPTION
	OPPOSED BLADE DAMPER
	HYDRONIC HEATING OR COOLING COIL
	NATURAL GAS HEATING COIL
	ELECTRIC HEATING COIL
	DIRECT EXPANSION COOLING COIL
	AUTOMATIC 2-WAY VALVE
	AUTOMATIC 3-WAY VALVE
	FAN OR PUMP MOTOR
DP	DIFFERENTIAL PRESSURE SENSOR
PT	PRESSURE TRANSMITTER
AFM	AIR FLOW MONITORING
SD	SMOKE DETECTOR
T	DUCT MOUNTED TEMPERATURE SENSOR
T	WALL MOUNTED TEMPERATURE SENSOR
H	WALL MOUNTED HUMIDITY SENSOR
TCU	TERMINAL CONTROL UNIT
VFD	VARIABLE FREQUENCY DRIVE
VS	VIBRATION SENSOR
AVA	ADJUSTABLE VALVE ACTUATION
	VAV DAMPER W/FLOW MONITOR
DI	DDC DIGITAL INPUT POINT
DO	DDC DIGITAL OUTPUT POINT
AI	DDC ANALOG INPUT POINT
AO	DDC ANALOG OUTPUT POINT
AV	ANALOG VALUE POINT THRU OPB
DV	DIGITAL VALUE POINT THRU OPB
OPB	OPEN PROTOCOL BUS
M	MOTOR
MS	MOTOR STARTER
DA	DAMPER ACTUATOR
BRD	BAROMETRIC RELIEF DAMPER
F	FLOW SENSOR
FR	FREEZE STAT
O/O	ON/OFF SWITCH
HH	HIGH HUMIDITY SENSOR
CO2	DUCT MOUNTED CO2 SENSOR
ES	ENTHALPY SENSOR, ECONOMIZER
HPL	HIGH STATIC PRESS. LIMIT SENS.
VFDP	VFD (DUCT) PRESSURE TRANSMITTER
CO2	WALL MOUNTED CO2 SENSOR
H	DUCT MOUNTED HUMIDITY SENSOR
LTC	LOW TEMPERATURE CUTOFF
SP	STATIC PRESSURE SENSOR
LD	LEAK DETECTION UNIT
CS	CURRENT SENSOR
EC	EXISTING CONTROLS
OC	WALL MOUNTED OCCUPANCY SENSOR
	WATER FLOW MEASURING SENSOR
	PIPE MOUNTED TEMPERATURE SENSOR
H L	WET-WET DIFFERENTIAL PRESSURE SENSOR

* NOT ALL SYMBOLS USED

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Revision / Addendum 02
Date 08/07/26

Project: TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT FOR TOMBALL ISD TOMBALL, TEXAS

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MECHANICAL CONTROL DIAGRAMS
VOLUME 2

Job No. 00802-04-01	Sheet No. M5.1
Drawn By: MBP	
Date: 07.15.2026	

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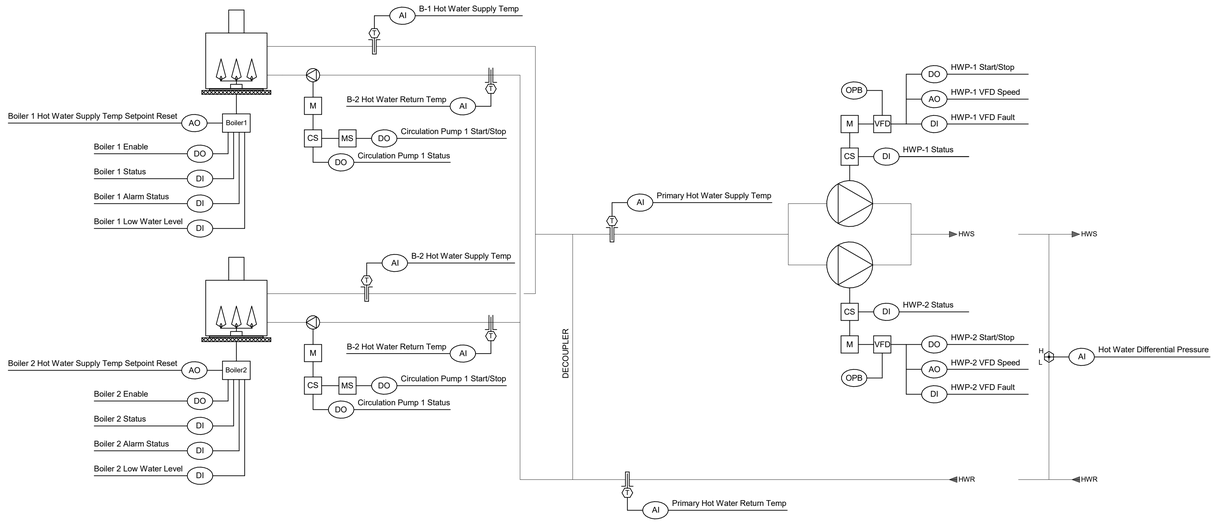


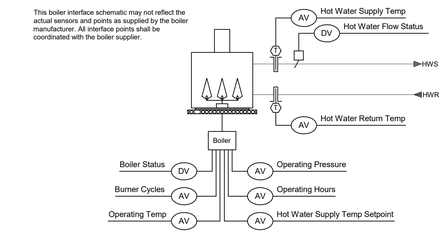
HOT WATER BOILER SYSTEM WITH LEAD/LAG PUMPS SEQUENCE OF OPERATIONS

HOT WATER BOILER WITH LEAD/LAG PUMPS SEQUENCE OF OPERATIONS

1. Boiler Run Conditions
   - 1.a. The boiler shall be enabled to run whenever:
     - 1.a.1. A definable number of hot water coils need heating
     - 1.a.2. AND the outside air temperature is less than 65°F (adj.)
   - 1.b. To prevent short cycling, the boiler shall run for and be off for minimum adjustable times (both user definable), unless shutdown on safeties or outside air conditions.
   - 1.c. The boiler shall run subject to its own internal safeties and controls.
   - 1.d. The boiler shall also run for freeze protection whenever the outside air temperature is less than 38°F (adj.).
2. Boiler Safeties
   - 2.a. The following safeties shall be monitored:
     - 2.a.1. Boiler alarm
     - 2.a.2. Low water level
   - 2.b. The following alarms shall be provided:
     - 2.b.1. Boiler alarm
     - 2.b.2. Low water level alarm
3. Hot Water Pump Lead/Lag Operation:
   - 3.a. The two hot water pumps shall operate in a lead/lag fashion.
     - 3.a.1. The lead pump shall run first.
     - 3.a.1. On a failure of the lead pump, the lag pump shall run and the lead pump shall turn off.
     - 3.a.2. On decreasing hot water differential pressure, the lag pump shall stage on and run in unison with the lead pump to maintain hot water differential pressure setpoint.
   - 3.b. The designated lead pump shall rotate upon one of the following conditions (user selectable):
     - 3.b.1. manually through a software switch
     - 3.b.2. if pump runtime (adj.) is exceeded
     - 3.b.3. daily
     - 3.b.4. weekly
     - 3.b.5. monthly
   - 3.c. Alarms shall be provided as follows:
     - 3.c.1. Hot Water Pump 1
       - 3.c.1.1. Failure: Commanded on, but the status is off.
       - 3.c.1.2. Running in Hand: Commanded off, but the status is on.
       - 3.c.1.3. Runtime Exceeded: Status runtime exceeds a user definable limit.
       - 3.c.1.4. VFD Fault
     - 3.c.2. Hot Water Pump 2
       - 3.c.2.1. Failure: Commanded on, but the status is off.
       - 3.c.2.2. Running in Hand: Commanded off, but the status is on.
       - 3.c.2.3. Runtime Exceeded: Status runtime exceeds a user definable limit.
       - 3.c.2.4. VFD Fault
4. Hot Water Differential Pressure Control:
   - 4.a. The controller shall measure hot water differential pressure and modulate the hot water pump VFDs in sequence to maintain its hot water differential pressure setpoint. The following setpoints are recommended values. All setpoints shall be field adjusted during the commissioning period to meet the requirements of actual field conditions.

     The controller shall modulate hot water pump speeds to maintain a hot water differential pressure of 12 psi (adj.). The VFD minimum speed shall not drop below 20% (adj.).
   - 4.b. On dropping hot water differential pressure, the VFDs shall stage on and run to maintain setpoint as follows:
     - 4.b.1. The controller shall modulate the lead VFD to maintain setpoint.
     - 4.b.2. If the lead VFD speed is greater than a setpoint of 90% (adj.), the lag VFD shall stage on.
     - 4.b.3. The lag VFD shall ramp up to match the lead VFD speed and then run in unison with the lead VFD to maintain setpoint.
   - 4.c. On rising hot water differential pressure, the VFDs shall stage off as follows:
     - 4.c.1. If the VFDs speeds drops back to 60% (adj.) below setpoint, the lag VFD shall stage off.
     - 4.c.2. The lead VFD shall continue to run to maintain setpoint.
   - 4.d. Alarms shall be provided as follows:
     - 4.d.1. High Hot Water Differential Pressure: If 25% (adj.) greater than setpoint.
     - 4.d.2. Low Hot Water Differential Pressure: If 25% (adj.) less than setpoint.
5. Circulation Pump 1:
   - 5.a. The Circulation Pump 1 shall run anytime Boiler 1 is called to run and shall have a user definable delay (adj.) on stop.
   - 5.b. Alarms shall be provide as follows:
     - 5.b.1. Circulation Pump 1 Failure: Commanded on, but the status is off.
     - 5.b.2. Circulation Pump 1 Running in Hand: Commanded off, but the status is on.
     - 5.b.3. Circulation Pump 1 Runtime Exceeded: Status runtime exceeds a user-definable limit.
6. Circulation Pump 2:
   - 6.a. The Circulation Pump 2 shall run anytime Boiler 2 is called to run and shall have a user definable delay (adj.) on stop.
   - 6.b. Alarms shall be provided as follows:
     - 6.b.1. Circulation Pump 2 Failure: Commanded on, but the status is off.
     - 6.b.2. Circulation Pump 2 Running in Hand: Commanded off, the the status is on.
     - 6.b.3. Circulation Pump 2 Runtime Exceeded: Status runtime exceeds a user-definable limit.
7. Boiler Lead/Lag Operation:
   - 7.a. The two boilers shall operate in a lead/lag fashion.
     - 7.a.1. The lead boiler shall run first.
     - 7.a.2. When the lead boiler reaches a set threshold, 80% firing rate (adj.) for a period of 5 mins (adj.), the lag boiler shall be engaged and the two boilers shall operate in unison to maintain design heating water setpoint.
     - 7.a.3. If both boilers are operating at a minimum set threshold, 20% firing rate (adj.) for a period of 5 minutes (adj.), the lag boiler shall be disengaged and the lead boiler shall operated solely.
     - 7.a.4. On a failure of the lead boiler, the lag boiler shall run and the lead boiler shall turn off. An alarm shall be generated at the front end.
   - 7.b. The designated lead boiler shall rotate upon one of the following conditions: (user selectable)
     - 7.b.1. manually through a software switch
     - 7.b.2. if boiler runtime (adj.) is exceeded
     - 7.b.3. daily
     - 7.b.4. weekly
     - 7.b.5. monthly
   - 7.c. Alarms shall be provided as follows:
     - 7.c.1. Boiler 1
       - 7.c.1.1. Failure: Commanded on, but the status is off.
       - 7.c.1.2. Running in Hand: Commanded off, but the status is on.
       - 7.c.1.3. Runtime Exceeded: Status runtime exceeds a user definable limit.
     - 7.c.2. Boiler 2
       - 7.c.2.1. Failure: Commanded on, but the status is off.
       - 7.c.2.2. Running in Hand: Commanded off, but the status is on.
       - 7.c.2.3. Runtime Exceeded: Status runtime exceeds a user definable limit.
   - 7.c.3. Lead Boiler Failure: The lead boiler is in failure and the standby boiler is on.
8. Hot Water Supply Temperature Setpoint:
   - 8.a. The hot water supply temperature setpoint shall reset based on outside air temperature.
   - 8.b. As outside air temperature rises from 0°F (adj.) to 50°F (adj.) the hot water supply temperature setpoint shall reset downwards by subtracting from 0°F (adj.) to 20°F (adj.) from the current boiler setpoint.
9. Primary Hot Water Temperature Monitoring:
   - 9.a. The following temperatures shall be monitored:
     - 9.a.1. Primary hot water supply
     - 9.a.2. Primary hot water return
   - 9.b. Alarms shall be provided as follows:
     - 9.b.1. High Primary Hot Water Supply Temp: If greater than 200°F (adj.)
     - 9.b.2. Low Primary Hot Water Supply Temp: If less than 100°F (adj.)
10. Boiler 1 Hot Water Temperature Monitoring:
    - 10.a. The following temperatures shall be monitored:
      - 10.a.1. Boiler 1 hot water supply
      - 10.a.2. Boiler 1 hot water return
    - 10.b. Alarms shall be provided as follows:
      - 10.b.1. High Hot Water Supply Temp: If greater than 200°F (adj.)
      - 10.b.2. Low Hot Water Supply Temp: If less than 100°F (adj.)
11. Boiler 2 Hot Water Temperature Monitoring:
    - 11.a. The following temperatures shall be monitored:
      - 11.a.1. Boiler 2 hot water supply
      - 11.a.2. Boiler 2 hot water return
    - 11.b. Alarms shall be provided as follows:
      - 11.b.1. High Hot Water Supply Temp: If greater than 200°F (adj.)
      - 11.b.2. Low Hot Water Supply Temp: If less than 100°F (adj.)

1 M5.2 CONTROL DIAGRAM - BOILER
N.T.S.



2 M5.2 CONTROL DIAGRAM - BOILER - MANUFACTURER INTERFACE
N.T.S.

Revision / 1
Date 08/07/26
Addendum 02

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FOR
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TOMBALL, TEXAS

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MECHANICAL CONTROL DIAGRAMS

VOLUME 2

Job No. 00802-04-01
Drawn By: MBP
Date: 07.15.2026
Sheet No. M5.2

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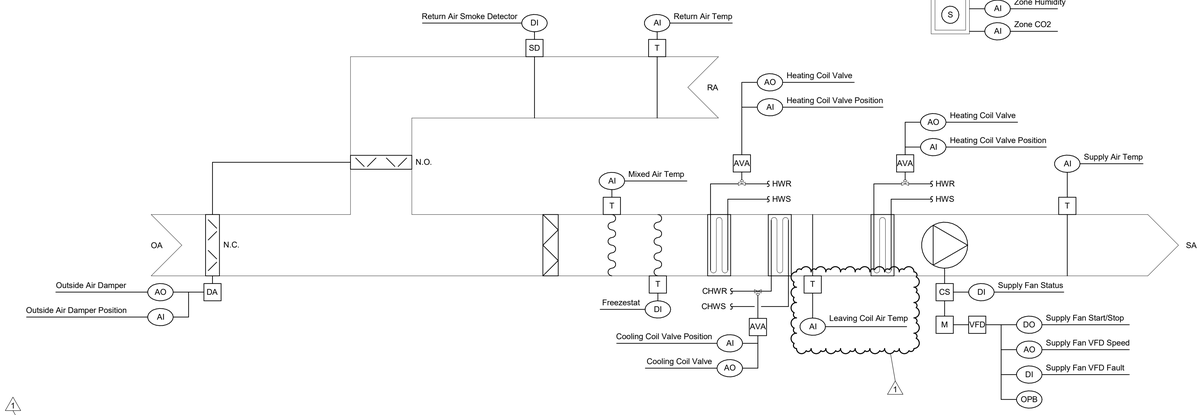


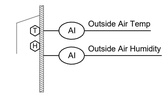
1

SINGLE ZONE AIR HANDLING UNIT SEQUENCE OF OPERATIONS

SINGLE ZONE AIR HANDLING UNIT SEQUENCE OF OPERATION:

1. Run Conditions - Requested:
   - 1.a.1. Occupied Mode: The unit shall maintain
     - 1.a.1.1. Space cooling setpoint: 75°F (adj)
     - 1.a.1.2. Space heating setpoint: 70°F (adj)
2. Freeze Protection:
   - 2.a. The unit shall shut down and generate an alarm upon receiving a freezestat status.
3. High Static Shutdown:
   - 3.a. The unit shall shut down and generate an alarm upon receiving a high static shutdown signal.
4. Return Air Smoke Detection:
   - 4.a. The unit shall shut down and generate an alarm upon receiving a return air smoke detector status.
5. AHU Optimal Start
   - 5.a. The unit shall start prior to scheduled occupancy based on the time necessary for the zones to reach their occupied setpoints. The start time shall automatically adjust based on changes in outside air temperature and zone temperatures.
6. Supply Fan:
   - 6.a. The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.
   - 6.b. Alarms shall be provided as follows:
     - 6.b.1. Supply Fan Failure: Commanded on, but the status is off.
     - 6.b.2. Supply Fan in Hand: Commanded off, but the status is on.
     - 6.b.3. Supply Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.)
   - 6.c. Alarms shall be provided as follows:
     - 6.c.1. High Supply Air Static Pressure: If the supply air static pressure is 25% (adj.) greater than setpoint.
     - 6.c.2. Low Supply Air Static Pressure: If the supply air static pressure is 25% (adj.) less than setpoint.
     - 6.c.3. Supply Fan VFD Fault.
7. Preheating coil valve:
   - 7.a.1. The controller shall measure the zone temperature for a demand call for heating and modulate the preheating coil valve to maintain its supply air temperature heating setpoin 95°F (adj). The Heating shall be enabled whenever:
     - 7.a.1.1. Outside air temperature is less than 65°F (adj)
     - 7.a.1.2. AND the zone temperature is below heating setpoint.
     - 7.a.1.3. AND the supply fan is on and status proven.
   - 7.b. Freeze protection
     - 7.a.1. The heating coil valve shall open whenever:
       - 7.a.1.1. Supply air temperature drops from 40°F to 35°F (adj.)
       - 7.a.1.2. OR the freezestat (if present) is on.
     - 7.a.2. Alarms shall be provided as follows:
       - 7.a.2.1. Low Supply Air Temp: If the supply air temperature is 5°F (adj.) less than setpoint.
8. Cooling Coil Valve:
   - 8.a. The controller shall measure the zone temperature for a demand call for cooling and modulate the cooling coil valve to maintain its supply air temperature cooling setpoint 55°F (adj.). The cooling shall be enabled whenever:
     - 8.a.1. Outside air temperature is greater than 60°F (adj.)
     - 8.a.2. AND the economizer (if present) is disabled or fully open
     - 8.a.3. AND the supply fan status is on
     - 8.a.4. AND the heating (if present) is not active
   - 8.b. The cooling coil valve shall open to 50% (adj.) whenever the freezestat (if present) is on.
   - 8.c. Alarms shall be provided as follows:
     - 8.c.1. High Supply Air Temp: If the supply air temperature is 5°F (adj.) greater than setpoint
9. Re-heating Coil Valve:
   - 9.a. The controller shall measure the zone temperature and zone humidity for dehumidification control. If the zone temperature is satisfied, but the zone humidity is above the zone humidity setpoint 55% RH (adj.) the unit shall enter dehumidification mode. The controller shall modulate the cooling coil valve to maintain its coil leaving air temperature cooling setpoint 55°F (adj). The re-heating coil valve shall modulate to maintain the supply air temperature re-heating setpoint 70°F (adj.). The heating shall be enabled whenever:
     - 9.a.1. Humidity measurement is above setpoint 55% RH (adj.)
     - 9.a.2. AND the supply fan status is on.
10. Demand control ventilation:
    - 10.a. When in the occupied mode, the controller shall measure the retrn air CO2 levels and modulate the outside air dampers open on rising CO2 concentrations, overriding normal damer operation to maintain a CO2 setpoint of 1800 ppm (adj.).
11. Mixed Air Temperature
    - 11.a. The controller shall monitor the mixed air temperature and use as required for economizer control (if present) or preheating control (if present).
    - 11.b. Alarms shall be provided as follows:
      - 11.b.1. High Mixed Air Temp: If the mixed air temperature is greater than 90°F (adj.)
      - 11.b.2. Low Mixed Air Temp: If the mixed air temperature is less than 45°F (adj.)
12. Return Air Humidity:
    - 12.a. The controller shall monitor the return air humidity and use as required for economizer control (if present) or humidity control (if present).
    - 12.b. Alarms shall be provided as follows:
      - 12.b.1. High Return Air Humidity: If the return air humidity is greater than 70% (adj.)
      - 12.b.2. Low Return Air Humidity: If the return air humidity is less than 35% (adj.)
13. Return Air Temperature
    - 13.a. The controller shall monitor the return air temperature and use as required for setpoint control or economizer control (if present).
    - 13.b. Alarms shall be provided as follows:
      - 13.b.1. High Return Air Temp: If the return air temperature is greater than 90°F (adj.)
      - 13.b.2. Low Return Air Temp: If the return air temperature is less than 45°F (adj.)
14. Supply Air Temperature
    - 14.a. The controller shall monitor the supply air temperature
    - 14.b. Alarms shall be provided as follows:
      - 14.b.1. High Supply Air Temp: If the supply air temperature is greater than 120°F (adj.).
      - 14.b.2. Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.).

1 M5.3 CONTROL DIAGRAM - HYDRONIC SINGLE ZONE AHU
N.T.S.



OUTSIDE AIR CONDITIONS SEQUENCE OF OPERATIONS

OUTSIDE AIR CONDITIONS SEQUENCE OF OPERATIONS

1. Outside Air Conditions
   - 1.a. The controller shall monitor the outside are temperature and humidity and calculate the outside air enthalpy on a continual basis. These values shall be made available to the system at all times.
   - 1.b. Alarms shall be generated as follows:
     - 1.b.1. Sensor Failure: Sensor reading indicates shorted or disconnected sensor. In the event of a sensor failure, an alternate outside air conditions sensor shall be made available to the system without interruption in sensor readings.
   - 1.c. If an OA Temp Sensor cannot be read, a default value of 65°F will be used
   - 1.d. If an OA Humidity Sensor cannot be read, a default value of 50% will be used
2. Outside Air Temperature History
   - 2.a. The controller shall monitor and record the high and low temperature readings for the outside air. These readings shall be recorded on a daily, month-to-date, and year-to-date basis.

MDF/IDF/ELEC ROOMS

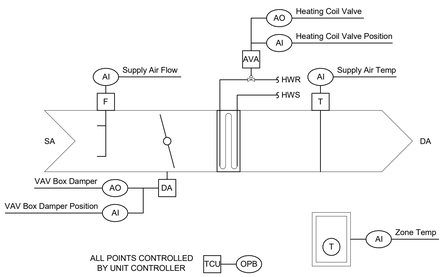
MDF/IDF/ELEC ROOMS

1. BMS shall provide secondary thermostat in each room indicated and monitor the zone temperature
2. Provide high temp alarm when zone temp exceeds setpoint 85F (adj.)

ADDITIONAL CONTROL POINTS

1. BMS shall monitor water heater and circ pump status.
2. BMS shall provide occupancy and schedules for lighting controls as noted by the electrical documents
3. BMS shall provide power for single duct VAV boxes from local controllers.
4. BMS shall provide monitoring/alarms for generator as noted by the electrical documents

2 M5.3 CONTROL DIAGRAM - ADDITIONAL CONTROL POINTS
N.T.S.



SINGLE DUCT VAV BOX WITH HOT WATER REHEAT SEQUENCE OF OPERATIONS

SINGLE DUCT VAV BOX WITH SUPPLEMENTAL HEAT SEQUENCE OF OPERATION

1. Run Conditions: The unit shall run according to a user definable time schedule in the following modes:
   - 1.a. Occupied Mode: The unit shall maintain
     - 1.a.1. A 75°F (adj.) cooling setpoint
     - 1.a.2. A 70°F (adj.) heating setpoint
   - 1.b. Unoccupied Mode (night setback): The unit shall maintain
     - 1.b.1. A 85°F (adj.) cooling setpoint
     - 1.b.2. A 55°F (adj.) heating setpoint
   - 1.c. Alarms shall be provided as follows:
     - 1.c.1. High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.)
     - 1.c.2. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.)
2. Zone Optimal Start:
   - 2.a. The unit shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period.
3. Reversing Variable Volume Terminal Unit - Flow Control:
   - 3.a. The unit shall maintain zone setpoints by controlling the airflow through one of the following:
   - 3.b. Occupied:
     - 3.b.1. When zone temperature is greater than its cooling setpoint, the zone damper shall modulate between the minimum occupied airflow (adj.) and the maximum cooling airflow (adj.) until the zone is satisfied.
     - 3.b.2. When the zone temperature is between the cooling setpoint and the heating setpoint, the zone damper shall maintain the minimum required zone ventilation (adj.)
     - 3.b.3. When zone temperature is less than its heating setpoint, the controller shall enable heating to maintain the zone temperature at its heating setpoint. Additionally, if warm air is available from the AHU, the zone damper shall modulate between the minimum occupied airflow (adj.) and the maximum heating airflow (adj.) until the zone is satisfied.
   - 3.c. Unoccupied:
     - 3.c.1. When the zone is unoccupied the zone damper shall control to its minimum unoccupied airflow (adj.)
     - 3.c.2. When the zone temperature is greater than its cooling setpoint, the zone damper shall modulate between the minimum unoccupied airflow (adj.) and the maximum cooling airflow (adj.) until the zone is satisfied.
     - 3.c.3. When zone temperature is less than its unoccupied heating setpoint, the controller shall enable heating to maintain the zone temperature at the setpoint. Additionally, if warm air is available from the AHU, the zone damper shall modulate between the minimum unoccupied airflow (adj.) and the auxiliary heating airflow (Adj.) until the zone is satisfied.
4. Reheating Coil Valve
   - 4.a. The controller shall measure the zone temperature and modulate the reheating coil valve open on dropping temperature to maintain its heating setpoint.
   - 4.b. When cold air is available from the AHU and there is no fan present in the box, the zone damper shall modulate to the minimum occupied airflow (adj.). If more heat is required, the zone damper shall modulate to the auxiliary heating airflow (adj.).
5. Discharge Air Temperature:
   - 5.a. The controller shall monitor the discharge air temperature.
   - 5.b. Alarms shall be provided as follows:
     - 5.b.1. High Discharge Air Temp: If the discharge air temperature is greater than 120°F (adj.)
     - 5.b.2. Low Discharge Air Temp: If the discharge air temperature is less than 40°F (adj.)

