OFFICIAL DATE OF ADDENDUM:
May 17, 2021

ADDENDUM NO: 1 - issued by the

TEXAS DEPARTMENT OF TRANSPORTATION

NEW MCKINNEY AEM FACILITY

LOCATION:	**2205 TX 5**	PROJECT ID #:	**18-470420012-REBID**
CITY/ST:	**MCKINNEY, TEXAS 75069**	COUNTY:	**COLLIN**
SITE NO.:	**189799**	DISTRICT:	**DALLAS**
BLDG NO.:	**188196, 188197**		

ESTIMATED COST: **$10,100,000.00**
BID GUARANTY or BID BOND: **$100,000.00**

PRE-BID DATE, TIME: **MAY 11, 2021 @ 1:00 PM CST**
BID DATE, TIME: **JUNE 1, 2021 @ 1:00 PM CST**
BIDS MUST BE RECEIVED BY: NOON (12:00 PM) FOR 1:00 PM READING

Project by the: TEXAS DEPARTMENT OF TRANSPORTATION
SUPPORT SERVICES DIVISION (SSD), FACILITIES PLANNING & MANAGEMENT
150 Riverside Dr., 4th Floor - North Tower, Austin, TX 78704

ADDENDUM NO. 1 IS ATTACHED WITH THIS NOTIFICATION.

Available to download from:
Electronic State Business Daily (ESBD) http://www.txsmartbuy.com/sp
Use Agency 601 for Requisition Number: 18-470420012-REBID
TxDOT Plans Online https://www.txdot.gov/business/letting-bids/plans-online.html
TxDOT Facilities Letting https://www.txdot.gov/business/letting-bids/facilities.html

NOTE: **THIS ADDENDUM SHALL BECOME AN OFFICIAL PART OF THE PLANS AND SPECIFICATIONS AND BIDDERS SHALL ACKNOWLEDGE RECEIPT OF THIS ADDENDUM IN PROPOSAL PACKAGE 1 (CONTRACT DOCUMENTS), "ADDENDUM ACKNOWLEDGMENT" SHEET**

NOTICE TO BIDDERS:

This Addendum shall be considered as part of the Contract Documents for the above mentioned project as though it had been issued at the same time and incorporated therewith. Where provisions of the following supplementary data differ from those of the original Contract Documents, this Addendum shall govern and take precedence. Work not specifically deleted, modified, changed or altered by this Addendum shall remain in effect as a part of the Contract Documents.

Bidders are hereby notified that they shall make any necessary adjustment(s) in their estimates based on this Addendum. It will be construed that each bidder's proposal is submitted with full knowledge of all modifications and supplemental data specified herein.

ADDENDUM NO. 1

Revise specifications and plans as per the attached.

Add RFI responses as per the attached.

FAILURE TO ACKNOWLEDGE RECEIPT OF AN ADDENDUM WILL RESULT IN THE BID NOT BEING READ.

INCOMPLETE PROPOSAL PACKAGE 1 (CONTRACT DOCUMENTS) WILL BE REJECTED

USE THE BID BOND FORM IN THE PROPOSAL. NO OTHER BID BOND FORM IS ACCEPTABLE. OBTAIN SIGNATURES, SEALS AND THE POWER OF ATTORNEY. THIS FORM MUST BE SIGNED BY THE CONTRACTOR AND SURETY – WITH AN IMPRESSED SEAL. AFTER SIGNATURES – INCLUDE THE COMPLETED BOND IN THE PROPOSAL.

Total pages to this Addendum including cover pages: 124

Jacobs

DAL MCKINNEY AEM FACILITY
2205 TX-5, McKinney, TX 75069
DALLAS DISTRICT - 18
PROJECT NO: 18-470420012

Issued by:
Steven John Tremmel, AIA
Jacobs
1999 Bryan St.
Suite #1200
Dallas, Texas 75201
214-563-8524
steven.tremmel@jacobs.com

05/17/2021

Project:
McKinney Area Engineering and Maintenance Facility
Dallas District (18), Collin County
18-470420012
100% IFC Package
McKinney,TX

Addendum No 01: 05-17-2021

ADDENDUM NO. 1

This addendum forms a part of the Contract Documents and modifies the original Project Specifications and Drawings dated 100% April 21, 2021, as noted below. Acknowledge receipt of the Addendum in the space provided in the bid form. Failure to do so may subject the Bidder to disqualification.

REFERNCE DRAWINGS:

See Revised Drawings dated May 17, 2021 to replace those in the Contract Document set:

G0.0 - COVER SHET & INDEX OF DRAWINGS
C1.1 - DEMOLTITION PLAN
S0.2 - STRUCTURAL NOTES
S1.2 - FOUNDATION PLAN AREA A
S1.3 - FOUNDATION PLAN AREA B
E4.1 - ELECTRICAL SCHEDULES
FS1.1 - FUEL STATION DETAILS

REFERENCE SPECIFICATIONS:

00 00 00	**Table of Contents**
00 01 07	**Seals Page**
02 41 00	**Site Demolition**
03 30 00	**Cast-In-Place Concrete**
22 13 16	**Sanitary Waste and Vent Piping**
31 11 00	**Clearing and Grubbing**
31 20 00	**Earth Moving**
31 50 00	**Excavation Support and Protection**
32 11 23	**Aggregate Base Courses**
32 12 16	**Asphalt Paving**
32 17 23	**Pavement Markings**

33 05 00 Common Work Results for Utilities
33 11 00 Water Distribution
33 30 00 Sanitary Sewage Utilities
33 39 13 Sewer Manholes, Frames, and Covers
33 51 00 Natural Gas Distribution

REQUEST FOR INFORMATION (RFI's):

1. Q. Will the contractor require TxDOT security badging?
   A. No, the contractor is solely responsible to securing the construction site.

2. Q. What is TxDOT's policy regarding current market conditions including estimate expiration, rising material costs and material availability?
   A. The contractor is solely responsible for all market conditions and should factor that into their bid.

3. Q. Will the REBID Documents supersede all other documents that were previously/originally issued on this project?
   A. Yes, the REBID Documents supersede all other documents that were previously/originally issued on this project.

4. Q. Does the Art /Wall and Limestone Bench allowance still apply to this project?
   A. No, the REBID Documents supersede all other documents that were previously/originally issued on this project.

5. Q. Is there a spec section for Asphalt Paving and Pavement Striping?
   A. See attached drawings and specifications.

6. Q. Can you confirm the quantities of earth for the soil remediation?
   B. For bid assume the estimated quantity of soil to be removed to be 2,600 CY.

7. Q. The specs call for Schlage lock sets and the plans call for Best?
   C. Basis of design is for Schlage locks but regardless of lock manufacture all cores shall be BEST per TxDOT standards.

8. Q. What are the specs for the Environmental Barrier under the slab?
   D. Additional type of vapor barrier has been added to 033000 Cast-in-Place Concrete specification. Plans have been modified to show specific locations.

9. Q. Can you supply a complete list of owner supplied equipment?
   E. Contractor is responsible for bid estimate and take-off. Additional information throughout the contract documents is shown on but not limited to A.9.4 & A9.5 Furniture and Equipment plans.

END OF ADDENDUM

TABLE of CONTENTS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

DIVISION 08 - OPENINGS

DIVISION 09 - FINISHES

DIVISION 10 - SPECIALTIES

DIVISION 11 - EQUIPMENT

NONE

DIVISION 12 - FURNISHINGS

DIVISION 13 – SPECIAL CONSTRUCTION

DIVISION 14 – CONVEYING EQUIPMENT

NONE

DIVISION 21 – FIRE SUPPRESSION

NONE

DIVISION 22 - PLUMBING

DIVISION 33 - UTILITIES

END OF SECTION

DOCUMENT 000107 - SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

A. Architect:

1. Steven Tremmel
2. Texas Architect #19414
3. Firm: Jacobs
4. Responsible for Divisions 01-49 Sections except where indicated as prepared by other design professionals of record.

B. Landscape Architect:

1. Chad St.John
2. Texas Landscape Architect #2154
3. Firm: Jacobs
4. Responsible for Division 32, except 323119.53.

C. Structural Engineer:

1. Gabriel Serna, PE
2. Texas PE #99793.
3. Firm: Jacobs
4. Responsible for Division 03, 04 and 05.

D. Telecommunications Design:

1. Brandon Houk, RCCD.
2. #183352R.
3. Responsible for Division 27 and 28.

E. HVAC Engineer / Plumbing Engineer:

1. Ken Meline, PE.
2. Texas PE #61722.
3. Responsible for Division 22 and 23.

04/21/21

F. Electrical Engineer:

1. John Haley, PE.
2. Texas PE #112905.
3. Responsible for Division 26.

04/21/21

G. Civil Engineer:

1. Vincent V. Mazidi, PE.
2. Texas PE #113088.
3. Responsible for earthwork, pavement, utilities specifications.

5/17/2021

Addendum #1: 05/17/2021

END OF DOCUMENT 000107

SECTION 02 41 00 - SITE DEMOLITION

PART 1 - GENERAL

1.1 GENERAL DOCUMENTS

A. The Terms and Conditions of the Contract, including Supplementary and Special Conditions of the Contract, and the Drawings apply to this Section.

1.2 SUMMARY

A. Furnish all material, equipment, and labor necessary to demolish and remove from the site those items noted on the drawings.

1.3 RELATED SECTIONS:

A. Section 31 20 00 – Earth Moving

B. Section 31 11 00 – Clearing and Grubbing

1.4 REFERENCES:

A. OSHA Regulations.

B. American National Standards Institute (ANSI)

1. ANSI A10.6-2006 – Safety and Health Program Requirements for Demolition Operations.

C. City of McKinney Standards and Specifications

1.5 GENERAL REQUIREMENTS:

A. Remove rubbish and debris from the site on a daily basis unless otherwise directed.

B. In the interest of occupational safety and health, perform work in accordance with OSHA and ANSI requirements.

1.6 REGULATORY AND SAFETY REQUIREMENTS

A. Comply with federal, state and local regulations regarding demolition activities, hauling and disposal of materials.

1.7 DUST AND DEBRIS CONTROL

A. Prevent the spread of dust and debris and avoid creation of a nuisance in the surrounding area.

B. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

C. Sweep pavements as often as necessary to control the spread of debris.

1.8 PROTECTION

A. Traffic Control Signs

1. Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights.

B. Existing Work

1. Before beginning any demolition work, survey the site and examine the drawings and specifications to determine the extent of the work.

C. Items to Remain in Place

1. Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Owner. Repair or replace damaged items as approved by the Owners Representative. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload pavements to remain. Provide new supports and reinforcement for existing construction weakened by demolition or removal work.

D. Existing Construction

1. Do not disturb existing construction, vegetation or natural features beyond the extent indicated or necessary for installation of new construction.

E. Trees

1. Protect trees within the project site which might be damaged during demolition, and which are indicated to be left in place. Reference Landscape Plans and Specifications for tree protection and removal.

F. Utility Service

1. Maintain existing utilities indicated to stay in service and protect against damage during demolition operations. Prior to start of work, the Contractor will contact owners of utility lines to be disconnected, and coordinate sealing of utilities serving each area of alteration or removal.

G. Facilities

1. Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities.

1.9 SPECIAL REQUIREMENTS

A. Existing utilities are to remain in place and operational until all utility relocations as shown on the plans have been constructed, inspected and approved by the Owners Representative.

1.10 BURNING

A. The use of burning at the site for the disposal of materials, or as a method of demolition, will not be permitted.

B. The accumulation of combustible debris in large quantities in one location will not be permitted. Remove combustible material from the site on a daily basis.

C. Do not allow combustible materials to accumulate which could result in an accidental fire.

1.11 EXPLOSIVES

A. The use of explosives in any form for any purpose on this site is prohibited.

1.12 HAZARDOUS CONDITIONS

A. Exercise care to avoid leaving hazardous conditions on the site at the end of a work day. If unavoidable, erect appropriate barricades, signs and take other necessary precautions to protect the public and passersby from these hazardous areas.

B. Large accumulations of rubble which may shift shall be avoided.

PART 2 - PRODUCTS

2.1 FILL MATERIAL

A. Backfill material for depressions or excavations resulting from demolition operations shall meet the requirements of Section 31 20 00.

PART 3 - EXECUTION

3.1 SURFACE FEATURES

A. The Contractor is to install all erosion and sedimentation control features including tree protection per the plans prior to any demolition activities.

B. All existing surface features shown or not shown on the plans that exist and are in conflict with proposed new improvements shall be demolished prior to any other demolition activities. Demolition shall be coordinated with the Owner's Designated Representative.

C. Existing trees

1. Reference Landscape plans and specifications.

3.2 UTILITIES AND RELATED EQUIPMENT

A. General Requirements

1. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Owner's Designated Representative. Do not interrupt existing utilities except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition or deconstruction work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.
2. Refer to Section 31 11 00 – Clearing and Grubbing for coordination and protection requirements of existing utilities that are to remain active during construction.
3. Notify Utility Owners' Representative to turn off affected utility services that are to be abandoned no less than 48 hours prior to starting demolition.

B. Disconnecting Existing Utilities

1. Remove existing utilities as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Owner's Designated Representative. When utility lines are encountered that are not indicated on the drawings, the Owner's Designated Representative shall be notified prior to further work in that area.

3.3 PAVING AND SLABS

A. Remove concrete and asphaltic concrete paving and slabs, including aggregate base. Provide neat sawcuts at limits of pavement removal as indicated. Pavement and slabs designated to be recycled and utilized in this project shall be moved, ground and stored as directed by the Owner's Designated Representative. Pavement and slabs not to be used in this project shall be removed from the Owner's property at Contractor's expense.

3.4 CONCURRENT EARTH-MOVING OPERATIONS

A. Do not begin excavation, filling, and other earth-moving operations that are sequential to demolition or deconstruction work in areas occupied by structures to be demolished or deconstructed until all demolition and deconstruction in the area has been completed and debris removed. Fill holes, open basements and other hazardous openings.

3.5 DUST CONTROL

A. Sprinkle debris, and use temporary enclosures as necessary to limit dust to the lowest practicable level.

B. Do not use water to an extent that may cause flooding, contaminated runoff, or icing.

3.6 DISPOSAL

A. All materials noted to be removed and disposed of become the property of the Contractor. All material shall be disposed of off-site in a legal manner. The Contractor shall include in his work the careful transporting of debris so that no mud, dirt, gravel, lumber, nails, concrete or any other material is allowed to fall on public property or any other property other than the destination to which the removed materials are legally being transported. In the event some materials fall on public property or other property the Contractor shall be responsible for damage caused and clean-up costs.

3.7 BACKFILLING

A. Backfill to existing ground level, foundation level of new construction, finish grades as shown on the drawings of subgrade elevation of new improvements.

B. Backfill material and compaction shall conform to Sections 31 20 00.

C. Demolition debris shall not be used as backfill material.

3.8 SALVAGE

A. Equipment and materials, including piping within the limits of demolition, unless otherwise specified, will become the property of the Contractor.

END OF SECTION 02 41 00

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, and other pozzolans materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Aggregates.
6. Admixtures:

   a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

7. Vapor retarders.
8. Curing materials.
   Joint fillers.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Air content.
6. Nominal maximum aggregate size.
7. Intended placement method.
8. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

a. Location of construction joints is subject to approval of the Engineer.

D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Vapor retarders.
5. Joint-filler strips.

1.5 QUALITY ASSURANCE

A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.7 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I, or Type II
2. Fly Ash: ASTM C618, Class C or F.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C33/C33M coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C260/C260M.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

E. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.3 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A, not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Sheet Vapor Retarder, Class A: ASTM E1745, Class A, not less than 20 mils thick. Methane transmission rate ASTM A1434 7.0 GTR. Include manufacturer's recommended adhesive or pressure-sensitive tape. Drago Wrap Vapor Instrusion Barrier, by Stego Industries, Vaporblock Plus Series (VBP20) by Raven or approved equal. Refer to Drawings for specific locations

2.4 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

C. Water: Potable or complying with ASTM C1602/C1602M.

2.5 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Other Pozzolans: 25 percent by mass.
2. Slag Cement: 50 percent by mass.
3. Total of Fly Ash or Other Pozzolans, Slag Cement: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass.
4. Total of Fly Ash or Other Pozzolans: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.

2.6 CONCRETE MIXTURES

A. Class A : Normal-weight concrete used for interior slabs on grade, footings.
1. Minimum Compressive Strength: As indicated on drawings.
2. Maximum w/cm: 0.45.

3. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

B. Class B: Normal-weight concrete used for stem walls/grade beams
1. Minimum Compressive Strength: As indicated on drawings.
2. Maximum w/cm: 0.45.
3. Air Content: 4.5 percent, plus or minus 1.5 percent at point of delivery
4. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94

PART 3 - EXECUTION

3.1 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

3.2 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
4. Lap joints 6 inches and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.

a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

B. The OWNER will utilize third-party inspectors to verify proper installation of the vapor intrusion barrier. Inspections may include performance of smoke tests, pressure tests, adhesive bonding confirmation, penetration seal verification, and termination review to verify the barrier will perform as specified. CONTRACTOR will need to coordinate with the selected inspector to allow inspection prior to completion of the installation. Contact information will be provided after award.

3.3 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Engineer.
2. Place joints perpendicular to main reinforcement.

    a. Continue reinforcement across construction joints unless otherwise indicated.
    b. Do not continue reinforcement through sides of strip placements of floors and slabs.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

3.4 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by the Engineer in writing, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

a. Do not use vibrators to transport concrete inside forms.
b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.5 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.

a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.

b. Remove projections larger than 1 inch.
c. Tie holes do not require patching.
d. Surface Tolerance: ACI 117 Class D.
e. Apply to concrete surfaces not exposed to public view.

2. ACI 301Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.

a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
b. Remove projections larger than 1/4 inch.
c. Patch tie holes.
d. Surface Tolerance: ACI 117 Class B.
e. Locations: Apply to concrete surfaces exposed to public view.

3.6 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view.

3.7 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 6 incheshigh unless otherwise indicated on Drawings, and extend base not less than 6 inchesin each direction beyond the maximum dimensions of

supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.

3. Minimum Compressive Strength: 3000 psiat 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices.

    a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    b. Cast anchor-bolt insert into bases.
    c. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.

1. Cast-in inserts and accessories, as shown on Drawings.
2. Screed, tamp, and trowel finish concrete surfaces.

3.8 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305.1, before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. If forms remain during curing period, moist cure after loosening forms.
3. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

    a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
    b. Continuous Sprinkling: Maintain concrete surface continuously wet.
    c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
    d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.

C. Curing Unformed Surfaces: Comply with ACI 308.1as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:

    a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:

        1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

            a) Lap edges and ends of absorptive cover not less than 12-inches.
            b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

        2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

            a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
            b) Cure for not less than seven days.

        3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

            a) Water.
            b) Continuous water-fog spray.

    b. Floors to Receive Polished Finish: Contractor has option of the following:

        1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

            a) Lap edges and ends of absorptive cover not less than 12 inches.
            b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

        2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

            a) Water.
            b) Continuous water-fog spray.

3.9 TOLERANCES

A. Conform to ACI 117.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

    a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

        1) Project name.
        2) Name of testing agency.
        3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
        4) Name of concrete manufacturer.
        5) Date and time of inspection, sampling, and field testing.
        6) Date and time of concrete placement.
        7) Location in Work of concrete represented by samples.
        8) Date and time sample was obtained.
        9) Truck and batch ticket numbers.
        10) Design compressive strength at 28 days.
        11) Concrete mixture designation, proportions, and materials.
        12) Field test results.
        13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
        14) Type of fracture and compressive break strengths at seven days and 28 days.

B. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

C. Inspections:

1. Headed bolts and studs.
2. Verification of use of required design mixture.

3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

    a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M:

    a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    b. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete.

    a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C1064/C1064M:

    a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C31/C31M:

    a. Cast and field cure two sets of three 4-inch by 8-inch cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C39/C39M.

    a. Test one set of two field-cured specimens at seven days and one set of three specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.

8. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by the Engineer but will not be used as sole basis for approval or rejection of concrete.
9. Additional Tests:

    a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.

        1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.

10. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
11. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.11 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 033000

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.
3. Encasement for underground metal piping.

1.2 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.

C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

D. Adhesive Primer: ASTM F 656.

1. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Solvent Cement: ASTM D 2564.

1. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Charlotte Pipe and Foundry Company.
2. Tyler Pipe; a part of McWane family of companies.

B. Pipe and Fittings: ASTM A 888 or CISPI 301.

C. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Charlotte Pipe and Foundry Company.
b. Fernco Inc.
c. Ideal Clamp Products, Inc.
d. Tyler Pipe; a subsidiary of McWane Inc.

2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

D. Cast-Iron, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Charlotte Pipe and Foundry Company.
b. MG Piping Products Company.

2. Standard: ASTM C 1277.

3. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 SPECIALTY PIPE FITTINGS

A. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:

a. Description:

1) Standard: ASSE 1079.
2) Pressure Rating: 125 psig minimum at 180 deg F.
3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Nipples:

a. Description:

1) Electroplated steel nipple complying with ASTM F 1545.
2) Pressure Rating: 300 psig at 225 deg F.
3) End Connections: Male threaded or grooved.
4) Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Drain: 1/4 inch per foot downward in direction of flow for piping NPS 2 and smaller; 1/8 inch per foot downward in direction of flow for piping NPS 3 and larger. All sanitary drains shall be 24” below finished floor.
2. Vent Piping: Slope down toward vertical fixture vent or toward vent stack.

M. Install steel piping according to applicable plumbing code.

N. Install stainless-steel piping according to ASME A112.3.1 and applicable plumbing code.

O. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

P. Install aboveground PVC piping according to ASTM D 2665.

Q. Install underground PVC piping according to ASTM D 2321. With 4” sand on all sides top and bottom.

R. Install engineered soil and waste drainage and vent piping systems as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.

S. Plumbing Specialties:

1. Install backwater valves in sanitary waste gravity-flow piping. Comply with requirements for backwater valves specified in Division 22 Section "Sanitary Waste Piping Specialties."

2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Division 22 Section "Sanitary Waste Piping Specialties."
3. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Division 22 Section "Sanitary Waste Piping Specialties."

T. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

U. Install sleeves for piping penetrations of walls, ceilings, and floors.

V. Install sleeve seals for piping penetrations of concrete walls and slabs.

W. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.2 JOINT CONSTRUCTION

A. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.3 SPECIALTY PIPE FITTING INSTALLATION

A. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

3.4 VALVE INSTALLATION

A. General valve installation requirements are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

B. Shutoff Valves:

1. Install shutoff valve on each sewage pump discharge.
2. Install gate or full-port ball valve for piping NPS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
3. Vertical Piping: MSS Type 8 or Type 42, clamps.
4. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
6. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

C. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

D. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

E. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.

F. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.

G. Install supports for vertical copper tubing every 10 feet.

H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Comply with requirements for backwater valves, cleanouts and drains specified in Division 22 Section "Sanitary Waste Piping Specialties."
6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 and smaller shall be the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Aboveground, soil and waste piping NPS 5 and larger shall be the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

D. Aboveground, vent piping shall be the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

E. Underground will extend 12” above ground, soil, waste, and vent piping shall be the following:
1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
2. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION

SECTION 31 11 00 - CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 GENERAL DOCUMENTS

A. The Terms and Conditions of the Contract, including Supplementary and Special Conditions of the Contract, and the Drawings apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Protection of existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above and below grade site improvements.
6. Site Preparation.
7. Erosion protection, noise and dust control.

1.3 RELATED WORK

A. Related work of other sections includes but is not limited to:

1. Section 02 41 00 – Site Demolition
2. Section 31 20 00 – Earth Moving

1.4 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil material.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and as indicated on the Tree Protection Plan.

F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.5 CONDITIONS

A. Contractor is referred to the Special Conditions and to other applicable sections of these Specifications in regard to protection of existing improvements and property shown to remain, as well as the proper barricading of all work areas.

B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
3. The Contractor shall be required to remove mud or debris from existing adjacent streets scheduled to remain in service throughout his contract period.
4. The Contractor shall be responsible and protect the Owner from damage during haul operations. Any damage shall be repaired at the Contractor's expense.

C. Erosion Protection: Provide erosion control as shown on the plans and maintain for the duration of the project. Provide routine maintenance as required to maintain integrity of erosion and sedimentation protection measures and remove any accumulations of mud or debris which would jeopardize the integrity of control measures. Refer to plans for details.

D. Dust Control: The Contractor shall exercise care during site clearing operations to confine dust to the immediate work area and shall employ dust control measures to the satisfaction of the Owner to ensure adequate dust control throughout site clearing operations.

E. The use of explosives will not be permitted.

1.6 SALVAGE OF MATERIALS

A. Contractor to deliver to the Owner all items that are specified to be salvaged and retained by the Owner (as applicable and shown on the Drawings). Owner’s Designated Representative shall direct Contractor in the field of where to deliver the salvaged material. The Contractor has salvage rights for all other existing materials, parts, or accessories scheduled for demolition.

B. All items specified to be removed or required to be removed because of conflicts with proposed improvements shall be removed from the Owner's property in a timely manner.

1.7 LEGALLY PERMITTED LANDFILL – CERTIFICATION

A. The Contractor shall dispose of all materials in a legally permitted landfill, permitted to accept construction waste, as determined by the Texas Department of Health, Municipal Solid Waste Management Regulation.

B. The Contractor shall be required to provide written evidence of the permitted landfill prior to commencement of site clearing operations.

1.8 DEMOLITION

A. Removal of Miscellaneous Items: Contractor shall remove all other miscellaneous items not identified elsewhere, for the purposes of carrying out the Work, and dispose of in accordance with Item 1.6 of this Section.

1.9 REFERENCES

A. OSHA Excavation and Trench Safety Standards.

1. 29 CFR Part 1926 - OSHA Health and Safety Standards for Excavations.

B. ASTM: American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103, U.S.A. All references are to current active standard.

1. ASTM D4318 – Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to store at the site, and handle in a manner which will maintain the materials in their original manufactured or fabricated condition until ready for use.

PART 2 - PRODUCTS

2.1 TREE WOUND PAINT

A. Bituminous based paint of standard manufacture specially formulated for tree wounds.

2.2 HERBICIDE

A. Comply with Federal Insecticide, Fungicide, and Rodenticide Act (Title 7 U.S.C. Section 136) for requirements on contractor's licensing, certification and record keeping. Contact the command Pest Control Coordinator prior to starting work.

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect and maintain benchmarks and survey control points from disturbance

during construction.

B. Roads and Walks

1. Keep roads and walks free of dirt and debris at all times.

C. Trees and Shrubs

1. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

D. Utility Lines

1. All existing utility locations shown on plans are approximate, based on information provided by utility service providers and field surveys. Utilities were not uncovered to determine precise locations, except as noted on the plans. The contractor shall verify the location of underground utilities and drainage structures at least forty- eight (48) hours prior to construction, whether shown on the plans or not, and shall protect same during construction.
2. Protect existing utility lines that are not identified to be removed. Notify the Owner's Designated Representative immediately of damage to or an encounter with an unknown existing utility line. The Contractor shall be responsible for the repairs of damage to existing utility lines that are indicated or made known to the Contractor prior to start of clearing and grubbing operations. When utility lines which are to be removed are encountered within the area of operations, the Contractor shall notify the Owner's Designated Representative in ample time to minimize interruption of the service.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Install erosion and sedimentation controls prior to commencing operations that disturb soil.

3.3 TREE AND PLANT PROTECTION

A. Protect trees and plants as described in the Drawings.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 SITE CLEARING AND GRUBBING

A. All areas of proposed construction shall be stripped of existing vegetation, concrete, asphalt and six inches (6") of topsoil, except as noted on the plans. Topsoil is to be stockpiled for reuse on the project, as directed below. The exposed subgrade shall be proof rolled with at least a 15-ton pneumatic roller to detect weak soil support areas. These areas will be removed and replaced according to the following:

1. Areas not designated for new improvements shall be reshaped and filled to

finished grade, less topsoil requirement.

2. Areas designated for new improvements shall be reshaped and filled to subgrade with material meeting requirements for select fill material.

    a. Place lifts of select fill in thin, loose layers not exceeding eight inches in thickness to the desired rough grade and compact to a minimum of 95% of the maximum density defined by ASTM D698.
    b. Maintain moisture within a range of optimum -1% to optimum +3%.
    c. Conduct in-place density tests at a rate of one test per 3,000 square feet for every lift with a minimum of 2 tests per lift.
    d. For select fill placed above the existing groundline, extend the lateral limits of the fill at least 5 feet beyond the perimeter of the building area, transitioning back to the existing groundline on a 3:1 (horizontal/vertical) slope.

B. Take all measures necessary to protect trees to remain from construction damage and keep them healthy during the construction process. This includes trees inside construction fences and adjacent to any construction activities.

C. Clear and grub all existing trees and understory where indicated on the drawings.

1. Remove all dead trees and tree limbs or trees that have substantial structural or cosmetic damage.
2. Remove all climbing vines to a height of 30’ above the ground. Grub out vine roots.
3. Remove all broken limbs and vines on trees that could fall and pose a hazard to pedestrians.
4. Spray all Poison Ivy with two (2) applications of a contact herbicide labeled for such use. After a complete kill has been achieved, grub out all plants and roots. Do not burn any part of Poison Ivy plants.
5. Remove Briars and other vines and brambles where these plants have grown up into trees.
6. Remove old fences and fence posts. In cases where wire penetrates existing trees to remain the wire shall be trimmed back flush with the tree bark.
7. Remove logs and stumps higher than four inches (4”) above grade and other debris from this area. Backfill holes in accordance with Section 31 20 00 – Site Earthwork.
8. Trim tree limbs to allow five feet (5’) clearance above ground.
9. Remove any trash or man-made debris from this area.
10. All material generated by the pruning and clearing process shall be disposed of legally off-site.

D. Perform these operations under the direction of the licensed arborist.

E. Do not begin operations until limits of clearing and grubbing have been identified and staked out by the contractor and approved by the Owner’s Designated Representative.

F. Do no damage to existing plant material, utilities, and/or pavements designated to remain as indicated on the drawings.

G. Fill any depression caused by clearing and grubbing operations; removing any improvements, over or underground, as necessary to facilitate new construction.

H. Disposal will be done legally; no burning is permitted on University property.

I. A certified arborist shall perform all pruning. Contractor shall submit proof of qualifications and three current references to A/E and Owner for approval prior to commencing any pruning.

3.5 GENERAL STRIPPING OF EXISTING WEEDS AND GRASSES:

A. The area within the work limits shown shall be stripped of lawns and vegetation under the direction of the Owner's Designated Representative.

B. Method of removal shall remove a minimum amount of topsoil and shall be even so as to not generally change the overall grading.

C. Remove and dispose of all products of stripping from the site. Do not allow material to accumulate at locations in or about the work areas.

3.6 STRIPPING AND REMOVAL OF EXISTING SOD:

A. All areas designated shall be stripped of existing sod to a depth of two and one-half (2 1/2") inches, or as deep as necessary to remove the majority of roots.

B. Sod shall be stripped by acceptable means and materials. Products of stripping operations shall be removed from the project area and legally disposed of.

3.7 STRIPPING AND STOCKPILING OF TOPSOIL:

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to a depth of six (6") inches or as necessary to remove all topsoil. Strip topsoil not in a muddy condition and avoid admixtures of subsoil.

C. Strip no soil where grades require only a slight change. Stockpile the topsoil in areas designated on the Drawings or as agreed upon with the Owner. Stockpiled topsoil shall be free from trash and other related material and shall be protected during the duration of the Contract.

D. Stripped and stockpiled topsoil not used for landscape fill or for planting operations shall be removed from the site and legally disposed of.

3.8 DISPOSAL OF MATERIALS

A. Non-saleable Materials

1. Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, shall be disposed of outside the limits of Owner controlled land at the Contractor's responsibility, except when otherwise directed in writing.

Such directive will state the conditions covering the disposal of such products and will also state the areas in which they may be placed.

END OF SECTION 31 11 00

SECTION 31 20 00 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes providing backfill materials for all trenches including select backfill, backfill, fill, granular embedment, and the satisfactory disposal of surplus and unacceptable materials.

B. No classification of excavated materials will be made. Excavation includes all materials regardless of type, character, composition, moisture, or condition thereof.

C. The Contractor shall perform all earthwork as specified in this Section. All trenching shall conform to the requirements of Section 31 50 00 – Excavation Support and Protection.

D. Related Sections:

1. Section 31 11 00 – Clearing and Grubbing
2. Section 31 50 00 – Excavation Support and Protection

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines

and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Test Reports

3. The testing laboratory shall submit copies of the following reports directly to the Engineer, with copy to the Contractor:

a. Field Density Tests
b. Optimum Moisture – maximum density curve for each soil used as backfill.

B. Samples of all select backfill, backfill, fill, granular embedment, pit run sand, and drain gravel, shall be submitted by the Contractor to the Testing Laboratory. Samples of the proposed material shall be submitted to least fourteen (14) days in advance of its anticipated use. Each material sample shall be submitted to the Testing Laboratory in three (3) five-gallon containers.

1.5 QUALITY ASSURANCE

A. Blasting: Not allowed.

B. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

C. Earthwork – perform sampling and testing as specified in this Section.

1. Perform one moisture-density (Proctor) test per soil type subgrade, backfill, fill and base materials.
2. Perform one Atterberg limits test per soil type subgrade, backfill, fill and base materials.
3. Perform one percent finer than #200 sieve test per soil type subgrade, backfill, fill and base materials.
4. In building areas refer to structural plans, notes, and specifications for requirements.
5. In pavement areas provide One moisture-density test per 5,000 square feet of surface area on the subgrade soil. One moisture-density test per 5,000 square feet of surface area for each compacted six inch (6") thickness of fill.
6. Failures in tested areas shall be re-tested until passed at the expense of the Contractor.

D. Trench Backfill: Establish level of compaction effort by frequent testing of initial lifts. Provide not less than one (1) test per lift per 500 linear feet of trench.

1. Make random tests of subsequent lifts of backfill. Frequency of tests shall be adequate to guarantee proper compaction. In no case shall there be less than one (1) test per lift per 500 linear feet of trench.
2. Failures in tested areas shall be re-tested until passed at the expense of the Contractor.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify the utility locator service, (Texas One Call System, Digg Tess, etc.) for area where Project is located before beginning earth moving operations.

D. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Division 01 Section "Temporary Facilities and Controls," Division 31 Section "Site Clearing and Grubbing," the Storm Water Pollution Prevention Plan (SWPPP), and the drawings are in place.

E. Do not commence earth moving operations until plant-protection measures specified in Division 01 Section "Temporary Tree and Plant Protection" and the Drawings are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.2 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, SM, and some CL soils according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 4 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
1. Liquid Limit: 40 or Less.
2. Plasticity Index: Between 8 and 18.

C. Unsatisfactory Soils: Materials which do not comply with the requirements for Satisfactory Material are unsatisfactory.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

2. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory materials which contains root and other organic matter or frozen material.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1- inch sieve and 0 to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C 33; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.3 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water entering excavations, trenches, or other parts of the Work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe is installed therein, and backfill operations have been completed.

1. The different working areas on the site shall be kept free of surface water at all times. The Contractor shall install drainage ditches and dikes and shall perform all pumping and other necessary work to divert or remove rainfall and all other accumulations of surface water from the excavations and fill areas. The diversion and removal of surface water shall be performed in a manner that will prevent the accumulation of water behind temporary structures or at any other locations within the construction area where it may be detrimental.
2. Water used for working or processing, resulting from dewatering operations, or containing oils or sediments that will reduce the quality of the water downstream of the point of discharge shall not be directly discharged. Such waters shall be diverted through a settling basin or filter before being discharged.
3. The Contractor will be held responsible for the condition of any pipe, conduit or channel which he may use for drainage purposes and all such pipes, conduits or channels shall be left clean and free of sediment.

B. The Contractor shall provide, install and operate sufficient trenches, sumps, pumps, hose, piping, wellpoints, deep wells, etc., necessary to depress and maintain the ground water level below the base of the excavations during all stages of construction operations. The ground water

table shall be lowered in advance of excavation and maintained two feet (2') below the lowest subgrade excavation made until structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural ground water. The system must be operated on a 24-hour basis and standby pumping facilities and personnel shall be provided to maintain the continued effectiveness of the system. If, in the opinion of the Engineer, the water levels are not being lowered or maintained as required by these Specifications, the Contractor shall install additional or alternate dewatering devices as necessary, at no additional cost to the Owner.

1. Elements of the system shall be located so as to allow a continuous dewatering operation without interfering with the construction of the permanent work. Where portions of the dewatering system are located in the area of permanent construction, the Contractor shall submit details of the methods he proposes to construct the permanent work in this location for the review of the Engineer. Control of groundwater shall continue until the permanent construction provides sufficient dead load to withstand the hydrostatic uplift of the normal groundwater, until concrete has attained sufficient strength to withstand earth and hydrostatic loads, until all waterproofing work below normal groundwater level has been completed, and until pipelines are properly jointed.
2. Dispose of all water removed from the excavation in such a manner so as not to endanger any portion of the work under construction or completed. Convey water from the excavations in a closed conduit. Do not use trench excavations as temporary drainage ditches. Before discontinuing dewatering operations, or

permanently permitting the rise of the groundwater level, computations shall be made to show that any pipeline or structure affected by the water level rise is protected by backfill or other means to sustain uplift. Use a safety factor of 1.25 when making these computations.

3. Dewatering operations shall not be discontinued without the prior authorizations of the Engineer.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

    a. 24 inches outside of concrete forms other than at footings.
    b. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

A. Pavement excavation shall consist of excavations for all site pedestrian and vehicular pavements, in conformity with the typical sections shown on the Drawings, and to the lines and grades established by the Engineer and shown on the Drawings, by the removal of existing material or addition of acceptable material.

B. All unstable or otherwise objectionable material shall be removed from the subgrade and replaced with acceptable material.

C. All holes, ruts, and depressions shall be filled with select fill material.

D. Subgrade preparation shall comply with the requirement of Section 00 31 32 – Geotechnical Data.

3.5 EXCAVATION FOR UTILITY TRENCHES

A. Trench Excavations

1. Reference Section 31 50 00 – Excavation Support and Protection.
2. Trenches shall be excavated to a width that will provide adequate working space and clearances for proper pipe installation, jointing and embedment.
3. Where pipe elevations are not shown on the Drawings, trenches shall be excavated to a depth sufficient to provide a minimum cover of three feet (3’) over the top of the

pipe, unless otherwise shown or specified.