*SINGLE DUCT VAV BOXES POWERED THRU DDC PANEL CONTROL VOLTAGE

3 M5.3 CONTROL DIAGRAM - SD VAV HW REHEAT
N.T.S.

Revision / Date
1 08/07/26 Addendum 02

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL ISD
TOMBALL, TEXAS

IEG
Innovative Engineering Group
www.iegengineers.com
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MECHANICAL CONTROL DIAGRAMS

VOLUME 2

Job No. 00802-04-01
Sheet No. M5.3
Drawn By: MBP
Date: 07.15.2026

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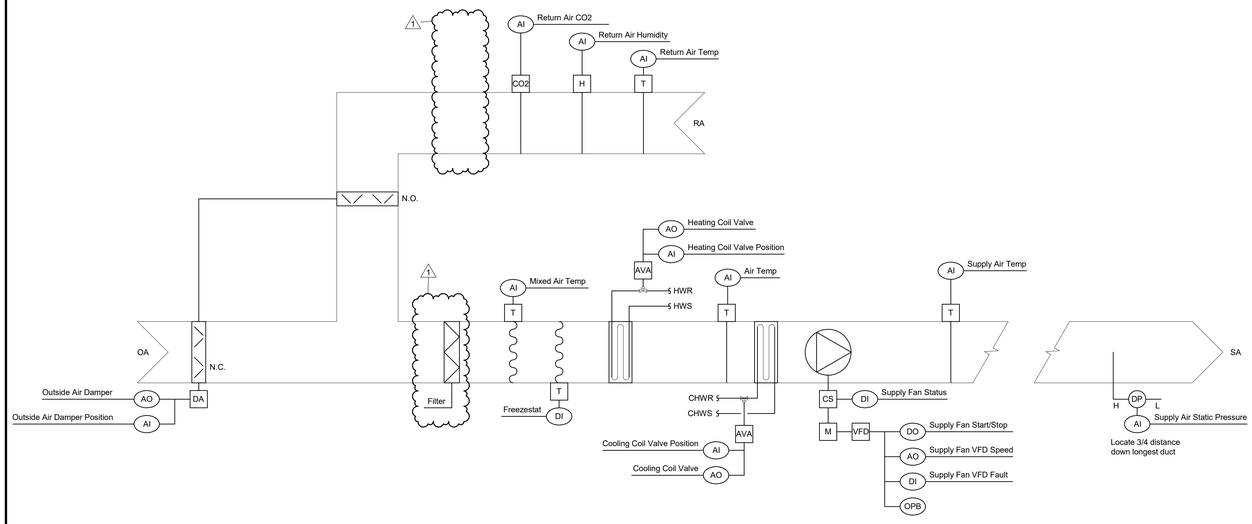
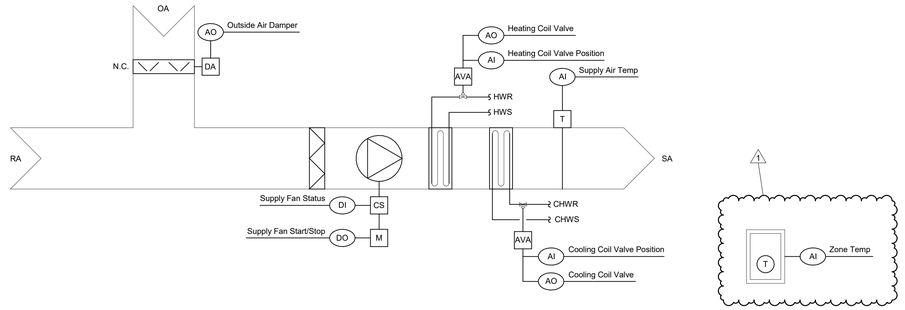




VARIABLE AIR VOLUME AIR HANDLING UNIT SEQUENCE OF OPERATIONS

VARIABLE AIR VOLUME AIR HANDLING UNIT SEQUENCE OF OPERATION:

1. Run Conditions - Requested:
 1.a. The unit shall run whenever
  1.a.1. Any zone is occupied
  1.a.2. OR a definable number of unoccupied zones need heating or cooling
2. Emergency Shutdown:
 2.a. The unit shall shut down and generate an alarm upon receiving an emergency shutdown signal.
3. Freeze Protection:
 3.a. The unit shall shut down and generate an alarm upon receiving a freezestat status.
4. High Static Shutdown:
 4.a. The unit shall shut down and generate an alarm upon receiving a high static shutdown signal.
5. Return Air Smoke Detection:
 5.a. The unit shall shut down and generate an alarm upon receiving a return air smoke detector status.
6. AHU Optimal Start
 6.a. The unit shall start prior to scheduled occupancy based on the time necessary for the zones to reach their occupied setpoints. The start time shall automatically adjust based on changes in outside air temperature and zone temperatures.
7. Supply Fan:
 7.a. The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.
 7.b. Alarms shall be provided as follows:
  7.b.1. Supply Fan Failure: Commanded on, but the status is off.
  7.b.2. Supply Fan in Hand: Commanded off, but the status is on.
  7.b.3. Supply Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.)
8. Supply Air Duct Static Pressure Control:
 8.a. The controller shall measure duct static pressure and modulate the supply fan VFD speed to maintain a duct static pressure setpoint. The speed shall not drop below 30% (adj.). The static pressure setpoint shall be reset based upon the position of the zone dampers, with a goal of reducing the static pressure until at least one zone damper is nearly wide open.
  8.a.1. The initial duct static pressure setpoint shall be 1.5 in. H2) (adj.)
  8.a.2. If no zone damper is nearly wide open, the setpoint shall incrementally reset down to a minimum of 1.3 in H2O (adj.).
  8.a.3. As one or more dampers nears the wide open position, the setpoint shall incrementally reset up to a maximum of 1.8 in H2O (adj.).
 8.b. Alarms shall be provided as follows:
  8.b.1. High Supply Air Static Pressure: If the supply air static pressure is 25% (adj.) greater than setpoint.
  8.b.2. Low Supply Air Static Pressure: If the supply air static pressure is 25% (adj.) less than setpoint.
  8.b.3. Supply Fan VFD Fault
9. Supply Air Temperature Setpoint - Fixed:
 9.a. The controller shall monitor the supply air temperature and shall maintain fixed supply air temperature setpoint of 55°F (adj.).
10. Cooling Coil Valve:
 10.a. The controller shall measure the supply air temperature and modulate the cooling coil valve to maintain its cooling setpoint. The cooling shall be enabled whenever:
  10.a.1. Outside air temperature is greater than 60°F (adj.)
  10.a.2. AND the economizer (if present) is disabled or fully open
  10.a.3. AND the supply fan status is on
  10.a.4. AND the heating (if present) is not active
 10.b. The cooling coil valve shall open to 50% (adj.) whenever the freezestat (if present) is on.
 10.c. Alarms shall be provided as follows:
  10.c.1. High Supply Air Temp: If the supply air temperature is 5°F (adj.) greater than setpoint
11. Heating Coil Valve:
 11.a. The controller shall measure the supply air temperature and modulate the heating coil valve to maintain its heating setpoint. The heating shall be enabled whenever:
  11.a.1. Outside air temperature is less than 65°F (adj.)
  11.a.2. AND the supply fan status is on.
  11.a.3. AND the cooling (if present) is not active.
 11.b. The heating coil valve shall open whenever:
  11.b.1. Supply air temperature drops from 40°F to 35°F (adj.)
  11.b.2. OR the freezestat (if present) is on.
 11.c. Alarms shall be provided as follows:
  11.c.1. Low Supply Air Temp: If the supply air temperature is 5°F (adj.) less than setpoint.
12. Demand Control Ventilation:
 12.a. When in the occupied mode, the controller shall measure the return air CO2 levels and modulate the outside air dampers open on rising CO2 concentrations, overriding normal damper operation to maintain a CO2 setpoint of 1800 ppm (adj.).
13. Mixed Air Temperature
 13.a. The controller shall monitor the mixed air temperature and use as required for economizer control (if present) or preheating control (if present).
 13.b. Alarms shall be provided as follows:
  13.b.1. High Mixed Air Temp: If the mixed air temperature is greater than 90°F (adj.)
  13.b.2. Low Mixed Air Temp: If the mixed air temperature is less than 45°F (adj.)
14. Return Air Humidity:
 14.a. The controller shall monitor the return air humidity and use as required for economizer control (if present) or humidity control (if present).
 14.b. Alarms shall be provided as follows:
  14.b.1. High Return Air Humidity: If the return air humidity is greater than 70% (adj.)
  14.b.2. Low Return Air Humidity: If the return air humidity is less than 35% (adj.)
15. Return Air Temperature
 15.a. The controller shall monitor the return air temperature and use as required for setpoint control or economizer control (if present).
 15.b. Alarms shall be provided as follows:
  15.b.1. High Return Air Temp: If the return air temperature is greater than 90°F (adj.)
  15.b.2. Low Return Air Temp: If the return air temperature is less than 45°F (adj.)
16. Supply Air Temperature
 16.a. The controller shall monitor the supply air temperature
 16.b. Alarms shall be provided as follows:
  16.b.1. High Supply Air Temp: If the supply air temperature is greater than 120°F (adj.).
  16.b.2. Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.).

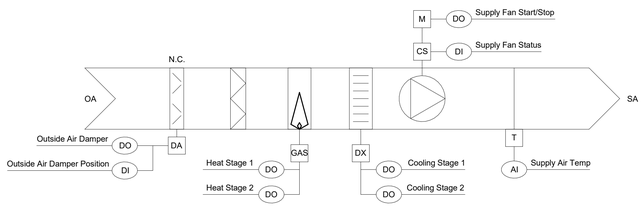
1 M5.4 CONTROL DIAGRAM - HYDRONIC VAV AHU
N.T.S.

UNIT VENTILATOR / FAN COIL UNIT SEQUENCE OF OPERATIONS

UNIT VENTILATOR / 4-PIPE FAN COIL UNIT SEQUENCE OF OPERATION:

1. Run Conditions: The unit shall run according to a user definable time schedule in the following modes:
 1.a. Occupied Mode: The unit shall maintain
  1.a.1. Space Cooling Setpoint: 75°F (adj.)
  1.a.2. Space Heating Setpoint: 70°F (adj.)
 1.b. Unoccupied Mode: The unit shall maintain
  1.b.1. Space Cooling Setpoint: 85°F (adj.)
  1.b.2. Space Heating Setpoint: 55°F (adj.)
2. Alarms shall be provided as follows:
 2.a. High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.)
 2.b. Low Zone Temp: If the zone temperature is lower than the heating setpoint by a user definable amount (adj.)
3. Zone Optimal Start
 3.a. The unit shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period.
4. Smoke Detection (For units greater than 2,000 CFM)
 4.a. The unit shall shut down and generate an alarm upon receiving a smoke detector status.
5. Supply Fan
 5.a. The fan shall run anytime the unit is commanded to run, unless shutdown on safeties. The fan speeds shall automatically be indexed as follows
  5.a.1. Low speed shall run anytime the zone temperature is within setpoints.
  5.a.2. High speed shall run anytime the zone temperature is outside of setpoints.
 5.b. The controller shall monitor the fan status. Alarms shall be provided as follows:
  5.b.1. Fan Failure: Commanded on, but the status is off
  5.b.2. Fan in Hand: Commanded off, the the status is on
6. Cooling Coil Valve:
 6.a.1. The controller shall measure the zone temperature for a demand call for cooling and modulate the cooling coil valve to maintain its discharge air temperature cooling setpoint 55°F (adj.). The cooling shall be enabled whenever:
 6.a.2. Outside air temperature is greater than 60°F (adj.)
 6.a.3. AND the zone temperature is above cooling setpoint
 6.a.4. AND the fan is on
7. Heating Coil Valve:
 7.a. The controller shall measure the zone temperature for a demand call for heating and modulate the heating coil valve to maintain its discharge air temperature heating setpoint 95° F (adj.). The heating shall be enabled whenever:
  7.a.1. Outside air temperature is less than 65°F (adj.)
  7.a.2. AND the zone temperature is below heating setpoint
  7.a.3. AND the fan is on
8. Outside Air Damper:
 8.a. The outside air damper shall open to provide a fixed percentage outside air ventilation anytime the unit is in occupied mode. The damper open position shall be set during testing and balancing. The outside air damper shall closed when the unit is off or in unoccupied mode.
9. Discharge Air Temperature
 9.a. The controller shall monitor the discharge air temperature.
 9.b. Alarms shall be provided as follows:
  9.b.1. High Discharge Air Temp: If the discharge air temperature is greater than 120°F (adj.)
  9.b.2. Low Discharge Air Temp: If the discharge air temperature is less than 40°F (adj.)
10. Fan Status
 10.a. The controller shall monitor the fan status
 10.b. Alarms shall be provided as follows:
  10.b.1. Fan Failure: Commanded on, but the status is off.
  10.b.2. Fan in Hand: Commanded off, but the status is on.
  10.b.3. Fan Runtime Exceeded: Fan status runtime exceeds a user definable limit (adj.).

2 M5.4 CONTROL DIAGRAM - FAN COIL UNIT
N.T.S.

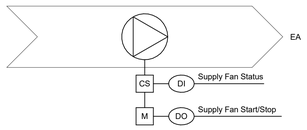


MAKEUP AIR UNIT SEQUENCE OF OPERATIONS

MAKEUP AIR UNIT SEQUENCE OF OPERATIONS

1. Run Conditions
 1.a. The unit shall be interlocked to run whenever the associated kitchen exhaust fan runs unless shutdown on safeties.
2. Emergency Shutdown
 2.a. The unit shall shut down and generate an alarm upon receiving an emergency shutdown signal.
3. Outside Air Damper
 3.a. The outside air damper shall open anytime the unit runs and shall close anytime the unit stops. The supply fan shall start only after the damper status has proven the damper is open. The outside air damper shall close 4 sec (adj.) after the supply fan stops.
 3.b. Alarms shall be provided as follows:
  3.b.1. Outside Air Damper Failure: Commanded open, but the status is closed.
  3.b.2. Outside Air Damper in Hand: Commanded closed, but the status is open.
4. Supply Fan
 4.a. The supply fan shall run anytime the unit is commanded to run. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime, unless shutdown on safeties.
 4.b. Alarms shall be provided as follows:
  4.b.1. Supply Fan Failure: Commanded on, but the status is off.
  4.b.2. Supply Fan in Hand: Commanded off, but the status is on.
  4.b.3. Supply Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.)
5. Supply Air Temperature Setpoint - Fixed
 5.a. The controller shall monitor the supply air temperature and shall maintain a fixed supply air temperature setpoint of 80°F (adj.)
6. Cooling Stages
 6.a. The controller shall measure the supply air temperature and stage the cooling to maintain its cooling setpoint. To prevent short cycling, there shall be a user definable (adj.) delay between stages, and each stage shall have a user definable (adj.) minimum runtime.
 6.b. The cooling shall be enabled whenever:
  6.b.1. Outside air temperature is greater than 60°F (adj.)
  6.b.2. AND the supply air temperature is above cooling setpoint.
  6.b.3. AND the fan status is on
7. Gas Heating Stages
 7.a. The controller shall measure the supply air temperature and stage the heating to maintain its heating setpoint. To prevent short cycling, there shall be a user definable (adj.) delay between stages, and each stage shall have a user definable (adj.) minimum runtime.
 7.b. The heating shall be enabled whenever:
  7.b.1. Outside air temperature is less than 65°F (adj.)
  7.b.2. AND the supply air temperature is below heating setpoint.
  7.b.3. AND the fan status is on.
8. Supply Air Temperature
 8.a. The controller shall monitor the supply air temperature.
 8.b. Alarms shall be provided as follows:
  8.b.1. High Supply Air Temp: If the supply air temperature is greater than 120°F (adj.)
  8.b.2. Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.)

3 M5.4 CONTROL DIAGRAM - MAKEUP AIR UNIT
N.T.S.



EXHAUST FAN SEQUENCE OF OPERATIONS

Occupancy Sensor - Fan shall be interlocked to occupancy sensor and/or light switch. Fan shall operate when lights/occupancy sensor are on and shall turn off when the lights/occupancy sensor are off. DDC contractor to monitor status only. Fan start/stop to be mechanical interlock as described

Local Switch - Fan shall operate when local switch is engaged and shall be off when the switch is off. DDC contractor to monitor status only. Fan start/stop to be mechanical interlock as described

Continuous - Fan shall operate continuously.

Scheduled - Fan shall operate according to a user definable schedule through the building BMS system.

Interlock: Kitchen Hood - Fan shall be controlled by food service controller.

4 M5.4 CONTROL DIAGRAM - EXHAUST FAN
N.T.S.

Revision / 1
Date 08/07/26
Addendum 02

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL ISD
TOMBALL, TEXAS

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MECHANICAL CONTROL DIAGRAMS

VOLUME 2

Job No. 00802-04-01
Sheet No. M5.4
Drawn By: MBP
Date: 07.15.2026

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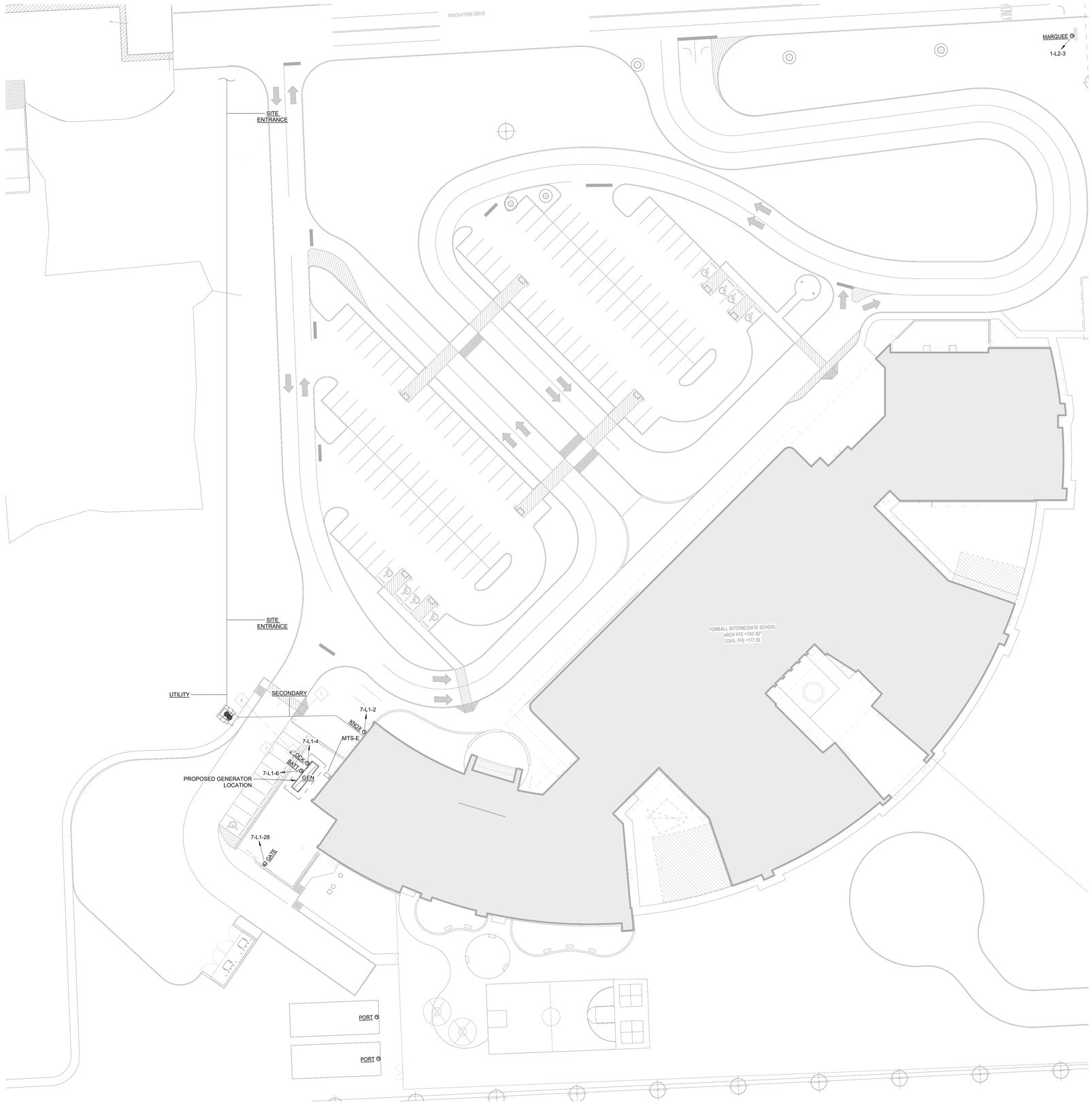

1 E1.00 ELECTRICAL POWER SITE PLAN
1" = 30'-0"

N TRUE

PLAN

ELECTRICAL GENERAL NOTES

NUMBER	NOTE
1	ALL EQUIPMENT IS TO BE LABELED WITH THE FOLLOWING WHEN APPLICABLE: NAME, VOLTAGE, PHASE, FUSE SIZE, INCOMING CABLE SIZE, FEED FROM NAME.
2	PROVIDE SEALING FITTINGS AT ALL PENETRATIONS THRU WALLS OF DIFFERENT TEMPERATURE SPACES.
3	PROVIDE TAMPER RESISTANT RECEPTACLES PER N.E.C. ARTICLE 406.12.
4	RECEPTACLES SHOWN FOR MAINTENANCE OF ROOF EQUIPMENT LOCATIONS ARE APPROXIMATE. CONTRACTOR TO ROUTE CIRCUIT INSIDE OF EQUIPMENT CURB IF POSSIBLE TO REDUCE THE NUMBER OF ROOF PENETRATIONS.
5	BELOW GRADE CONDUIT SHALL BE RUN UNDER CONCRETE SLAB, AND TURNED UP, USING A 90-DEGREE FACTORY ELBOW. CONDUIT SHALL STUB UP 6" ABOVE TOP OF CONCRETE.
6	ALL DEVICES/DISCONNECTS MOUNTED EXTERIOR TO BUILDING SHALL WP AND OR NEMA 3R RATED DEVICES/DISCONNECTS.
7	IN ALL ENCLOSED OFFICES, CLASSROOMS, CONFERENCE ROOMS, ROOMS USED PRIMARILY FOR COPY OR PRINT FUNCTIONS, BREAKROOMS, TRAINING ROOMS AND INDIVIDUAL WORKSTATIONS, "ALL RECEPTACLES SHALL BE CONTROLLED (I.E. TOP CONTROLLED AND BOTTOM UNCONTROLLED UNLESS NOTED OTHERWISE. (I.E., BOTH TOP AND BOTTOM RECEPTACLES).

ELECTRICAL UNDERLINED NOTES _

KEY	DESCRIPTION
BATT	J-BOX FOR GENERATOR BATTERY CHARGER. COORDINATE EXACT LOCATION WITH MANUFACTURER OF GEN-SET.
BLOCK	J-BOX FOR GENERATOR BLOCK HEATER. COORDINATE EXACT LOCATION WITH MANUFACTURER OF GEN-SET.
GATE	MOTORIZED GATE OPERATOR. PROVIDE TWO(2) 2"C TO COMPUTER ROOM FOR DIGITAL CONTROL. PROVIDE 1"C FROM GATE CONTROLLER TO ENTRANCE CARD READER POLE FOR ENTRANCE ACCESS. EXIT LANE PROVIDE 1"C TO LOOP DETECTOR. COORDINATE EXACT LOCATIONS WITH GATE INSTALLER.
GEN	NEW 200KW NATURAL GAS 480Y/277V GENERATOR.
KNOX	PROPOSED LOCATION FOR BUILDING MAIN SHUNT TRIP DEVICE TO DE-ENERGIZE ELECTRICAL SERVICE. COORDINATE FINAL INSTALL LOCATION WITH AHJ.
MARQUEE	J-BOX FOR MARQUEE SITE SIGNAGE. PROVIDE TWO (2) 2" CONDUITS FROM ELECTRICAL ROOM TO MARQUEE/SIGN. PROVIDE PULL STRING AND CAP.
PORT	PROVIDE (2) 4" CONDUITS WITH PULL STRING TO THE MDP FOR FUTURE PORTABLE BUILDING POWER. PROVIDE JUNCTION BOX ON THE SITE TAGGED WITH ELECTRICAL AND NOTED FOR PORTABLE BUILDINGS. SWITCHBOARD DIRECTORY SHALL BE TAGGED FOR FUTURE PORTABLE BUILDINGS AT THE 400A BREAKER. CONDUIT SHALL BE TAGGED AND LABELED ON BOTH ENDS FOR FUTURE IDENTIFICATION OF THE START/END OF THE CONDUITS.
SECONDARY	APPROXIMATE ROUTING OF SECONDARYUTILITY CONDUITS. EXACT ROUTING TO BE FIELD DETERMINED. REFER TO ONE-LINE AND PANEL SCHEDULES FOR ADDITIONAL INFORMATION.
SITE ENTRANCE	COORDINATE CONNECTION LOCATION WITH UTILITY COMPANY.
UTILITY	PROPOSED LOCATION OF UTILITY DISTRIBUTION TRANSFORMER. REFER TO ONE-LINE AND SERVICE ENTRANCE SPECIFICAITONS FOR ADDITIONAL INFORMATION AND DIVISION OF LABOR FOR ELECTRIC UTILITY SERVICE ENTRANCE. COORDINATE EXACT LOCATION WITH CIVIL AND UTILITY PROVIDER PRIOR TO INSTALLATION OF TRANSFORMER PAD.

1

GENERATOR NOTE

NUMBER	NOTE
1	NATURAL GAS GENERATORS TO BE PERMITTED SEPARATELY BY GENERATOR INSTALLERS. SUBJECT TO REVIEW AND INSPECTORS OF 2021 IFC, 2021 IMC AND APPILCABLE NFPA PROVISIONS

Revision / Date
1 ADDENDUM 1 07/24/26
2 ADDENDUM 2 08/07/26

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL ISD
TOMBALL, TEXAS

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ELECTRICAL POWER SITE PLAN

VOLUME 2

Job No.	Sheet No.
00802-04-01	E1.00
Drawn By: MH	
Date: 07.15.2026	

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ELECTRICAL GENERAL NOTES

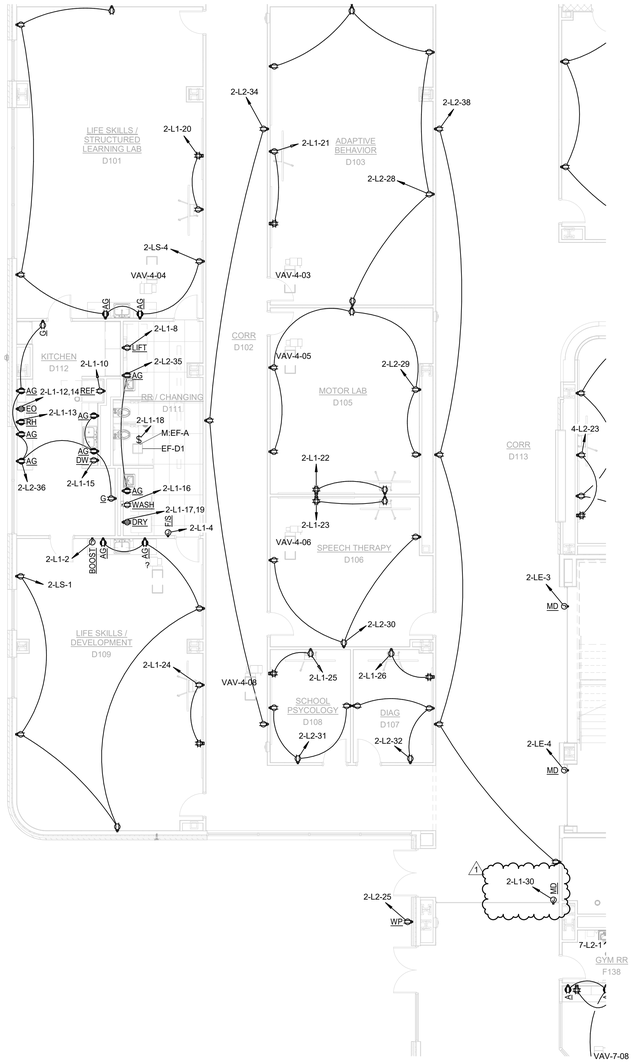
NUMBER	NOTE
1	ALL EQUIPMENT IS TO BE LABELED WITH THE FOLLOWING WHEN APPLICABLE: NAME, VOLTAGE, PHASE, FUSE SIZE, INCOMING CABLE SIZE, FEED FROM NAME.
2	PROVIDE SEALING FITTINGS AT ALL PENETRATIONS THRU WALLS OF DIFFERENT TEMPERATURE SPACES.
3	PROVIDE TAMPER RESISTANT RECEPTACLES PER N.E.C. ARTICLE 406.12.
4	RECEPTACLES SHOWN FOR MAINTENANCE OF ROOF EQUIPMENT LOCATIONS ARE APPROXIMATE. CONTRACTOR TO ROUTE CIRCUIT INSIDE OF EQUIPMENT CURB IF POSSIBLE TO REDUCE THE NUMBER OF ROOF PENETRATIONS.
5	BELOW GRADE CONDUIT SHALL BE RUN UNDER CONCRETE SLAB, AND TURNED UP, USING A 90-DEGREE FACTORY ELBOW. CONDUIT SHALL STUB UP 6" ABOVE TOP OF CONCRETE.
6	ALL DEVICES/DISCONNECTS MOUNTED EXTERIOR TO BUILDING SHALL WP AND OR NEMA 3R RATED DEVICES/DISCONNECTS.
7	IN ALL ENCLOSED OFFICES, CLASSROOMS, CONFERENCE ROOMS, ROOMS USED PRIMARILY FOR COPY OR PRINT FUNCTIONS, BREAKROOMS, TRAINING ROOMS AND INDIVIDUAL WORKSTATIONS, "ALL RECEPTACLES SHALL BE CONTROLLED (I.E. TOP CONTROLLED AND BOTTOM UNCONTROLLED UNLESS NOTED OTHERWISE. (I.E., BOTH TOP AND BOTTOM RECEPTACLES).

ELECTRICAL UNDERLINED NOTES _

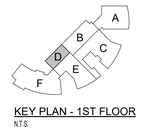
KEY	DESCRIPTION
A	ABOVE COUNTER RECEPTACLE, REFER TO ARCHITECTURAL ELEVATIONS FOR EXACT PLACEMENT.
AG	GFCI ABOVE COUNTER RECEPTACLE, REFER TO ARCHITECTURAL ELEVATIONS FOR EXACT PLACEMENT.
BOOST	J-BOX FOR BOOSTER FAN. COORDINATE EXACT MOUNTING WITH INSTALLER OF BOOSTER FAN.
DRY	OUTLET FOR CLOTHES DRYER COORDINATE EXACT NEMA CONFIGURATION WITH ITEM PURCHASED BY OTHERS MOUNT AT 36" AFF. PROVIDE GFI BREAKER.
DW	DEDICATED GFI RECEPTACLE FOR DISHWASHER. MOUNT IN MILLWORK ADJACENT TO DISHWASHER SO GFI IS ACCESSABLE WITHOUT MOVING DISHWASHER.
EO	ELECTRIC RANGE/OVEN. CONFIRM EXACT ELECTRICAL REQUIREMENT WITH EQUIPMENT TO BE PURCHASED PRIOR TO INSTALLATION. PROVIDE GFI BREAKER.
F/S	J-BOX FOR FIRE SMOKE DAMPER. COORDINATE EXACT LOCATION AND QUANTITY OF CONNECTIONS WITH MECHANICAL DRAWINGS.
G	GFCI DUPLEX RECEPTACLE AT 18"ABOVE FINISHED FLOOR UNLESS NOTED OTHERWISE.
LIFT	GFI RECEPTACLE FOR SPED LIFT. LOCATE AT 18" AND CONFIRM EXACT LOCATION WITH INSTALLER OF LIFT.
MD	J-BOX FOR MOTOR OPERATED DOOR OPEN/CLOSE. COORDINATE EXACT LOCATION WITH INSTALLER OF DOOR AND PROVIDE CONTROL WIRING TO LOCATION REQUIRED BY INSTALLER OF DOOR.
REF	GFI RECEPTACLE FOR REFRIGERATOR. COORDINATE LOCATION WITH INSTALLER OF REFRIGERATOR.
RH	CONNECTION FOR RANGE HOOD. COORDINATE EXACT LOCATION WITH INSTALLER OF HOOD.
WASH	OUTLET FOR CLOTHES WASHING MACHINE COORDINATE EXACT NEMA CONFIGURATION WITH ITEM PURCHASED BY OTHERS MOUNT AT 36" AFF. PROVIDE GFI BREAKER.
WP	WEATHER RESISTANT GFCI RECEPTACLE IN WEATHERPROOF, EXTRA DUTY TYPE ENCLOSURE.

NAMED EQUIPMENT

KEY	TYPE COMMENTS	LOAD VA	VOLTAGE	#POLE
M:EF-A	MOTOR RATED SWITCH FOR EXHAUST FAN.	528 VA	120 V	1



1 POWER PLAN - LEVEL 01 - AREA D
1/8" = 1'-0"



KEY PLAN - 1ST FLOOR
N.T.S.

PLAN

Revision /	Date	
1	08/07/26	ADDENDUM 2

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL ISD
TOMBALL, TEXAS

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POWER PLAN - LEVEL 01 - AREA D

VOLUME 2

Job No.	Sheet No.
03802-04-01	E2.1D
Drawn By: MH	
Date: 07.15.2026	

8/6/2026 10:59:39 AM
Autodesk Docs://TOMBALL ISD - IS REPLACEMENT/03802-04-01_Tomball ISD IS Replacement_ELEC.rvt

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Panel: 2-H1

Location: ELEC. B121 **Volts:** 480Y/277V WYE **A.I.C. Rating:** 42,000
Supply From: MDP1 **Phas...** 3 **Mains Rating:** 100 A
Mounting: SURFACE **Wires:** 4 **Mains Type:** MLO

NO...	C...	CIRCUIT DESCRIPTION	WIRE	BRKR	#	A	B	C	A	B	C	#	BRKR	WIRE	CIRCUIT DESCRIPTION	C...	NO...
	1	2-H2	RISER	60	3	3547			25386			3	125	RISER	2-T2	2	
--	3	--	--	--	--		3547			20066		--	--	--	--	4	--
--	5	--	--	--	--			3547			23234	--	--	--	--	6	--
(L)	7	LIGHTS Room B135, B123, B11...	10	20	1	3138			728			1	20	12	LIGHTS Room B139, 133	8	(L)
(L)	9	LIGHTS CORR B106	12	20	1		35			525		1	20	12	EXTERIOR LIGHTS	10	(E)
(L)	11	LIGHTS D101, D103, D105	12	20	1			1551			1140	1	20	12	LIGHTS D102	12	(L)
(E)	13	EXTERIOR LIGHTS	12	20	1	445			276			1	20	12	LIGHTS B106	14	(L)
	15	SPARE	--	20	1		0			0		1	20	--	SPARE	16	
	17	SPARE	--	20	1			0			0	1	20	--	SPARE	18	
	19	SPARE	--	20	1	0			0			1	20	--	SPARE	20	
	21	SPARE	--	20	1		0			0		1	20	--	SPARE	22	
	23	SPARE	--	20	1			0			0	1	20	--	SPARE	24	
	25	SPARE	--	20	1	0			0			1	20	--	SPARE	26	
	27	SPARE	--	20	1		0			0		1	20	--	SPARE	28	
	29	SPARE	--	20	1			0			0	1	20	--	SPARE	30	
	31	SPARE	--	20	1	0			0			1	20	--	SPARE	32	
	33	SPARE	--	20	1		0			0		1	20	--	SPARE	34	
	35	SPARE	--	20	1			0			0	1	20	--	SPARE	36	
	37	SPARE	--	20	1	0			0			1	20	--	SPARE	38	
	39	SPARE	--	20	1		0			0		1	20	--	SPARE	40	
	41	SPARE	--	20	1			0			0	1	20	--	SPARE	42	
		Total Load:				33520 W		24173 W			29472 W						
		Total Amps:				124 A		87 A			109 A						

NOTES:
1. Provide GFCI Breaker
2. Circuit Via Energy Management System
3. Circuit Via Photo Cell Operation / DDC Controller
4. Provide Breaker and Fuses Per Manufacturers Recommendation
5. Provide H.A.C.R. Breaker
6. Provide a Lock on Breaker

PANEL TOTALS
Total Conn. Load: 87164 VA
Total Est. Demand: 83409 VA
Total Conn.: 105 A
Total Est. Demand: 100 A

Panel: 2-H2

Location: ELEC. B121 **Volts:** 480Y/277V WYE **A.I.C. Rating:** 42,000
Supply From: 2-H1 **Phas...** 3 **Mains Rating:** 60 A
Mounting: SURFACE **Wires:** 4 **Mains Type:** MLO

NO...	C...	CIRCUIT DESCRIPTION	WIRE	BRKR	#	A	B	C	A	B	C	#	BRKR	WIRE	CIRCUIT DESCRIPTION	C...	NO...
(H)	1	AHU-4	12	20	3	1773			1773			3	20	12	AHU-2	2	(H)
--	3	--	--	--	--		1773			1773		--	--	--	--	4	--
--	5	--	--	--	--			1773			1773	--	--	--	--	6	--
	7	SPARE	--	20	1	0			0			1	20	--	SPARE	8	
	9	SPARE	--	20	1		0			0		1	20	--	SPARE	10	
	11	SPARE	--	20	1			0			0	1	20	--	SPARE	12	
	13	SPARE	--	20	1	0			0			1	20	--	SPARE	14	
	15	SPARE	--	20	1		0			0		1	20	--	SPARE	16	
	17	SPARE	--	20	1			0			0	1	20	--	SPARE	18	
	19	SPARE	--	20	1	0			0			1	20	--	SPARE	20	
	21	SPARE	--	20	1		0			0		1	20	--	SPARE	22	
	23	SPARE	--	20	1			0			0	1	20	--	SPARE	24	
	25	SPARE	--	20	1	0			0			1	20	--	SPARE	26	
	27	SPARE	--	20	1		0			0		1	20	--	SPARE	28	
	29	SPARE	--	20	1			0			0	1	20	--	SPARE	30	
	31	SPARE	--	20	1	0			0			1	20	--	SPARE	32	
	33	SPARE	--	20	1		0			0		1	20	--	SPARE	34	
	35	SPARE	--	20	1			0			0	1	20	--	SPARE	36	
	37	SPARE	--	20	1	0			0			1	20	--	SPARE	38	
	39	SPARE	--	20	1		0			0		1	20	--	SPARE	40	
	41	SPARE	--	20	1			0			0	1	20	--	SPARE	42	
		Total Load:				3547 W		3547 W			3547 W						
		Total Amps:				13 A		13 A			13 A						

NOTES:
1. Provide GFCI Breaker
2. Circuit Via Energy Management System
3. Circuit Via Photo Cell Operation / DDC Controller
4. Provide Breaker and Fuses Per Manufacturers Recommendation
5. Provide H.A.C.R. Breaker
6. Provide a Lock on Breaker

PANEL TOTALS
Total Conn. Load: 10640 VA
Total Est. Demand: 10640 VA
Total Conn.: 13 A
Total Est. Demand: 13 A

Panel: 2-HE

Location: ELEC. B121 **Volts:** 480Y/277V WYE **A.I.C. Rating:** 42,000
Supply From: EM1 **Phas...** 3 **Mains Rating:** 60 A
Mounting: SURFACE **Wires:** 4 **Mains Type:** MLO

NO...	C...	CIRCUIT DESCRIPTION	WIRE	BRKR	#	A	B	C	A	B	C	#	BRKR	WIRE	CIRCUIT DESCRIPTION	C...	NO...
(L)	1	LIGHTS Room B117, B119	12	20	1	1090						3	25	RISER	2-TE	2	
(L)	3	LIGHTS B106	12	20	1		298					--	--	--	--	4	--
(E)	5	LIGHTS B106	12	20	1			40			250	--	--	--	--	6	--
(L)	7	LIGHTS ELEVATOR	12	20	1	76			1554			1	20	12	LIGHTS D101, D103, D105	8	(L)
	9	SPARE	--	20	1		0			0		1	20	--	SPARE	10	
	11	SPARE	--	20	1			0			0	1	20	--	SPARE	12	
	13	SPARE	--	20	1	0			0			1	20	--	SPARE	14	
	15	SPARE	--	20	1		0			0		1	20	--	SPARE	16	
	17	SPARE	--	20	1			0			0	1	20	--	SPARE	18	
	19	SPARE	--	20	1	0			0			1	20	--	SPARE	20	
	21	SPARE	--	20	1		0			0		1	20	--	SPARE	22	
	23	SPARE	--	20	1			0			0	1	20	--	SPARE	24	
	25	SPARE	--	20	1	0			0			1	20	--	SPARE	26	
	27	SPARE	--	20	1		0			0		1	20	--	SPARE	28	
	29	SPARE	--	20	1			0			0	1	20	--	SPARE	30	
	31	SPARE	--	20	1	0			0			1	20	--	SPARE	32	
	33	SPARE	--	20	1		0			0		1	20	--	SPARE	34	
	35	SPARE	--	20	1			0			0	1	20	--	SPARE	36	
	37	SPARE	--	20	1	0			0			1	20	--	SPARE	38	
	39	SPARE	--	20	1		0			0		1	20	--	SPARE	40	
	41	SPARE	--	20	1			0			0	1	20	--	SPARE	42	
		Total Load:				3720 W		2698 W			290 W						
		Total Amps:				15 A		11 A			1 A						

NOTES:
1. Provide GFCI Breaker
2. Circuit Via Energy Management System
3. Circuit Via Photo Cell Operation / DDC Controller
4. Provide Breaker and Fuses Per Manufacturers Recommendation
5. Provide H.A.C.R. Breaker
6. Provide a Lock on Breaker

PANEL TOTALS
Total Conn. Load: 6708 VA
Total Est. Demand: 7473 VA
Total Conn.: 8 A
Total Est. Demand: 9 A

Panel: 2-HS

Location: ELEC. B121 **Volts:** 480Y/277V WYE **A.I.C. Rating:** 42,000
Supply From: ST1 **Phas...** 3 **Mains Rating:** 100 A
Mounting: SURFACE **Wires:** 4 **Mains Type:** MLO

NO...	C...	CIRCUIT DESCRIPTION	WIRE	BRKR	#	A	B	C	A	B	C	#	BRKR	WIRE	CIRCUIT DESCRIPTION	C...	NO...
(P)	1	ELEVATOR	8	40	3	7479			14924			3	50	RISER	2-TS	2	
--	3	--	--	--	--		7479			13824		--	--	--	--	4	--
--	5	--	--	--	--			7479			7560	--	--	--	--	6	--
	7	SPARE	--	20	1	0			0			1	20	--	SPARE	8	
	9	SPARE	--	20	1		0			0		1	20	--	SPARE	10	
	11	SPARE	--	20	1			0			0	1	20	--	SPARE	12	
	13	SPARE	--	20	1	0			0			1	20	--	SPARE	14	
	15	SPARE	--	20	1		0			0		1	20	--	SPARE	16	
	17	SPARE	--	20	1			0			0	1	20	--	SPARE	18	
	19	SPARE	--	20	1	0			0			1	20	--	SPARE	20	
	21	SPARE	--	20	1		0			0		1	20	--	SPARE	22	
	23	SPARE	--	20	1			0			0	1	20	--	SPARE	24	
	25	SPARE	--	20	1	0			0			1	20	--	SPARE	26	
	27	SPARE	--	20	1		0			0		1	20	--	SPARE	28	
	29	SPARE	--	20	1			0			0	1	20	--	SPARE	30	
	31	SPARE	--	20	1	0			0			1	20	--	SPARE	32	
	33	SPARE	--	20	1		0			0		1	20	--	SPARE	34	
	35	SPARE	--	20	1			0			0	1	20	--	SPARE	36	
	37	SPARE	--	20	1	0			0			1	20	--	SPARE	38	
	39	SPARE	--	20	1		0			0		1	20	--	SPARE	40	
	41	SPARE	--	20	1			0			0	1	20	--	SPARE	42	
		Total Load:				22403 W		21303 W			15039 W						
		Total Amps:				84 A		80 A			54 A						

NOTES:
1. Provide GFCI Breaker
2. Circuit Via Energy Management System
3. Circuit Via Photo Cell Operation / DDC Controller
4. Provide Breaker and Fuses Per Manufacturers Recommendation
5. Provide H.A.C.R. Breaker
6. Provide a Lock on Breaker

PANEL TOTALS
Total Conn. Load: 58745 VA
Total Est. Demand: 52650 VA
Total Conn.: 71 A
Total Est. Demand: 63 A

Panel: 2-L1

Location: MECH. B119 **Volts:** 208Y/120V WYE **A.I.C. Rating:** 42,000
Supply From: 2-T1 **Phas...** 3 **Mains Rating:** 225 A
Mounting: SURFACE **Wires:** 4 **Mains Type:** MCB

NO...	C...	CIRCUIT DESCRIPTION	WIRE	BRKR	#	A	B	C	A	B	C	#	BRKR	WIRE	CIRCUIT DESCRIPTION	C...	NO...
(R)	1	2-L2	RISER	100	3	10180			1200			1	20	12	A/C EQUIPMENT DEVELOPMENT...	2	
--	3	--	--	--	--		11440			250		1	20	12	MISCELLANEOUS RR / CHANGING...	4	
--	5	--	--	--	--			10020			0	1	20	--	SPARE	6	
(H)	7	EXHAUST FAN	10	20	1	1056			1800			1	20	10	MISCELLANEOUS	8	(R)
(H)	9	EXHAUST FAN	12	20	1		1056			600		1	20	10	MISCELLANEOUS	10	(R)
(H)	11	EXHAUST FAN Room B123, B122	12	20	1			1056			3850	2	40	8	ELEC. HEATING EQUIP. Space 175	12	(H)
(R)	13	MISCELLANEOUS KITCHEN...	12	20	1	180			3850			--	--	--	--	14	--
(R)	15	MISCELLANEOUS KITCHEN...	6	20	1		1200			1200		1	20	6	MISCELLANEOUS Space 145	16	(R)
(H)	17	ELEC. HEATING EQUIP. RR / ...	8	30	2			2500			528	1	20	10	EXHAUST FAN	18	(H)
--	19	--	--	--	--	2500			540			1	20	12	RECEPTS. D101	20	(R)
(R)	21	RECEPTS. ADAPTIVE...	12	20	1		540			540		1	20	10	RECEPTS. D105	22	(R)
(R)	23	RECEPTS. SPEECH THERAPY...	10	20	1	540			540			1	20	10	RECEPTS. D109	24	(R)
(R)	25	RECEPTS. D108	10	20	1	540			540			1	20	10	RECEPTS. D107	26	(R)
	27	WATER HEATER MECH. B119	8	35	3	3000			240			1	20	12	RECEPTS. D103	28	(R)
--	29	--	--	--	--		3000			1200		1	20	8	MOTORIZED DOOR	30	(R)
--	31	--	--	--	--	3000			0			1	20	--	SPARE	32	
	33	SPARE	--	20	1		0			0		1	20	--	SPARE	34	
	35	SPARE	--	20	1			0			0	1	20	--	SPARE	36	
	37	SPARE	--	20	1	0			0			1	20	--	SPARE	38	
	39	SPARE	--	20	1		0			0		1	20	--	SPARE	40	
	41	SPARE	--	20	1			0			0	1	20	--	SPARE	42	
		Total Load:				25386 W		20066 W			23234 W						
		Total Amps:				216 A		167 A			198 A						

NOTES:
1. Provide GFCI Breaker
2. Circuit Via Energy Management System
3. Circuit Via Photo Cell Operation / DDC Controller
4. Provide Breaker and Fuses Per Manufacturers Recommendation
5. Provide H.A.C.R. Breaker
6. Provide a Lock on Breaker

PANEL TOTALS
Total Conn. Load: 68686 VA
Total Est. Demand: 62971 VA
Total Conn.: 191 A
Total Est. Demand: 175 A

Panel: 2-L2

Location: MECH. B119 **Volts:** 208Y/120V WYE **A.I.C. Rating:** 42,000
Supply From: 2-L1 **Phas...** 3 **Mains Rating:** 100 A
Mounting: SURFACE **Wires:** 4 **Mains Type:** MLO

NO...	C...	CIRCUIT DESCRIPTION	WIRE	BRKR	#	A	B	C	A	B	C	#	BRKR	WIRE	CIRCUIT DESCRIPTION	C...	NO...
	1	RECEPTS. WORK RM / MAIL R...	12	20	1	720				1800		1	20	6	RECEPTS. RECEPTION B101	2	
	3	RECEPTS. ATTENDREGISTRA...	8	20	1		1260				1080	1	20	8	RECEPTS. B134	4	
	5	RECEPTS. ADMIN CONF B134	12	20	1			180			180	1	20	12	RECEPTS. B134	6	
	7	RECEPTS. Room B133	8	20	1	1080			1080			1	20	8	RECEPTS. B132	8	
	9	RECEPTS. B131	8	20	1		1080			1080		1	20	8	RECEPTS. Room B129	10	
	11	RECEPTS. RECEPTION B101	12	20	1			720			720	1	20	10	RECEPTS. Room B127	12	
	13	RECEPTS. WORK RM / MAIL R...	10	20	1	720			1000			1	20	10	MISCELLANEOUS	14	
	15	MISCELLANEOUS WORK RM /...	10	20	1		1000			1260		1	20	12	RECEPTS. B118	16	
	17	RECEPTS. B116, B115, ...	6	20	1			1440			1080	1	20	10	RECEPTS. LARGE CONF RM B112	18	
	19	RECEPTS. LARGE CONF RM ...	12	20	1	360			180			1	20	12	RECEPTS. LARGE CONF RM B112	20	
	21	RECEPTS. Room B108, B109	12	20	1		540			1260		1	20	8	RECEPTS. Room B212, B105	22	
	23	RECEPTS. B106	10	20	1			900			1200	1	20	10	MISCELLANEOUS	24	
	25	RECEPTS.	12	20	1	180			900			1	20	10	RECEPTS. Room B123, B122, B213	26	
	27	RECEPTS. Room B126	10	20	1		900			900		1	20	10	RECEPTS. ADAPTIVE BEHAVIOR...	28	
	29	RECEPTS. MOTOR LAB D105	8	20	1			900			540	1	20	10	RECEPTS. Room D106	30	
	31	RECEPTS. D108	10	20	1	540			540			1	20	10	RECEPTS. Room D107	32	
	33	RECEPTS. ELEC. B121	12	20	1		180			540		1	20	12	RECEPTS. D102	34	
	35	RECEPTS. RR / CHANGING...	12	20	1			360			1260	1	20	6	RECEPTS. KITCHEN D112	36	
	37	RECEPTS. WORK RM / MAIL R...	12	20	1	360			720			1	20	8	RECEPTS. D113	38	
	39	RECEPTS. B101	12	20	1		180			180		1	20	12	MISCELLANEOUS	40	
	41	SPARE	--	20	1			0			540	1	20	12	RECEPTS. WORK RM / MAIL RM B127	42	
	43	SPARE	--	20	1	0			0			1	20	--	SPARE	44	
	45	SPARE	--	20	1		0			0		1	20	--	SPARE	46	
	47	SPARE	--	20	1			0			0	1	20	--	SPARE	48	
	49	SPARE	--	20	1	0			0			1	20	--	SPARE	50	
	51	SPARE	--	20	1		0			0		1	20	--	SPARE	52	
	53	SPARE	--	20	1			0			0	1	20	--	SPARE	54	
	55	SPARE	--	20	1	0			0			1	20	--	SPARE	56	
	57	SPARE	--	20	1		0			0		1	20	--	SPARE	58	
	59	SPARE	--	20	1			0			0	1	20	--	SPARE	60	
		Total Load:				10180 W		11440 W			10020 W						
		Total Amps:				85 A		96 A			84 A						

NOTES:
1. Provide GFCI Breaker
2. Circuit Via Energy Management System
3. Circuit Via Photo Cell Operation / DDC Controller
4. Provide Breaker and Fuses Per Manufacturers Recommendation
5. Provide H.A.C.R. Breaker
6. Provide a Lock on Breaker

PANEL TOTALS
Total Conn. Load: 31640 VA
Total Est. Demand: 22510 VA
Total Conn.: 88 A
Total Est. Demand: 62 A

Panel: 2-LE

Location: MECH. B119 **Volts:** 208Y/120V WYE **A.I.C. Rating:** 42,000
Supply From: 2-TE **Phas...** 3 **Mains Rating:** 60 A
Mounting: **Wires:** 4 **Mains Type:** MCB