4. Where necessary to reduce earth load on pipe trench banks to prevent sliding or caving, banks may be cut back on slopes that shall not extend lower than twelve inched (12") above the top of the pipe.
5. Except where otherwise required, pipe trenches shall be excavated six inches (6") below or 1/8 of the outside diameter of the pipe, whichever is greater, the underside of the pipe to provide for the installation of granular embedment material.
6. Over depth excavations shall be backfilled with select backfill material compacted to 95 percent (95%) of maximum density, as determined by ASTM D698 at a moisture content between optimum and optimum +4%.
7. Whenever subgrade material that is incapable of properly supporting the pipe is encountered, the subgrade material shall be removed to the depth required and the trench backfilled to the proper grade with select backfill material compacted to 95 percent (95%) of maximum density, as determined by ASTM D698 at a moisture content between optimum and optimum +4%.
8. Bell holes shall provide adequate clearance for tools and methods used in installing pipe. No part of any bell or coupling should be in contact with the trench bottom, trench walls, or granular embedment when the pipe is jointed.
9. Where existing piping constructed by others cross the new pipeline trench, the existing piping or ductbank shall be adequately supported and protected from damage due to construction. All methods of supporting and maintaining these facilities shall be subject to review by the Engineer and/or the Testing Laboratory.

B. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow- tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3.6 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 25 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.10 UTILITY TRENCH BACKFILL

A. Backfill in Pipe trenches

1. Pipeline trenches may be backfilled prior to pressure testing, but no structure shall be constructed over any pipeline until it has been tested.
2. All pipe larger than six inches (6") in diameter shall be placed on granular embedment material. Pipe six inches (6") in diameter and smaller shall be placed in bedding zone of granular embedment material unless the trench bottom has been graded

to provide uniform and continuous support of the installed pipe.

Backfill is divided into three (3) separate zones: (a) bedding, the material in trench bottom in direct contact with the bottom of the pipe; (b) initial backfill, the backfill zone extending from the surface of the bedding to a point one foot (1') above the top of the pipe; and (c) secondary backfill, the backfill zone extending from the initial backfill surface to the top of the trench. Placement of materials for each of the zones shall be as described herein.

a. Bedding

1) When unacceptable materials such as water, silt, muck, trash or debris, or rock boulder or coarse gravel (particle size greater than 1 ¾ inch) exist at the bearing level or for pipes with a nominal inner diameter greater than six inches (6"), a bedding of granular embedment material shall be used.
2) Unstable materials shall be removed at the direction of the Engineer and replaced to a minimum depth of four inches (4") or one-eighth (1/8) of the outside diameter of the pipe, whichever is greater, with granular embedment material. This material shall extend up to the sides of the pipe sufficient to embed the lower quadrant of the pipe. If stability is not accomplished by using the above procedure, the Engineer may require additional granular embedment.
3) Granular embedment shall be spread and graded to provide a uniform and continuous bedding zone beneath the pipe at all points between bell holes or pipe joints. It will be permissible to slightly disturb the finished subgrade surface to withdraw pipe slings or other lifting tackle. After each pipe has been graded, aligned, and shoved home, sufficient pipe embedment material shall be deposited and compacted under and around each side of the pipe and back of the bell or end thereof to hold the pipe in proper position and alignment during subsequent pipe jointing and embedment operations. Embedment material shall be deposited and compacted uniformly and simultaneously on each side of the pipe to prevent lateral displacement.
4) Each layer of embedment material shall be compacted by at least two complete coverages of all portions of the surface of each lift using adequate compaction equipment. One coverage is defined as the conditions reached when all portions of the lift fill have been subjected to the direct contact of the compacting surface of the compactor.
5) The method of compaction and the equipment used shall be appropriate for the material to be compacted and shall not transmit damaging shocks to the pipe.

b. Initial Backfill

1) Select Initial Backfill: Where pipe is to be laid in a rock cut or where rock in boulder ledge or coarse gravel (particle size larger than 1¾ inch) formations exist in the initial backfill zone, or where trench walls or conditions are unstable or where the pipe to be laid is flexible pipe, select initial backfill material shall conform to the requirements of Granular Embedment. For conduits less than twenty-four inches (24") in

diameter select initial backfill material shall be placed in two (2) lifts. The first lift shall be spread uniformly and simultaneously on each side and under the shoulders of the pipe to the mid-point or spring line of the pipe. The first lift of select initial backfill shall be inspected and approved prior to placement of the second lift. The second lift of select initial backfill material shall extend from the spring line of the pipe to a depth sufficient to produce a compacted depth of material a minimum of one foot (1') above the top of the pipe. The second lift shall be evenly spread in a similar manner as the first lift. For conduits twenty-four (24") in diameter and larger, select initial backfill material shall be evenly and simultaneously spread alongside, under the shoulders or haunches of the pipe and over the pipe in twelve-inch (12") lifts to a point sufficient to produce a compacted depth of material a minimum of one foot (1') above the top of the pipe.

2) Optional Select Initial Backfill: Where the pipe to be laid is Flexible Pipe or where unstable materials exist at the pipe bearing level or the initial backfill zone, in lieu of the material specified above, an optional select backfill may be used by the Contractor where rock, in ledge, boulder, or coarse gravel (particle size larger than 1 ¾" inch) formations are not present in the bedding or initial backfill zone of the trench and where water is not present at the pipe bearing level. Optional Select Initial Backfill shall be clean, well graded gravels, crushed screenings or sand with 100% passing a ½" sieve, 95% to 100% passing a ¼" sieve. The plasticity index shall not be more than 12 when tested in accordance with the ASTM D4318. Optional select initial backfill shall be placed around the pipe and to the defined limit for initial backfill above. Sand and other materials as may be required by the Engineer shall be thoroughly compacted. Minimum thickness of completed optional select initial backfill shall be one foot (1') above the top of the pipe.
3) Natural Initial Backfill: Where the pipe to be laid is rigid pipe and where stable materials and laying conditions exist at the pipe bearing level and initial backfill zone and existing excavated materials are acceptable to the Engineer, such excavated natural materials may be utilized as initial backfill material.

c. Secondary Backfill

1) Secondary backfill shall generally consist of materials removed from the trench and shall be free of trash brush and other debris. No rock or stones having any dimension larger than one half of the trench width, or eight inches (8"), unless otherwise approved, at the largest dimension, whichever is less, shall be used in the secondary backfilling zone. In special cases where excessive width and/or depth of the trench permit, and only with approval of the Engineer, larger rocks up to twelve inches (12") in diameter may be incorporated into the backfill provided that the surrounding compactable soil may be properly and adequately compacted. Material for backfill shall be placed in uniform layers not more than nine inches (9") in depth (loose measurement) and shall be compacted to the density specified herein.
2) The initial lift of secondary backfill shall be a maximum of nine inches

(9"') in loose thickness. Consideration should be given to keeping the initial lift of secondary backfill as close as possible to the maximum nine inches (9") thickness to reduce the possibility of damage resulting from the compaction operations. This initial lift of secondary backfill material shall be compacted to a minimum of 95 percent of the laboratory determined maximum dry density (ASTM D698) using suitable compaction equipment. The backfill material shall be wetted or dried in such a manner as to provide uniform moisture content near the optimum moisture content identified by laboratory testing. Moisture contents in excess of 5 percent above or below the optimum laboratory moisture content are considered unacceptable and will require adjustment as necessary.

3) Moisture density tests will be performed by a geotechnical engineer at periodic intervals on the top of the initial lift of backfill to determine the degree of compaction. If these test results indicate marginal compaction has been obtained near the surface of this lift, the Contractor will be given the option of applying more compactive effort or excavating a portion of the upper fill materials to allow access for moisture-density testing near the bottom of the lift. Any materials determined to be under compacted will require additional work by the Contractor to meet the above compaction requirements.

4) After the initial lift of secondary backfill has been properly compacted as evidenced by moisture-density tests, subsequent lifts of secondary backfill material shall be placed and compacted in accordance with the above Specification. All subsequent lifts of secondary backfill shall be placed in loose lifts not to exceed twelve inches (12") in thickness and compacted in accordance with the above Specifications. Succeeding lifts of supplemental backfill may be placed only after completion of adequate moisture-density tests on backfill material already in place.

5) Due to the rather large vertical displacement of backfill material, experienced by using thick lifts, it is anticipated that, in some areas, the final lift of backfill material could be approximately one foot (1') thick. Compaction of this last lift of backfill material may be accomplished in the manner described above, or by a combination of use of vibratory plate compaction equipment and conventional pneumatic or sheep-foot rollers.

3.11 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.12 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.13 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under pavements, scarify and recompact top 8 inches of existing subgrade at 98 percent. For pavements, recompact each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

3.14 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

4. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.
5. Place and compact impervious fill over drainage backfill in 6-inch- thick compacted layers to final subgrade.

3.15 FIELD QUALITY CONTROL

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

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 5000 sq. ft., but in no case fewer than two tests per lift.
2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.16 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially

completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.17 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 20 00

SECTION 31 50 00 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes temporary excavation support and protection systems.

B. Related Requirements:

1. Section 31 20 00 – Earth Moving

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review geotechnical report.
2. Review existing utilities and subsurface conditions.
3. Review coordination for interruption, shutoff, capping, and continuation of utility services.
4. Review proposed excavations.
5. Review proposed equipment.
6. Review monitoring of excavation support and protection system.
7. Review coordination with waterproofing.
8. Review abandonment or removal of excavation support and protection system.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, performance properties, and dimensions of individual components and profiles, and calculations for excavation support and protection system.

B. Shop Drawings: For excavation support and protection system, prepared by or under the supervision of a qualified professional engineer.

1. Include plans, elevations, sections, and details.
2. Show arrangement, locations, and details of soldier piles, piling, lagging, tiebacks, bracing, and other components of excavation support and protection system according to engineering design.

3. Indicate type and location of waterproofing.
4. Include a written plan for excavation support and protection, including sequence of construction of support and protection coordinated with progress of excavation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Existing Conditions: Using photographs, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by inadequate performance of excavation support and protection systems. Submit before Work begins.

D. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.6 FIELD CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify **Architect** no fewer than **two** days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without **Architect's** written permission.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.

1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection according to the performance requirements.
2. The geotechnical report is included elsewhere in Project Manual.

C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide, design, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads.

1. Contractor Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer.
2. Prevent surface water from entering excavations by grading, dikes, or other means.
3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
4. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

2.2 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

1. Corners: Site-fabricated mechanical interlock or Roll-formed corner shape with continuous interlock.

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of size and strength required for application.

E. Shotcrete: Comply with Section 033713 "Shotcrete" for shotcrete materials and mixes, reinforcement, and shotcrete application.

F. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

G. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

H. Tiebacks: Steel bars, ASTM A 722/A 722M.

I. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Locate excavation support and protection systems clear of permanent construction so that construction and finishing of other work is not impeded.

3.2 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.3 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock vertical edges to form a continuous barrier.

B. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches (1500 mm). Accurately align exposed faces of sheet piling to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment.

C. Cut tops of sheet piling to uniform elevation at top of excavation.

3.4 TIEBACKS

A. Drill, install, grout, and tension tiebacks.

B. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

1. Have test loading observed by a qualified professional engineer responsible for design of excavation support and protection system.

C. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.5 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
2. Install internal bracing if required to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.6 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.

C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

3.7 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches (1200 mm) below overlying construction and abandon remainder.

2. Fill voids immediately with approved backfill compacted to density specified in Section 312000 "Earth Moving."
3. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.

B. Leave excavation support and protection systems permanently in place.

END OF SECTION 31 50 00

SECTION 32 11 23 - AGGREGATE BASE COURSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes furnishing and installing flexible base for curbs and gutters, roadways, and parking areas as shown and detailed on the Drawings.

1.2 RELATED WORK

A. Related Work of Other Sections:

1. Section 31 20 00 – Earth Moving
2. Section 32 12 16 – Asphalt Paving

1.3 REFERENCES

A. American Society of Testing and Materials (ASTM), 1916 Race Street, Philadelphia, Pennsylvania 19103. All references shall be to current active standard.

1. ASTM C117 – Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing.
2. ASTM D75 – Standard Practice for Sampling Aggregates.
3. ASTM D422 – Standard Test Method for Particle Size Analysis of Soils.
4. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
5. ASTM D2216 – Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
6. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
7. ASTM D4318 – Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
8. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

B. Texas Department of Transportation (TxDOT), 125 East 11^{th} Street, Austin, Texas 78701.

1. Tex-116-E – Ball Mill Method for Determining the Disintegration of Flexible Base Material
2. Tex-117-E – Triaxial Compression for Disturbed Soils and Base Materials
3. Tex-140-E – Measuring Thickness of Pavement Layer

1.4 SUBMITTALS

A. Test Reports: Submit two (2) copies of test reports of the physical properties of base material for review and approval by the Owner's Representative.

B. Laboratory analysis of each base course material proposed demonstrating compliance with the requirements listed below in 2.1A. Utilize the following ASTM and TxDOT standard laboratory test procedures:

1. Moisture Content (ASTM D2216)
2. Liquid Limit (ASTM D4318)
3. Plasticity Index (ASTM D4318)
4. Sieve Analysis (ASTM D422)
5. Moisture-Density Determination (ASTM D1557)
6. Roadway Density (ASTM D6938)
7. Wet Ball Mill (Tex-116-E)
8. Compressive Strength (Tex-117-E)

1.5 QUALITY ASSURANCE

A. Obtain materials from same source throughout.

B. Take samples for laboratory testing in conformance with ASTM D75.

C. One optimum moisture-maximum density curve from proposed material

PART 2 - PRODUCTS

2.1 BASE COURSE

A. Type A Base Course – Type A material shall be crushed stone produced and graded from oversize quarried aggregate that originates from a single, naturally occurring source. Crushed gravel or uncrushed gravel shall not be acceptable A material. No blending of sources and/or additive materials will be allowed in material.

B. Base Course material shall meet the following criteria:

Property	Test Method	Grade 1-2
Master Gradation Sieve Size (% Retained)	ASTM D422	
2-1/2”		-
1-3/4”		0-10
7/8”		10-35
3/8”		30-65

No. 4		45-75

No. 40		65-90
Liquid Limit (% Max.)	ASTM D4318	40
Plasticity Index (Max.)	ASTM D4318	10
Wet Ball Mill (% Max.)	Tex-116-E	40
Ball Mill (% Max. Increase Passing No. 40 Sieve)	Tex-116-E	20
Minimum Compressive Strength (psi)		
Lateral Pressure 0 psi	Tex-117-E	35
Lateral Pressure 15 psi	Tex-117-E	175

1. The Engineer may accept material if no more than one (1) of the five (5) most recent gradation tests has an individual sieve outside the specified limits of the gradation.
2. The Engineer may accept material if no more than one (1) of the five (5) most recent plasticity index tests is outside the specified limit. No single test may exceed the allowable limit by more than 2 points.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall provide and set all construction stakes as required by a Registered Professional Land Surveyor for the work required. All stakes shall be checked for conformity with the drawings and existing conditions. After approval of lines and grades the Contractor shall protect and maintain the approved stakes until they have served their purpose. Blue tops shall be set by the Contractor for subgrade on centerline, quarter points, and curb lines at intervals not exceeding 50 feet or 25 feet within curves.

B. The subgrade shall have been compacted to a minimum of 95 percent density, to the typical sections, lines and grades shown on the drawings. The Contractor shall verify that the subgrade has been prepared and compacted in accordance with Section 31 23 13 by proof rolling. Any deviation shall be corrected and proof rolled prior to placement of aggregate, and must be approved by the Owner's Representative. As soon as possible after the acceptance of the condition of the subgrade, the base course shall be installed.

3.2 PLACEMENT

A. Placing: Flexible base shall be placed in 6 inches or less in compacted thickness in layers

of equal thickness, and in accordance with the following:

1. First Course:

    a. It shall be the responsibility of the Contractor to deliver the required amount of base material to each 100-foot station. Base material shall be spread uniformly and shaped the same day as delivered. In the event inclement weather or other unforeseen circumstances render this impractical, the material shall be shaped as soon as practical.
    b. Prior to compacting the flexible base, the flexible base material shall be bladed and shaped to conform to the typical sections as shown on the plans. All areas of segregated coarse or fine material shall be corrected or removed and replaced with well-graded material, as directed by the Engineer and at the Contractor's expense.
    c. The Contractor shall sprinkle for dust control as directed by the Engineer.

2. Succeeding or Finish Courses:

    a. Construction methods shall be the same as required for the first course. Throughout this entire operation, the shape of each course shall be maintained by blading. Upon completion, the surface shall be smooth and in conformity with the typical section as shown on the plans and the established lines and grades. Prior to placing the surfacing on the completed base, the base shall be cured to the extent directed by the Engineer.

3. Compaction Method:

    a. The flexible base shall be compacted to a minimum of 98% of the maximum dry density as determined by the modified Proctor test (ASTM D1557) and the moisture content shall be within plus or minus 1.5% of the optimum moisture content.
    b. When the material fails to meet the density requirements, or it loses the required stability, density or finish before the next course is placed or the project is completed, it shall be reworked and retested in accordance with Section 3.2.A.4, below.

4. Reworking a Section:

    a. Should the base course, due to any reason or cause, lose the required stability, density or finish before the surfacing is complete; it shall be reworked, recompacted and refinished at the sole expense of the Contractor.

5. Tolerances shall conform to the following:

    a. Density Tolerances. The Engineer may accept the work pro- viding not more than one (1) out of the most recent five (5) consecutive density tests performed is below the specified density, and providing that the failing test is no more than three (3.0) pounds per cubic foot below the specified

density.

b. Grade Tolerances. In areas on which surfacing is to be placed, any deviation in excess of 1/4 inch in cross section or 1/4 inch in a length of 16 feet measured longitudinally shall be corrected by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.

c. Thickness Measurement. When the measurement is by the square yard, the flexible base will be measured for depth in units of 4000 square yards, or fraction thereof. The measurements will be at location(s) determined by the Engineer and performed in accordance with Test Method Tex-140-E. In any unit where flexible base is deficient by more than 1/2 inch in thickness, the

B. Spreading

1. Flexible base material deposited upon the prepared subgrade shall be spread, shaped and rolled the same day if possible. If not possible to do this within the first twenty-four hours (24), delay shall be held to a minimum. The base shall be wetted, bladed and rolled to achieve at least 98% compaction as determined by ASTM D1557. If the material fails to meet the density specified, it shall be re-worked as necessary to meet the density required.

C. Deviation

1. Any deviation in the finish surface in excess of 1/4" in cross-section or removing material, reshaping and recompacting by sprinkling or rolling. Any re-working of the base course required to conform to these specifications shall be at the cost of the Contractor.

3.3 QUALITY CONTROL TESTING

A. Inspect and test each lift of base course. Do not place base for subsequent lifts until test results for the previously placed lift verify compliance with compaction requirements.

B. Perform field density tests in accordance with ASTM D6938.

C. Perform at least one field in-place density test for every 500 square feet, in no case shall be less than three (3) tests for any base course placement.

D. D. Moisture-Density Relationship: One test of a representative sample of each day's delivery.

END OF SECTION 32 11 23

SECTION 32 12 16 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Hot-mix asphalt paving.
2. Hot-mix asphalt overlay.
3. Cold milling of existing asphalt pavement.
4. Hot-mix asphalt patching.
5. Asphalt surface treatments.
6. Wheel Stops

B. Related Requirements:

1. Section 31 20 00 – Earth Moving
2. Section 32 11 23 Aggregate Base Courses

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
2. Job-Mix Designs: For each job mix proposed for the Work

B. Qualification Data: For qualified manufacturer and Installer.

C. Material Certificates: For each paving material, from manufacturer.

D. Material Test Reports: For each paving material.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved

by TxDOT.

B. Testing Agency Qualifications: Qualified in accordance with ASTM D3666 for testing indicated.

C. requirements of **TxDOT** for asphalt paving work.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
3. Slurry Coat: Comply with weather limitations in ASTM D3910.
4. Asphalt Base Course and Binder Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D692/D692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: ASTM D1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: ASTM D242/D242M or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: ASTM D6373 or AASHTO M 320 binder designation **PG 64-22**.