NO...	C...	CIRCUIT DESCRIPTION	WIRE	BRKR	#	A	B	C	A	B	C	#	BRKR	WIRE	CIRCUIT DESCRIPTION	C...	NO...
(R)	1	MISCELLANEOUS MDF 10x14...	12	20	1	500			500			1	20	10	MISCELLANEOUS RECEPTION B101	2	(R)
(R)	3	MISCELLANEOUS STAIR E121	8	20	1		1200			1200		1	20	6	MISCELLANEOUS STAIR E121	4	(R)
(R)	5	MISCELLANEOUS ELEV-1...	12	20	1			250			0	1	20	--	SPARE	6	
	7	SPARE	--	20	1	0			0			1	20	--	SPARE	8	
	9	SPARE	--	20	1		0			0		1	20	--	SPARE	10	
	11	SPARE	--	20	1			0			0	1	20	--	SPARE	12	
	13	SPARE	--	20	1	0			0			1	20	--	SPARE	14	
	15	SPARE	--	20	1		0			0		1	20	--	SPARE	16	
	17	SPARE	--	20	1			0			0	1	20	--	SPARE	18	
	19	SPARE	--	20	1	0			0			1	20	--	SPARE	20	
	21	SPARE	--	20	1		0			0		1	20	--	SPARE	22	
	23	SPARE	--	20	1			0			0	1	20	--	SPARE	24	
	25	SPARE	--	20	1	0			0			1	20	--	SPARE	26	
	27	SPARE	--	20	1		0			0		1	20	--	SPARE	28	
	29	SPARE	--	20	1			0			0	1	20	--	SPARE	30	
	31	SPARE	--	20	1	0			0			1	20	--	SPARE	32	
	33	SPARE	--	20	1		0			0		1	20	--	SPARE	34	
	35	SPARE	--	20	1			0			0	1	20	--	SPARE	36	
	37	SPARE	--	20	1	0			0			1	20	--	SPARE	38	
	39	SPARE	--	20	1		0			0		1	20	--	SPARE	40	
	41	SPARE	--	20	1			0			0	1	20	--	SPARE	42	
		Total Load:				1000 W		2400 W			250 W						
		Total Amps:				9 A		21 A			2 A						

NOTES:
1. Provide GFCI Breaker
2. Circuit Via Energy Management System
3. Circuit Via Photo Cell Operation / DDC Controller
4. Provide Breaker and Fuses Per Manufacturers Recommendation
5. Provide H.A.C.R. Breaker
6. Provide a Lock on Breaker

PANEL TOTALS
Total Conn. Load: 3650 VA
Total Est. Demand: 3650 VA
Total Conn.: 10 A
Total Est. Demand: 10 A

Panel: 2-LS

Location: MECH. B119 **Volts:** 208Y/120V WYE **A.I.C. Rating:** 42,000
Supply From: 2-TS **Phas...** 3 **Mains Rating:** 100 A
Mounting: SURFACE **Wires:** 4 **Mains Type:** MCB

NO...	C...	CIRCUIT DESCRIPTION	WIRE	BRKR	#	A	B	C	A	B	C	#	BRKR	WIRE	CIRCUIT DESCRIPTION	C...	NO...
(R)	1	RECEPTS. Room D109	6	20	1	1080			900			1	20	12	RECEPTS. MDF 10x14 B117	2	(R)
(R)	3	RECEPTS. Room B117	12	20	1		900			1080		1	20	8	RECEPTS. Room D101	4	(R)
(R)	5	RECEPTS. MDF 10x14 B117	12	20	1			1800			1800	1	20	12	RECEPTS. MDF 10x14 B117	6	(R)
(R)	7	RECEPTS. MDF 10x14 B117	10	30	2	2496			2496			2	30	10	RECEPTS. MDF 10x14 B117	8	(R)
--	9	--	--	--	--		2496			2496		--	--	--	--	10	--
(R)	11	RECEPTS. MDF 10x14 B117	12	20	1			360			360	1	20	12	RECEPTS. MDF 10x14 B117	12	(R)
(R)	13	RECEPTS.	10	30	2	2496			2496			2	30	10	RECEPTS. B117	14	(R)
--	15	--	--	--	--		2496			2496		--	--	--	--	16	--
(R)	17	RECEPTS. MDF 10x14 B117	12	20	1			360			1800	1	20	12	RECEPTS. MDF 10x14 B117	18	(R)
(R)	19	RECEPTS. ELEV-1 C219-1	12	20	1	180			1200			1	20	10	MOTORS ELEV-1 C219-1	20	
	21											1	20	8	RECEPTS. Room B104	22	(R)
(R)	23	RECEPTS. B117	8	20	1			360			720	1	20	10	RECEPTS. RECEPTION B101	24	(R)
(R)	25	RECEPTS. Room B128	10	20	1	1080			500			1	20	10	MISCELLANEOUS RECEPTION B101	26	
(R)	27	MISCELLANEOUS PATIENT R...	12	20	1		600			0		1	20	--	SPARE	28	
	29	SPARE	--	20	1	0			0			1	20	--	SPARE	30	
	31	SPARE	--	20	1		0			0		1	20	--	SPARE	32	
	33	SPARE	--	20	1	0			0			1	20	--	SPARE	34	
	35	SPARE	--	20	1		0			0		1	20	--	SPARE	36	
	37	SPARE	--	20	1	0			0			1	20	--	SPARE	38	
	39	SPARE	--	20	1		0			0		1	20	--	SPARE	40	
	41	SPARE	--	20	1			0			0	1	20	--	SPARE	42	
		Total Load:				14924 W		13824 W			7560 W						
		Total Amps:				132 A		123 A			63 A						

NOTES:
1. Provide GFCI Breaker
2. Circuit Via Energy Management System
3. Circuit Via Photo Cell Operation / DDC Controller
4. Provide Breaker and Fuses Per Manufacturers Recommendation
5. Provide H.A.C.R. Breaker
6. Provide a Lock on Breaker

PANEL TOTALS
Total Conn. Load: 36308 VA
Total Est. Demand: 24604 VA
Total Conn.: 101 A
Total Est. Demand: 68 A

Revision / 1
Date 08/07/26
ADDENDUM 2

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL ISD
TOMBALL, TEXAS

IEG
Innovative Engineering Group
www.iegengineers.com
817.410.2858
TBPE/ELS Firm No. F-5923

STATE OF TEXAS
B. KYLE HASKOVEC
143448
LICENSED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY B. KYLE HASKOVEC, PE 8/1/2026 00:00:00

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ELECTRICAL PANEL SCHEDULES

VOLUME 2

Job No.	Sheet No.
03802-04-01	E5.03
Drawn By: MH	
Date: 07.15.2026	

8/6/2026 11:00:00 AM

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GENERAL ABBREVIATIONS

--	NOT APPLICABLE
@	AT
3DC	3D CONTROLLER
A/C	AIR CONDITIONING
ABV	ABOVE
AC	ALTERNATING CURRENT
ADA	AMERICANS WITH DISABILITIES ACT
ADJ	ADJUSTABLE
AFC	ABOVE FINISHED CEILING
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHJ	AUTHORITY HAVING JURISDICTION
ALT	ALTERNATE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
ARCH	ARCHITECT, ARCHITECTURAL
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
AUX	AUXILIARY
AWG	AMERICAN WIRE GAUGE
BFC	BELOW FINISHED CEILING
BFF	BELOW FINISHED FLOOR
BLDG	BUILDING
BOH	BACK OF HOUSE
BOP	BOTTOM OF PIPE
BOS	BOTTOM OF STRUCTURE
C	CONDUIT
CAT	CATEGORY CABLE
CKT	CIRCUIT
CL	CENTER LINE
CLG	CEILING
CMU	CONCRETE MASONRY UNIT
COL	COLUMN
CTRL	CONTROL
D	DEPTH, DEEP
DC	DIRECT CURRENT
DC	DOWNSTAGE CENTER
DEG	DEGREES
DEMO	DEMOLITION
DFP	DIRECTOR'S FLOOR POCKET
DIA	DIAMETER
DIM	DIMENSION
DIV	DIVISION
DS	DOWNSTAGE
DSL	DOWNSTAGE LEFT
DSR	DOWNSTAGE RIGHT
DWG	DRAWING
EA	EACH
EC	ELECTRICAL CONTRACTOR
EL	ELEVATION
ELEC	ELECTRICAL
ENCL	ENCLOSURE
EQ	EQUAL
EQUIP	EQUIPMENT
ER	EQUIPMENT RACK
ESW	ETHERNET SWITCH
EXIST	EXISTING
FA	FIRE ALARM
FB	FLOOR BOX
FLEX	FLEXIBLE
FLR	FLOOR
FO	FINISHED OPENING
FOH	FRONT OF HOUSE
FPB	FIBER OPTIC PATCHBAY
FPM	FEET PER MINUTE
FT	FOOT, FEET
FV	FIELD VERIFY
GND	GROUND
GA	GAUGE
H	HEIGHT
HL	HOUSE LEFT
HMP	HOUSE MANAGER POSITION
HOR	HORIZONTAL
HP	HORSEPOWER
HR	HOUSE RIGHT
HZ	HERTZ
I/O	INPUT/OUTPUT
ID	INSIDE DIAMETER
IDF	INTERMEDIATE DISTRIBUTION FRAME
IG	ISOLATED GROUND
ISO	ISOLATED
JB	JUNCTION BOX
JBD	JUNCTION BOX - DATA
JP	JUNCTION BOX - SYSTEM POWER
KPD	KEYPAD
KW	KILOWATT
L	LENGTH, LEFT
L/R	LEFT/RIGHT
LAN	LOCAL AREA NETWORK
LB	POUNDS
LF	LINEAR FEET
LTG	LIGHTING
MAX	MAXIMUM
MDF	MAIN DISTRIBUTION FRAME
MECH	MECHANICAL
MIN	MINIMUM
MMFO	MULTIMODE FIBER OPTIC CABLE
MTD	MOUNTED
NA	NOT APPLICABLE
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURER'S ASSOC.
NETWORK	NETWORK
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
OFE	OWNER FURNISHED EQUIPMENT
OFOI	OWNER FURNISHED OWNER INSTALLED
P	PRIMARY
P/O	PART OF
PC	PERSONAL COMPUTER
PDU	POWER DISTRIBUTION UNIT
PGM	PROGRAM
PH	PHASE
PNL	PANEL
PROC	PROCESSOR
PRH	PROJECT RECEPTACLE HEIGHT
PRX	PROXIMITY SENSOR
PS	POWER SUPPLY
PSF	POUNDS PER SQUARE FOOT
PSH	PROJECT SWITCH HEIGHT
PSI	POUNDS PER SQUARE INCH
PT	PASS THROUGH
PVC	POLYVINYL CHLORIDE
PWR	POWER
QTY	QUANTITY
R	RIGHT
RCP	REFLECTED CEILING PLAN
REF	REFERENCE, REFER
REINF	REINFORCING
REQD	REQUIRED
REV	REVISION, REVISE
RM	ROOM
RO	ROUGH OPENING
RPM	REVOLUTIONS PER MINUTE
S	SURFACE, SECONDARY
SCS	STRUCTURED CABLING SYSTEM
SQFT	SQUARE FEET
SIM	SIMILAR
SL	STAGE LEFT
SMFO	SINGLE MODE FIBER OPTIC CABLE
SMP	STAGE MANAGER POSITION
SPEC	SPECIFICATION
SQ	SQUARE
SR	STAGE RIGHT
STD	STANDARD
STP	SHIELDED TWISTED PAIR
SURF	SURFACE
SUSP	SUSPEND
TBD	TO BE DETERMINED
THRU	THROUGH
TYP	TYPICAL
UC	UPSTAGE CENTER
UL	UNDERWRITERS LABORATORIES, INC.
UNO	UNLESS NOTED OTHERWISE
UPS	UNINTERRUPTIBLE POWER SUPPLY
US	UPSTAGE
USL	UPSTAGE LEFT
USR	UPSTAGE RIGHT
USB	UNIVERSAL SERIAL BUS
UTP	UNSHIELDED TWISTED PAIR
V	VOLT
VA	VOLT-AMPERE
VERT	VERTICAL
VIF	VERIFY IN FIELD
W/	WITH
W/O	WITHOUT
WP	WEATHERPROOF
WT	WEIGHT

STRUCTURED CABLING ABBREVIATIONS

DAS	DISTRIBUTED ANTENNA SYSTEM
ER	EQUIPMENT ROOM
TBB	TELECOMMUNICATIONS BONDING BACKBONE
PBB	PRIMARY BONDING BUSBAR
SBB	SECONDARY BONDING BUSBAR
TR	TELECOMMUNICATIONS ROOM

CABLE TYPE LEGEND

	TYPE	DESCRIPTION	NOTES
SECURITY	A	18AWG, 6 CONDUCTOR, STRANDED, OVERALL SHIELD	REFERENCE SPECIFICATION 28 0513
	B	18AWG, 4 CONDUCTOR, STRANDED, UNSHIELDED	REFERENCE SPECIFICATION 28 0513
	C	18AWG, 2 CONDUCTOR, STRANDED, UNSHIELDED	REFERENCE SPECIFICATION 28 0513
	E	22AWG, 4 CONDUCTOR, STRANDED, UNSHIELDED	REFERENCE SPECIFICATION 28 0513
	F	COMPOSITE ACCESS CONTROLLED DOOR CABLE	REFERENCE SPECIFICATION 28 0513
	J	COMPOSITE COPPER FIBER CABLE	REFERENCE SPECIFICATION 27 1000
STRUCTURED CABLING	M	CATEGORY 6, BLUE - DATA	REFERENCE SPECIFICATION 27 1000
	N	CATEGORY 6, GREEN - SECURITY CAMERAS	REFERENCE SPECIFICATION 27 1000
	R	CATEGORY 6A, YELLOW - APs	REFERENCE SPECIFICATION 27 1000

NOTES:
1. PROVIDE CABLE RATED FOR ENVIRONMENTAL AIR TYPE PLENUM WHERE REQUIRED.
2. PROVIDE CABLE RATED FOR WET APPLICATIONS FOR USE IN PATHWAYS BELOW GRADE AND FOR USE IN PATHWAYS IN SLAB ON GRADE.

CAMERA TYPES

TYPE	DESCRIPTION
IN	INFRASTRUCTURE ONLY CAMERA

NOTE:

ROUGH-IN BOX SCHEDULE

TYPE 10 RECESSED: 4 11/16" SQUARE BOX. 2 1/8" DEEP WITH KNOCKOUTS. PROVIDE DEVICE EXTENSION AS REQUIRED TO ACCOMMODATE DEVICE COVER SIZE. DEVICE COVER/ RING EDGE TO BE FLUSH WITH FINISHED WALL.

MASONRY: 2-GANG BOX. 2 1/2" DEEP WITH KNOCKOUTS IN 4" CMU/BRICK/CONCRETE; 3 1/2" DEEP WITH KNOCKOUTS IN 6" OR 8" CMU/CONCRETE. COVER EDGE TO BE FLUSH WITH FINISHED WALL.

SURFACE MOUNTED (INDOOR): 4 11/16" SQUARE BOX. 2 1/8" DEEP WITH KNOCKOUTS. PROVIDE DEVICE EXTENSION AS REQUIRED TO ACCOMMODATE DEVICE COVER SIZE.

SURFACE MOUNTED (OUTDOOR / WEATHER PROOF): 2-GANG DIE CAST BOX. 2 5/8" DEEP WITH THREADED OUTLETS.

TYPE 11 RECESSED: 5" SQUARE BOX. 2 7/8" DEEP. PROVIDE DEVICE EXTENSION AS REQUIRED TO ACCOMMODATE DEVICE COVER SIZE. DEVICE COVER/ RING EDGE TO BE FLUSH WITH FINISHED WALL.

MASONRY: 2-GANG BOX. 2 1/2" DEEP WITH KNOCKOUTS IN 4" CMU/BRICK/CONCRETE; 3 1/2" DEEP WITH KNOCKOUTS IN 6" OR 8" CMU/CONCRETE. COVER EDGE TO BE FLUSH WITH FINISHED WALL.

SURFACE MOUNTED (INDOOR): 4 11/16" SQUARE BOX. 2 1/8" DEEP WITH KNOCKOUTS. PROVIDE DEVICE EXTENSION AS REQUIRED TO ACCOMMODATE DEVICE COVER SIZE.

SURFACE MOUNTED (OUTDOOR / WEATHER PROOF): 2-GANG DIE CAST BOX. 2 5/8" DEEP WITH THREADED OUTLETS.

TYPE 12 RECESSED: 4 11/16" SQUARE BOX. 2 1/8" DEEP WITH KNOCKOUTS. PROVIDE DEVICE EXTENSION AS REQUIRED TO ACCOMMODATE DEVICE COVER SIZE. DEVICE COVER/ RING EDGE TO BE FLUSH WITH FINISHED WALL.

MASONRY: 1-GANG BOX. 2 1/2" DEEP WITH KNOCKOUTS IN 4" CMU/BRICK/CONCRETE; 3 1/2" DEEP WITH KNOCKOUTS IN 6" OR 8" CMU/CONCRETE. COVER EDGE TO BE FLUSH WITH FINISHED WALL.

SURFACE MOUNTED (INDOOR): 4 11/16" SQUARE BOX. 2 1/8" DEEP WITH KNOCKOUTS. PROVIDE DEVICE EXTENSION AS REQUIRED TO ACCOMMODATE DEVICE COVER SIZE.

SURFACE MOUNTED (OUTDOOR / WEATHER PROOF): 1-GANG DIE CAST BOX. 2 5/8" DEEP WITH THREADED OUTLETS.

TYPE A JUNCTION BOX (HxWxD) WITH SCREW COVER. PROVIDE NEMA TYPE 1 AT INDOOR LOCATIONS; PROVIDE NEMA TYPE 3R AT OUTDOOR LOCATIONS. PAINTED AT EXPOSED LOCATIONS.

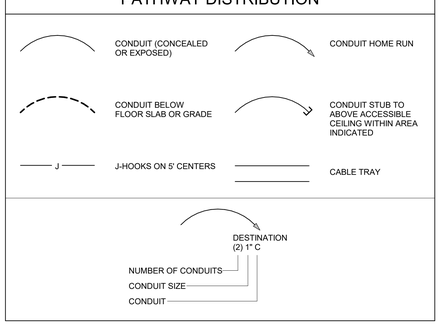
TYPE B JUNCTION BOX (HxWxD) WITH HINGED COVER. PROVIDE NEMA TYPE 1 AT INDOOR LOCATIONS; PROVIDE NEMA TYPE 3R AT OUTDOOR LOCATIONS. PAINTED AT EXPOSED LOCATIONS.

TYPE C JUNCTION BOX (HxWxD) WITH LOCKING HINGED COVER. PROVIDE NEMA TYPE 1 AT INDOOR LOCATIONS; PROVIDE NEMA TYPE 3R AT OUTDOOR LOCATIONS. PAINTED AT EXPOSED LOCATIONS

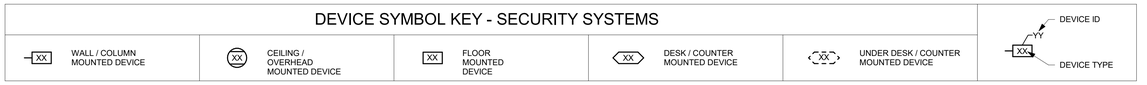
CONDUIT AND PATHWAY NOTES

1. COORDINATE LOCATION OF EQUIPMENT, JUNCTION BOXES, OUTLETS, CONDUIT, ETC. ACCORDING TO THE PROJECT GENERAL CONDITIONS.
2. PROVIDE A COMPLETE RACEWAY SYSTEM TO CONSIST OF METALLIC CONDUIT (EXCLUDING IN-GROUND PATHWAY), JUNCTION BOXES, DEVICE BACK BOXES, AND FITTINGS UNLESS NOTED OTHERWISE.
3. THE DRAWINGS INDICATE ONE ROUTING METHOD OF THE CABLING PATHWAY. CHANGES MAY BE MADE TO THE PATHWAY SYSTEM ROUTING TO ACCOMMODATE SITE CONDITIONS OR TO SIMPLIFY INSTALLATION PROVIDING THAT NOTED CONDUIT SIZE OR LARGER IS MAINTAINED AND DISTANCE LIMITATIONS LISTED BELOW ARE NOT EXCEEDED.
4. CONDUIT STUBS FROM DEVICES TO THE NEAREST CABLE TRAY OR OTHER NOTED DESTINATIONS SHALL BE CONTINUOUS.
5. UNLESS NOTED OTHERWISE, CONDUIT IS 1 INCH TRADE SIZE.
6. CONDUIT BODIES (LB'S) ARE NOT PERMITTED.
7. CONDUITS SHALL BE REAMED TO ELIMINATE SHARP EDGES. METALLIC CONDUITS SHALL BE TERMINATED WITH AN INSULATED BUSHING. PULL STRINGS WITH A MINIMUM PULL RATING OF 400 POUNDS SHALL BE PROVIDED.
8. MAINTAIN PROPER CONDUIT BEND RADIUS. FOR CONDUIT WITH AN INTERNAL DIAMETER OF 2" OR LESS, MAINTAIN A BEND RADIUS OF AT LEAST SIX (6) TIMES THE INTERNAL CONDUIT DIAMETER. FOR CONDUIT WITH AN INTERNAL DIAMETER GREATER THAN 2", MAINTAIN A BEND RADIUS OF AT LEAST TEN (10) TIMES THE INTERNAL CONDUIT DIAMETER.
9. BENDS IN THE CONDUIT SHALL NOT CONTAIN ANY KINKS OR OTHER DISCONTINUITIES. FLEX IS NOT PERMITTED UNLESS NOTED OTHERWISE.
10. NO SECTION OF CONDUIT SHALL EXCEED 100 FEET. RUNS IN EXCESS OF 100 FEET REQUIRE A PULL BOX / HANDHOLE / VAULT.
11. NO SECTION OF CONDUIT SHALL CONTAIN MORE THAN TWO 90 DEGREE BENDS, OR EQUIVALENT 180 DEGREES, BETWEEN PULL BOXES.
12. PULL BOX SHALL NOT BE USED IN LIEU OF A BEND. CONDUITS MUST RUN STRAIGHT THROUGH A PULL BOX WITH THE BEND LOCATED EITHER BEFORE OR AFTER THE PULL BOX.
13. REFER TO PULL BOX SIZING TABLE FOR REQUIRED PULL BOX DIMENSIONS.
14. PROVIDE COVERS WITH LABELING FOR JUNCTION BOXES, BACK BOXES WITHOUT FACEPLATES AND PULL BOXES. LABELING SHALL INCLUDE THE CABLE TYPES AND THE APPLICABLE NUMBERING SCHEME FOR EACH CABLE CONTAINED WITHIN THE BOX.
15. PROVIDE CONDUIT TO CROSS INACCESSIBLE CEILINGS OR IN AREAS WITHOUT CEILINGS UNLESS NOTED OTHERWISE.
16. PROVIDE CONDUIT IN EXPOSED AREAS, MECHANICAL SPACES, AND ELEVATOR CONTROL ROOMS.
17. REGARDLESS OF PATHWAY TYPE, CABLING SHALL BE SUPPORTED AT 5 FEET MAXIMUM INTERVALS UTILIZING INDEPENDENT MOUNTING METHODS IN ACCORDANCE WITH MANUFACTURER INSTALLATION REQUIREMENTS. J-HOOK PATHWAYS SHALL BE ESTABLISHED TO SUPPORT EXPOSED CABLING AND PREVENT PHYSICAL CONTACT OF THE CABLING WITH BUILDING STRUCTURE AND OTHER MECHANICAL AND ELECTRICAL SYSTEMS INCLUDING MECHANICAL AND ELECTRICAL SYSTEMS MOUNTING PRODUCTS.
18. ROUTE CONDUIT WITH OTHER BUILDING SERVICES AND CONCEAL WHENEVER POSSIBLE. GROUP AND RUN PARALLEL ALONG A SINGLE BUILDING COLUMN LINE, HOLD TIGHT TO STRUCTURE AND PAINT AS DIRECTED BY THE ARCHITECT.
19. IF SCS AND POWER CONDUITS MUST CROSS, CROSS AT RIGHT ANGLES.
20. FOR IN-SLAB OR UNDERGROUND CONDUIT ENTERING A BUILDING, TRANSITION BACK TO METALLIC CONDUIT WITHIN 3 FEET OF THE ENTRY POINT.
21. REFER TO ELECTRICAL DRAWINGS AND PROJECT MANUAL FOR ADDITIONAL REQUIREMENTS.
22. PROVIDE SPECIFIED FIRE-STOPPING PRODUCTS AT FIRE-RATED WALL AND FLOOR PENETRATIONS IN ORDER TO MAINTAIN THE FIRE RATING OF THE MEMBRANE.
23. PROVIDE THROUGH-WALL ACOUSTICAL PATHWAY PRODUCTS IN ORDER TO MAINTAIN THE ACOUSTIC RATING OF A WALL.

PATHWAY DISTRIBUTION



DEVICE SYMBOL KEY - SECURITY SYSTEMS



SYMBOL LEGEND - SECURITY SYSTEMS

SIZES, DIMENSIONS AND NOTES DESCRIBE TYPICAL REQUIREMENTS. IF APPLICABLE, VARIATIONS AND/OR ADDITIONAL REQUIREMENTS WILL BE NOTED ON THE DRAWINGS. UNLESS NOTED OTHERWISE, MOUNTING HEIGHTS ARE TO CENTER OF ROUGH-IN BOX.

TYPE	DEVICE	ROUGH-IN BOX (H"xW"xD")	DEVICE COVER SIZE	MOUNTING HEIGHT			CABLE (QTY) TYPE	DEVICE NOTES	CONDUIT NOTES
				WALL/COLUMN	CEILING/OVERHEAD	FLOOR			
ACP	ACCESS CONTROL PANEL	--	--	4'-6" AFF TO CENTER OF PANEL	--	--	(1)M	INCLUDES ENCLOSURE, ACCESS CONTROL PANELS, AND ELECTRIC LOCK POWER SUPPLY.	REF DETAIL
CRS	CARD READER SYSTEM	REF DETAIL	REF DETAIL	BUILDING SWITCH HEIGHT	--	--	(1)F	SYSTEM INCLUDES MULTIPLE DEVICES; REF DETAIL AND SPECIFICATIONS.	REF DETAIL
CS	IP CEILING SPEAKER	TYPE 10	--	--	FLUSH IN CEILING	--	(1)M	CEILING MOUNTED IP SPEAKER THAT CONNECTS TO THE VIDEO INTERCOM SYSTEM FOR AUDIBLE ALERTS UPON VIDEO INTERCOM ACTIVATION.	REF DETAIL
DR	DOOR RELEASE	--	--	--	--	--	(1)B	INTERFACE TO THE ACCESS CONTROL SYSTEM TO RELEASE ASSOCIATED DOOR.	REF DETAIL
MVI	MASTER VIDEO OR AUDIO ONLY INTERCOM STATION	--	--	--	--	--	(1)M	DESK OR WALL MOUNTED MASTER INTERCOM THAT CONNECTS TO LOCAL OR POE POWER TO COMMUNICATE WITH INTERCOM DOOR STATIONS.	--
PB	PANIC BUTTON	TYPE 12	1-GANG	BUILDING SWITCH HEIGHT	--	--	(1)B	INCLUDES A PANIC BUTTON.	REF DETAIL
VIC	VIDEO INTERCOM DOOR STATION	CUSTOM	--	4'-6" AFF	--	--	(1)M	INTERCOM THAT PROVIDES AUDIO AND VIDEO TO THE MASTER INTERCOM STATION.	REF DETAIL

LEGEND NOTES - SECURITY SYSTEMS

1 CATEGORY CABLING PROVIDED BY DIVISION 27.

2 PROVIDE QTY. (2) ADDITIONAL 18/6 CABLES FROM ACP TO ACCESS CONTROLLED DOOR LOCATIONS TO AUTO DOOR MOTOR. COORDINATE TERMINATIONS WITH DIVISION 08.

3 REFERENCE SCHEDULES FOR ADDITIONAL INFORMATION.

4 REFERENCE DIVISION 26 FOR ALL ELECTRICAL POWER AND CONDUIT.

5 REFER TO DIVISION 08 7100 FOR DOOR HARDWARE SPECIFICATIONS. COORDINATE ELECTRIC LOCK POWER AND CABLE PATHWAY REQUIREMENTS WITH DIVISION 08 AND DIVISION 26.

DEVICE SYMBOL KEY - VIDEO SURVEILLANCE SYSTEMS

SYMBOL LEGEND - VIDEO SURVEILLANCE SYSTEMS

SIZES, DIMENSIONS AND NOTES DESCRIBE TYPICAL REQUIREMENTS. IF APPLICABLE, VARIATIONS AND/OR ADDITIONAL REQUIREMENTS WILL BE NOTED ON THE DRAWINGS. UNLESS NOTED OTHERWISE, MOUNTING HEIGHTS ARE TO CENTER OF ROUGH-IN BOX.

TYPE	DEVICE	ROUGH-IN BOX (H"xW"xD")	DEVICE COVER SIZE	MOUNTING HEIGHT			CABLE (QTY) TYPE	DEVICE NOTES	CONDUIT NOTES
				WALL/COLUMN	CEILING/OVERHEAD	FLOOR			
IN	CAMERA - INFRASTRUCTURE ONLY	TYPE 12	1-GANG	REF SCHEDULE	REF SCHEDULE	--	(1)N	--	REF DETAIL
INP	CAMERA - INFRASTRUCTURE ONLY	CUSTOM	CUSTOM	REF SCHEDULE	REF SCHEDULE	--	(1)J	-- ⚠1	REF DETAIL

LEGEND NOTES - VIDEO SURVEILLANCE SYSTEMS

1 CATEGORY CABLING PROVIDED BY DIVISION 27.

2 REFERENCE SCHEDULES FOR ADDITIONAL INFORMATION.

3 PROVIDE CONDUIT PATHWAYS, BACK BOXES, CABLING, AND FLUSH WALL COVER PLATES FOR SECURITY CAMERAS NOTED AS INFRASTRUCTURE ONLY.

4 SECUIRTY CAMERAS SHALL BE OWNER FURNISHED - CONTRACTOR INSTALLED. COORDINATE WITH OWNER FOR THE PROVISIONING OF SECURITY CAMERAS AND MOUNTING HARDWARE.

5 COORDINATE COMPOSITE FIBER/COPPER CABLE LOCATION WITH DIVISION 27. COMPOSITE FIBER CABLING REQUIRED FOR VIDEO SURVEILLANCE CAMERAS LOCATED ON LIGHT POLES AND AT LOCATIONS EXCEEDING 100 METERS FROM IDF/TELECOM ROOMS.

SYMBOL LEGEND - STRUCTURED CABLING SYSTEMS

SIZES, DIMENSIONS AND NOTES DESCRIBE TYPICAL REQUIREMENTS. IF APPLICABLE, VARIATIONS AND/OR ADDITIONAL REQUIREMENTS WILL BE NOTED ON THE DRAWINGS. UNLESS NOTED OTHERWISE, MOUNTING HEIGHTS ARE TO CENTER OF ROUGH-IN BOX.

TYPE	DEVICE	ROUGH-IN BOX (H"xW"xD")	DEVICE COVER SIZE	MOUNTING HEIGHT			CABLE TYPE	DEVICE NOTES	CONDUIT NOTES
				WALL/COLUMN	CEILING/OVERHEAD	FLOOR			
(#)	COMMUNICATIONS WALL OUTLET	TYPE 10	REF DETAILS	BUILDING OUTLET HEIGHT	--	--	(#)M	--	--
(#)	COMMUNICATIONS FLOOR OUTLET	SEE NOTE 2	--	--	--	COORDINATE WITH ELECTRICAL REQUIREMENTS	(#)M	REF ARCHITECTURAL FOR EXACT LOCATION	--
(#)	COMMUNICATIONS CEILING OUTLET	TYPE 10	REF DETAILS	--	FLUSH IN CEILING (UNLESS IN ACCESSIBLE CEILING)	--	(#)M	--	--
(#) ADM	COMMUNICATIONS WALL OUTLET, CAMPUS INTERCOM ADMINISTATION CONSOLE	REF AV	REF AV	REF AV	--	--	(#)M	--	--
(#) AP	COMMUNICATIONS WALL OUTLET, WIRELESS ACCESS POINT	TYPE 10	REF DETAILS	10'-0" AFF	--	--	(#)R	ACCESS POINT DEVICE TO BE OWNER FUNISHED, CONTRACTOR INSTALLED	--
(#) AP	COMMUNICATIONS CEILING OUTLET, WIRELESS ACCESS POINT	TYPE 10	REF DETAILS	--	FLUSH WITH CEILING (UNLESS IN ACCESSIBLE CEILING)	--	(#)R	ACCESS POINT DEVICE TO BE OWNER FUNISHED, CONTRACTOR INSTALLED	--
(#) ER	COMMUNICATIONS WALL AOUTLET, AV RACK	TYPE 10	2 GANG	PROJECT WALL OUTLET HEIGHT	--	--	(#)M	--	--
(#) FB	FLOOR OUTLET	REF AV	REF AV	--	--	COORDINATE WITH AV AND ELECTRICAL REQUIREMENTS	(#)M	REF ARCHITECTURAL FOR EXACT LOCATION	
HH	HANDHOLE	REF DETAILS	REF DETAILS	--	--	FLUSH WITH GRADE	--	--	REF PLANS
MH	MANHOLE	EXISTING, FIELD VERIFY	EXISTING	--	--	FLUSH WITH GRADE	--	--	REF PLANS
(#) POS	COMMUNICATIONS FLOOR OUTLET	SEE NOTE 2	--	--	--	COORDINATE WITH ELECTRICAL REQUIREMENTS	(#)N	REF ARCHITECTURAL FOR EXACT LOCATION	--
(#) TE1	TELECOM ENCLOSURE - TE1	--	--	SEE DRAWINGS	--	--	--	--	--
(#) TV	COMMUNICATIONS WALL OUTLET, TELEVISION	TYPE 10	REF DETAILS	COORDINATE WITH ARCHITECT	--	--	(1)M	--	--
(#) WC1	COMMUNICATIONS WALL OUTLET, WALL CLOCK	REF AV	REF AV	REF AV	--	--	(#)M	--	--
(#) WC2	COMMUNICATIONS WALL OUTLET, WALL CLOCK	REF AV	REF AV	REF AV	--	--	(#)M	--	--

LEGEND NOTES - STRUCTURED CABLING SYSTEMS

1 (#) REPRESENTS THE NUMBER OF CABLES FOR THAT LOCATION. IF NO NUMBER SHOWN, PROVIDE (1).

2 PROVIDE NECESSARY ADAPTER, BEZELS, OR MODULES TO ACCOMODATE THE STRUCTURED CABLING SYSTEM WITH THE FLOOR OUTLET SYSTEM. REFERENCE ELECTRICAL DRAWING FOR FLOOR BOX INFORMATION.

3 PROVIDE NECESSARY ADAPTER, BEZELS, OR MODULES TO ACCOMODATE THE STRUCTURED CABLING SYSTEM WITH THE RACEWAY SYSTEM. REFERENCE ELECTRICAL DRAWING FOR RACEWAY INFORMATION.

PULL BOX SIZING

TRADE SIZE	WIDTH	LENGTH	DEPTH	WIDTH INCREASE FOR ADDITIONAL CONDUIT
1	4"	16"	3"	2"
1-1/4	6"	20"	3"	3"
1-1/2	8"	27"	4"	4"
2	8"	36"	4"	5"
2-1/2	10"	42"	5"	6"
3	12"	48"	5"	6"
3-1/2	12"	54"	6"	6"
4	15"	60"	8"	8"

Revision /	Date
1	07.24.26 Addendum 01
2	08.06.26 Addendum 02

Project: TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT FOR TOMBALL INDEPENDENT SCHOOL DISTRICT TOMBALL, TEXAS

REGISTERED COMMUNICATIONS DISTRIBUTION DESIGNER
Bicsi
Joshua Thomas
BICSI ID # 160773
EXPIRES 12-31-27
RCDD
18.07.2025

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GENERAL NOTES AND LEGENDS

VOLUME 2

Job No. 00802-04-01	Sheet No. T0.00
Drawn By: W.JHW	
Date: 07.15.26	

8/6/2026 2:01:33 PM
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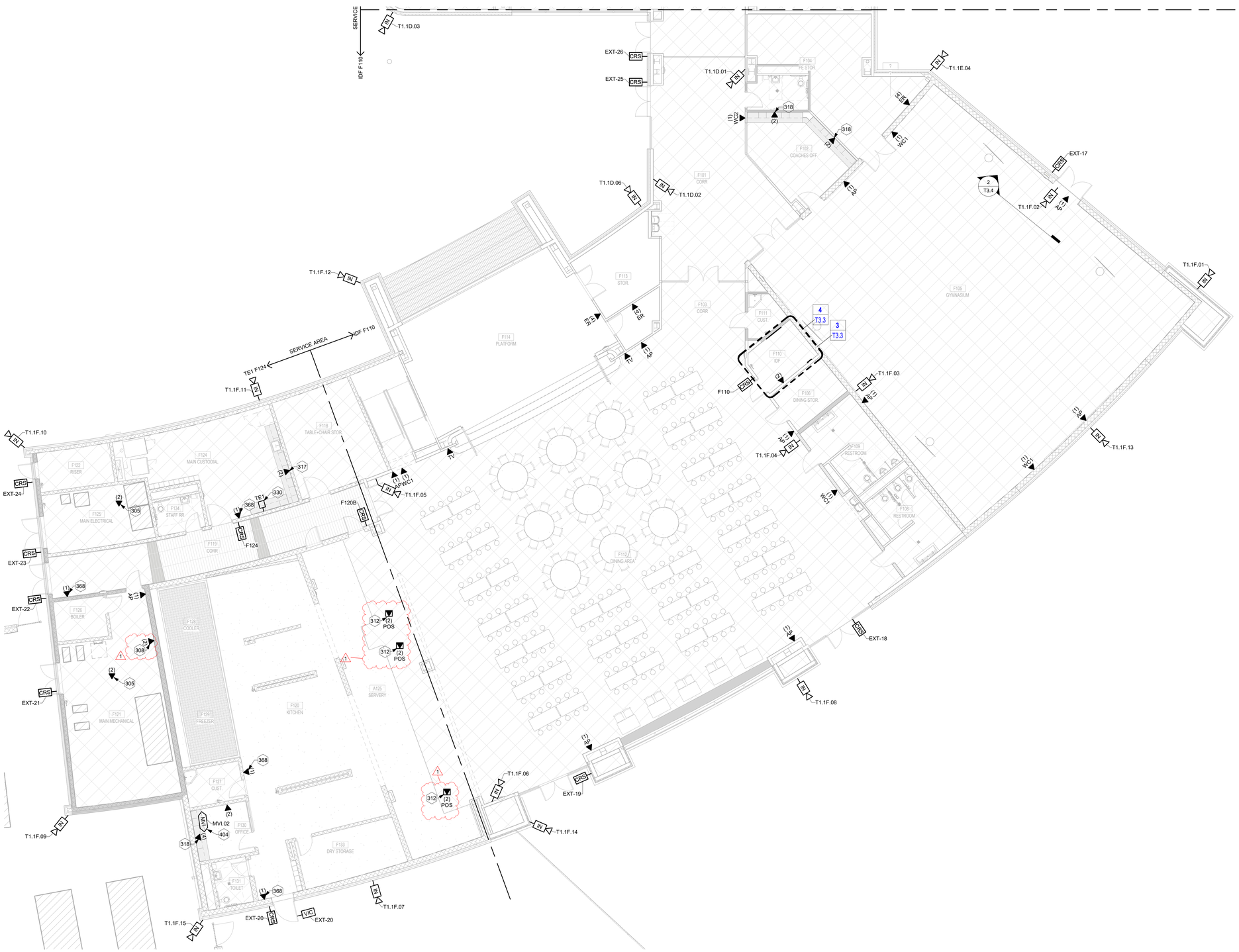
305 COORDINATE LOCATION WITH BUILDING AUTOMATION PANEL. PROVIDE A CONTINUOUS CONDUIT PATHWAY WITHIN THIS SPACE.
308 COORDINATE LOCATION WITH PUMP (aka IRRIGATION) CONTROL PANEL. PROVIDE A CONTINUOUS CONDUIT PATHWAY WITHIN THIS SPACE.
312 COORDINATE LOCATION WITH FOOD SERVICE
317 MOUNT ABOVE COUNTER. MATCH HEIGHT AND FACEPLATE ORIENTATION WITH OF ELECTRICAL OUTLET.
318 COORDINATE WITH MILLWORK INSTALLATION.
330 5'-0" AFF TO THE CENTER.
368 FOR OFE TIMECLOCK, MOUNT AT 4' AFF. COORDINATE EXACT LOCATION WITH OWNER.
404 MASTER INTERCOM TO PROVIDE REMOTE UNLOCK CAPABILITIES FOR DOOR EXT-20.

KEYNOTES



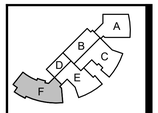
1 T_FLOOR PLAN - LEVEL 01 - AREA F
1/8" = 1'-0"

PLAN N

8/6/2026 2:14:16 PM
Autodesk Docs://TOMBALL ISD - IS REPLACEMENT/Tomball ISD IS Replacement_AV.rvt

Revision /	Date	
1	06.06.26	Addendum 02

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS



KEY PLAN - LEVEL 1
N.T.S.

REGISTERED COMMUNICATIONS DISTRIBUTION DESIGNER
Bicsi
Joshua Thomas
BICSI ID # 1607773
EXPIRES 12-31-27
RCDD

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FLOOR PLAN - LEVEL 01 - AREA F

VOLUME 2

Job No.	Sheet No.
00802-04-01	T1.1F
Drawn By: WJH/W	
Date: 07.15.26	

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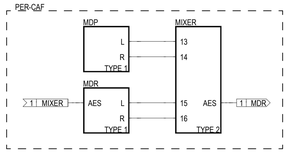
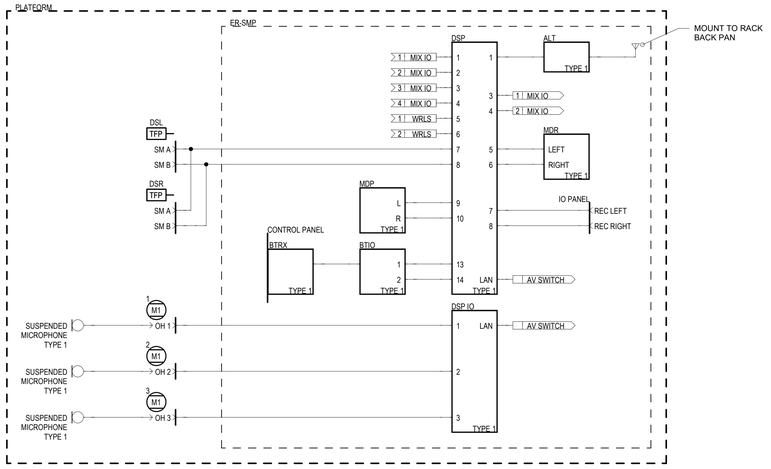


3 AUDIO SYSTEM DSP FUNCTIONAL DIAGRAM
NTS



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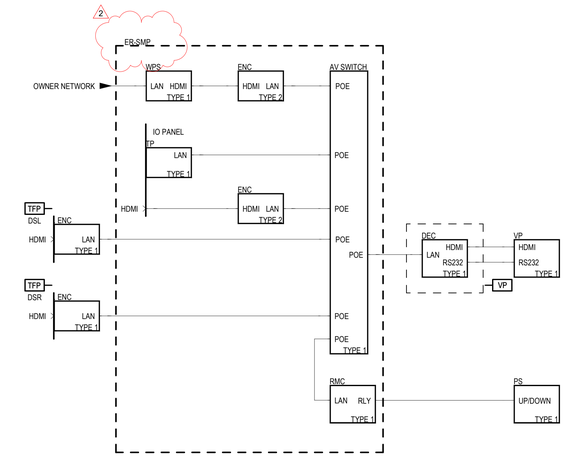
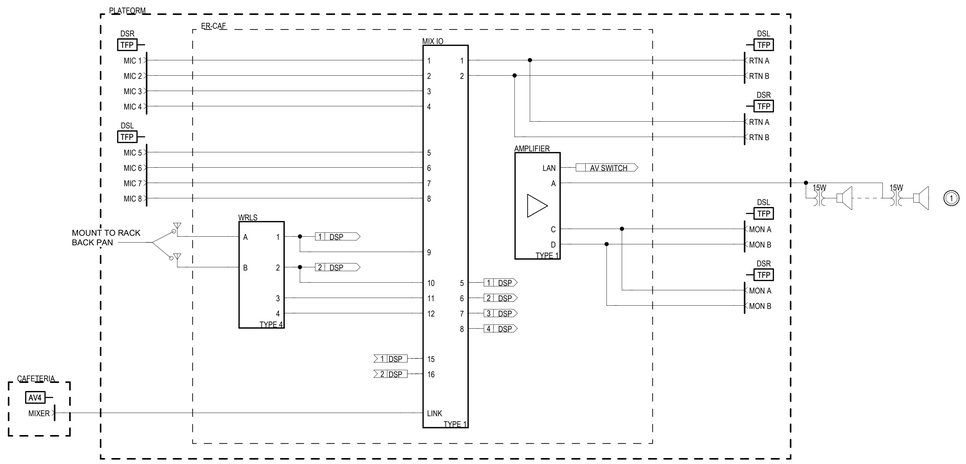
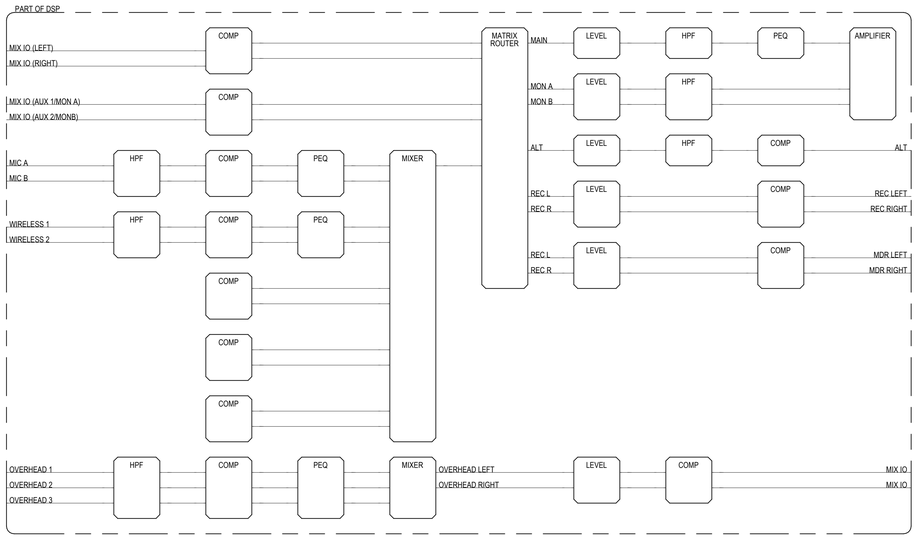


5 AV FUNCTIONAL DIAGRAM
NTS



4 STAGE I/O AUDIO SYSTEM FUNCTIONAL DIAGRAM
NTS



1 AUDIO SYSTEM DSP FUNCTIONAL DIAGRAM
NTS

Revision / 2
Date 06.07.26
Addendum 02

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

STATE OF TEXAS
ALEXANDER MONKLE
157422
LICENSED
PROFESSIONAL ENGINEER

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CAFETORIUM FUNCTIONAL DIAGRAMS
VOLUME 2

Job No. 00802-04-01
Sheet No. AV11.11
Drawn By: WJHW
Date: 07.15.26

8/6/2026 7:42:36 AM
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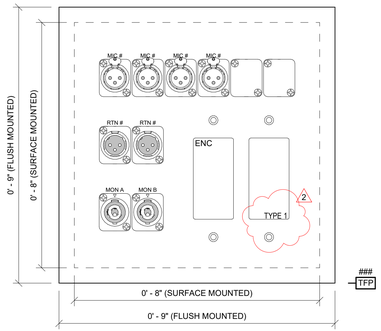
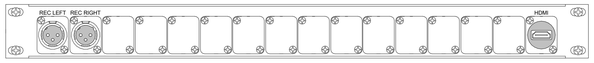
LOOSE EQUIPMENT - CAFETORIUM (REFERENCE SPECIFICATION 27 41 16)			
QUANTITY	DESCRIPTION	TYPE	NOTES
4	BODYPACK WIRELESS MICROPHONE	1	--
4	HANDHELD WIRELESS MICROPHONE	1	--
1	WIRELESS MICROPHONE CHARGE BASE	2	--
1	DRUM MICROPHONE PACKAGE	1	--
1	PIANO MICROPHONE PACKAGE	1	--
6	VOCAL MICROPHONE	1	--
2	INSTRUMENT MICROPHONE	1	--
2	INSTRUMENT MICROPHONE	2	--
1	INSTRUMENT MICROPHONE	3	--
2	CHOIR MICROPHONE	1	--
2	PODIUM MICROPHONE	1	--
4	GENERAL PURPOSE MICROPHONE	1	--
6	MICROPHONE STAND AND MOUNTING	1	--
2	MICROPHONE STAND AND MOUNTING	2	--
4	MICROPHONE STAND AND MOUNTING	3	--
4	MICROPHONE STAND AND MOUNTING	4	--
4	MICROPHONE STAND AND MOUNTIING	5	--
2	MONO DI BOX	1	--
1	STEREO DI BOX	1	--
1	STEREO COMPUTER DI BOX	1	--
1	STEREO COMPUTER USB DI BOX	1	--
4	SPEAKER	10	--
2	SPEAKER STAND	1	--
1	PORTABLE EQUIPMENT RACK	1	PER-CAF
4	MICROPHONE CABLE	06	--
12	MICROPHONE CABLE	25	--
4	MICROPHONE CABLE	50	--
2	INSTRUMENT CABLE	06	--
2	SPEAKER CABLE	06	--
4	SPEAKER CABLE	25	--
2	SPEAKER CABLE	50	--
2	ETHERNET AUDIO CABLE	25	--
1	POWER EXTENSION CABLE	25	--
1	HEADPHONES	1	--
1	MOBILE CABINET	1	--
1	MOBILE CABINET	2	--
16	ASSISTED LISTENING RECIEVERS	1	COORDINATE FINAL QUANTITY WITH OWNER

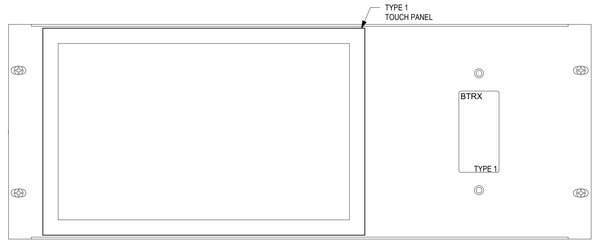
2



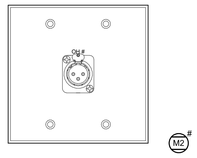
3 TECHNICAL FACILITY PANEL DETAIL - TYPICAL
6" = 1'-0"
NOTE: REFERENCE FUNCTIONAL DIAGRAMS FOR CONNECTOR LABELS



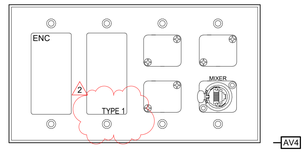
2 IO PANEL DETAIL
6" = 1'-0"



1 CONTROL PANEL DETAIL
6" = 1'-0"



5 MICROPHONE PLATE DETAIL
6" = 1'-0"
NOTE: REFERENCE FUNCTIONAL DIAGRAMS FOR CONNECTOR LABELS



4 AV4 PLATE DETAIL
6" = 1'-0"

BLANK
POWER/LIGHT
BLANK
WRLS TYPE 4
BLANK
BLANK
RESERVED FOR LIGHTING
CONTROL PANEL
MDP TYPE 1
MDR TYPE 1
BLANK
IO PANEL
OPEN RU
SLIDE OUT SHELF
BLANK
DRAWER
DRAWER

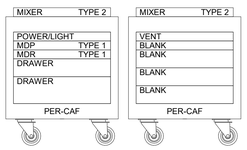
ER-SMP

7 ER-SMP ELEVATION
1" = 1'-0"

BLANK
AV SWITCH TYPE 1
POWER/LIGHT
SEQ TYPE 2
BLANK
DSP TYPE 1
DSP IO (1) TYPE 1
BLANK
WPS ENC
BLANK ENC
BLANK
CABLE MANAGEMENT
MIX IO
TYPE 1
CABLE MANAGEMENT
BLANK
AMPLIFIER
TYPE 1
DRAWER
UPS