B. Asphalt Cement: ASTM D3381/D3381M for viscosity-graded material or ASTM

D946/D946M for penetration-graded material.

C. Cutback Prime Coat: ASTM D2027/D2027M, medium-curing cutback asphalt, **MC-30 or MC- 70**.

D. Emulsified Asphalt Prime Coat: ASTM D977 or AASHTO M 140 emulsified asphalt, or ASTM D2397/D2397M or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Tack Coat: ASTM D977 or AASHTO M 140 emulsified asphalt, or ASTM D2397/D2397M or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

F. Fog Seal: ASTM D977 or AASHTO M 140 emulsified asphalt, or ASTM D2397/D2397M or AASHTO M 208 cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

G. Water: Potable.

H. Undersealing Asphalt: ASTM D3141/D3141M; pumping consistency.

2.3 AUXILIARY MATERIALS

A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled tires asphalt shingles or glass from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.

B. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.

C. Sand: ASTM D1073 or AASHTO M 29, Grade No. 2 or No. 3.

D. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.

E. Joint Sealant: ASTM D6690, **Type I**, hot-applied, single-component, polymer-modified bituminous sealant.

F. Wheel Stops: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate. Dowels galvanized steel, 3/4-inch diameter, 10-inch minimum length.

2.4 MIXES

A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes **approved by** TxDOT and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Surface Course: Type D Fine.

B. Emulsified-Asphalt Slurry: ASTM D3910, Type 2.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

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

3.2 PREPARATION

A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the Work.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction**,** repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

3.3 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

1. Mill to a depth of **2 inches.**
2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, driveway aprons, manholes, and other construction damaged during cold milling.

5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. Patch surface depressions deeper than 1 inch (25 mm) after milling, before wearing course is laid.
7. Keep milled pavement surface free of loose material and dust.
8. Do not allow milled materials to accumulate on-site.

3.4 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.

1. Undersealing: Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

D. Placing Single-Course Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

E. Placing Two-Course Patch Material: Partially fill excavated pavements with hot-mix asphalt base course mix and, while still hot, compact. Cover asphalt base course with compacted layer of hot-mix asphalt surface course, finished flush with adjacent surfaces.

3.5 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth

of 1/4 inch (6 mm).

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.6 SURFACE PREPARATION

A. Ensure that prepared subgrade has been proof-rolled and is ready to receive paving. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces.

B. Herbicide Treatment: Apply herbicide in accordance with manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted- aggregate base before applying paving materials.

1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.

C. Cutback Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

D. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. per inch depth (0.5 to 1.40 L/sq. m per 25 mm depth). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

E. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.7 HOT-MIX ASPHALT PLACEMENT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at a minimum temperature of 250 deg F (121 deg C).
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches (25 to 38 mm) from strip to strip to ensure proper compaction of mix along longitudinal joints.
2. Complete a section of asphalt base course[**and binder course**] before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.8 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints **using** either "bulkhead" or "papered" method in accordance with AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.9 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight

without excessive displacement. Compact hot-mix paving with hot hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density, Marshall Test Method: 96 percent of reference laboratory density in accordance with **ASTM D6927 or AASHTO T 245**, but not less than 94 percent or greater than 100 percent.
2. Average Density, Rice Test Method: 92 percent of reference maximum theoretical density in accordance with ASTM D2041/D2041M, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.10 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce thickness indicated within the following tolerances:

1. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Pavement Surface Smoothness: Compact each course to produce surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

1. Surface Course: **1/8 inch (3 mm)**.

2. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

3.11 SURFACE TREATMENTS

A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. (0.45 to 0.7 L/sq. m) to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.

B. Slurry Seals: Apply slurry coat in a uniform thickness in accordance with ASTM D3910 and allow to cure.

1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.12 WHEEL STOPS

A. Install wheel stops in bed of adhesive as recommended by manufacturer.

B. Securely attach wheel stops to pavement with not less than two galvanized-steel dowels embedded at one-quarter to one-third points. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined in accordance with ASTM D3549/D3549M.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement in accordance with **ASTM D979/D979M or AASHTO T 168**.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared in accordance with ASTM D2041/D2041M, and compacted in accordance with job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples in accordance with ASTM D1188 or ASTM D2726/D2726M.

    a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than three cores taken.
    b. Field density of in-place compacted pavement may also be determined by nuclear method in accordance with ASTM D2950/D2950M and coordinated

with ASTM D1188 or ASTM D2726/D2726M.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.1 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill. Do not allow milled materials to accumulate on-site.

END OF SECTION 32 12 16

SECTION 32 17 23 – PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Section includes parking striping, handicapped stall graphics, drive lane markings, and related work as shown and detailed on the Drawings.

1.2 REFERENCES

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

B. American Association of State Highway and Transportation (AASHTO):
   1. AASHTO M247 - Glass Beads Used in Traffic Paints
   2. AASHTO M248 - Ready-Mixed White and Yellow Traffic Paints

C. ASTM International (ASTM):
   1. ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness by Notched Gauges.

D. Federal Specifications (FS):
   1. FS A-A-2886 - Paint, Traffic, Solvent Based (supersedes FS TT-P-85 and FS TT-P-115, Type I)
   2. FS TT-B-1325 - Beads (Glass Spheres) Retro-Reflective
   3. FS TT-P-1952 - Paint, Traffic And Airfield Marking, Waterborne

1.3 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs, and warning lights as required.

B. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4.4 deg C) for alkyd materials and 55 deg F (12.8 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include technical data and tested physical and performance properties.

B. Shop Drawings: For pavement markings.

   1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
   2. Indicate, with international symbol of accessibility, spaces allocated for people

with disabilities.

C. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches (200 mm) square.

1.5 QUALITY ASSURANCE

A. Use trained and experienced personnel in applying the products and operating the equipment required for properly performed work.

B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Texas Department of Transportation (TxDOT) for pavement-marking work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type N; colors complying with FS TT-P-1952.

1. Color: As indicated.

B. Glass Beads: AASHTO M 247, Type 1.

1. Roundness: Minimum 75 percent true spheres by weight.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.

B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 APPLICATION

C. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

D. Allow paving to age for a minimum of 30 days before starting pavement marking.

E. Sweep and clean surface to eliminate loose material and dust.

F. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to

provide a minimum wet film thickness of 15 mils (0.4 mm).

1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond the stencil. Apply paint so that it cannot run beneath the stencil.
2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal. (0.72 kg/L).

G. Apply glass beads at pedestrian crosswalk. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal.

3.3 FIELD QUALITY CONTROL

A. Protect pavement markings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 32 17 23

SECTION 33 05 00 - COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Piping joining materials.
2. Transition fittings.
3. Sleeves.
4. Identification devices.
5. Grout.
6. Flowable fill.
7. Piped utility demolition.
8. Piping system common requirements.
9. Equipment installation common requirements.
10. Painting.
11. Concrete bases.
12. Metal supports and anchorages.

1.3 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

C. CPVC: Chlorinated polyvinyl chloride plastic.

D. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Identification devices.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.

C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-

face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.2 TRANSITION FITTINGS

A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

B. Transition Couplings NPS 1-1/2 and Smaller:

1. Underground Piping: Manufactured piping coupling or specified piping system fitting.
2. Aboveground Piping: Specified piping system fitting.

C. AWWA Transition Couplings NPS 2 and Larger:

1. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.

D. Plastic-to-Metal Transition Fittings:

1. Description: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint or threaded end.

E. Plastic-to-Metal Transition Unions:

1. Description: MSS SP-107, CPVC and PVC four-part union. Include brass or stainless-steel threaded end, solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.

F. Flexible Transition Couplings for Underground Nonpressure Drainage Piping:
1. Description: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.3 SLEEVES

A. Mechanical sleeve seals for pipe penetrations are specified in Division 22 Section "Common Work Results for Plumbing."

B. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

D. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.

2.4 IDENTIFICATION DEVICES

A. General: Products specified are for applications referenced in other Division 33 Sections. If more than single type is specified for listed applications, selection is Installer's option.

B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
2. Location: Accessible and visible.

C. Stencils: Standard stencils prepared with letter sizes complying with recommendations in ASME A13.1. Minimum letter height is 1-1/4 inches for ducts, and 3/4 inch for access door signs and similar operational instructions.

1. Material: Fiberboard or Brass.
2. Stencil Paint: Exterior, oil-based, alkyd-gloss black enamel, unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, oil-based, alkyd enamel in colors according to ASME A13.1, unless otherwise indicated.

D. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.

E. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils thick.

1. Width: 1-1/2 inches on pipes with OD, including insulation, less than 6 inches ; 2-1/2 inches for larger pipes.
2. Color: Comply with ASME A13.1, unless otherwise indicated.

F. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in piped utility identification with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of piped utility systems and equipment.

1. Multiple Systems: Identify individual system number and service if multiple systems of same name are indicated.

2.5 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.6 FLOWABLE FILL

A. Description: Low-strength-concrete, flowable-slurry mix.

1. Cement: ASTM C 150, Type I, portland.
2. Density: 115- to 145-lb/cu. ft.
3. Aggregates: ASTM C 33, natural sand, fine and crushed gravel or stone, coarse.
4. Aggregates: ASTM C 33, natural sand, fine.
5. Admixture: ASTM C 618, fly-ash mineral.
6. Water: Comply with ASTM C 94/C 94M.
7. Strength: 100 to 200 psig at 28 days.

PART 3 - EXECUTION

3.1 PIPED UTILITY DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING INSTALLATION

A. Install piping according to the following requirements and Division 33 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at

right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

a. PVC Pipe Sleeves: For pipes smaller than NPS 6 .

J. Verify final equipment locations for roughing-in.

K. Refer to equipment specifications in other Sections for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 33 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

F. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.

G. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

H. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.5 EQUIPMENT INSTALLATION

A. Install equipment level and plumb, unless otherwise indicated.

B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.

C. Install equipment to allow right of way to piping systems installed at required slope.

3.6 PAINTING

A. Painting of piped utility systems, equipment, and components is specified in Division 09 painting Sections.

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 IDENTIFICATION

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Stenciled Markers: According to ASME A13.1.
2. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.

3. Locate pipe markers on exposed piping according to the following:

    a. Near each valve and control device.
    b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
    c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
    d. At manholes and similar access points that permit view of concealed piping.
    e. Near major equipment items and other points of origination and termination.

B. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

3.8 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.9 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.10 GROUTING

A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors

H. Cure placed grout.

END OF SECTION 33 05 00

SECTION 33 11 00 - WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
1. Site water piping and fittings including domestic potable waterline and fire protection system supply waterline, valves, and fire hydrants.
2. Refer to City of McKinney Standard Specifications and Details for all public service lines, meters and associated piping and appurtenances located within public street ROW.
3. Refer to Plumbing specifications for all domestic water piping located beneath and within 5 feet of buildings, and backflow prevention devices located inside the building.

B. Related Sections
1. Section 31 20 00 – Earth Moving
2. Section 31 50 00 – Excavation Support and Protection
3. Section 33 05 00 – Common Work Results for Utilities

1.2 REFERENCES

A. American Society of Mechanical Engineers (ASME)
1. ASME B 16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

B. American Society for Testing and Materials (ASTM)
1. ASTM B88 - Seamless Copper Water Tube
2. ASTM D1784 - Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
3. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series)
4. ASTM D2564 - Poly (Vinyl Chloride) (PVC) Solvent Cement
5. ASTM D2672 - Poly (Vinyl Chloride) (PVC) Integrally Molded Bell Ends For Solvent - Cemented Pipe Joints.
6. ASTM D3139 - Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals
7. ASTM F477 - Elastomeric Gaskets And Lubricant
8. ASTM F656 - Poly (Vinyl Chloride) (PVC) Cement Primer

C. American Water Works Association (AWWA)
1. AWWA C104 – Cement-Mortar Lining For Ductile-Iron Pipe And Fittings For Water
2. AWWA C105 – Polyethylene Encasement for Ductile Iron Piping for Water and other Liquids
3. AWWA C116 – Protective Fusion-Bonded Epoxy Coatings For The Interior And Exterior Surfaces Of Ductile-Iron And Gray-Iron Fittings For Watersupply Service
4. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
5. AWWA C153 - Ductile-Iron Compact Fittings For Water Service
6. AWWA C500 - Gate Valves for Water and Sewage Systems
7. AWWA C550 - Protective Interior Coatings For Valves And Hydrants
8. AWWA C504 - Rubber-Seated Butterfly Valves

9. AWWA C600 - Installation of Ductile-Iron Water Mains and Appurtenances
10. AWWA C651 - Disinfecting Water Mains
11. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches Through 12 Inches, for Water Distribution

D. National Fire Protection Associations (NFPA)
1. NFPA 24 - Installation of Private Fire Service Mains and Their Appurtenances

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water (City of McKinney), including connection of domestic water piping and backflow prevention.
2. Comply with requirements of authorities having jurisdiction (City of McKinney and/or TCEQ as applicable) for potable-water-service piping, including materials, installation, testing, and disinfection.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.

D. NSF Compliance:

1. Comply with NSF 14 for plastic potable-water-service piping. Include marking "NSF- pw" on piping.
2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

E. Perform disinfection of potable lines in accordance with AWWA C651.

F. All materials which come in contact with water, including but not limited to pipes, coatings, valves, water meters, fittings, gaskets, adhesives, and lubricants, shall be evaluated, tested and certified for conformance with ANSI/NSF 61.

1.4 SUBMITTALS

A. Product Data: Provide Project Engineer with data on pipe materials, pipe fittings, hydrants, valves, and accessories.

B. Manufacturer's Certificate: Certify that products meet or exceed state or local requirements.

C. Test Reports
1. Backfill density tests.
2. Bacteriological tests.
3. Hydrostatic tests.

D. Submit Record Documents (As Builts) locating actual horizontal and vertical location of installed piping, service connections, valves, and appurtenances.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew- point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify **Architect** no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of water-distribution service without **Architect's** written permission.

1.7 COORDINATION

A. Coordinate connection to water meter with utility company (City of McKinney).

PART 2 - PRODUCTS

2.1 PIPE

A. All pipes 4 inch to 12 inch shall meet the requirements of AWWA C900, Class 200, unless otherwise noted. Pipe shall be gasket bell end. Gasket shall be in conformance with ASTM F477. Integral bell shall be at least as strong as the pipe in conformance with ASTM D3139.

B. All service lines smaller than 4 inch shall be Schedule 40 PVC meeting the requirements of ASTM D1785 with Injection Molded PVC Schedule 40 socket fittings meeting ASTM D2466.

2.2 VALVES

A. Gate Valves, 2-Inches and Larger:
1. Manufacturer and Model: Mueller Resilient Wedge Gate Valves or approved equal.
2. AWWA C500, Iron body, non-rising stem with square nut, single wedge, resilient seat, flanged or mechanical joint ends, control rod, post indicator where indicated on Construction Drawings, extension box and valve key.

B. Ball Valves, 2-Inches and Smaller:
1. Manufacturer and Model: Mueller Oriseal or approved equal.
2. Brass body, teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA compression inlet end, compression outlet with electrical ground connector, with control rod, extension box and valve key.

C. Butterfly Valves, From 2-Inch to 24-Inch: AWWA C504, Iron body, bronze disc, resilient replace- able seat, water or lug ends, infinite position lever handle.

2.3 WATER METER BOXES AND VAULTS

A. Provide water service connection in compliance with utility company requirements including reduced pressure backflow preventor (if required) and water meter with by-pass valves and sand strainer. Refer to City of McKinney Standard Details and Specifications.

2.4 FIRE HYDRANTS

A. Fire Hydrants: Type as required by utility company/Local Fire Department and as shown on Construction Drawings.

B. Hydrant Extensions: Fabricate in multiples of 6-inches with rod and coupling to

increase barrel length.

C. Hose and Steamer Connections: Match sizes with utility company, with two hose nozzles, one pumper nozzle.

D. Finish: Apply primer and 2 coats of enamel or special coating to color as required by utility company.

2.5 ACCESSORIES

A. Thrust Blocking: Place 3000 psi concrete to provide sufficient bearing area to transmit unbalanced thrust from bends, tees, caps, or plugs to undisturbed soil without loading undisturbed soil in excess of 2,500 pounds per square foot when water main pressure is 100 psi.

B. Locked mechanical joint fittings shall be installed where vertical changes in direction are required and, if approved by Owner and governing authority, can be installed in lieu of above thrust blocking requirements.

C. Trace Wire: Magnetic detectable conductor, (#12 Copper) brightly colored plastic covering imprinted with “Water Service” in large letters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location, and depth are as indicated on Construction Drawings.

B. Perform no pipe work in fill areas until embankment or fill has been completed to at least 2 feet above the top of pipe and has been properly compacted.

3.2 PREPARATION

A. Ream pipe and tube ends and remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare pipe for connections to equipment with flanges or unions.

D. Stake locations of fittings, fire hydrants and valves prior to installation for review by Engineer.

E. Do not lay pipe in water, or when trench or weather is unsuitable to work. Keep water out of trench until jointing is complete and initial backfill is placed on top of pipe. When work is not in progress, close ends of pipes and fittings securely so that no trench water, earth or other substance will enter pipes or fittings.

3.3 TRENCHING AND BEDDING

A. Excavate pipe trench and place bedding material in accordance with Section 31 20 00.

3.4 INSTALLATION - PIPE AND FITTINGS

A. Maintain separation of water main from sanitary and storm sewer piping in accordance with state or local codes. Locate joints no closer than 9 feet from sanitary sewer cross-overs.

B. Install pipe and fittings in accordance with AWWA C600.

C. 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 a sufficient number of shorter lengths of pipe to provide angular deflections within limits set or approved.

D. Install pipe to allow for expansion and contraction without stressing pipe or joints or as specified by pipe manufacturer.

E. Install access fittings in accordance with local codes to permit disinfection of water system performed under this Section.

F. Connections with Existing Pipelines: Where connections are made between new work and existing piping, make connection using suitable fittings for conditions encountered. Make each connection with existing pipe at time and under conditions with least interference with operation of existing pipeline and in compliance with local utility company. Underground piping is to be completely flushed before the connection is made to the downstream piping.

G. Form and place concrete for thrust blocks or other specified methods of retainage at each change of direction or end of pipe main. Place blocks so that the joints will be accessible for inspections and repair.

H. Backfill trench in accordance with Section 31 20 00.

I. Install trace wire continuous over top of non-metal pipe. Bury a minimum of 6 inches below finish grade, and above pipeline.

3.5 INSTALLATION - VALVES AND HYDRANTS

A. Install gate valves, AWWA C509, in accordance with the requirements of AWWA C600 for valve and fitting installation and with the recommendations of the Appendix ("Installation, Operation, and Maintenance of Gate Valves") to AWWA C500.

B. Install hydrants in accordance with AWWA C600.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Sterilize each unit of completed distribution system with chlorine before acceptance for domestic operation. Use not less than 50 mg/liter chlorine to water. Flush lines thoroughly before introducing chlorinating materials. Introduce chlorinating material to the water lines in and distribution systems in an approved manner.

B. After contact period of not less than 24 hours, flush system with clean water until residual chlorine is no greater than 0.2 mg/liter chlorine to water.