ER-CAF

6 ER-CAF ELEVATION
1" = 1'-0"



8 PER-CAF ELEVATION
1" = 1'-0"

Addendum 02

Revision / 2
Date 06.07.26

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
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CAFETORIUM DETAILS

VOLUME 2

Job No.	Sheet No.
00802-04-01	AV11.12
Drawn By: Author	
Date: 07.15.26	

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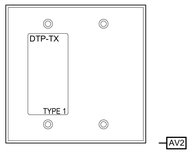
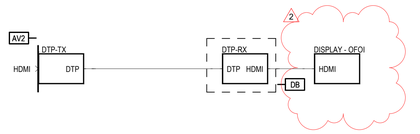
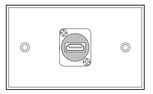


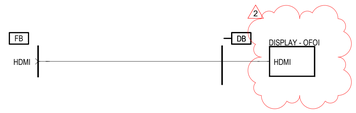
4 PRINCIPALS OFFICE AV2 PLATE DETAILS
NTS



3 PRINCIPALS OFFICE B128 FUNCTIONAL DIAGRAM
NTS



2 FLOORBOX DETAIL
NTS



1 MEETING ROOMS B112, B134, E234 FUNCTIONAL DIAGRAM
NTS

1

Revision /	Date	
1	07.24.26	Addendum 01
2	08.07.26	Addendum 02

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
FOR
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OFFICE AND MEETING ROOMS FUNCTIONAL DIAGRAMS AND DETAILS

VOLUME 2

Job No.	Sheet No.
00802-04-01	AV11.13
Drawn By: WJHW	
Date: 07.15.26	

8/6/2026 7:42:38 AM
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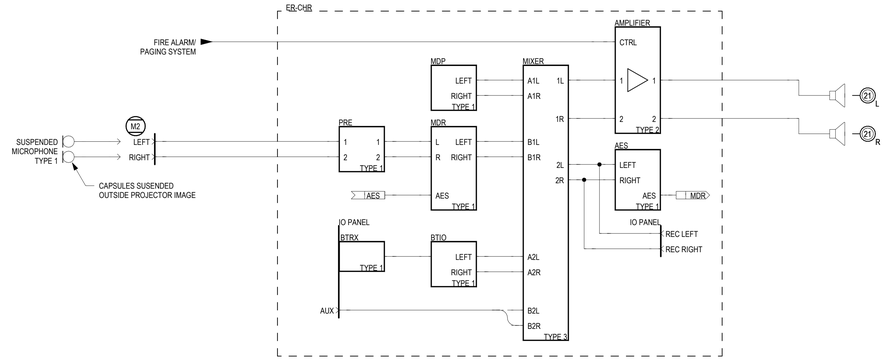
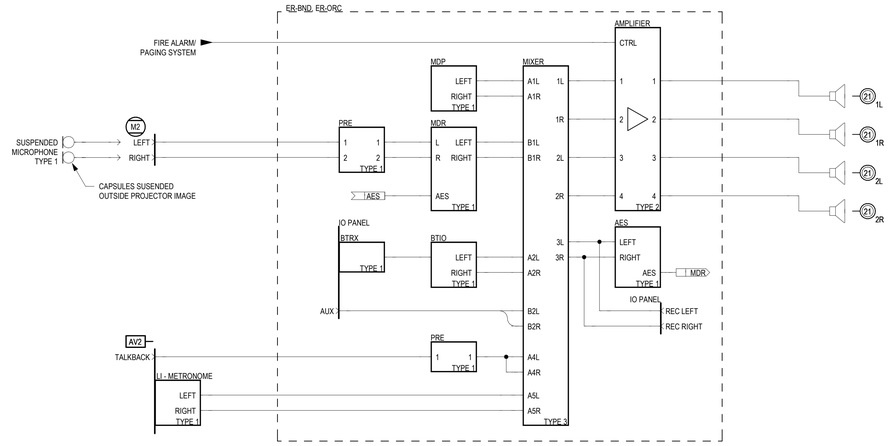
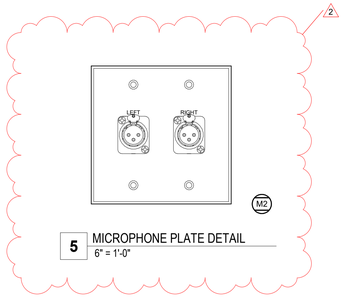
LOOSE EQUIPMENT - MUSIC ROOM (TYPICAL OF 3) (REFERENCE SPECIFICATION 27 41 16)			
QUANTITY	DESCRIPTION	TYPE	NOTES
1	SWITCHED VOCAL MICROPHONE	1	--
2	INSTRUMENT MICROPHONE	2	--
2	MICROPHONE STAND AND MOUNTING	1	--
2	MICROPHONE STAND AND MOUNTING	2	--
2	MICROPHONE STAND AND MOUNTING	5	--
1	STEREO DI BOX	1	--
3	MICROPHONE CABLE	06	--
3	MICROPHONE CABLE	25	--
2	MICROPHONE CABLE	50	--
1	HEADPHONES	1	--



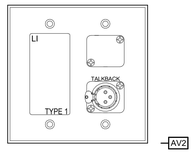
2 CHOIR ROOM AUDIO SYSTEM FUNCTIONAL DIAGRAM
NTS



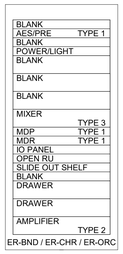
1 BAND ROOM AND ORCHESTRA ROOM AUDIO SYSTEM FUNCTIONAL DIAGRAM
NTS



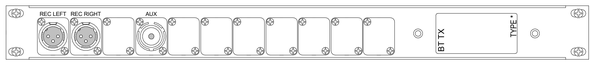
5 MICROPHONE PLATE DETAIL
6" = 1'-0"



4 AV2 PLATE DETAIL
6" = 1'-0"



6 ER-BND / ER-CHR / ER-ORC ELEVATION
1" = 1'-0"



3 IO PANEL DETAIL
6" = 1'-0"

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Revision / 2
Date 06.07.26
Addendum 02

Project:
TOMBALL ISD INTERMEDIATE SCHOOL REPLACEMENT
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MUSIC ROOM DETAILS

VOLUME 2

Job No.	Sheet No.
0/2602-04-01	AV11.21
Drawn By: WJHW	
Date: 07.15.26	

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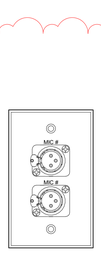
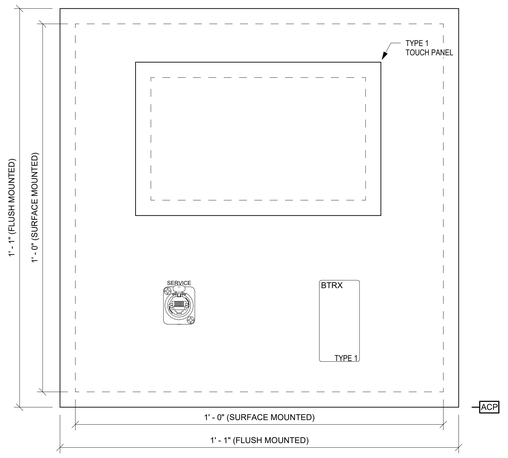
LOOSE EQUIPMENT - GYMNASIUM (REFERENCE SPECIFICATION 27 41 16)			
QUANTITY	DESCRIPTION	TYPE	NOTES
2	HANDHELD WIRELESS MICROPHONE	1	--
1	WIRELESS MICROPHONE CHARGE BASE	1	--
2	GENERAL PURPOSE MICROPHONE	1	--
2	MICROPHONE STAND AND MOUNTING	1	--
2	MICROPHONE CABLE	06	--
4	MICROPHONE CABLE	25	--
2	MICROPHONE CABLE	50	--
15	ASSISTED LISTENING RECIEVERS	1	COORDINATE FINAL QUANTITY WITH OWNER

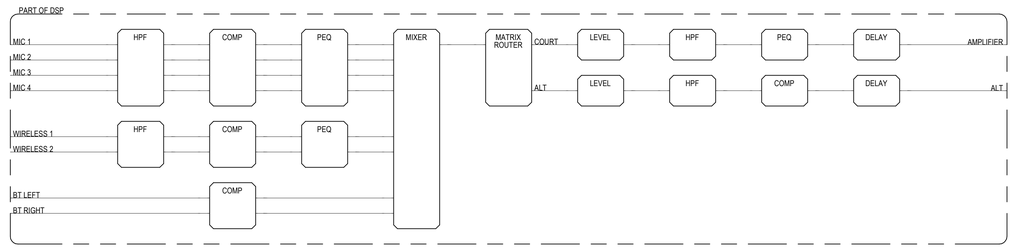
5 ER-GYM ELEVATION
1" = 1'-0"



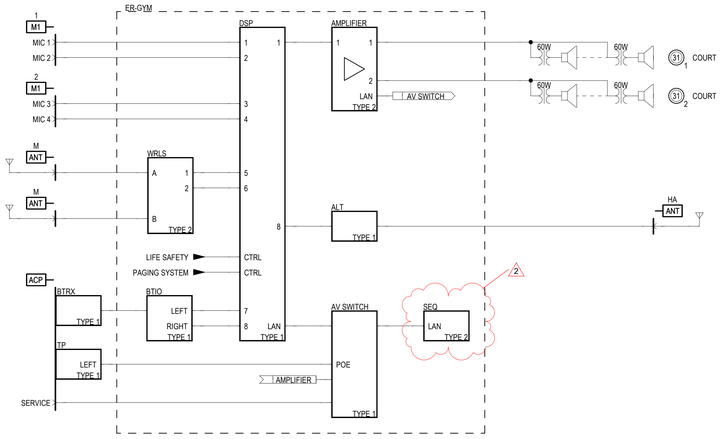
4 MICROPHONE PLATE DETAIL
6" = 1'-0"
NOTE: REFERENCE FUNCTIONAL DIAGRAM FOR CONNECTOR LABELING



3 ATHLETIC CONTROL PANEL DETAIL
6" = 1'-0"



2 AUDIO SYSTEM FUNCTIONAL DIAGRAM
NTS



1 AUDIO SYSTEM DSP FUNCTIONAL DIAGRAM
NTS

8/6/2026 7:42:40 AM
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Revision /	Date	Addendum 02
2	06.07.26	

Project:
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FOR
TOMBALL INDEPENDENT SCHOOL DISTRICT
TOMBALL, TEXAS

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ALEXANDER TONKLE
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GYMNASIUM DETAILS

VOLUME 2

Job No.	Sheet No.
03802-04-01	AV11.31
Drawn By: WJHW	
Date: 07.15.26	

00802-04-01 Tomball ISD Intermediate School Replacement									
Date Received	**From:**	**Issue**	**Completed?**	**Coorespondance:**	**Spec. / Sheets Affected**	**Date issued:**	**Correspondence**	**Who:**	**Response Issued:**
7/20/2026	Stewart Builders	"On Googlemaps there appears to be an existing detention pond that overlaps the new proposed site as shown on C7.1. In addition, is the detention pond shown south of the new site existing?"	Yes	Phone	N/A	N/A	Response: "Googlemaps is outdatted. The pond shown on Googlemaps has since been moved to the south, as captured within the site plan shown on C7.1. This work was previously done by the district as part of an older project scope. The detention pond shown on C7.1 is existing and sized to accomodate the new IS facility, without additional rework to the pond." - Caitlin Munch	Caitlin Munch	Addendum 01
7/20/2026	RPC/ Gamma	"I have a question about the skylight size. Can you submit this for me for clarification? The skylight scope is large enough that this will affect the price. Sheet A7.02 shows the outside dimension of the skylight at 18'-6 5/8" wide between column lines D&E. Sheet A614, detail 3 indicates the skylight would be smaller and 17'-10" wide in the flat dimension – outside curb dimension. Which dimension is correct?"	YES	Add 1	A6.14, A7.02		The flat opening dimension of the skylight has been added to 3/A6.14 - 16' - 2 5/8". The dimension on A7.02 has been updated to reflect the same opening dimensions. Perimeter framing graphically updated to match detailing.	Chris Brennan	Addendum 01
7/20/2026	Gamma	"Caitlin, could you please tell me where the permitting is being completed?"	Yes	Email	N/A	N/A	"The main permitting for the building and main site will be through City of Tomball, the left turn lane and traffic signal off Hufsmith Korville will be Harris County." - Caitlin Munch	Caitlin Munch	Addendum 01
7/20/2026	Stewart Builders	The spec book is not including any spec for Div 33 (Site Utilities). Please Provide.	Yes				Site utility details found on C9.1 - C10.1.	Annelie Geldenhuys Jarvie	Addendum 01
7/20/2026	Stewart Builders	The Spec book is not including any spec for Landscaping. Please Provide	Yes				Landscape specifications found on sheet within current drawing set.	Ed Wong	Addendum 01
7/21/2026	Stewart Builders	The spec section for the alternates, the bid form and the list of alternate on sheet G1.22 are all list differently. Which is correct?	Yes	Add 2			The alternates in the specification and on the drawing sheets are to be updated to match the bid form.	Caitlin Munch	Addendum 2
7/21/2026	Stewart Builders	the AIA contract documents and the list of allowance in the spec do not match. Will we need to carry $500k or $15k for traffic signage?	YES				$500k allowance is to be carried for the traffic signal. $15k allowance is to be carried for site directional signage.	Chris Brennan	Addendum 01
7/21/2026	Stewart Builders	Sheet E6.04, the notes boxes (Note #5) is calling for an allowance for 2 coordination meetings? How much should be carried for this?	YES				It is up to the contractor to determine the amount for the allowance.	Mason High	Addendum 01
7/21/2026	Stewart Builders	Sheet AS1.02 is showing at the gates EG10 & EG11 side to run the fence through the playground surface area. Is this to be done?	YES	Add 1	AS1.02		Surface area to be updated to run parallel with west fence.	Chris Brennan	Addendum 01
7/21/2026	Stewart Builders	Spec 01 4516 could you please clarify which testing and inspection services will need to be provided by the GC	YES	Email	N/A	N/A	"This specification section is in regard to what the GC needs to test on their own for quality control before the owner's testing agency will come out as per the 01 4533 section. Third Party Material Testing, Commissioning, and Test & Balance services shall be performed by the Owner's consultants and coordinated by the General Contractor who shall assist these consultants as required.All test reports, reports showing deficiencies and their corrections shall be copied to the owner and provided in the closeout documents." - Caitlin Munch	Caitlin Munch	Addendum 01
7/21/2026	Gamma	Caitlin is there a specific manufacturer that you want to use for the glass railing? Question below: I see there are a few pages in the spec section pertaining to the glass railing, but there's no manufacturer listed. While we typically fabricate all glass railing we sell, if there's a specific manufacturer that the architect wants to use, I would like to carry their materials number with our installation. If the architect is allowing alternates or substitutions without a substitution request procedure, then we would be interested in pricing a substitution.	YES	Email	N/A	N/A	"The basis of design for the glass railings was the Viva Solo line however, we detailed out this railing to open it up for a fabrication bid. We often see better pricing utilizing fabrication within this market." - Caitlin Munch	Caitlin Munch	Addendum 01
7/21/2026	Stewart Builders	Please provide a spec section for pavement markings.	Yes	Email	C8.1 & C8.3		Site utility details found on C8.1 & C8.3.	Annelie Geldenhuys Jarvie	
7/21/2026	Stewart Builders	The fence going around the back side of the building is calling to be 6' High but the far left side is calling to be 8' high. Can you confirm this is correct?	YES	Add 1	AS1.02		Fencing to be at perimeter to be 6' High. Drawings to be updated in Addendum 01.	Chris Brennan	Addendum 01
7/21/2026	Stewart Builders	Can we add the Kitchen Hand Sink and the Freeze Proof Hose Bib to the Plumbing Schedule?	YES				We will have these added to the schedule for Addendum 1*, as NFWH2 (outside	Vincent Duran	Addendum 01
7/21/2026	Stewart Builders	Sheet S3.03 is calling for volleyball sleeves however it is not calling this anywhere else. Please confirm if there is to be sleeves or not.	YES	Add 1	S3.03		There will not be volleyball sleeves within this project.	Chris Brennan	Addendum 01
7/22/2026	SCI	(A101) Exhibit A, Insurance and Bond Requirements, requires umbrella or excess liability coverage equal to the Contract Sum, subject to a $25 million maximum. Please confirm that $25 million per occurrence and aggregate is required for the New Tomball Intermediate School project and advise whether a project-specific excess policy or other evidence of equivalent coverage would be acceptable.	YES	Email	N/A	N/A	"The insurance listed in the RFP is what is required for the project." - Scotty Lewis	Scotty Lewis	Addendum 01
7/22/2026	SCI	Sections VII.D.2 and VII.D.3 require respondents to use the Microsoft Excel file provided with the RFP. The completed file is due by email on July 31, 2026, at 2:00 p.m. We have reviewed the procurement documents available on our drive and followed the RFP link to the Tomball ISD bid and proposal documents, but we have been unable to locate the referenced Excel file. Please provide the required Microsoft Excel file or advise where it is available for download.	YES	Add 1	N/A	N/A	"It will be included in the First Addendum." - Scotty Lewis	Scotty Lewis	Addendum 01
7/22/2026	Stewart Builders	What Fence Product is the Decorative Fence ? What Material size is the panel ? Rail size , Picket size , Post size?	YES				Specification to be provided in addendum 02.	CB	Addendum 02
7/22/2026	Stewart Builders	Will the science rooms need lab casework? If so, please provide a spec section.	Yes				Science rooms will be casework as documented in A8 series.	CB	Addendum 02
7/27/2026	Gamma/Griesenbeck	Will phasing for division 10 specialties be required by area for this project?	YES	Email			"This will be up to the GC." - Caitlin Munch	CM	Addendum 02
7/27/2026	Gamma/Griesenbeck	Is there a preliminary schedule that can be shared?	YES	Email			"This will be up to the GC." - Caitlin Munch	CM	Addendum 02

7/27/2026	Gamma/Griesenbeck	Is a Class A (0-25) or Class B (26-75) interior flame spread required per Specification Section 08 4500? Paragraph 2.02.A.1.a. states that the interior face sheets are to have a flame spread rating no greater than 25 when tested in accordance with UL 723. However, since the building is Sprinklered, Table 803.13 of the 2021 IBC allows for a Class B interior flame spread rating. To note, a Class B interior flame spread provides a cost savings.	YES				Provide flame spread in accordance with IBC 2021.	CB	Addendum 02
7/27/2026	Gamma/Griesenbeck	Per general notes 8 & 9 of drawing A4.1B corner guards are to be provided at all main corridor walkways with gypsum board and tiled wall outside corners. The only corner guards shown per the drawings are in Corridor B11. We assume corridors such as B106, B135, C100 and so on should also include corner guards per these notes. – Please confirm.	Yes				Confirmed. Corner guards are required at all applicable in locations in corridors and science classrooms.	Aldine Sumolang	Addendum 02
7/27/2026	Gamma/Griesenbeck	Per enlargement 18/A4.44 this shows a flush mount, fire rated corner guard. Per the specifications this is to be a surface mount corner guard. As of now there are no corner guards shown at fire rated walls. – Please confirm if these are flush mount or surface mount as well as if fire barrier will be required.	Yes				Corner guards will be flush mount non rated. Spec and detail will be updated in Addendum 2.	Aldine Sumolang	Addendum 02
7/27/2026	Gamma/Griesenbeck	T7 – Electric Hand Dryer – per the toilet accessory legend of drawing A1.31. This mark is not listed in the specifications and lists no model number. This mark does not appear to be used we assume this can be excluded. – Please confirm	Yes				Confirmed. There is no electric hand dryer in the project.		Addendum 02
7/27/2026	Gamma/Griesenbeck	T8 – Combo paper towel and waste disposal – per the toilet accessory legend of drawing A1.31. This mark is not listed in the specifications and lists no model number. This mark does not appear to be used we assume this can be excluded. – Please confirm	Yes				Confirmed. There is no Combo paper towel and waste disposal in the project.		Addendum 02
7/27/2026	Gamma/Griesenbeck	T14V – 18" Vertical Grab Bar - – per the toilet accessory legend of drawing A1.31. This mark is not listed in the specifications and lists no model number. We assume a stainless steel – peened 1 ½" diameter grab bar to match the listed grab bar marks in restrooms. -Please confirm.	Yes				Confirmed.		Addendum 02
7/27/2026	Gamma/Griesenbeck	Per the specifications mark T16 is a 48" Shower Grab Bar. Per the toilet accessory legend of drawing A1.31 mark T16 is a 30" Grab Bar. This mark does not appear to be used we assume this can be excluded. – Please confirm	Yes				Confirmed. There are no 48" Shower Grab Bar & 30" Grab Bar in the project.		Addendum 02
7/27/2026	Gamma/Griesenbeck	T19 – Towel Bar – per the toilet accessory legend of drawing A1.31. This mark is not listed in the specifications and lists no model number. This mark does not appear to be used we assume this can be excluded. – Please confirm	Yes				Confirmed. There is no towel bar in the project.	Chris Brennan	Addendum 02
7/27/2026	Gamma/Griesenbeck	T20 – Diaper Changing Station is not listed in the specifications and no model number is shown. Per the specifications and further down the accessory legend, mark T27 fixed changing station and T28 adjustable changing station has been listed. Per elevation 39 of A4.43 we assume this to be a T27. Please confirm. I am unable to locate the 05 note description to check which type of accessory this is, equipment plan also lists 05 as a cubicle curtain.– Please confirm.	Yes				39/A4.43 denotes T28. 05 Note Description on Equipment Plans is Clinic Curtain. 05 Note Description on RR Elevations is T20 Diaper changing station.		Addendum 02
7/27/2026	Gamma/Griesenbeck	T25 – Dressing Bench – wall mounted – folding & T26 – Dressing Bench – stationary with back support are listed per the toilet accessory legend of drawing A1.31. This mark is not listed in the specifications and lists no model number. This mark does not appear to be used we assume this can be excluded. – Please confirm	Yes				T25 & T26 are not in the project.		Addendum 02
7/27/2026	Gamma/Griesenbeck	Elevation 35 of drawing A4.43 shows double grab bars in the interior south restroom we assume this to be a mistake and will not be including this in our quantities. Please confirm.	Yes				Confirmed. Double grab bars are a mistake.		Addendum 02
7/27/2026	Gamma/Griesenbeck	Elevation 28 of typical staff RR on drawing A4.43 shows a wall hung extinguisher. We will include this in our counts per what is shown on the elevation but would like to confirm that this was purposely listed as a restroom elevation.	Yes				Wall hung extinguisher in this location is a mistake.		Addendum 02
7/27/2026	Gamma/Griesenbeck	Elevation 35 of south restroom on drawing A4.43 shows a wall hung extinguisher over a urinal. We assume this to be a mistake and will not be including this in our quantities – Please confirm.	Yes				Confirmed.	Chris Brennan	Addendum 02
7/27/2026	Gamma/Griesenbeck	Per the equipment schedule on drawing A8.1A lists recessed cabinet while the specs list semi-recessed. We assume cabinets to be semi-recessed per the specifications. – Please confirm	Yes				FEC to be semi-recessed per specifications.	Chris Brennan	Addendum 02
7/27/2026	Gamma/Griesenbeck	Per drawing G2.01 shows semi recessed Knox box's but specifications list recessed. We assume these to be recessed per the specifications. – Please confirm	Yes				Confirmed.		Addendum 02
7/27/2026	Gamma/Griesenbeck	Per AS2.03 marks EG12 and EG13 are to be pole mounted Knox Boxes. The Knox company does not manufacture a pole mount kit. This mounting site would need to be wide enough and prepared for installation of a surface mounted or recessed mounted Knox Box. – We assume both mark EG12 and EG13 to be a 3200 series Knox box.	Yes				This is correct. Knox Box at this location to be surface mounted.	CB	Addendum 02
7/27/2026	Gamma/Griesenbeck	Specifications list a 4505 model Key switch and note it to be recessed. The model 4534 per the Knox company is a recessed model while a 4505 is a surface mount. We assume this to be a surface mounted box per the specified model number.	Yes				Provide model 4534 when recessed or semi-recessed knox box is noted.	CB	Addendum 02
7/27/2026	Gamma/Griesenbeck	There is no indication of a Knox Key switch, Knox Padlock, or Knox FDC on the drawings. We assume these should not be included in our quantities. – Please confirm.	Yes				FDC called out on civil and arch site plan.		Addendum 02
7/27/2026	Stewart Builders / Division One	FD3 is not Defined in the P0.02 Plumbing Fixture Schedule and is called out on P2.0F, P4.01 and P5.06. Please advise.	Yes				Will be addressed in Addendum 02	Brandon Adams	Addendum 02
7/27/2026	Stewart Builders / Division One	FS2 is not defined in the P0.02 Plumbing Fixture Schedule but is called out on P2.2A, P2.2C, P2.2E, P2.2F, P5.01 and P5.04. Please advise	Yes				Will be addressed in Addendum 02	Brandon Adams	Addendum 02
7/27/2026	Stewart Builders / Division One	P0.02 lists EWH6 as an 80-gallon heater with two 4.5-kW elements but identifies A.O. Smith DEL-20, the same model listed for 20-gallon EWH5. EWH1 through EWH4 use DEN-80 for the scheduled 80-gallon units. Electrical E5.08 identifies a 3,000-VA EWH6 load, which also does not correspond to two 4.5-kW elements. Please advise as to the EWH6 capacity, manufacturer and model number, element quantity, kW, and voltage.	Yes				Will be addressed in Addendum 02	Brandon Adams	Addendum 02
7/27/2026	Stewart Builders / Division One	The 4-inch SSD serving elevator sump pump SP1 is shown on P2.0B, P2.0C and P2.0E, but its material is not expressly identified. Please confirm whether ASTM D2665 Schedule 40 PVC DWV is acceptable.	Yes				Will be addressed in Addendum 02	Brandon Adams	Addendum 02
7/27/2026	Stewart Builders	Sheet A6.24/Detail 9 is calling for the HSS Tubes to match the anodized windows. Is this to be painted finish? or brake metal?	Yes				Paint to match clear annodized window frames.		Addendum 02
7/27/2026	Stewart Builders	Detail 1 on A6.11 , what is the purpose of using R-30 Spray AND Foamed-in-place insulation on the underside of the deck?	Yes				Foamed-In-Place to be used in exterior wall crevices, junctions of dissimilar wall and roof materials and other confined spaces where Sprayed Insulation can not be properly installed/applied.		Addendum 02
7/27/2026	Stewart Builders	08 4500 Transulcent wall and roof assemblies - Is a Class A (0-25) or Class B (26-75) interior flame spread required per Specification Section 08 4500? Paragraph 2.02.A.1.a. states that the interior face sheets are to have a flame spread rating no greater than 25 when tested in accordance with UL 723. However, since the building is Sprinklered, Table 803.13 of the 2021 IBC allows for a Class B interior flame spread rating. To note, a Class B interior flame spread provides a cost savings.	YES				Provide flame spread in accordance with IBC 2021.	CB	Addendum 02
7/27/2026	Stewart Builders	10 26 00 Wall and Door Protection - Per general notes 8 & 9 of drawing A4.1B corner guards are to be provided at all main corridor walkways with gypsum board and tiled wall outside corners. The only corner guards shown per the drawings are in Corridor B11. We assume corridors such as B106, B135, C100 and so on should also include corner guards per these notes. – Please confirm.	Yes				Confirmed. Corner guards are required at all applicable in locations in corridors and science classrooms.	Aldine Sumolang	Addendum 02

7/27/2026	Stewart Builders	10 26 00 Wall and Door Protection - Per enlargement 18/A4.44 this shows a flush mount, fire rated corner guard. Per the specifications this is to be a surface mount corner guard. As of now there are no corner guards shown at fire rated walls. – Please confirm if these are flush mount or surface mount as well as if fire barrier will be required.	Yes				Corner guards will be flush mount non rated. Spec and detail will be updated in Addendum 2.	Aldine Sumolang	Addendum 02
7/27/2026	Stewart Builders	T14V – 18" Vertical Grab Bar - – per the toilet accessory legend of drawing A1.31. This mark is not listed in the specifications and lists no model number. We assume a stainless steel – peened 1 ½" diameter grab bar to match the listed grab bar marks in restrooms. -Please confirm.	Yes				Confirmed.		Addendum 02
7/27/2026	Stewart Builders	Elevation 28 of typical staff RR on drawing A4.43 shows a wall hung extinguisher. We will include this in our counts per what is shown on the elevation but would like to confirm that this was purposely listed as a restroom elevation.	Yes				Wall hung extinguisher in this location is a mistake.		Addendum 02
7/27/2026	Stewart Builders	Elevation 35 of south restroom on drawing A4.43 shows a wall hung extinguisher over a urinal. We assume this to be a mistake and will not be including this in our quantities – Please confirm.	Yes				Confirmed.		Addendum 02
7/27/2026	Stewart Builders	Per the equipment schedule on drawing A8.1A lists recessed cabinet while the specs list semi-recessed. We assume cabinets to be semi-recessed per the specifications. – Please confirm	Yes				Semi-recessed is correct.	Chris Brennan	Addendum 02
	Division One	What is the status of the permit?	Yes	Add 2 - as part of this schedule			The project has recieved comments from the City of Tomball regarding the main building and civil. The team has responded to the first round of comments and is waiting for round 2. We have recieved approval regarding the left turn lane from Harris County, but are still awaiting approval for the traffic light (which is a separate permit).		Addendum 02
	Division One	Who is responsible for the cost of the permit?	Yes	Add 2 - as part of this schedule			The General Contractor. Note this will be City of Tomball for building and site, and Harris County for the left turn lane and traffic light off Huffsmith-Korhville.	Caitlin Munch	Addendum 02
	Division One	Please confirm this is a City of Tomball project and Harris County for the road work.	Yes	Add 2 - as part of this schedule			The City of Tomball is the AHJ for the main building and civil for the site itself. Harris County is the AHJ for the left turn lane on Hufsmith-Korhville and the traffic light.	Chris Brennan	Addendum 02
	Division One	Who is responsible for utility meter/tap fees?	Yes	Add 2 - as part of this schedule			The General Contractor.	Caitlin Munch	Addendum 02
	Division One	Are water and power readily available, if not, what is the anticipated date it will be?	Yes	Add 2 - as part of this schedule			Water and power are available off the main road.	Caitlin Munch	Addendum 02
	Division One	Please clarify when the 6' tall chain-link stops and the 8' tall starts?	Yes				Fencing updated in addendum 01. 6' fencing around play ground area as shown.	Chris Brennan	Addendum 02
	Division One	In the Specs, it is calling for 1 3/4" Mesh for the fence, that is typically only used for tennis courts. Wil, they want it price 1 3/4" or a 2" mesh or 1" Mini mesh?	Yes						Addendum 02
	Division One	On Sheet AS2.03, the gates schedule under comment sections, the details they are refencing don't line up. Would this be clarified?	Yes				These will be clarified in Addendum 2.		Addendum 02
	Division One	For the Dumpster Gates, will they need any privacy slats for visual blockage?	Yes				Privacy fabric will be required at all black vinyl chain link fencing. Specification to be updated in addendum 02.		Addendum 02
	Division One	Both spec sections 11 61 33 & 11 61 43 in the bid documents make a reference to "Section 11 61 62: Theatrical Lighting Systems" as a related document, but that spec section is not in the bid documents. The TS drawings in the plan set also have drawings pertaining to the theatrical lighting scope. Is there a spec section for the theatrical lighting that we can be provide? It will be needed to get a quote from suppliers on this scope.	Yes				11 6162 to be included in Addendum 2		Addendum 02
	Division One	If so, will that spec section contain information on the theatrical lighting fixtures that are desired for this project as well?	Yes				Yes. 11 6162 will contain information related to the types and quantities of fixtures.		Addendum 02
	Division One	I did not see volleyball equipment listed in section 116623. Will there be volleyball equipment within the scope of the project?	Yes				There are no Volleyball inserts within scope.	Chris Brennan	Addendum 02
	Gamma/Griesenbeck	While reviewing the drawings and specifications for the glass railing system, we noticed a discrepancy and would appreciate your clarification. Detail 10/A6.41 indicates a Blade Post system. Detail 12/A6.41 indicates a Solo Post system. The project specifications do not identify which post system should be provided. Could you please confirm whether the glass railing should be supplied with the Blade Post system or the Solo Post system?	Yes				Detail 10&11/A6.41 will be revised to remove conflicting note.		Addendum 02
	Gamma/Griesenbeck	For the overhead coiling doors (Specification 08 33 23), both the fire-rated and non-fire-rated doors are called out as surface-mounted applications in the specs. However, the jamb detail for the non-fire-rated, and rated doors depicts an in-between jamb application recessed into the wall. Please clarify which mounting application is intended.	Yes				Provide OHD & OCD as detailed. Specification to be updated for recessed doors.	CB	Addendum 02

	Gamma/Griesenbeck	If it truly is an in-between jamb mount, the jamb detail shown is not feasible as drawn. Additional space is required for the guide pack-off to accommodate the tension sprocket and motor gear spindle. Please see the attached rendering illustrating a typical in-between jamb installation. If an in-between jamb application is required, please confirm that the wall detail will be revised accordingly.	Yes				OCD & OHD width to be decreased min requirements to allow installation of guide pack-off.	CB	Addendum 02
	Gamma/Griesenbeck	The overhead grilles (Specification 08 33 26, Grilles F132A & F132B) are shown as an in-between jamb application. However, the jamb details do not indicate the required structural tube supports. These grilles are typically designed to mount to 3" x 3" structural steel tubes integrated into the wall assembly. Please confirm that adequate space will be provided within the wall construction to accommodate the required 3" x 3" tubing.	Yes		1/S2.18		Overhead grilles are supported by building columns and HSS header per 1/S6.11. If additional miscellaneous steel is required, GC to provide mounting tubes as required by the overhead grille manufacturer within the column furr-out space. Yes, adequate space is provided within the column furr-out space for the additional 3" x 3" mounting tubes, if required. (See note added to 1/S2.18.)	YC	Addendum 02
	Division One	Please confirm which items will be furnished by Tomball ISD for this project. Is the metal shelving Owner-Furnished, Owner-Installed (OFOI)? Are the security systems Owner-Furnished? The drawings indicate the cameras are Owner-Furnished, Contractor-Installed (OFCI). Please confirm whether this applies to all security-related systems. There is no specification section for the Intrusion Detection System. Is this system Owner-Furnished, Owner-Installed (OFOI)? There is no specification section for the Video Surveillance System. Is this system Owner-Furnished, Owner-Installed (OFOI)?	Yes				Metal shelving to be OFOI. All security cameras, associated mounting hardware, recording servers, and video management license are to be Owner-Furnished and Owner-Installed. Conduit, data cabling, and back boxes are to be provided in the project. Access control in its entirety is included in the project. Intrusion Detection Burglar Alarms are not included in this project. The Genetec Access Control System will monitor the door position switches.		Addendum 02
	Division One	We were unable to locate a specification section for the pavement markings. Please provide the applicable specification.	Yes				Pavement Markings are located on drawings.		Addendum 02
	Division One	We were unable to locate the specification sections for landscaping and irrigation. Please provide the applicable specifications.	Yes				Landscape and irrigation specifications are located on drawings.		Addendum 02
	Division One	We were unable to locate the specification section for the site utility scope. Please provide the applicable specification.	Yes				Site Utility Scope is located within drawings.		Addendum 02
	Division One	FD3 is not Defined in the P0.02 Plumbing Fixture Schedule and is called out on P2.0F, P4.01 and P5.06. Please advise.	Yes				Will be addressed in Addendum 02	Brandon Adams	Addendum 02
	Division One	FS2 is not defined in the P0.02 Plumbing Fixture Schedule but is called out on P2.2A, P2.2C, P2.2E, P2.2F, P5.01 and P5.04. Please advise	Yes				Will be addressed in Addendum 02	Brandon Adams	Addendum 02
	Division One	P0.02 lists EWH6 as an 80-gallon heater with two 4.5-kW elements but identifies A.O. Smith DEL-20, the same model listed for 20-gallon EWH5. EWH1 through EWH4 use DEN-80 for the scheduled 80-gallon units. Electrical E5.08 identifies a 3,000-VA EWH6 load, which also does not correspond to two 4.5-kW elements. Please advise as to the EWH6 capacity, manufacturer and model number, element quantity, kW, and voltage.	Yes				Will be addressed in Addendum 02	Brandon Adams	Addendum 02
	Division One	Please confirm whether plumbing subcontractors are required to maintain their own Projectmates account and whether any license, setup, or training fees must be included in the subcontractor's bid.	Yes				The GC will hold a projectmates account and coordinate with subcontractors as needed.	CB	Addendum 02
	Division One	The 4-inch SSD serving elevator sump pump SP1 is shown on P2.0B, P2.0C and P2.0E, but its material is not expressly identified. Please confirm whether ASTM D2665 Schedule 40 PVC DWV is acceptable.	Yes				Will be addressed in Addendum 02	Brandon Adams	Addendum 02
	Division One	There are no PTD, PTD/WR or hand dryers shown in any of the gang restrooms (F108, F109, A104, A105, C113, C114, E111, E107, C123, C124, E206,E207) - what should be included here?	Yes				All listed items are OFOI.	CB/YC	Addendum 02
	Division One	1. Spec section 07 22 00 / 2.01 / A / 2 states for the insulation thickness to be 5" minimum. Typically, an R-25 (4.4") is required for new construction projects. Please confirm the design intent.	Yes				Reference updated specification in addendum 02.		Addendum 02
	Division One	2. Spec section 07 22 00 / 2.01 / D lists the cover board size as 4' X 8', which is typically used when mechanically fastening the board. However, 3.02 / C / 1 / B states for the cover board to be adhered. Please confirm the design intent.	Yes				Reference updated specification in addendum 02.		Addendum 02
	Division One	3. Details G3.01 / R103, R110, & R111 reference a single-ply membrane, however a single-ply spec was not provided in the project manual. Please confirm the design intent.	Yes				Specification to be provided in addendun 02.		Addendum 02
	Division One	4. Is the roofing edge metal to match MP01 & MP02 "Clear Anodized"?	Yes				Confirmed for MP02. MP01 roofing edge to be continuation of MP01 panel.	CB	Addendum 02
	Division One	08 4500 TRANSLUCENT WALL AND ROOF ASSEMBLIES 1.Is a Class A (0-25) or Class B (26-75) interior flame spread required per Specification Section 08 4500? Paragraph 2.02.A.1.a. states that the interior face sheets are to have a flame spread rating no greater than 25 when tested in accordance with UL 723. However, since the building is Sprinklered, Table 803.13 of the 2021 IBC allows for a Class B interior flame spread rating. To note, a Class B interior flame spread provides a cost savings.	YES				Provide flame spread in accordance with IBC 2021.	CB	Addendum 02
	Division One	10 2600 WALL AND DOOR PROTECTION 1.Per general notes 8 & 9 of drawing A4.1B corner guards are to be provided at all main corridor walkways with gypsum board and tiled wall outside corners. The only corner guards shown per the drawings are in Corridor B11. We assume corridors such as B106, B135, C100 and so on should also include corner guards per these notes. – Please confirm.	Yes				Confirmed. Corner guards are required at all applicable in locations in corridors and science classrooms.	Aldine Sumolang	Addendum 02
	Division One	2.Per enlargement 18/A4.44 this shows a flush mount, fire rated corner guard. Per the specifications this is to be a surface mount corner guard. As of now there are no corner guards shown at fire rated walls. – Please confirm if these are flush mount or surface mount as well as if fire barrier will be required.	Yes				Corner guards will be flush mount and non rated. Spec and detail will be updated in Addendum 2.	Aldine Sumolang	Addendum 02
	Division One	10 2800 TOILET, BATH, AND LAUNDRY ACCESSORIES 1.T7 – Electric Hand Dryer – per the toilet accessory legend of drawing A1.31. This mark is not listed in the specifications and lists no model number. This mark does not appear to be used we assume this can be excluded. – Please confirm	Yes				Confirmed. There is no electric hand dryer in the project.		Addendum 02
	Division One	2.T8 – Combo paper towel and waste disposal – per the toilet accessory legend of drawing A1.31. This mark is not listed in the specifications and lists no model number. This mark does not appear to be used we assume this can be excluded. – Please confirm	Yes				Confirmed. There is no Combo paper towel and waste disposal in the project.		Addendum 02
	Division One	3.T14V – 18" Vertical Grab Bar - – per the toilet accessory legend of drawing A1.31. This mark is not listed in the specifications and lists no model number. We assume a stainless steel – peened 1 ½" diameter grab bar to match the listed grab bar marks in restrooms. -Please confirm.	Yes				Confirmed.		Addendum 02
	Division One	4.Per the specifications mark T16 is a 48" Shower Grab Bar. Per the toilet accessory legend of drawing A1.31 mark T16 is a 30" Grab Bar. This mark does not appear to be used we assume this can be excluded. – Please confirm	Yes				Confirmed. There are no 48" Shower Grab Bar & 30" Grab Bar in the project.		Addendum 02
	Division One	5.T19 – Towel Bar – per the toilet accessory legend of drawing A1.31. This mark is not listed in the specifications and lists no model number. This mark does not appear to be used we assume this can be excluded. – Please confirm	Yes				Confirmed. There is no towel bar in the project.		Addendum 02

	Division One	6. T20 – Diaper Changing Station is not listed in the specifications and no model number is shown. Per the specifications and further down the accessory legend, mark T27 fixed changing station and T28 adjustable changing station has been listed. Per elevation 39 of A4.43 we assume this to be a T27. Please confirm. a. I am unable to locate the 05 note description to check which type of accessory this is, equipment plan also lists 05 as a cubicle curtain.– Please confirm.	Yes				39/A4.43 denotes T28. 05 Note Description on Equipment Plans is Clinic Curtain. 05 Note Description on RR Elevations is T20 Diaper changing station.		Addendum 02
	Division One	7. T25 – Dressing Bench – wall mounted – folding & T26 – Dressing Bench – stationary with back support are listed per the toilet accessory legend of drawing A1.31. This mark is not listed in the specifications and lists no model number. This mark does not appear to be used we assume this can be excluded. – Please confirm	Yes				T25 & T26 are not in the project.		Addendum 02
	Division One	8. Elevation 35 of drawing A4.43 shows double grab bars in the interior south restroom we assume this to be a mistake and will not be including this in our quantities. Please confirm.	Yes				Confirmed. Double grab bars are a mistake.		Addendum 02
	Division One	10 4400 FIRE PROTECTION SPECIALTIES 1. Elevation 28 of typical staff RR on drawing A4.43 shows a wall hung extinguisher. We will include this in our counts per what is shown on the elevation but would like to confirm that this was purposely listed as a restroom elevation.	Yes				Wall hung extinguesher in this location is a mistake.		Addendum 02
	Division One	2. Elevation 35 of south restroom on drawing A4.43 shows a wall hung extinguisher over a urinal. We assume this to be a mistake and will not be including this in our quantities – Please confirm.	Yes				Confirmed.		Addendum 02
	Division One	3. Per the equipment schedule on drawing A8.1A lists recessed cabinet while the specs list semi-recessed. We assume cabinets to be semi-recessed per the specifications. – Please confirm	Yes				FEC to be semi-recessed per specifications.		Addendum 02
	Division One	4. Per drawing G2.01 shows semi recessed Knox box's but specifications list recessed. We assume these to be recessed per the specifications. – Please confirm	Yes				Confirmed.		Addendum 02
	Division One	5. Per AS2.03 marks EG12 and EG13 are to be pole mounted Knox Boxes. The Knox company does not manufacture a pole mount kit. This mounting site would need to be wide enough and prepared for installation of a surface mounted or recessed mounted Knox Box. – We assume both mark EG12 and EG13 to be a 3200 series Knox box.	Yes				This is correct. Knox Box at this location to be surface mounted.		Addendum 02
	Division One	6. Specifications list a 4505 model Key switch and note it to be recessed. The model 4534 per the Knox company is a recessed model while a 4505 is a surface mount. We assume this to be a surface mounted box per the specified model number.	Yes				Provide model 4534 when recessed or semi-recessed knox box is noted.		Addendum 02
	Division One	7. There is no indication of a Knox Key switch, Knox Padlock, or Knox FDC on the drawings. We assume these should not be included in our quantities. – Please confirm.	Yes				FDC called out on civil and arch site plan.		Addendum 02
	Stewart Builders	Sheet C3.2 is calling for the generator to be by others. Please confirm.	Yes				Generator is included in MEP scope. Reference MEP drawings.		Addendum 02
	Stewart Builders	Plan page A4.33/detail 9 calls out for AP06. The finish schedule does not contain a AP06.	Yes		A4.33		AP06 will be added to the schedule. The update will be included in Addendum 2.	Aldine Sumolang	Addendum 02
	Stewart Builders	The alternate sheets calls for water cooled and the mechanical schedule calls for air cooled. Please correct.	Yes				Alternate sheet in drawings and specifications to be updated.		Addendum 02
	Stewart Builders	Vertical steel tube support will be required for coiling doors D113, E121A, and E121B at the jambs. Details 13 & 14 on A3.09 only show the steel track but these are large doors so additional support will be required. CFMF engineer can supoort overhead but we will need steel in the jambs. Please confirm this is acceptable.	Yes		A3.09, 1/S6.04, 1/S6.10		Jambs to be designed by CFMF Engineer per structural engineer. Misc steel to be installed if required. IEG takes no exceptions to using steel, in lieu of CFMF, for the jambs. GC to provide steel for the jambs as required by the coiling door manufacturer.	CB/YC	Addendum 02
	Stewart Builders	Door D113 does not have note 13 for motor operation. This is a large door so we justwant to be sure. Please confirm this is correct.	Yes				Door D113 will be motorized. Note will be added in Addendum 02.		Addendum 02
	Stewart Builders	G5.01 material schedule lists 08 36 13 (sectional doors) as 'Relinta' but this manufactuer is refrenced in spec section 08 33 13 (overhead folding doors). For doors E117H & E117G, should we quote 08 36 13 Raynor manufactuer, or should we quote Relinta in 08 33 13?	Yes		08 33 13 / 08 36 13		Doors E117H & E117G should quote 08 3313 Renlita.		Addendum 02
	Stewart Builders	Could we provide an Access Control/Cameras number from NextGen Security? They are a licensed integrator for Genetec.	Yes		28 10 00		Only approved vendors referenced in Section 28 1000 Access Control are allowed. Hardware Integrators must be an approved Genetec Unified Elite Partners. Any other integrator must be approved by Tomball ISD Technology Department prior to contract award.		Addendum 02
	Stewart Builders	Please confirm that epoxy grout is required at all tile locations per Specification Section 09 30 00, item 2.04 .	Yes		09 30 00/2.04		Confirmed.	Aldine Sumolang	Addendum 02
	Stewart Builders	The finish plans indicate BSS at the restroom base. Please confirm wheather BSS refers to the Schluter DILEX profile shown in Detail 20/A4.44.	Yes				Schluter DILEX-AHK	Aldine Sumolang	Addendum 02
	Stewart Builders	Contradictory metal finishes: Detail 3/A4.44 indicates aluminum trims; however, Specification Section 09 30 00, item 2.02, requires brushed stainless steel.	Yes		09 30 00/2.02		Brushed stainless steel.	Aldine Sumolang	Addendum 02
	Stewart Builders	Please confirm all upholstry benches will recieve the water fall/wave seat backs. Detail 1 on A6.27 refers you to detail 15 on A8.34. Please confirm.	Yes		A6.27 & A8.34		Confirmed.	Aldine Sumolang	Addendum 02
	Millenium	Section 01 23 00 - Schedule of Alternates does not appear to match Exhibit S - Bid Alternates Form. the alternates listed in each document are different. Please clarify which document the GC shall use for bidding purposes and confirm the correct list of alternates to be included in the bid.	Yes				Alternate sheet in drawings and specifications to be updated.		Addendum 02
	Millenium	Please confirm whether any known soil contamination exists within the project limits and provide any applicable reports or handling requirements.	Yes	Add 2 - as part of this schedule			No known soil contamination exists within the project limits.	AGJ	Addendum 02
	Millenium	General Notes 8 and 9 on Drawing A4.1B require corner guards at all main corridor outside corners. Only corridor B11 is shown with corner guards. Please confirm corner guards are required at all applicable corridor locations.	Yes				Confirmed. Corner guards are required at all applicable in locations in corridors and science classrooms.	Aldine Sumolang	Addendum 02
	Millenium	Fixture FD3 is referenced on Sheets P2.0F, P4.01 and P5.06 but is not included in the plumbing fixture schedule on sheet P0.02. Please provide the required specification.	Yes				Will be addressed in Addendum 02	Brandon Adams	Addendum 02
	Millenium	Fixture FS2 is referenced on Sheets P2.2A, P2.2C, P2.2E, P2.2F, P5.01, and P5.04 but is not included in the plumbing fixture schedule on sheet P0.02. Please provide the required fixture specificaiton.	Yes				Will be addressed in Addendum 02	Brandon Adams	Addendum 02
	Covenant	Functional diagrams in drawing AV11.11 do not seem to incorporate the ER-SMP rack. If that's the case, can you please provide updated functional diagrams incorporating the ER-SMP rack?	Yes				Addendum 2 will contain corrections to functional diagrams.		Addendum 02