3.7 FIELD QUALITY CONTROL

A. Public Water Main Hydrostatic Test:

1. All testing to comply with TCEQ regulations.
2. Prior to completion of backfill, and while joints and fittings are still exposed, test new water lines hydrostatically. Conduct hydrostatic tests in presence of Owner's Designated Representative. Provide pumps, gages, meters and other equipment necessary for performance of tests.
3. Test water lines at 200 psi.
4. Before applying pressure test, expel air from pipe by slowly filling each valved section of pipe with water and providing taps if necessary, to expel trapped air.
5. Test water lines in lengths between valves or plugs of no more than 1,500 feet, unless otherwise directed by the Engineer.
6. Examine pipe, fittings and joints during testing.
7. Allowable leakage shall not exceed 11.65 gallons per inch of diameter per mile of pipe per 24 hours.
8. No joint leakage is allowed.
9. Minimum duration of testing for each section shall be 4 hours for new mains in excess of 1,000 linear feet and 1 hour for new mains less than 1,000 linear feet after the main has been brought up to test pressure.
10. Replace defective material with sound material and repeat test until satisfactorily completed and approved.
11. Repair observed or visible leaks at exposed joints, regardless of total leakage.

B. Water Supply System Hydrostatic Test

1. The tests shall be performed in compliance with IPC Sections 107 and 312.
2. Upon completion of a section of or the entire water supply system, the system, or portion completed, shall be tested and proved tight under a water pressure not less than the working pressure of the system; or for piping systems other than plastic, by an air test of not less than 50psi. This pressure shall be held for not less than 15 minutes.
3. The water utilized for tests shall be obtained from a potable source of supply.

C. Private Fire Service Main Hydrostatic Test

1. All testing shall be in accordance with the requirements of NFPA 24.
2. Prior to completion of backfill, and while joints and fittings are still exposed, test new water lines hydrostatically. Conduct hydrostatic tests in presence of Owner's Designated Representative. Provide pumps, gages, meters and other equipment necessary for performance of tests.

3. All piping and attached appurtenances subject to system working pressure shall be hydrostatically tested at gauge pressure of 200 psi or 50 psi in excess of system working pressure, whichever is greater, and shall maintain that pressure at gauge pressure of +/-5 psi for 2 hours.
4. Acceptable test results shall be determined by indication of either a pressure loss less than gauge pressure of 5 psi or no visible leakage.
5. Where additional water is added to the system to maintain test pressure, the amount of water shall be measured and shall not exceed 0.057 gph/100 ft of pipe for 6" nominal pipe diameter and 0.076 gph/100 ft of pipe for 8" nominal pipe diameter

D. Bacteriological Tests:

1. After sterilizing and flushing mains, obtain services of an approved laboratory to gather representative samples and conduct bacteriological tests.
2. Tests shall meet requirements of Texas Department of Health and Texas Commission On Environmental Quality.
3. Make necessary correction, repeat sterilization and flushing procedures, and retest affected lines if test results are not acceptable.
4. Repeat this procedure until satisfactory test results are obtained.
5. No main shall be placed in service or accepted until water samples are approved by applicable regulatory agency.

3.8 CLEANUP

A. Upon completion of the installation of water lines and appurtenances, all debris and surplus materials resulting from the work shall be removed.

END OF SECTION 33 10 00

SECTION 33 30 00 - SANITARY SEWERAGE UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes sanitary sewer and appurtenances from a point 5 feet outside building lines to the point of disposal. Refer to Division 22 Sections for continuation of sanitary sewer system.

1.2 RELATED WORK

A. Related Work of Other Sections:

1. Section 31 20 00 – Earth Moving
2. Section 31 50 00 – Excavation Support and Protection
3. Section 33 05 00 – Common Work Results for Utilities
4. Section 33 39 13 – Sewer Manholes, Frames, and Covers

1.3 SUBMITTALS

A. Product Data: Provide data of pipe materials, pipe fittings, and accessories.

B. Manufacturer's Certificate: Certify that products meet or exceed specified or local requirements.

C. Test Reports

D. Project Record Documents:

1. Accurately record actual locations of pipe runs, connections, cleanouts, and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify **Architect** no fewer than **two** days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without **Architect's** written permission.

B. Coordinate work with termination of sanitary sewer connection outside building and connection to municipal sewer utility service.

PART 2 - PRODUCTS

2.1 PVC PIPE AND FITTINGS

A. PVC Type PSM Sewer Piping:

1. Pipe: ASTM D 3034, SDR 26, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

B. PVC Pressure Piping:

4. Pipe: AWWA C900, Class 150 PVC pipe with bell-and-spigot ends for gasketed joints.
5. Gaskets: ASTM F 477, elastomeric seals.

2.2 PIPE ACCESSORIES

A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene-ribbed gasket for positive seal.

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps, etc.

2.3 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Josam Company.

b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.
d. Tyler Pipe.
e. Watts Water Technologies, Inc.
f. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

2. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
3. Top-Loading Classification(s): Heavy Duty.
4. Sewer Pipe Fitting and Riser to Cleanout: PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

B. PVC Cleanouts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Canplas LLC.
b. IPS Corporation.
c. NDS.
d. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
e. Sioux Chief Manufacturing Company, Inc.
f. Zurn Light Commercial Products Operation; Zurn Plumbing Products Group.

2. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.4 APPURTENANCES

A. Trace Wire: Magnetic detectable conductor (#12 copper), brightly colored plastic covering, imprint-ed with “Sanitary Sewer Service” in large letters.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 31 20 00 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written

instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe- jacking process of microtunneling.

F. Install gravity-flow, non-pressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent unless otherwise indicated.
2. Install piping NPS 6 (DN 150) and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
3. Install piping with 36-inch (915-mm) minimum cover.
4. Install ductile-iron, gravity sewer piping according to ASTM A 746.
5. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.

G. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, non-pressure, drainage piping according to the following:

1. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
2. Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
3. Join dissimilar pipe materials with non-pressure-type, flexible or rigid couplings.

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use non-pressure flexible couplings where required to join gravity-flow, non-pressure sewer piping unless otherwise indicated.
    a. Shielded flexible or rigid couplings for pipes of same or slightly different OD.
    b. Unshielded, increaser/reducer-pattern, flexible or rigid couplings for pipes with different OD.

c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.4 MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Form continuous concrete channels and benches between inlets and outlet.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches (76 mm) above finished surface elsewhere unless otherwise indicated.

E. Install manhole-cover inserts in frame and immediately below cover.

3.5 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.6 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Medium-Duty, top-loading classification cleanouts in earth, paved or unpaved foot- traffic areas.
2. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
3. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches (450 by 450 by 300 mm) deep. Set with tops 1 inch (25 mm) above surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.7 CONNECTIONS

A. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections.

Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch (150-mm) overlap with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3,000 psi (20.7 MPa).

2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3,000 psi (20.7 MPa).
3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 3,000 psi (20.7 MPa) unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

B. Connect to grease, oil and sand interceptors when applicable.

3.8 CLOSING ABANDONED SANITARY SEWER SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch- (203-mm-) thick, brick masonry bulkheads.

2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Backfill to grade according to Section 31 20 00 "Earth Moving."

3.9 IDENTIFICATION

A. Comply with requirements in Section 31 20 00 "Earth Moving" for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

1. Use warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.10 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Re-inspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.

2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:

    a. Fill sewer piping with water. Test with pressure of at least 10-foot (3-m) head of water, and maintain such pressure without leakage for at least 15 minutes.
    b. Close openings in system and fill with water.
    c. Purge air and refill with water.
    d. Disconnect water supply.
    e. Test and inspect joints for leaks.

6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
b. Option: Test concrete gravity sewer piping according to ASTM C 924 (ASTM C 924M).

3.11 CLEANING

Clean dirt and superfluous material from interior of piping. Flush with potable water.

END OF SECTION 33 30 00

SECTION 33 39 13 - SEWER MANHOLES, FRAMES, AND COVERS

PART 1 - GENERAL

1.1 SUMMARY

1.2 Section Includes

1. Monolithic concrete, modular precast concrete, masonry, and precast polyethylene manhole assemblies.

1.3 Related Sections

1. Section 31 20 00 - Earth Moving
2. Section 33 30 00 - Sanitary Sewer Utilities

1.4 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)
   1. ASTM A 48 - Gray Iron Castings
   2. ASTM C 55 - Concrete Building Brick
   3. ASTM C 478 - Precast Reinforced Concrete Manhole Sections
   4. ASTM C 923 - Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes
   5. ASTM D 1248 - Polyethylene Plastics Molding and Extrusion Materials

B. International Masonry Industry All-Weather Council (IMIAC)
   1. Recommended Practices and Guide Specification for Cold Weather Masonry Construction

C. State Department of Transportation (DOT), Construction and Material Specifications

1.5 SUBMITTALS

A. Shop Drawings: Indicate reference to Construction Drawings of manhole locations, elevations, piping with sizes, locations, and elevations of penetrations.

B. Product Data: Provide data for manhole covers, component construction, features, configuration, and dimensions.

PART 2 - PRODUCTS

2.1 MANHOLES

A. Precast Concrete: Reinforced precast concrete barrel.
   1. Manhole sections conforming to ASTM C 478 with gaskets in accordance with ASTM C 923.
   2. Construct manholes of precast concrete sections as required by Construction Drawings to size, shape, and depth indicated.

B. Mortar and Grout: Mortar for finishing and sealing shall be Class "C". Honeycombing less

than 2- inches deep shall be repaired using Class "D" mortar.

C. Brick Transition Reinforcement: Formed steel 8-gauge wire with galvanized finish.

D. Configuration:
1. Barrel Construction: Concentric with eccentric cone top section.
2. Shape: Cylindrical
3. Clear Inside Dimensions: 48-inches diameter minimum or as indicated on Construction Drawings.
4. Design Depth: As indicated on Construction Drawings.
5. Clear Lid Opening: 22-inches minimum
6. Pipe Entry: Provide openings as indicated on Construction Drawings
7. Main and Lateral Pipes: Neatly cut off main and lateral pipes flush with inside of manhole or inlet where they enter structure walls. Point up irregularities and rough edges with non- shrinking grout.

E. Inverts: Shape inverts for smooth flow across structure floor as indicated on Construction Drawings. Use concrete and mortar to obtain proper grade and contour. Finish surface with fine textured wood float.

2.2 COMPONENTS

A. Lid and Frame:
1. ASTM A 48, Class 30B heavy duty cast iron construction, machined flat bearing surface.
2. Removable lid, closed or open as indicated on Construction Drawings, sealing gasket.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify items specified by other Sections are properly sized and located.

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

C. Verify that the excavation for manholes is correct.

3.2 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves as indicated on Construction Drawings.

3.3 PRECAST MANHOLE CONSTRUCTION

A. Place base pad to proper elevation and location and trowel top surface level for placement of man- hole barrel.

B. Place manhole barrel plumb and level to correct elevations and anchor to base pad.
1. After completion of slab foundation, lower first joint of manhole barrel into position, grooved end first, and set level and plumb on concrete base. Align and adjust to

proper grade prior to placing and forming invert. Pour invert immediately after setting of first section of manhole barrel.

2. Prior to setting subsequent manhole barrel sections, apply primer to tongue and groove ends and allow to set in accordance with manufacturer's recommendations. Place "Ram-nek", or equivalent, plastic rope on tongue end. Lower next section into position, and remove excess material from interior of structure. Add additional material on exterior of joint, if necessary, for completely watertight joint.

C. Set cover frames and lids level without tipping, to correct elevations. Utilize pre-cast rings or brick and mortar to achieve final rim elevation. Maximum limit, 4 courses.

END OF SECTION 33 93 13

SECTION 33 51 00 - NATURAL GAS DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pipe and fittings for site utility natural gas distribution.
   2. Connection of site natural gas system and private utility company system.

B. Related Sections
   1. Section 31 20 00 – Earth Moving

1.2 REFERENCES

A. American Society of Mechanical Engineers (ASME)
   1. ASME B16.3 - Malleable Iron Threaded Fittings
   2. ASME B16.11 -Forged Steel Fittings, Socket Welding and Threaded
   3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings
   4. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
   5. ASME B31.8 - Gas Transmission and Distribution Piping Systems
   6. ASME S00081 – Boiler and Pressure Vessel Code, Sec VIII: Pressure Vessels
   7. ASME Q00090 - Boiler and Pressure Vessel Code, Sec. IX: Welding and Brazing Qualifications
   8. ASME Boiler and Pressure Code

B. American Society for Testing and Materials (ASTM)
   1. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated (Galvanized) Welded and Seamless
   2. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperature
   3. ASTM B32 - Solder Metal
   4. ASTM B88 - Seamless Copper Water Tube
   5. ASTM D2513 - Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
   6. ASTM D2517 - Reinforced Epoxy Resin Gas Pressure Pipe and Fittings
   7. ASTM D2683 - Socket-Type Polyethylene Fittings For Outside Diameter-Controlled Poly- ethylene Pipe and Tubing
   8. ASTM D 3261 - Butt Heat Fusion Polyethylene (PE) Plastic Polyethylene (PE) Plastic Pipe And Tubing

C. American Welding Society (AWS)
   1. AWS A5.8 - Brazing Filler Metal

D. American Water Works Association (AWWA)
   1. AWWA C105 - Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids

E. American National Standards Institute (ANSI)
   1. ANSI B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes

2. ANSI B31.2 - Fuel Gas Piping

F. National Fire Protection Agency (NFPA)
1. NFPA 54 - National Fuel Gas Code

1.3 QUALITY ASSURANCE

A. Perform installation in accordance with utility company requirements.

B. Gas Cock: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Conform to ASME Boiler and Pressure Vessel Code and applicable state regulations.

D. Welders Certification: In accordance with ASME Q00090, Sec IX.

E. Conform to NFPA 54, ANSI B31.2, or ASME B31.8.

1.4 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories.

B. Manufacturer's Certificate: Certify that products meet or exceed specified local requirements.

1.5 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of pipe mains, valves, connections, and top of pipe elevations.

B. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to be included.

B. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 PIPE

A. Steel Pipe
1. Below Ground: ASTM A53, Schedule 40, type E or S, grade B, black:
a. Fittings: ASME B16.11, forged steel, or ASTM A234 forged steel welding type.

b. Joints: Welded and seamless.
c. Jackets: AWWA C105 polyethylene jacket, double layer, half lapped, 10-mil polyethylene tape.

2. Above Ground: ASTM A53, Schedule 40, type E or S, grade B, black:
a. Fittings: ASME B16.3, malleable iron, ASME B16.11, forged steel, or ASTM A234, forged steel welding type.
b. Joints: Threaded.

B. Copper Tubing:
1. Below ground: ASTM B88, Type K, internally tinned:
a. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper; internally tinned.
b. Joint: AWS A5.8 BCuP silver brazed.
2. Above ground: ASTM B88, Type K, L or ASTM B75, Type GP; internally tinned:
a. Fittings: ASME B16.18 cast copper, ASME B 16.22, wrought copper, or ANSI B16.26, cast copper, internally tinned.
b. Joint: ASTM B32, Solder, Grade 95TA or AWS A5.8, Bcup silver brazed.

C. Polyethylene Pipe (below ground only): ASTM D-2513, SDR 11.5.
1. PE Fittings: ASTM D 2683, socket type or ASTM D 3261, butt type with dimensions matching ASTM D 2513, SDR 11, PE pipe.
2. Joints: Mechanical or Compression fit.

2.2 GAS COCKS

A. 2 Inches and Smaller: 150 psig WOG, bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends with cast iron curb box, cover, and key.

B. Larger than 2 inches: 125 psig WOG, Steel or Cast iron body and tapered plug, non-lubricated, Teflon packing, threaded ends, with cast iron curb box, cover, and key.

C. For Applications with Line Pressure Greater than 60 psig: Over 2 Inches: Cast iron body and plug, pressure lubricated, Teflon packing, flanged ends, with cast iron curb box, cover, and key.

2.3 PRESSURE REGULATING VALVES

A. Single stage, malleable iron body, corrosion-resistant, pressure regulator with atmospheric vent, elevation compensator; with threaded ends for 2 inches and smaller or flanged ends for larger than 2 inches. Install earthquake actuated automatic shutoff valve, if required by local code or utility.

B. Capacity: For inlet and outlet gas pressures, specific gravity, and flow rate indicated.

2.4 TRACE WIRE

A. Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Natural Gas Ser- vice" in large letters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions.

B. Verify that building service connection and utility gas main size, location, and depth are as indicated on Construction Drawings.

3.2 PREPARATION

A. Ream pipe ends and remove burrs. Bevel plain end ferrous pipe over 2-inches diameter or thread ferrous pipe 2-inches diameter and under.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections with flanges or threading and unions.

D. Comply with NFPA 54 on installation of gas lines.

3.3 BEDDING

A. Excavate pipe trench and place bedding material in accordance with Section 31 20 00.

3.4 INSTALLATION - PIPING

A. Maintain a minimum of 12 inches separation of gas line from sewer, water, or storm water piping in accordance with state or local code.

B. Install piping to conserve space and not interfere with use of site space.

C. Install piping to allow for expansion and contraction without stressing pipe or joints.

D. Install cocks and other fittings as required.

E. Establish elevations of buried piping in accordance with Section 31 20 00.

F. Wrap couplings and fittings of steel pipe with polyethylene tape and heat shrink over pipe in accordance with AWWA C105.

G. Install trace wire continuous over top of pipe for nonmetallic pipe.

H. Backfill trench in accordance with Section 31 20 00.

I. Center and plumb valve box over valve. Set box cover flush with finished ground surface. Prevent shock or stress from being transmitted through valve box to valve.

J. Wrap valve and valve box with polyethylene tape and heat shrink or paint valves and valve boxes with red anti-rust primer and 1 coat of epoxy paint.

3.5 SERVICE CONNECTIONS

A. Provide sleeve in foundation wall for gas service main. Caulk enlarged sleeve watertight.

B. Anchor service main to interior surface of foundation wall.

C. Install service regulator adjacent to building wall in specified location.

D. Install service regulator and riser pipe to prevent undue stress on service pipe. For plastic service pipe, use steel pipe riser from below ground to regulator.

E. Provide regulator vent with rain and insect proof opening, terminating not less than 5 feet away from building openings.

END OF SECTION 33 51 00

McKinney Area Engineering and Maintenance Facility

VICINITY MAP

NORTH

BUILDING SUMMARY:

OFFICE:	8,375 SQFT.
CORE:	2,167 SQFT.
LAB / SHOP:	6,695 SQFT.
TRUCK WASH / EQUIP.ROOM:	1,891 SQFT.
WALLS, CHASES, ETC:	1,763 SQFT.
TOTAL BUILDING:	**20,892 SQFT.**
TOTAL STAFF:	**110 Full Time Employeess**
VEHICLE PULL-THRU SHED:	5,340 SQFT.

BUILDING CODES:

INTERNATIONAL BUILDING CODE	IBC - 2018
AMERICANS W/ DISABILITIES ACT	ADAAG - 2010
TEXAS ACCESSIBILITY STANDARDS	TAS - 2012
INTERNATIONAL ENERGY CODE	IECC - 2018
INTERNATIONAL MECHANICAL CODE	IMC - 2018
	ASHRAE 62.1 - 2016
INTERNATIONAL PLUMBING CODE	IPC - 2018
NATIONAL ELECTRIC CODE	NEC - 2020
NATIONAL FIRE CODE	NFPA 1 - 2018
NATIONAL LIFE SAFETY CODE	NFPA 101 - 2018
TxDOT STANDARD SPECS FOR ...	STREETS - 2014

TDLR REGISTRATION:

EABPRJ # TABS2021008806

SCOPE OF WORK:

THIS PROJECT INCLUDES SITE DEVELOPMENT AND A NEW FACILITY FOR THE MCKINNEY AREA ENGINEER AND MAINTENANCE OFFICE. THE NEW BUILDING WILL BE A COMBINATION OF OFFICE SPACES, LABS AND SHOPS.

Texas Department of Transportation

Support Services Division / Facilities Planning & Management

Project Manager:
Sharon Warbrouck
(817) 889-7973
Sharon.Warbrouck@txdot.gov

150 E. Riverside Drive
Austin, Texas 78701-2483
(512) 416-2257

05/17/2021

CIVIL:
Vincent Mazidi, P.E
LINA T. RAMEY & ASSOCIATES, INC.
3320 Belt Line Rd
Farmers Branch, TX 75234
Firm Registration No. F-782

LANDSCAPE:
Chad St.John
JACOBS ENGINEERING GROUP, INC.
1999 Bryan St, Suite 1200
Dallas, TX 75201
Firm Registration No. 2966

ARCHITECTURE:
Steven Tremmel, R.A.
JACOBS ENGINEERING GROUP, INC.
1999 Bryan St, Suite 1200
Dallas, TX 75201
Firm Registration No. 2966

STRUCTURE:
Gabriel Serna, P.E.
JACOBS ENGINEERING GROUP, INC.
1999 Bryan St, Suite 1200
Dallas, TX 75201
Firm Registration No. 2966

ELECTRICAL:
John Haley, P.E.
DFW CONSULTING GROUP, INC.
1616 Corporate Court, Suite 100
Irving, TX 75038
Firm Registration No. 720

HVAC & PLUMBING:
Ken Meline, P.E.
DFW CONSULTING GROUP, INC.
1616 Corporate Court, Suite 100
Irving, TX 75038
Firm Registration No. 720

PROJECT:

SITE # 189799
BUILDING # 188196 & 188197

2205 TX-5, McKinney, TX 75069

DALLAS DISTRICT (18)
PROJECT NUMBER: 18-470420012

INDEX OF DRAWINGS

McKinney Area Engineering and Maintenance Facility
PROJECT NUMBER: 18-470420012

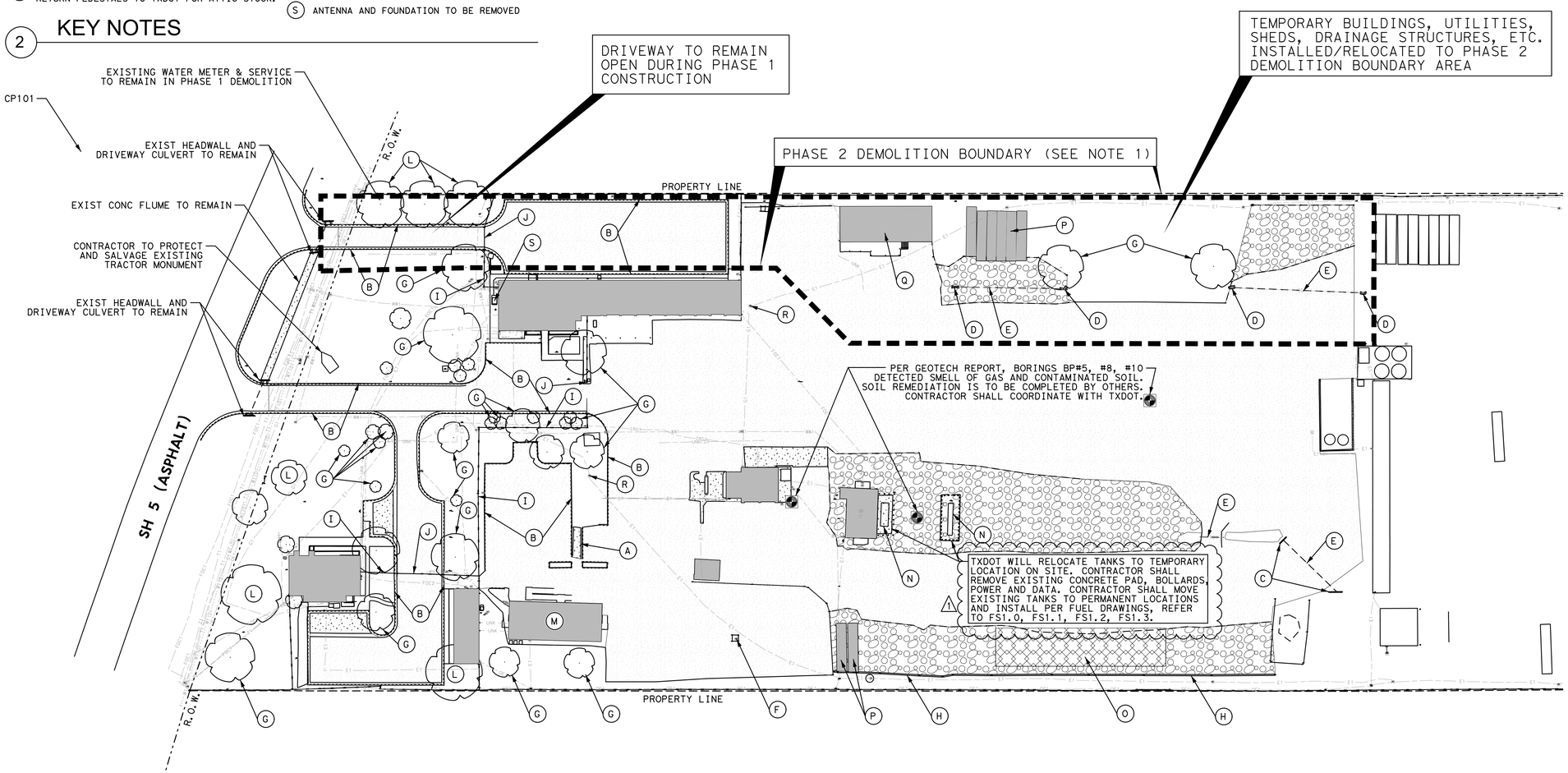
(A) REMOVE CONCRETE FLUME
(B) REMOVE CONCERETE CURB & GUTTER
(C) REMOVE HEADWALL
(D) REMOVE CMP MITERED END SECTION
(E) REMOVE PIPE
(F) REMOVE LIGHT POLE
(G) REMOVE TREE, COORDINATE W/ LANDSCAPE
(H) REMOVE MISC CONCRETE STRUCTURE
(I) REMOVE FENCE
(J) REMOVE GATE & SECURITY PEDESTALS. RETURN PEDESTALS TO TXDOT FOR ATTIC STOCK.
(K) BUILDING TO DEMOLISH IN PHASE 2
(L) TREE TO BE PRESERVED, COORDINATE W/ LANDSCAPE
(M) BUILDING TO BE RELOCATED BY TXDOT. CONTRACTOR TO REMOVE FOUNDATION
(N) FUELING TO BE RELOCATED BY TXDOT. CONTRACTOR TO REMOVE CONCRETE PAD, BOLLARDS, POWER AND DATA ONLY
(O) OLD SPREADER RACKS TO BE DEMOLISHED
(P) CONEX STORAGE CONTAINERS TO BE RELOCATED BY TXDOT
(Q) BUILDING AND FOUNDATION HAVE ALREADY BEEN REMOVED BY TXDOT
(R) REMOVE LIGHTS SAVED FOR RELOCATION, REFER TO ELECTRICAL
(S) ANTENNA AND FOUNDATION TO BE REMOVED

PROJECT CONTROL

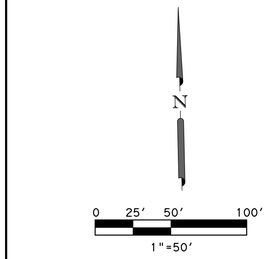
GRID					SURFACE		GEOGRAPHIC DMS	
PID	Northing	Easting	Elevation	Decription	Northing	Easting	Latitude	Longitude
CP101	7112376.730	2540791.024	594.978	ALC^3.25INTXDOTCONTROLMARKDRILLEDINCONC	7113462.861	2541179.028	33 09 58.99401	96 37 46.57252
CP102	7112781.004	2541045.777	589.466	ALC^3.25INTXDOTCONTROLMARKDRILLEDINCONC	7113867.197	2541433.820	33 10 02.94874	96 37 43.49108
F0430250	7108686.757	2542016.799	605.942	ALC^3-I/2IN TXDOT CONTROL MARK	7109772.325	2542404.990	33 09 22.27164	96 37 32.92789
F0430260	7114284.053	2541420.110	570.498	ALC^3-I/2IN TXDOT CONTROL MARK	7115370.475	2541808.210	33 10 17.75292	96 37 38.77246

PRIMARY SURVEY CONTROL SET BY LTRA MAY 2020
DATUM: TEXAS NORTH CENTRAL 4202, NGS 2010 ADJUSTMENT,
NAVD 88 ADJUSTMENT 2011, USING GEOID 12A, CSF:1.000152710 COLLIN CO.
HORIZONTAL AND VERTICAL WERE DERIVED FROM BASE-ROVER OBSERVATIONS; THREE, 3 MINUTE (180 EPOCH) OBSERVATIONS, AVERAGED. HOLDING EXISTING TXDOT CONTROL MONUMENTS F0430260 & F0430250

2 KEY NOTES



1 DEMOLITION PLAN



NOTES:

1. AREA OUTSIDE OF PHASE 2 DEMOLITION BOUNDARY WILL BE PART OF PHASE 1 DEMOLITION AND CONSTRUCTION.
2. CONTRACTOR SHALL PROVIDE TEMPORARY CHAIN LINK CONSTRUCTION FENCING ALONG PERIMETER OF PROJECT BOUNDARY TO ENSURE SAFETY AND SECURITY OF THE CONSTRUCTION SITE.
3. CONTRACTOR TO COORDINATE WITH TxDOT FOR A DETAILED PLAN FOR CONSTRUCTION OF PROPOSED IMPROVEMENTS. SOME IMPROVEMENTS SHALL BE CONSTRUCTED OR INSTALLED PRIOR TO REMOVAL OF ON-SITE EXISTING FACILITIES.
4. STAGING AREAS AND ON-SITE STORAGE OF CONTRACTOR EQUIPMENT SHALL BE REVIEWED AND APPROVED BY TxDOT PRIOR TO THE BEGINNING OF CONSTRUCTION.

LEGEND:

- ASPHALT PAVING & BASE TO BE REMOVED
- GRAVEL PAVING TO BE REMOVED
- CONCRETE PAVING & BASE TO BE REMOVED
- BUILDING AND FOUNDATION TO BE DEMOLISHED AND REMOVED, REFER TO SPECIFICATIONS

GENERAL CONSTRUCTION NOTES:

1. ALL MATERIAL AND CONSTRUCTION SHALL CONFORM TO TXDOT STANDARD SPEC NOV. 2014, THE CITY OF MCKINNEY AND NCTCOG STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION. ALL CONSTRUCTION OPERRATIONS SHALL BE ACCOMPLISHED IN ACCORDANCE WITH APPLICABLE STATE STATUTES AND U.S. OCCUPATIONAL SAFETY GOVERNMENT PRINTING OFFICE.
2. ALL DIMENSIONS GIVEN ARE TO FACE OF CURB (6" FROM BOC) AND TO PIPE CENTERLINES UNLESS OTHERWISE NOTED ON PLANS.
3. CONTRACTOR SHALL ASSURE THAT ALL CONSTRUCTION PERMITS HAVE BEEN OBTAINED PRIOR TO COMMENCEMENT OF WORK. REQUIRED PERMITS THAT CAN BE ISSUED TO CONTRACTOR WILL BE OBTAINED AT THEIR EXPENSE.
4. THE ESTIMATED QUANTITIES PUBLISHED WITH THESE CONSTRUCTION DOCUMENTS ARE FURNISHED AS AN AID IN THE BIDDING PROCESS AND ARE NOT TO BE SUBSTITUTED FOR THE CONTRACTOR QUANTITY TAKE-OFFS.
5. UNDERGROUND SURFACE, AND AERIAL UTILITIES SHOWN REFLECT THE BEST INFORMATION AVAILABLE AT THE TIME THAT PROJECT WAS DESIGNED/SURVEYED AND IS NOT GUARANTEED TO BE EXACT OR COMPLETE. THE CONTRCTOR IS RESPONSIBLE FOR DETERMINING THE EXACT TYPE, LOCATION, AND DEPTH OF ALL UTILITIES AFFECTED BY CONSTRUCTION FOR THIS PROJECT IN ORDER TO AVOID DAMAGING THOSE UTILITIES.
6. CONTRACTOR SHALL FURNISH AND INSTALL ALL PAVEMENT MARKINGS FOR FIRE LANES, PARKING STALLS, HANDICAPPED PARKING SYMBOLS, AND MISCELLANEOUS STRIPING WITHIN PARKING LOT AND AROUND BUILDING AS SHOWN ON THE PLANS.
7. CONTRACTOR TO REFERENCE IRRIGATION PLAN AND MEP PLANS FOR LOCATION OF PROPOSED SLEEVING AND CONDUITS.
8. REFER TO PROJECT EARTHWORK SPECIFICATION AND GEOTECHNICAL REPORT FOR PREPARATION OF BUILDING AND PAVING SUBGRADES.
9. ALL DISTURBED GRASS AND NON-PAVED AREAS NOT INDICATED FOR IMPROVEMENTS BY LANDSCAPING PLANS ARE TO BE STABILIZED AND RESTORED WITH 4" MINIMUM TOPSOIL AND SODDING AS INDICATED TO MATCH FINISH GRADES PER GRADING PLAN.
10. ALL STRIPING SHALL BE EXTRUDED THERMOPLASTIC MARKING MATERIAL.
11. FIRE APPARATUS ACCESS ROADS SHALL BE MARKED BY PAINTED LINES OF RED TRAFFIC PAINT 6 IN. WIDTH TO SHOW THE BOUNDARIES OF THE LANE. THE WORDS "NO PARKING FIRE LANE" OR "FIRE LANE NO PARKING" SHALL APPEAR IN 4 IN. WHITE LETTERS AT 25 FT. INTERVALS ON THE RED BORDER MARKINGS ALONG BOTH SIDES OF THE FIRE LANES. WHERE A CURB IS AVAILABLE, THE STRIPING SHALL BE ON BOTH THE VERTICAL AND HORIZONTAL FACES OF THE CURB.
12. CONTRACTOR SHALL VERIFY BENCHMARKS AND DATUM PRIOR TO COMMENCING CONSTRUCTION OR STAKING OF IMPROVEMENTS.

LTRA
3320 Belt Line Rd
Farmers Branch, Texas 75234
LINA T. RAMEY & ASSOCIATES, INC.
Firm Registration No. F-782

STATE OF TEXAS
VINCENT V. MAZIDI
113088
LICENSED
PROFESSIONAL ENGINEER
4/21/2021

DISTRICT (18)
COLLIN COUNTY
McKinney Area Engineering and Maintenance Facility
2205 TX-5, McKinney, TX 75069
PROJECT NO. 18-470420012

ISSUED: 2021.04.21
DRAWN BY: VM
REVISIONS:

1	05/17/2021	VVM

DEMOLITION PLAN

C1.1

THIS DRAWING CREATED FOR PRODUCTION ON 22"x34" SHEET SIZE. DO NOT SCALE PRINTS.

GENERATED ON:

STEEL JOISTS NOTES

A. PROVIDE OPEN WEB, UNDERSLUNG, PARALLEL CHORD JOISTS UNLESS OTHERWISE NOTED ON THE DRAWINGS.

B. DESIGN, FABRICATE, AND ERECT OPEN WEB STEEL JOISTS TO THE SPECIFICATIONS OF THE STEEL JOIST INSTITUTE, LATEST EDITION.

C. UNLESS OTHERWISE SHOWN, WELD K-SERIES JOISTS TO SUPPORTING BEAMS OR BEARING PLATES WITH 3/16 INCH FILLET WELD, 1-1/2 INCHES LONG ON EACH SIDE OF JOIST SEAT. USE MINIMUM OF 2-3/4 INCH DIAMETER A325N BOLTS AT JOIST CONNECTIONS ON OR NEAREST TO COLUMN LINES.

D. UNLESS OTHERWISE SHOWN, WELD LH OR DLH-SERIES JOISTS TO SUPPORTING BEAMS OR BEARING PLATES WITH 1/4 INCH FILLET WELD, 2 INCHES LONG ON EACH SIDE OF JOIST SEAT. USE MINIMUM OF 2-3/4 INCH DIAMETER A325N CONNECTION BOLTS AT JOIST CONNECTIONS ON OR NEAREST TO COLUMN LINES.

E. PROVIDE JOIST BRIDGING, SIZE, AND SPACING, IN ACCORDANCE WITH STEEL JOIST INSTITUTE. PROVIDE SUPPLEMENTAL BRIDGING AS REQUIRED FOR NET WIND UPLIFT CONDITION.

F. SEE COMPONENTS AND CLADDING WIND FORCES ON SHEET S0.2.NET WIND UPLIFT PRESSURE = (0.9 X DEAD LOAD) + WIND LOAD

G. JOIST SIZES AS SHOWN ON DRAWINGS ARE BASED ON GRAVITY LOAD CAPACITIES. DESIGN JOISTS [AND JOIST GIRDERS] FOR THE GRAVITY LOAD CAPACITIES IN ADDITION TO OTHER LOADS (UPLIFT, AXIAL LOADS, CONCENTRATED LOADS, MOMENTS, ETC.) INDICATED ON DRAWINGS.

H. SHOP DRAWINGS FOR JOISTS AND JOIST ACCESSORIES TO BE PREPARED BY THE JOIST MANUFACTURER'S DETAILERS.

I. SUBMIT DESIGN CALCULATIONS IN ACCORDANCE WITH STEEL JOIST INSTITUTE DESIGN STANDARDS. SUBMIT DESIGN CALCULATIONS SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE WHERE THE PROJECT IS LOCATED.

J. PROVIDE 2-1/2 INCH MINIMUM BEARING ON STRUCTURAL STEEL FOR K-SERIES JOISTS OR PROVIDE BEARING LENGTHS PER STEEL JOIST INSTITUTE REQUIREMENTS UNLESS GREATER LENGTHS ARE SHOWN ON DRAWINGS.

K. APPLY FULL DEAD LOADS TO JOIST GIRDERS PRIOR TO WELDING THE BOTTOM CHORD STRUTS TO STABILIZER PLATES.

L. PROVIDE SLOPED BEARING ENDS WHERE JOIST SLOPE EXCEEDS 1/4 INCH VERTICAL IN 12 INCH HORIZONTAL DIMENSIONS.

M. PROVIDE TOP AND BOTTOM CHORD EXTENSIONS WHERE INDICATED ON DRAWINGS.

N. WHERE STEEL JOIST ARE USED FOR WIND OR SEISMIC BRACING, DESIGN TOP AND BOTTOM CHORDS FOR THE FORCES INDICATED ON DRAWINGS. THE CONNECTION AT THE TOP AND BOTTOM CHORD CONNECTIONS TO DEVELOP EQUAL FORCES. THE BOTTOM CHORD OF THE MEMBER IS NOT TO BE WELDED UNTIL ALL OF THE FLOOR/ROOF DEAD LOAD IS IN PLACE.

O. DO NOT WELD BOTTOM CHORD CONNECTION TO SUPPORTING MEMBERS UNTIL FLOOR/ROOF DEAD LOAD HAS BEEN APPLIED.

P. IN THE INSTANCE WHERE A SUPPORT BEAM FLANGE IS NOT WIDE ENOUGH TO ACCOMMODATE PROPER BEARING FOR TWO JOISTS SEATS, STAGGER JOISTS AS REQUIRED TO ACHIEVE PROPER BEARING.