	Covenant	I was unable to find specifications for the following equipment, but they are shown in the AV drawings. Please provide specifications for the following equipment if they are required: Drum Microphone Package Type 1 (Cafetorium Loose Equipment), Piano Microphone Package Type 1 (Cafetorium Loose Equipment), Switched Vocal Microphone Type 1 (Loose equipment for music rooms), Speaker Stand Type 1 (Cafetorium Loose Equipment), DB Displays, HDMI Transmitters (AV2), HDMI receivers, back boxes (if required), mounts: (B112, B128, B134, E234), AES/PRE Type 1 Devices (ER-BND, ER-CHR, ER-ORC)	Yes				Addendum 2 will contain corrections to specifications. Stands are listed in section 2.03 R. DB & AV2 defined on AV0.00. B112, B128, B134, E234 defined on AV11.13. Ref 27 41 16 for updates in Addendum 02		Addendum 02
	Covenant	Please confirm that the Type 1 loudspeakers indicated on diagram 4/AV11.11 are intended to be type 11 loudspeakers.	Yes				Confirmed		Addendum 02
	Covenant	Please provide a location for the ALT Type 1 device and antenna (ER-SMP or ER-CAF).	Yes				ER-SMP		Addendum 02
	Covenant	Please provide product specifications and/or plate details for the devices. Is the intent for the AV contractor to provide half-wave antennae that come with wireless receiver kits?	Yes				The included half-wave antennas are acceptable. Addendum 2 will contain corrections to details.		Addendum 02
	Covenant	Please confirm that video encoders on TFPs per panel detail 3/AV11.12 should be type 1.	Yes				Correct		Addendum 02
	Covenant	Please confirm that video encoders on AV4 per panel detail 4/AV11.12 should be type 1. Also, please confirm that the video encoder should be networked to the AV SWITCH in functional diagram 5/AV11.11.	Yes				Correct		Addendum 02
	Covenant	It appears that the IO Panel is intended to be located at the SMP rack (Diagram 5/AV11.11 shows it in the CAF rack). Please confirm. Additionally, should the video encoder connected to passive HDMI input in IO Panel be relocated to the SMP rack? Lastly, 5/AV11.11 shows a Type 1 TP on the IO panel, and it is understood that the TP is intended to be on the Control Panel.	Yes				Addendum 2 will contain corrections to functional diagrams. AV11.11/2 "Audio System Functional Diagrams" is intended to be contained in ER-SMP.		Addendum 02
	Covenant	Please clarify if the power sequencer for ER-GYM should be Type 2 (Elevation 5/AV11.31) or Type 1 (Diagram 1/AV11.31).	Yes				Addendum 2 will contain corrections to details to clarify		Addendum 02
	Covenant	Please clarify if equipment rack power terminations are to be standard receptacles and backboxes provided by Division 26 or if the Division 27 AV contractor is to provide RPD Type 1 (Middle Atlantic MPR) raceways and modules.	Yes				Standard backboxes and receptacles are acceptable. RDP's are to be used as-needed.		Addendum 02
	Covenant	According to the manufacturer, Middle Atlantic FAN2-DC-FC fan kits are not compatible with DWR series racks. Please provide a product specification for a compatible cooling fan kit.	Yes				Addendum 2 will contain corrections to specifications. Use Middle Atlantic DWRSR-138FT-K-EU		Addendum 02
	Covenant	The loose equipment schedule on AV11.12 lists two different quantities of required ALS receivers. Please clarify if (8) or (16) are required.	Yes				Addendum 2 wil contain corrections to details. (16) ALS recievers is correct.		Addendum 02
	Covenant	The following plates are not detailed in the AV drawings. If a specific layout or labeling/engraving is required, please provide details of the custom plates for fabrication. ACP, ANT-M, ANT-HA, M1, M2 (music rooms)	Yes				Addendum 2 will contain corrections to details.		Addendum 02
	Covenant	There are some AV backboxes and associated devices that do not have cover plates shown in the AV drawings. Please clarify if the intent is for the AV contractor to furnish pass-through cover plates for speakers, displays, and projection screens or if they are provided by the Division 26 contractor.	Yes				AV0-00 specifies general plate requirement. Scope delination is at the discretion of the GC.		Addendum 02
	Satterfield & Pontikes	It is our understanding that epoxy grout is required at all tile locations per Specification Section 09 30 00, Item 2.04. Please confirm that this is the design intent, as epoxy grout is not typically used throughout projects of this type. We want to ensure that the work is priced accurately.	Yes				Confirmed.	Aldine Sumolang	Addendum 02
	Satterfield & Pontikes	The finish plans indicate BSS at the restroom wall base. Please confirm whether BSS refers to the Schluter DILEX profile shown in Detail 20/A4.44.	Yes				Schluter DILEX-AHK	Aldine Sumolang	Addendum 02
	Satterfield & Pontikes	Detail 3/A4.44 indicates aluminum trims; however, Specification Section 09 30 00, Item 2.02, requires brushed stainless-steel trims and accessories. Since there is a significant price difference between these materials, please clarify which finish is required.	Yes				Brushed stainless steel.	Aldine Sumolang	Addendum 02
	Satterfield & Pontikes	Jamb details 13 & 14 on A3.09 show between jamb mounting, but do not show proper support. For each of these items you will need to install tube steel supports running from floor to deck. Please confirm our understanding as to if support misc. steel is required. Please provide an updated detail indicating supports.	Yes				Jambs to be designed by CFMF Engineer per structural engineer. Misc steel to be installed if required.	CB	Addendum 02
	Satterfield & Pontikes	D113 does not include note 13 calling for motor operation and does not have power on the electrical plans. This is a BIG door, its in a corridor, can we confirm whether it needs to be motorized or not?	Yes				This door will be motorized.		Addendum 02
	Satterfield & Pontikes	There is a spec section 083613 for sectional doors. With E117H & E117G bidding under 083313, I do not see anything for 083613. Confirm none are needed?	Yes				Confirmed.	CB	Addendum 02
	Satterfield & Pontikes	Current Specifications seem to be missing SWPP spec. Please provide	Yes				Civil specifications located on sheets.	AGJ	Addendum 02
	Satterfield & Pontikes	Current Specifications seem to be missing Pavement Markings (Striping) spec. Please provide	Yes				Pavement Markings Specifications located on sheets.	AGJ	Addendum 02
	Satterfield & Pontikes	Current Specifications seem to be missing Landscaping spec. Please provide	Yes				Landscape specifications located on sheets.	AGJ	Addendum 02
	Satterfield & Pontikes	Current Specifications seem to be missing Site Utilites spec. Please provide	Yes				Site Utility specifications located on sheets.	AGJ	Addendum 02
	Satterfield & Pontikes	Detail 6/A1.40 there are lines drawn along the RD grid line between grid lines R4 and R5. This situation is in Area F. Please identify what the 'yellow' highlighted item is. Mistake?	Yes				Lines denote chevron bracing that will travel above opening. Ref. Struct. Bracing will continue above ceiling at opening.		Addendum 02
	Satterfield & Pontikes	Refer section 3/S3.02, please provide the base plate details associated with the W14 column in the Typical Braced Frame Base Plate Details	Yes		3/S3.02		3/S3.02 has been updated to include base plate information for W14 columns.	YC	Addendum 02
	Satterfield & Pontikes	Refer to Section 3/S8.03 and provide the gusset plate details for the highlighted areas shown below.	Yes		3/S8.03		Detail callouts have been added to 3/S8.03.	YC	Addendum 02
	Satterfield & Pontikes	Please refer to Sheet S2.07, Gridline C-28.9, and provide the details of the post	Yes				Per the note on 1/S2.07, "AT POSTS, REF 7/S3.03."	YC	Addendum 02
	Satterfield & Pontikes	Refer sheet A8.36 signage schedule, sign type 'A, B, F, L1, J, L, M, Q, 17(Exterior door label) are not identified in the schedule. Please confirm the required locations and quantities for these sign types. If these sign types are not required, please confirm that they are not part of this project scope.	Yes						Addendum 02

	Satterfield & Pontikes	Refer to Sheet S7.09, Section 5. The detail is specified for strip windows with widths greater than 12'-0". Please confirm whether this detail is also applicable for strip windows with widths less than 12'-0".	Yes				5/S7.09 is not applicable for windows with widths less than 12'-0". Windows less than 12'-0" in width are supported by CFMF.	YC	Addendum 02
	Satterfield & Pontikes	Ref. A1.2C – Kindly confirm whether a railing is required in the highlighted portion. If a railing is required, please provide the required railing type and relevant specification/details.	Yes				No railing is required at this location.		Addendum 02
	Satterfield & Pontikes	Please refer to Sheet C5.2 – Utilities Plan and the image below for reference. Kindly confirm the location of the proposed 12-inch water line.	Yes				The callouts on Sheet C5.2 has been adjusted to clearly reference the proposed 12-inch water line shown above. The plans have been updated accordingly for clarity.	AH	Addendum 02
	Satterfield & Pontikes	Throughout the Finish sheets: A4.01 - A4.2E there seems to be missing a Master Finish Schedule. For example, please provide product information for the tags LVT01A and LVT01B	Yes				Refer to Sheet G5.01 and G5.02 for finish schedules.	Aldine Sumolang	Addendum 02
	Satterfield & Pontikes	Sheet A4.1F, Kitchen has TQ01 Floor and Servery also shown as TQ01 but both has different hatch and Arrow markings for floor separation are not matching. Is there any QT01 flooring or is this a Typo? Please Clarify.	Yes				It is a typo. It should be TQ01.	Aldine Sumolang	Addendum 02
	Satterfield & Pontikes	Detail 10/A6.41 indicates a Blade Post System and Detail 12/A6.41 indicates a Solo Post System. The specifications does not identify which post system should be provided. Please confirm whether the glass railing should be supplied with a Blade post system or the Solo post system	Yes				Detail 10&11/A6.41 will be revised to remove conflicting note.		Addendum 02
	Satterfield & Pontikes	Please confirm our understanding of the "Allowances" to be carried: 1. $1,500.00 for a project sign 2. $3,000,000.00 for Owners Contingency Allowance 3. $500,000.00 for the Traffic Sign Allowance	Yes	Add 2 - as part of this schedule			Yes this is correct.		Addendum 02
	Satterfield & Pontikes	Please specify the Area name and Flooring type on sheet A4.2E, below the Stairs E222, and the same for sheet A4.30	Yes				Floor in area below stair E222 is to have LVT04 finish. Refer to STAIR E121 on sheet A4.1E FINISH PLAN. Update on sheet A4.30 will be included in Addendum 2.	Aldine Sumolang	Addendum 02
	Satterfield & Pontikes	TS1.2F shows no theatrical batten mounted lights. Please confirm there are no theatrical lights in the theatrical package.	Yes				Theatrical lighting to be found in specification section 11 61 62. Section to be issued in addendum 02.		Addendum 02
	Satterfield & Pontikes	Refer to Sheet AS2.03. The Decorative Metal Fence and Gate detail indicates an concrete mow strip at the bottom of the fence and gate, as well as, around the building perimeter. Please provide detail for said mow strip	Yes				Decorative metal fence and gate installed fully on paving.		Addendum 02
	Satterfield & Pontikes	Refer to Sheet C3.2. The plan indicates a portable classroom (by others) Please confirm all work asosicated for or with these portable classrooms are NIC "Not in Contract".	Yes				Utilities to portables is in scope. Portables are not in scope.		Addendum 02
	Satterfield & Pontikes	Refer to Sheet C3.2. The plan indicates "by others" items such as: Prop. Generator, Prop. Elec. Transformer, and Prop. Fence. Please confirm all work associated for or with these "by others" items are NIC "Not in Contract".	Yes				Items are in contract. By others refers to other consultants/disciplines. Ref. full drawing set for scope items.	CB	Addendum 02
	Gamma	Stair E121: Finish Plan A4.1E indicates TP03 at the risers and landings, while Finish Plan A4.2E specifies RTR01. Please clarify the intended finish.	Yes				Finish will be TP03. Update on drawings will be included in Addendum 2	Aldine Sumolang	Addendum 02
	Gamma	Elevation A4.38/8 shows TP03 only at the east wall in the curved corridor on Level 01 (Areas C and E); however, on Level 02, this wall is shown as TP03/TP04. Please confirm whether both walls are intended to be TP03/TP04.	Yes				Confirmed. Both wall will receive TP03/TP04. Elevation update will be included in Addendum 2.	Aldine Sumolang	Addendum 02
	Division One	1. It is our understanding that epoxy grout is required at all tile locations per Specification Section 09 30 00, Item 2.04. Please confirm that this is the design intent, as epoxy grout is not typically used throughout projects of this type. We want to ensure that the work is priced accurately.	Yes				Confirmed.	Aldine Sumolang	Addendum 02
	Division One	2. The finish plans indicate BSS at the restroom wall base. Please confirm whether BSS refers to the Schluter DILEX profile shown in Detail 20/A4.44.	Yes				Confirmed. DILEX-AHK	Aldine Sumolang	Addendum 02
	Division One	3. Detail 3/A4.44 indicates aluminum trims; however, Specification Section 09 30 00, Item 2.02, requires brushed stainless-steel trims and accessories. Since there is a significant price difference between these materials, please clarify which finish is required.	Yes				Brushed stainless steel.	Aldine Sumolang	Addendum 02
	Automated Logic	Building Controls: RFP -CSP1003-26 page 45 states: Alternate NO. 3: Section 23 0923 – Direct-Digital Control Devices for HVAC – Owner will select one alternate from Alternates 3A – 3B to be included with the Base Proposal. Do not include Direct-Digital Control Devices for HVAC in the Base Proposal. Alternate Spec 01 2300 page 2, Item E1 states: E. Alternate Number 3: 1. Provide new DDC building management system by Unify as specified and as shown on the drawings in lieu of Automated Logic (ALC). DDC Spec 23 0923 page 2, Section 2.01 states: A. Base Bid: Automated Logic, B. Alternate 3: Unify Question: Please clarify whether Automated Logic will submit with Base bid as indicated in the DDC Spec and Alternate section or Alternate 3A as indicated in the RFP?	Yes				Refer to addendum #2 for manufacturer alternate clarification	MBP	Addendum 02
	Automated Logic	Gas Water Heaters: There are 3 Gas Water Heaters but no CO Monitors shown on plans. Question: Who will provide these and will they need to tie into BAS?	Yes				CO Monitors are not code required for water heaters <200 MBH	MBP	Addendum 02
	Automated Logic	Thermostats: M0.01 General Note 9 states: INSTALL THERMOSTATS WITH PROTECTIVE LOCKING COVER Question: Does this note apply to every thermostat?	Yes				Refer to addendum #2.	MBP	Addendum 02
	Automated Logic	AHU's w/DCV: Mech Schedule shows that all AHU's have Demand Control Ventilation but there is only one (1) sensor with T/H/CO2. Question: Will the sensors be revised to have at least one zone per AHU with CO2 monitoring?	Yes				Refer to addendum #2 for sensor clarification	MBP	Addendum 02
	Brookstone Construction	Stainless steel base (BSS) is shown in the material schedule. In the interior finish details, 20 / A4.44, it shows an aluminum cove base at the tile area. Could you please clarify?	Yes		G5.01		Cove base will be aluminum as per detail. Schedule will be updated in Anddendum 2.	Aldine Sumolang	Addendum 02
	Brookstone Construction	Tether ball set show OFCI. Could you please provide a spec for this?	Yes		AS1.02		Specification to be provided by owner when providing equipment.	CB	Addendum 02

	Brookstone Construction	Are there specs available for 11 61 62? Spec section 11 61 63 / 1.03 B, and section 11 61 43 / 1.04 B lists section 11 61 62 Theatrical Lighting Systems as related work. This spec section is not included in the project spec.	Yes				Specification to be included in addendum 02.		Addendum 02
	Brookstone Construction	Note 43 states that existing asphalt is to be removed. Could you please confirm that asphalt is correct and not concrete?	Yes		C1.4		No asphalt removal is included in the project demolition scope. Accordingly, Demolition Keynote 43 has been removed from the demolition plans	AH	Addendum 02
	Brookstone Construction	Is BIM Coordination required?	Yes				Yes.	CB	Addendum 02
	Brookstone Construction	Are there elevations available for the curved bench?	Yes		9&10 / A8.34		Refer to elevation 1/A8.31	Aldine Sumolang	Addendum 02
	Brookstone Construction	Please confirm this project does not have playground equipment / fall surfacing. Playground equipment is noted on L1.2 and AS1.02, but it does not appear to be included. We believe playground at this campus only refers to the outdoor basketball court.	Yes		L1.2 and AS1.02		Confirmed.		Addendum 02
	Brookstone Construction	Could you please provide details for the backlit custom cut metal signage?	Yes		3 / A4.34		Refer to detail 5/A4.46.	Aldine Sumolang	Addendum 02
	Brookstone Construction	Is custom cut metal signage included in base bid? If so, could you please provide details?	Yes				Yes. Custom metal signage is included. Refer to elevation 5/A4.40 for mounting method.	Aldine Sumolang	Addendum 02
	Brookstone Construction	Floor sinks at 2nd level mechancial rooms have FS2 tags for floor sinks. However, this tag is not in the fixture schedule. Could you please clarify if this is a different sink from FS1?	Yes				Will be addressed in Addendum 02	Brandon Adams	Addendum 02
	Brookstone Construction	Specification 10 5613 was provided for metal storage shelving. General Note #6 states "All metal shelving to be OFOI". Metal utility shelving is also listed as OFOI in the equipment schedule on A8.1A, B, D. Please clarify if we are to include or exclude metal shelving.	Yes				Metal Shelving to be OFOI	CB	Addendum 02
	Brookstone Construction	Hospital bed is listed as CFCI. Could you please provide a spec?	Yes				Mobile Hospital Bed to be OFOI.	CB	Addendum 02
	Brookstone Construction	Decorative concrete topping is shown on the schedule of materials. However, this tage was not found in any other location. Could you please clarify?	Yes				Not in scope.	CB	Addendum 02
	Brookstone Construction	Please confirm if Emergency Responder Radio System (ERRS) will be required. We did not find a specification for this. We did find a specification 27 5129 for Two Way Emergency Communications System, but that appears to be a different system specific to the elevator lobbies, areas of refuge, and fire command.	Yes				ERRS scope to be included in project. Confirmation of scope will be determined at end of construction		Addendum 02
	Brookstone Construction	General notes 8 & 9 state that corner guards are to be provided at all main corridor walkways w/ GWB and tiled wall outwide corners. The only corners guards that are shown are in corridor B111. Should we assume that general notes are correct?	Yes				Confirmed. Corner guards are required at all applicable in locations in corridors and science classrooms.	Aldine Sumolang	Addendum 02
	Brookstone Construction	Partition type Y and Z show linear wood siding. Could you please confirm that this is in reference to the linear wall system (Armstrong Encore Series 1)?	Yes				Confirmed.		Addendum 02
	Brookstone Construction	Spec 09 2400 shows cement plastering spec. and drawing A3.08 refers to it. Plaster location was not seen in the drawings. Could you please point out where this would be installed?	Yes				Specification not applicable to project.	CB	Addendum 02
	Terracon	Pile Nos. 10 and 13 and 33 and 34 have spacing distances of less than 3 diameters, cetner-to-center. Our original geotechnical engineering report recommends a minimum spacing of three diameters, center-to-center, for piles placed in groups beneath square or rectangular caps. However, for piles placed in a linear pattern beneath load bearing walls, a minimum spacing of two diameters center-to-center would generally be accepratable.	Yes	Email			IEG sent an email to Terracon. We are waiting for a response from Terracon.	YC	Addendum 02
	Terracon	Pile nos. 68 and 80 have a spacing distance of less than 3 diameters, center-to-center. Our original geotechnical engineering reports recommends a minimum spacing of three diameters, center-to-center, for piles placed in groups beneath square or rectangular caps. Howevere, for piles in a linear pattern beneath load bearing walls, a minimum spacing of two diameters center-to-center would cenerally be acceptable.	Yes	Email			IEG sent an email to Terracon. We are waiting for a response from Terracon.	YC	Addendum 02
	Terracon	Piles Nos. 334, 337, 339, 346, 347, and 348 have spacing distances of less than 3 diameters, center-to-center. Our original geotechnical engineering report recommends a minimum spacing of three diameters, center-to-center, for piles placed in groups beneath square or rectangular caps. However, for piles placed in a linear pattern beneath load bearing walls, a minimum spacing of two diameters center-to-center would generally be acceptable.	Yes	Email			IEG sent an email to Terracon. We are waiting for a response from Terracon.	YC	Addendum 02
	Gamma	The following Division 23 specifications, do not have other manufacture names in the spec section beside named on the schedule. 23 21 14-Hydronic Specialties- no manufacture named in spec 23 21 23-Hydronic Pumps-no manufacture named in spec besides named on mechanical schedule. 23 25 00-HVAC Water Treatment-no named manufacture in spec. 23 36 00-Air Terminal Units-No named manufacture in specs, besides named on mechanical schedule. 23 81 26.13-Small-Capacity Split-system Air Conditioners-No named manufacture in specs. 23 82 00-Convestion Heating and Cooling Units-No named manufacture in specs.	Yes				Refer to addendum #2 for mechanical equipment manufacturers. Where no manufacturer is listed, refer to specifications for manufacturer requirements.	MBP	Addendum 02
	Pogue Construction	Please confirm whether liquidated damages apply to this project and, if so, the amounts.	Yes	Add 2	General Narrative		Liquidated damages to amount to $1,000. Refer to the General narrative for clarification.	Caitlin Munch	Addendum 02
	Pogue Construction	Exhibit A holds alternate pricing for 120 days; 01 2300 says 45 days. Please confirm which governs.	Yes	Add 2	01 2300		The specification section will be updated to match Exhibit A.	Caitlin Munch	Addendum 02
	Pogue Construction	Please confirm Unit Price 20 (structural steel) is priced per pound. The unit field reads 'Ea.'	Yes	Add 2 - as part of this schedule			Per pound		Addendum 02
	Pogue Construction	Unit Prices 7 and 8 include removal of existing base and signage. Please confirm these are add/deduct unit prices for work installed under this contract.	Yes	Add 2 - as part of this schedule			There will be no existing base or signage.		Addendum 02
	Pogue Construction	Please confirm the allowances to carry. The Addendum 1 RFI log directs a $500,000 allowance for the traffic signal and a $15,000 allowance whose description is cut off in the published log. Please provide the full response and confirm whether 01 2100 will be revised.	Yes	Add 2	01 2100		Specifcation to be updated.	Caitlin Munch	Addendum 02
	Pogue Construction	Please confirm improvements to Huffsmith-Kohrville are to be included in this CSP and who is responsible for permitting and inspection fees.	Yes	Add 2 - as part of this schedule			These improvements are to be included in the bid. The GC is responsible for permit and inspection fees.	Caitlin Munch	Addendum 02
	Pogue Construction	01 1400 (Work Restrictions) requires pricing per a phasing plan included in the project manual, but no phasing plan is included, and 1.01.C.7 leaves the commencement and substantial completion dates blank. Please confirm the project is single phase and the RFP milestone dates govern.	Yes	Add 2 - as part of this schedule			Yes, this is a single phase project where the RFP dates govern.	Caitlin Munch	Addendum 02

	Pogue Construction	The alternate structure is defined three different ways and it determines what is in the base bid for the major HVAC equipment. Exhibit S excludes chillers (23 6426), air handling units (23 7313), and DDC controls (23 0923) from the Base Proposal and prices them only as Owner-selected alternates (1A-1C chillers: Carrier/Trane/Dunham Bush; 2A-2C AHUs: Carrier/Trane/Temptrol; 3A-3B controls: Automated Logic/Unified). Section 01 2300 instead carries Trane equipment and ALC controls in the base bid, with alternates 1A/1B and 2A/2B (Carrier, JCI/York) and Alternate 3 as Unify in lieu of ALC. Sheet G1.22 lists the alternates differently again, and the Addendum 1 mechanical sheets reference 'Alternate #3: Unify in lieu of ALC,' which matches 01 2300 but not Exhibit S. We cannot price the base mechanical scope or complete the Part 2 alternates form until this is resolved. Please confirm: (1) whether chillers, AHUs, and DDC controls are in or out of the Base Proposal; (2) the governing alternate numbering and manufacturer list for the Part 2 form; and (3) that 01 2300 and/or Exhibit S will be reissued to match. This was raised in the Addendum 1 RFI log without a posted response.	Yes				Refer to addendum #2 for mechanical equipment manufacturer alternate clarifications	MBP	Addendum 02
	Pogue Construction	Please supply a spec for single-ply assemblies R103, R110, and R111 tagged on A7.01.	Yes				Specification to be provided in addendum 02.	CB	Addendum 02
	Pogue Construction	Please confirm if AESS is applicable to the project and, if so, please clarify which members and AESS level.	Yes				Yes. AESS is applicable to the project. Reference 1/S6.13 & 2/S6.13	CB	Addendum 02
	Pogue Construction	08 4500 requires a flame spread of 25 or less at the interior face sheets. The building is fully sprinklered, and IBC Table 803.13 allows Class B at these locations. Please confirm whether Class B face sheets are acceptable.	Yes				Provide flame spread per 2021 IBC acceptable class.	CB	Addendum 02
	Pogue Construction	Please clarify where sprayed insulation per 07 2129 applies.	Yes				Reference A6 series for location of scope.		Addendum 02
	Pogue Construction	08 3323 and 08 3326 specify surface mounting, but A3.09 details 13 through 16 show a between-jamb application at CFMF walls. Please confirm which governs. If between-jamb, please revise the details to provide guide pack-off clearance (see attached markup) and clarify the 3x3 tube supports required at grilles F132A/B.	Yes				These will be recessed. Specification to be updated in addendum 02.	CB	Addendum 02
	Pogue Construction	Please confirm if overhead folding doors per 08 3313 are applicable. A typical detail appears on A3.21, but no door marks are shown.	Yes				Section 08 3313 and details on A3.21 are applicable to doors E117H and E117G.	CB	Addendum 02
	Pogue Construction	Please confirm if bicycle racks per 12 9313 are in the project and, if so, quantity and locations.	Yes				Bicycle Racks are in the drawings. Ref. AS1.02 for a total of (4) racks.	CB	Addendum 02
	Pogue Construction	Please confirm if cathodic protection per 26 4200 applies to this project.	Yes				This spec section can be removed in its entirety	Mason High	Addendum 02
	Pogue Construction	Please confirm if dedicated outdoor air units per 23 7433 apply. None are scheduled.	Yes				Refer to Add 2 - remove spec section in its entirety	MBP	Addendum 02
	Pogue Construction	DCT01 (decorative concrete topping) has a Schedule of Materials row but no spec section or plan location. Please confirm if it is in the project.	Yes				Not in scope.		Addendum 02
	Pogue Construction	Notes 8 and 9 on the finish plans require corner guards at all main corridor and tiled outside corners, but guards are only tagged at Corridor B11. Please confirm the notes govern throughout. Please also confirm surface-mounted guards per 10 2600 or flush/fire-rated per detail 18/A4.44.	Yes				Confirmed. Corner guards are required at all applicable in locations in corridors and science classrooms. Corner guards will be flush mount non rated. Spec and detail update will be included in Addendum 2.	Aldine Sumolang	Addendum 02
	Pogue Construction	The one-line shows a 200kW natural gas generator, the site keynote says 125kW, and 26 3213 specifies diesel. Please confirm size and fuel and reissue the spec.	Yes				Site note will be updated to 200kW and spec section will be updated to reflect this in Addendum 2	Mason High	Addendum 02
	Pogue Construction	Please confirm lightning protection is not required. There is no spec section and none is shown on the drawings.	Yes				No lightning protection required or requested for this project.	Mason High	Addendum 02
	Pogue Construction	Please supply spec section 11 6162, Theatrical Lighting Systems. It is referenced by 11 6133 and 11 6143 and shown on TS16.01.	Yes				11 6162 to be included in Addendum 2	MW	Addendum 02

00802-04-01 Tomball ISD Intermediate School Replacement							
Spec Number	**Item**	**Basis of Design**	**Substituted product**	**Date Received**	**From**	**Response**	**Comments**
10 5100	Lockers		Duralife Lockers	7/21/2026	Courtney Smith	Declined	
10 2113.17	Toilet Partitions		Toilet Partitions	7/21/2026	Courtney Smith	Declined	
07 2700	Air / Weather Barrier		TK-AirMax 2104	7/21/2026		Declined	
10 1100	Visual Display Units	Claridge / Table Ticket	Platnium Visual	7/22/2026		Accepted	
			PSA	7/23/2026	Keith Patterson	Accepted	
			Elevate SBS	7/24/2026	Peter Saker	Accepted	
07 4213.16			Laminator's AdaptaClad RS	7/24/2026	Peter Saker	Declined	
14 2400	Hydraulic Elevator		Kaiser Hydraulic Elevator	7/27/2026	Brooke Anderson	Declined	
12 3551	Instrument Storage		UltraStor Instrument Storage Cabinets	7/27/2026	Carissa Schmidt	Accepted	
05 5133	Metal Ladders		Access Ladder - O'Keefe	7/28/2026	Saira Seldo	Accepted	
07 52 16	SBS Modified Bituminous Roofing		Modified Bitumen System - (Sika Shield HB79 + Sika Shield E54)	7/28/2026	Cristina Vides	Accepted	
07 4213.26	Aluminum Metal Plate Wall Panels		Dri-Design Metal Wall Panels	7/29/2026	Leila Meyer	Accepted	
	Aluminum Metal Plate Wall Panels		American Metalcraft Inc. RS100 Metal Plate Wall Panel System	7/30/2026	Jill Crawford	Declined	
09 65 66		Elasti-Plus 7+2 by Connor	Synchro 7+2 by Action Floor Systems, LLC	8/1/2026	Don G. Brown	Accepted	
07 52 16			GAF - Ruberoid SBS Smooth	8/1/2026		Accepted	
07 52 16			GAF - Ruberoid Cap, Insulation, Adhesive & SBS Accessories	8/1/2026		Accepted	