SPECIAL INSPECTION NOTES

A. SPECIAL INSPECTIONS ARE TO BE PROVIDED BY AN AGENCY APPROVED BY THE LOCAL BUILDING OFFICIALS AND HIRED BY THE OWNER. SPECIAL INSPECTION IS REQUIRED FOR THE FOLLOWING TYPES OF WORK.

1. ALL CONCRETE WORK FOR STRENGTHS GREATER THAN 2,500 PSI (EXCEPT FOR NON-STRUCTURAL CONCRETE)
2. MASONRY WORK AND DURING ALL GROUTING OPERATIONS
3. BOLTS AND DOWELS INSTALLED IN MASONRY AND CONCRETE
4. ALL FIELD WELDING (EXCEPT METAL STUDS, FURRING CHANNELS, ETC.)
5. ALL WORK INVOLVING HIGH STRENGTH BOLTS
6. BUILDING PAD PREPARATION
7. SEE SPEC 033000 FOR VAPOR BARRIER INSPECTIONS

1

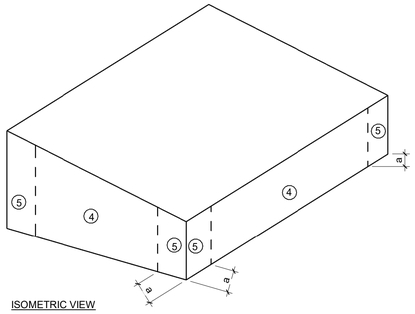
A. GENERAL:

1. STRUCTURAL TESTS AND SPECIAL INSPECTIONS SHALL BE PROVIDED IN ACCORDANCE WITH CHAPTER 17 OF THE 2018 INTERNATIONAL BUILDING CODE, THE SPECIAL INSPECTOR SHALL BE A QUALIFIED PERSON OR AGENCY, CONTRACTED BY THE OWNER WHO SHALL DEMONSTRATE COMPETENCE, TO THE SATISFACTION OF THE BUILDING OFFICIAL, FOR INSPECTION OF THE PARTICULAR TYPE OF CONSTRUCTION OR OPERATION REQUIRING SPECIAL INSPECTION.

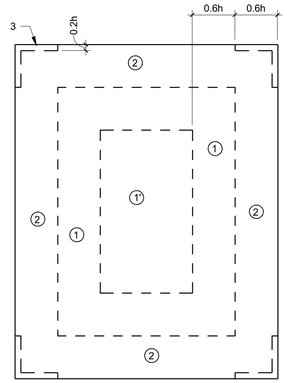
B. REPORT REQUIREMENTS:

1. THE SPECIAL INSPECTORS SHALL KEEP RECORDS OF SPECIAL INSPECTIONS. THE SPECIAL INSPECTOR SHALL FURNISH INSPECTION REPORTS TO THE BUILDING OFFICIAL AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE. REPORTS SHALL INDICATE THAT WORK INSPECTED WAS DONE IN CONFORMANCE TO THE APPROVED CONSTRUCTION DOCUMENTS. DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION. IF THE DISCREPANCIES ARE NOT CORRECTED, THE DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE BUILDING OFFICIAL AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE PRIOR TO THE COMPLETION OF THAT PHASE OF THE WORK. A FINAL REPORT DOCUMENTING REQUIRED SPECIAL INSPECTIONS AND CORRECTION OF ANY DISCREPANCIES NOTED IN THE INSPECTIONS SHALL BE SUBMITTED AT A POINT IN TIME AGREED UPON BY THE OWNER AND THE BUILDING OFFICIAL PRIOR TO THE START OF WORK.

MAINTENANCE & WASH BAYS



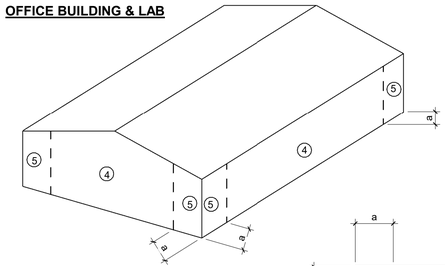
ISOMETRIC VIEW



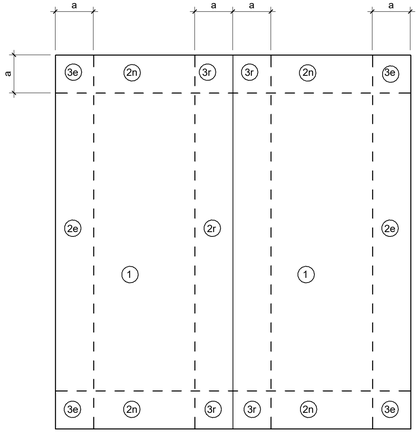
SCHEMATIC ROOF PLAN

ZONE	EFFECTIVE WIND AREA (SQ. FT)						
	10	20	50	100	250	500	1000
1	-42	-39	-36	-33	-29	-27	-27
1'	-24	-24	-24	-24	-20	-17	-17
2	-55	-52	-47	-44	-39	-35	-35
3	-55	-52	-47	-44	-39	-35	-35
1 & 1'	+16	+16	+16	+16	+16	+16	+16
2 & 3	+26	+25	+24	+23	+21	+19	+19
PARAPET	-55 +76	-52 +71	-47 +65	-43 +60	-38 +53	-35 +48	-35 +48
4	-29	-27	-26	-25	-23	-22	-22
5	-35	-33	-30	-28	-24	-22	-22
4 & 5	+26	+25	+24	+23	+21	+20	+20

OFFICE BUILDING & LAB



ISOMETRIC VIEW



SCHEMATIC ROOF PLAN

ZONE	EFFECTIVE WIND AREA (SQ. FT)						
	10	20	50	100	250	500	1000
1 & 2e	-47	-47	-29	-17	-17	-17	-17
2n, 2r & 3e	-68	-59	-47	-37	-26	-26	-26
3r	-80	-69	-54	-42	-42	-42	-42
ROOF ALL ZONES	+19	+17	+17	+17	+17	+17	+17
OVERHANG 1 & 2e	-53	-53	-41	-32	-32	-32	-32
OVERHANG 2n & 2r	-75	-68	-59	-52	-43	-43	-43
OVERHANG 3e	-87	-76	-60	-48	-32	-32	-32
OVERHANG 3r	-100	-85	-65	-49	-49	-49	-49
4	-28	-26	-25	-24	-22	-21	-21
5	-34	-33	-29	-26	-23	-21	-21
WALL ALL ZONES	+26	+24	+23	+22	+20	+19	+19

NOTES

1. FOR WIND DESIGN PARAMETERS, SEE GENERAL STRUCTURAL NOTES.
2. UNITS ARE POUNDS PER SQUARE FOOT.
3. PLUS AND MINUS SIGNS SIGNIFY PRESSURES ACTING TOWARDS AND AWAY FROM THE SURFACES RESPECTIVELY.
4. a = 10 PERCENT OF LEAST HORIZONTAL DIMENSION, BUT NOT LESS THAN 3 FEET.
5. WALL AND PARAPET FORCES SHALL BE APPLIED INWARD AND OUTWARD AS ALTERNATIVE LOAD CASES.
6. BUILDING SKETCHES SHOWN DO NOT REPRESENT THE ACTUAL BUILDING SHAPE, BUT ARE INTENDED TO SHOW ZONES OF PRESSURE VARIATION.

2 COMPONENTS AND CLADDING WIND FORCES
3/16" = 1'-0"

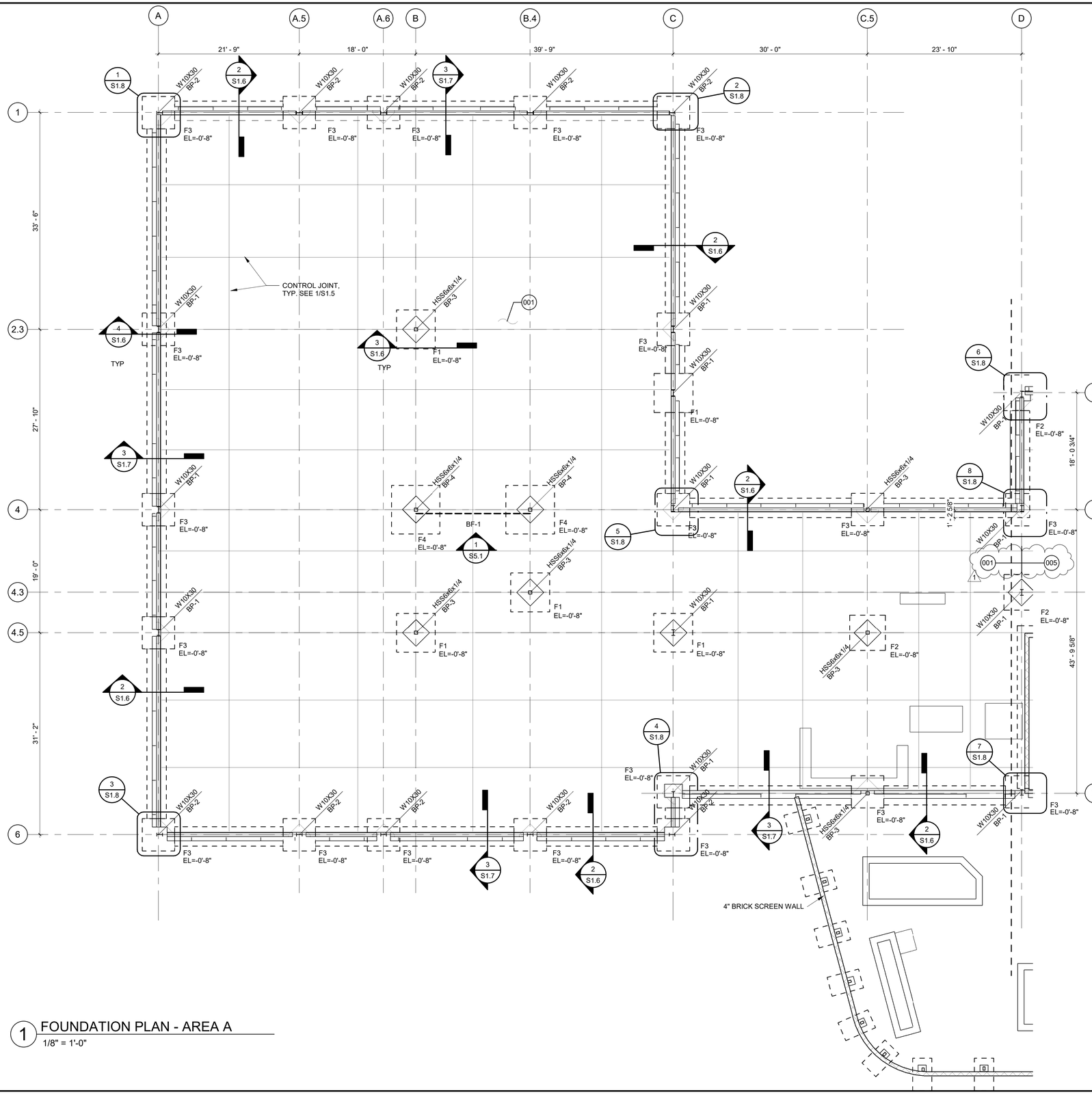
Jacobs
1999 Bryan Street, Suite 1200
Dallas, Tx 75201
JACOBS ENGINEERING GROUP, INC
TEXAS REGISTRATION #2966
GABRIEL A. SERNA 99793 LICENSED PROFESSIONAL ENGINEER
05/17/2021

DALLAS DISTRICT (18)
COLLIN COUNTY
McKinney Area Engineering and Maintenance Facility
2205 TX-5, McKinney, TX 75069
PROJECT NO. 18-4704200012

ISSUED: 2021.04.21
DRAWN BY: PA/JS
REVISIONS:
1 05/17/2021 PA

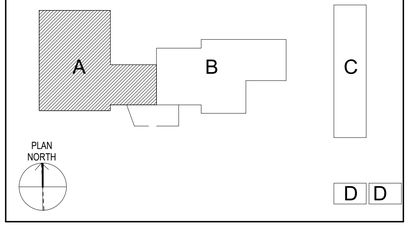
STRUCTURAL NOTES
S0.2

THIS DRAWING CREATED FOR PRODUCTION ON 22"x34" SHEET SIZE. DO NOT SCALE PRINTS.



1 FOUNDATION PLAN - AREA A
1/8" = 1'-0"

KEYPLAN



SCALES

1/8" = 1'-0"

8' 6' 4' 2' 0' 4' 8' 16'

KEY NOTES

001	5" THICK SLAB-ON-GRADE OVER 15 MIL VAPOR RETARDER OVER PREPARED SUBGRADE. REINFORCE SLAB WITH #4 @ 16" ON CENTER EACH WAY AT TOP OF SLAB. TOP OF SLAB ELEVATION = 0'-0" UNLESS OTHERWISE NOTED.
005	5" THICK SLAB-ON-GRADE OVER 20 MIL VAPOR RETARDER OVER PREPARED SUBGRADE. REINFORCE SLAB WITH #4 @ 16" ON CENTER EACH WAY AT TOP OF SLAB. TOP OF SLAB ELEVATION = 0'-0" UNLESS OTHERWISE NOTED.

PLAN NOTES

1.	FINISH FLOOR ELEVATION = 0'-0" CORRESPONDS TO ACTUAL ELEVATION = 610.60', RE: CIVIL
2.	- - - - - INDICATES BRACED FRAME. SEE SHEET S5.1 FOR BRACED FRAMED ELEVATIONS
3.	"Fx" INDICATES FOOTING TYPE. SEE SHEET S1.7 FOR FOOTING SCHEDULE
4.	BPx INDICATES BASE PLATE TYPE, RE: S2.10
5.	RE: S0.1 THROUGH S0.3 FOR STRUCTURAL GENERAL NOTES
6.	RE: S1.5 FOR TYPICAL FOUNDATION DETAILS
7.	RE: S2.10 FOR TYPICAL STEEL SECTIONS AND DETAILS
8.	RE: S4.10 FOR TYPICAL MASONRY SECTIONS AND DETAILS
9.	ALL COLUMNS SHALL BE CENTERED ON GRIDLINES UNLESS OTHERWISE NOTED
10.	ALL SPREAD FOOTINGS SHALL BE CENTERED UNDER COLUMN CENTERLINES UNLESS OTHERWISE NOTED
11.	RE: ARCH AND MEP DRAWINGS FOR LOCATIONS OF OPENINGS, PENETRATIONS, CURBS, SLAB SLOPES AND DEPRESSIONS

Jacobs
1999 Bryan Street, Suite 1200
Dallas, Tx 75201

JACOBS ENGINEERING GROUP, INC
TEXAS REGISTRATION #2966

STATE OF TEXAS
GABRIEL A. SERNA
99793
REGISTERED
ENGINEER
05/17/2021

DALLAS DISTRICT (18)
COLLIN COUNTY

McKinney Area Engineering and Maintenance Facility

2205 TX-5, McKinney, TX 75069

PROJECT NO. 18-4704300012

ISSUED: 2021.04.21

DRAWN BY: GP

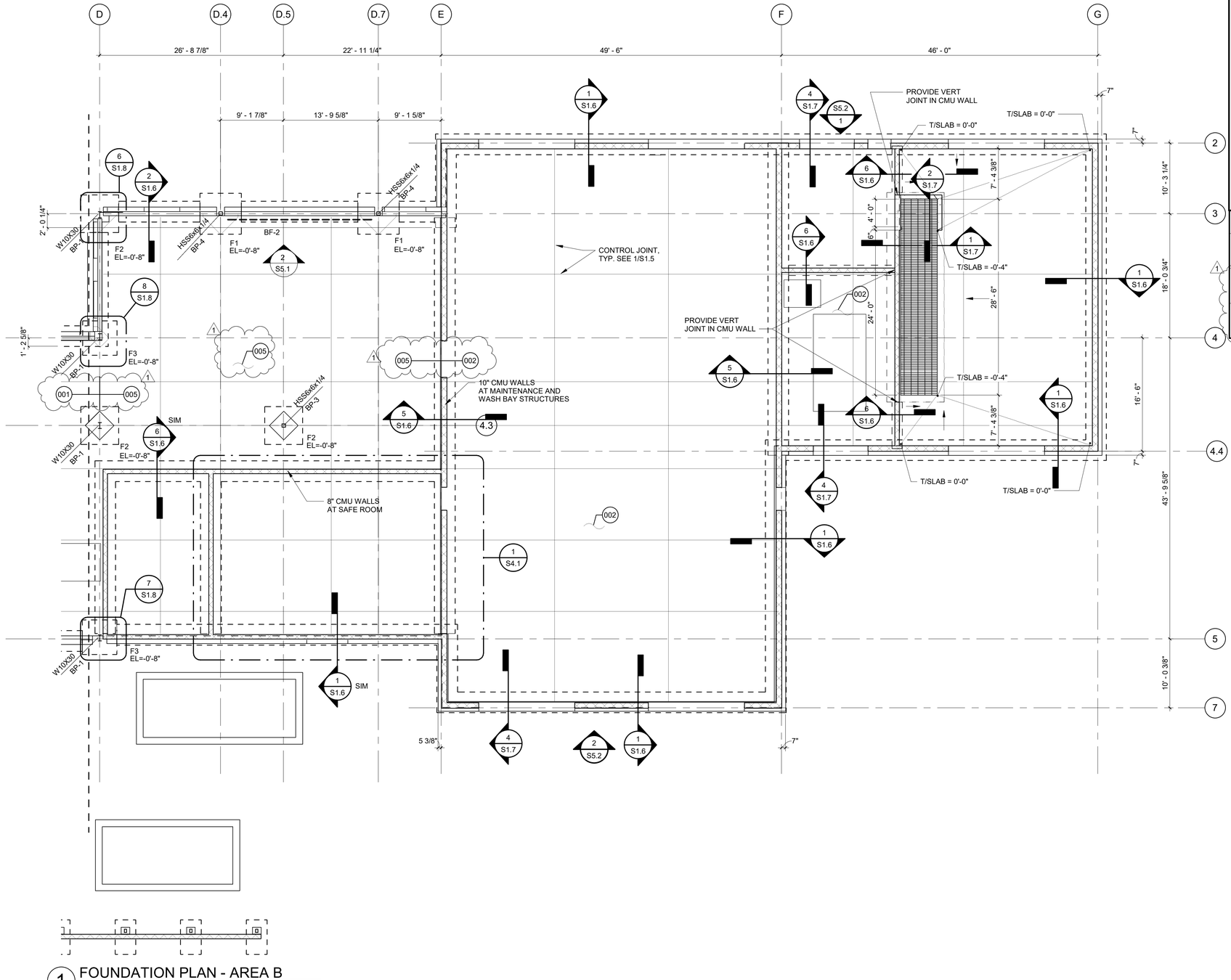
REVISIONS:

1 05/17/2021 PA

FOUNDATION PLAN AREA A

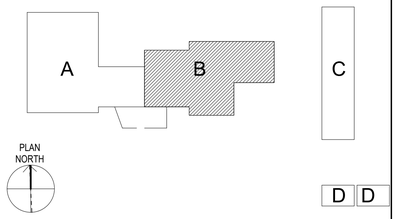
S1.2

THIS DRAWING CREATED FOR PRODUCTION ON 22"x34" SHEET SIZE. DO NOT SCALE PRINTS.



1 FOUNDATION PLAN - AREA B
1/8" = 1'-0"

KEYPLAN



SCALES

1/8" = 1'-0"

8' 6' 4' 2' 0' 4' 8' 16'

KEY NOTES

001	5" THICK SLAB-ON-GRADE OVER 15 MIL VAPOR RETARDER OVER PREPARED SUBGRADE. REINFORCE SLAB WITH #4 @ 16" ON CENTER EACH WAY AT TOP OF SLAB. TOP OF SLAB ELEVATION = 0'-0" UNLESS OTHERWISE NOTED.
002	8" THICK SLAB-ON-GRADE OVER 20 MIL VAPOR RETARDER OVER PREPARED SUBGRADE. REINFORCE SLAB WITH #5 @ 12" ON CENTER EACH WAY AT TOP OF SLAB. TOP OF SLAB ELEVATION = 0'-0" UNLESS OTHERWISE NOTED.
005	5" THICK SLAB-ON-GRADE OVER 20 MIL VAPOR RETARDER OVER PREPARED SUBGRADE. REINFORCE SLAB WITH #4 @ 16" ON CENTER EACH WAY AT TOP OF SLAB. TOP OF SLAB ELEVATION = 0'-0" UNLESS OTHERWISE NOTED.

PLAN NOTES

1.	FINISH FLOOR ELEVATION = 0'-0" CORRESPONDS TO ACTUAL ELEVATION = 610.60', RE: CIVIL
2.	- - - - - INDICATES BRACED FRAME. SEE SHEET S5.1 FOR BRACED FRAMED ELEVATIONS
3.	"Fx" INDICATES FOOTING TYPE. SEE SHEET S1.7 FOR FOOTING SCHEDULE
4.	BPx INDICATES BASE PLATE TYPE, RE: S2.10
5.	RE: S0.1 THROUGH S0.3 FOR STRUCTURAL GENERAL NOTES
6.	RE: S1.5 FOR TYPICAL FOUNDATION DETAILS
7.	RE: S2.10 FOR TYPICAL STEEL SECTIONS AND DETAILS
8.	RE: S4.10 FOR TYPICAL MASONRY SECTIONS AND DETAILS
9.	ALL COLUMNS SHALL BE CENTERED ON GRIDLINES UNLESS OTHERWISE NOTED
10.	ALL SPREAD FOOTINGS SHALL BE CENTERED UNDER COLUMN CENTERLINES UNLESS OTHERWISE NOTED
11.	RE: ARCH AND MEP DRAWINGS FOR LOCATIONS OF OPENINGS, PENETRATIONS, CURBS, SLAB SLOPES AND DEPRESSIONS

Jacobs
1999 Bryan Street, Suite 1200
Dallas, Tx 75201

JACOBS ENGINEERING GROUP, INC
TEXAS REGISTRATION #2966

STATE OF TEXAS
GABRIEL A. SERNA
99793
REGISTERED
05/17/2021

DALLAS DISTRICT (18)
COLLIN COUNTY

McKinney Area Engineering and Maintenance Facility

2205 TX-5, McKinney, TX 75069

PROJECT NO. 18-4704300012

ISSUED: 2021.04.21
DRAWN BY: GP
REVISIONS:
1 05/17/2021 PA

FOUNDATION PLAN AREA B

S1.3

THIS DRAWING CREATED FOR PRODUCTION ON 22"x34" SHEET SIZE. DO NOT SCALE PRINTS.

Panel: LP1

CKT	Circuit Description	Trip	Poles	Load Classification	A		B		Load Classification	Poles	Trip	Circuit Description	CKT
1	PANEL 'WB'	100 A	2	Lighting; Motor;...	5010 VA	598 VA			Heating	2	20 A	OVEN A	2
3	--	--	--	--			3950 VA	598 VA	--	--	--	--	4
5	OVEN #5	20 A	2	Heating	1380 VA	1104 VA			Heating	2	20 A	OVEN B	6
7	--	--	--	--			1380 VA	1104 VA	--	--	--	--	8
9	PULVERIZER	20 A	2	Motor	920 VA	598 VA			Heating	2	20 A	OVEN C	10
11	--	--	--	--			920 VA	598 VA	--	--	--	--	12
13	RECEPTS RM. 123	20 A	1	Receptacles	360 VA	1380 VA			Heating	2	20 A	OVEN D	14
15	RECEPTS RM. 123A	20 A	1	Receptacles			720 VA	1380 VA	--	--	--	--	16
17	CYLINDER BREAKER	20 A	1	Motor	1800 VA	1560 VA			Heating	2	20 A	OVEN #6	18
19	CHIPMUNK CRUSHER	20 A	2	Motor			2016 VA	1560 VA	--	--	--	--	20
21	--	--	--	--	2016 VA	180 VA			Motor	1	20 A	SAMPLE SPLITTER	22
23	SOIL SAMPLE TROUGH	20 A	1	Receptacles			180 VA	528 VA	Motor	1	20 A	SAND EQUIVALENT SHAKER	24
25	GYRATORY COMPACTOR	20 A	1	Motor	1380 VA	1000 VA			Motor	1	20 A	SILENT SIFTER	26
27	PANEL 'FE'	100 A	2	Other; Motor			8750 VA	1000 VA	Motor	1	20 A	GRADATION SHAKER	28
29	--	--	--	--	8000 VA	500 VA			Receptacles	2	20 A	EXT. WP/GFI RECEPT	30
31	AIR COMPRESSOR	20 A	2	Motor			2064 VA	500 VA	--	--	--		32
33	--	--	--	--	2064 VA	750 VA			--	2	20 A	SPARE	34
35	SPARE	20 A	2	--			750 VA	750 VA	--	--	--		36
37	--	--	--	--	750 VA	750 VA			--	2	20 A	SPARE	38
39	SPARE	20 A	1	--			750 VA	750 VA	--	--	--	--	40
41	SPARE	20 A	1	--	750 VA	750 VA			--	1	20 A	SPARE	42
				Total Load:	33600 VA		30248 VA						
				Total Amps:	280 A		252 A						

Load Classification	Connected Load	Connected Current	Design Factor	Design Load	Design Current
Lighting	1400 VA	6 A	125.00%	1750 VA	7 A
Receptacles	2620 VA	11 A	100.00%	2620 VA	11 A
Data	0 VA	0 A	0.00%	0 VA	0 A
Motor	26088 VA	109 A	106.90%	27888 VA	116 A
Cooling	0 VA	0 A	0.00%	0 VA	0 A
Heating	13240 VA	55 A	80.00%	10592 VA	44 A
Kitchen	0 VA	0 A	0.00%	0 VA	0 A
Other	7250 VA	30 A	100.00%	7250 VA	30 A
Spare	13250 VA	55 A	50.00%	6625 VA	28 A
Totals:	63848 VA	266 A		56725 VA	236 A

Notes:
1. Contractor shall provide full size neutral and ground bus.
2. Contractor shall balance phases to within +/-10%.

Location:	ELEC 125
Supply From:	TR-LP
Mounting:	Surface
Enclosure:	Type 1

Summary	
Voltage:	120/240 Single
Phases	1
Wires:	3
Neutral:	100.00%
Ground Bus:	Yes
A.I.C. Rating:	42k
Mains Type:	MCB
Bus Rating:	400 A
Total Amps:	236 A

Additional Notes:
PROVIDE WITH FEED THRU LUGS.

Panel: LP2

CKT	Circuit Description	Trip	Poles	Load Classification	A		B		C		Load Classification	Poles	Trip	Circuit Description	CKT
1	RECEPTS EXT. WP/GFI	20 A	1	Receptacles	540 VA	720 VA					Receptacles	1	20 A	RECEPTS EXT. WP/GFI	2
3	LIGHTING	20 A	1	Lighting			1587 VA	1562 VA			Lighting	1	20 A	LIGHTING RM 128	4
5	RECEPTS RM. 123A & 126	20 A	1	Receptacles					720 VA	180 VA	Receptacles	1	20 A	RECEPTS RM. 123	6
7	SOILS MACHINE 1	20 A	1	Heating	3120 VA	3120 VA					Heating	1	20 A	SOILS MACHINE 2	8
9	RECEPTS CNTR RM 122A	20 A	1	Receptacles			720 VA	720 VA			Receptacles	1	20 A	RECEPTS CNTR RM 122A	10
11	RECEPTS CNTR RM 122A	20 A	1	Receptacles					540 VA	540 VA	Receptacles	1	20 A	RECEPTS CNTR RM 122A	12
13	SPARE	20 A	1	--	500 VA	500 VA					--	1	20 A	SPARE	14
15	SPARE	20 A	1	--			500 VA	500 VA			--	1	20 A	SPARE	16
17	SPARE	20 A	1	--					500 VA	500 VA	--	1	20 A	SPARE	18
19	SPARE	20 A	1	--	500 VA	500 VA					--	1	20 A	SPARE	20
21	SPARE	20 A	1	--			500 VA	500 VA			--	1	20 A	SPARE	22
23	SPARE	20 A	1	--					500 VA	500 VA	--	1	20 A	SPARE	24
25	SPARE	20 A	1	--	500 VA	500 VA					--	1	20 A	SPARE	26
27	SPARE	20 A	1	--			500 VA	500 VA			--	1	20 A	SPARE	28
29	SPARE	20 A	1	--					500 VA	500 VA	--	1	20 A	SPARE	30
31	SPARE	20 A	1	--	500 VA	500 VA					--	1	20 A	SPARE	32
33	SPACE ONLY	--	--	--			0 VA	0 VA			--	--	--	SPACE ONLY	34
35	SPACE ONLY	--	--	--					0 VA	0 VA	--	--	--	SPACE ONLY	36
37	SPACE ONLY	--	--	--	0 VA	0 VA					--	--	--	SPACE ONLY	38
39	SPACE ONLY	--	--	--			0 VA	0 VA			--	--	--	SPACE ONLY	40
41	SPACE ONLY	--	--	--					0 VA	0 VA	--	--	--	SPACE ONLY	42
				Total Load:	11500 VA		7589 VA		4980 VA						
				Total Amps:	99 A		67 A		42 A						

Load Classification	Connected Load	Connected Current	Design Factor	Design Load	Design Current
Lighting	3149 VA	9 A	125.00%	3937 VA	11 A
Receptacles	4680 VA	13 A	100.00%	4680 VA	13 A
Data	0 VA	0 A	0.00%	0 VA	0 A
Motor	0 VA	0 A	0.00%	0 VA	0 A
Cooling	0 VA	0 A	0.00%	0 VA	0 A
Heating	6240 VA	17 A	80.00%	4992 VA	14 A
Kitchen	0 VA	0 A	0.00%	0 VA	0 A
Other	0 VA	0 A	0.00%	0 VA	0 A
Spare	10000 VA	28 A	50.00%	5000 VA	14 A
Totals:	24069 VA	67 A		18609 VA	52 A

Notes:
1. Contractor shall provide full size neutral and ground bus.
2. Contractor shall balance phases to within +/-10%.

Location:	ELEC 125
Supply From:	MSB
Mounting:	Surface
Enclosure:	Type 1

Summary	
Voltage:	120/208 Wye
Phases	3
Wires:	4
Neutral:	100.00%
Ground Bus:	Yes
A.I.C. Rating:	42k
Mains Type:	MLO
Bus Rating:	125 A
Total Amps:	52 A

Additional Notes:
PROVIDE WITH FEED THRU LUGS AND INTERNAL SURGE PROTECTION DEVICE.

Distribution Panel: MSB

CKT	Circuit Description	Load Classification	Load
1	SPD	Other	36026 VA
2	P1	Lighting; Other; Kitchen; Receptacles; Data; Receptacle	72253 VA
3	MP-1	Other; Motor; Heating; Receptacles	202087 VA
4	TR-LP	Lighting; Other; Motor; Heating; Receptacles	63848 VA
5	LP2	Lighting; Heating; Receptacles	24069 VA
6	P2	Other; Motor; Receptacles	25240 VA
7	MP-2	Other; Motor; Heating	110881 VA
8	DOAS-1	Motor	25939 VA
9	SPARE	--	28821 VA
10	SPACE	--	0 VA
11	SPACE	--	0 VA
12	SPACE	--	0 VA
13	SPACE	--	0 VA
14	SPACE	--	0 VA
15	SPACE	--	0 VA
16	SPACE	--	0 VA
17	SPACE	--	0 VA
18	SPACE	--	0 VA
19	SPACE	--	0 VA
20	SPACE	--	0 VA

Load Classification	Connected Load (VA)	Connected Current	Design Factor	Design Load (VA)	Design Current
Lighting	15513 VA	43 A	125.00%	19391 VA	54 A
Receptacles	45300 VA	126 A	61.04%	27650 VA	77 A
Data	2000 VA	6 A	100.00%	2000 VA	6 A
Motor	84009 VA	233 A	107.72%	90494 VA	251 A
Cooling	0 VA	0 A	0.00%	0 VA	0 A
Heating	266686 VA	740 A	80.00%	213348 VA	592 A
Kitchen	14440 VA	40 A	80.00%	11552 VA	32 A
Other	61966 VA	172 A	100.00%	61966 VA	172 A
Spare	99071 VA	275 A	50.00%	49536 VA	137 A
Totals:	589165 VA	1635 A		476117 VA	1322 A

Notes:
1. Contractor shall provide full size neutral and ground bus.
2. Contractor shall balance phases to within +/-10%.

Location:	
Supply From:	UTILITY...
Mounting:	
Enclosure:	

Summary	
Voltage:	120/208 Wye
Phases:	3
Wires:	4
Neutral:	100.00%
Ground Bus:	Yes
A.I.C. Rating:	42k
Mains Type:	MCB
Bus Rating:	1600 A
Total Amps:	1322 A

Additional Notes:

1

Panel: FE

CKT	Circuit Description	Trip	Poles	Load Classification	A		B		Load Classification	Poles	Trip	Circuit Description	CKT
1	[DIESEL FUEL DISPENSERS	20 A	1	Other	750 VA	1000 VA			Other	2	20 A	[PROPANE STATION	2
3	[SWITCHED NEUTRAL	--	--	--			0 VA	1000 VA	--	--	--	--	4
5	[SHUNT TRIP - DISPENSERS	--	--	--	0 VA	0 VA			--	--	--	[SHUNT TRIP - P.STATION	6
7	[ASSET WORKS - FMS	20 A	1	Other			500 VA	500 VA	Other	1	20 A	REMOTE ALARM	8
9	[SWITCHED NEUTRAL	--	--	--	0 VA	750 VA			Other	1	20 A	VSMART/RECEPT.	10
11	[SHUNT TRIP - ASSET...	--	--	--			0 VA	500 VA	Other	1	20 A	E.P.O.	12
13	[DIESEL PUMP (MOTOR)	20 A	2	Motor	1500 VA	500 VA			Other	2	20 A	[SPD *	14
15	--	--	--	--			1500 VA	500 VA	--	--	--	--	16
17	[SHUNT TRIP - DIESEL PUMP	--	--	--	0 VA	500 VA			--	2	20 A	[SPARE	18
19	[TEST & ACK. BUTTON	20 A	1	Other			500 VA	500 VA	--	--	--	--	20
21	[TANK MONITORING SYS.	20 A	1	Other	750 VA	0 VA			--	--	--	[SHUNT TRIP- SPARE	22
23	[SPARE	20 A	2	--			500 VA	500 VA	--	2	20 A	[SPARE	24
25	--	--	--	--	500 VA	500 VA			--	--	--	--	26
27	[SHUNT TRIP - SPARE	--	--	--			0 VA	0 VA	--	--	--	[SHUNT TRIP - SPARE	28
29	[SPARE	20 A	2	--	500 VA	500 VA			--	1	20 A	[SPARE	30
31	--	--	--	--			500 VA	0 VA	--	--	--	[SWITCHED NEUTRAL	32
33	[SHUNT TRIP - SPARE	--	--	--	0 VA	0 VA			--	--	--	[SHUNT TRIP - SPARE	34
35	[SPARE	20 A	1	--			500 VA	500 VA	--	1	20 A	SPARE	36
37	[SWITCHED NEUTRAL	--	--	--	0 VA	500 VA			--	1	20 A	SPARE	38
39	[SHUNT TRIP - SPARE	--	--	--			0 VA	0 VA	--	--	--	SPACE	40
41	SPARE	20 A	1	--	500 VA	0 VA			--	--	--	SPACE	42
				Total Load:	8750 VA		8000 VA						
				Total Amps:	73 A		67 A						

Load Classification	Connected Load	Connected Current	Design Factor	Design Load	Design Current
Lighting	0 VA	0 A	0.00%	0 VA	0 A
Receptacles	0 VA	0 A	0.00%	0 VA	0 A
Data	0 VA	0 A	0.00%	0 VA	0 A
Motor	3000 VA	13 A	125.00%	3750 VA	16 A
Cooling	0 VA	0 A	0.00%	0 VA	0 A
Heating	0 VA	0 A	0.00%	0 VA	0 A
Kitchen	0 VA	0 A	0.00%	0 VA	0 A
Other	7250 VA	30 A	100.00%	7250 VA	30 A
Spare	6500 VA	27 A	50.00%	3250 VA	14 A
Totals:	16750 VA	70 A		14250 VA	59 A

Notes:
1. Contractor shall provide full size neutral and ground bus.
2. Contractor shall balance phases to within +/-10%.

Location:	
Supply From:	LP1
Mounting:	Surface
Enclosure:	NEMA 3R

Summary	
Voltage:	120/240 Single
Phases	1
Wires:	3
Neutral:	100.00%
Ground Bus:	Yes
A.I.C. Rating:	42k
Mains Type:	MLO
Bus Rating:	100 A
Total Amps:	59 A

Additional Notes:
PROVIDE WITH FEED THRU LUGS.
* = INTEGRAL SPD

Texas Department of Transportation

DFW Consulting Group, Inc.
1616 Corporate Court, Suite 100
Irving, Tx 75038
(972) 929-1199
www.dfwcgi.com
Project No. 2004
Firm Registration No. 720

STATE OF TEXAS
JOHN HALEY
112905
LICENSED
PROFESSIONAL ENGINEER
05/17/2021

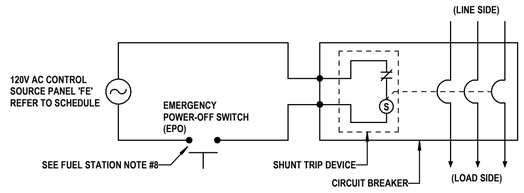
DALLAS DISTRICT (18)
COLLIN COUNTY
McKinney Area Engineering and Maintenance Facility
2205 TX-5, McKinney, TX 75069
PROJECT NO. 18-470420012

ISSUED: 2021.05.17
DRAWN BY: DFWCGI
REVISIONS:
1 05/17/21

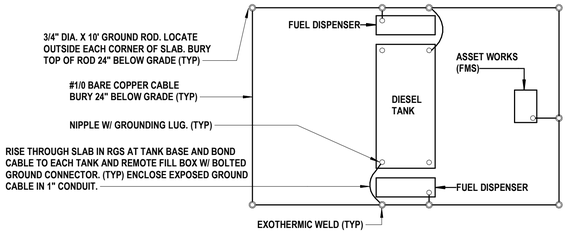
ELECTRICAL SCHEDULES

E4.1

THIS DRAWING CREATED FOR PRODUCTION ON 22"x34" SHEET SIZE. DO NOT SCALE PRINTS.

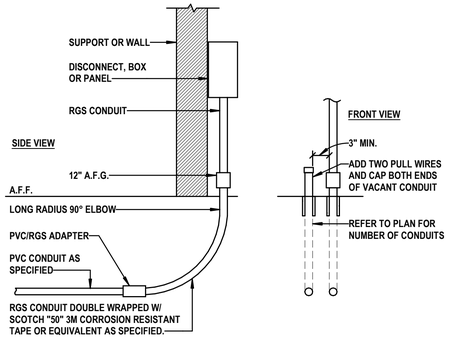


05 SHUNT TRIP WIRING DIAGRAM
SCALE: NONE



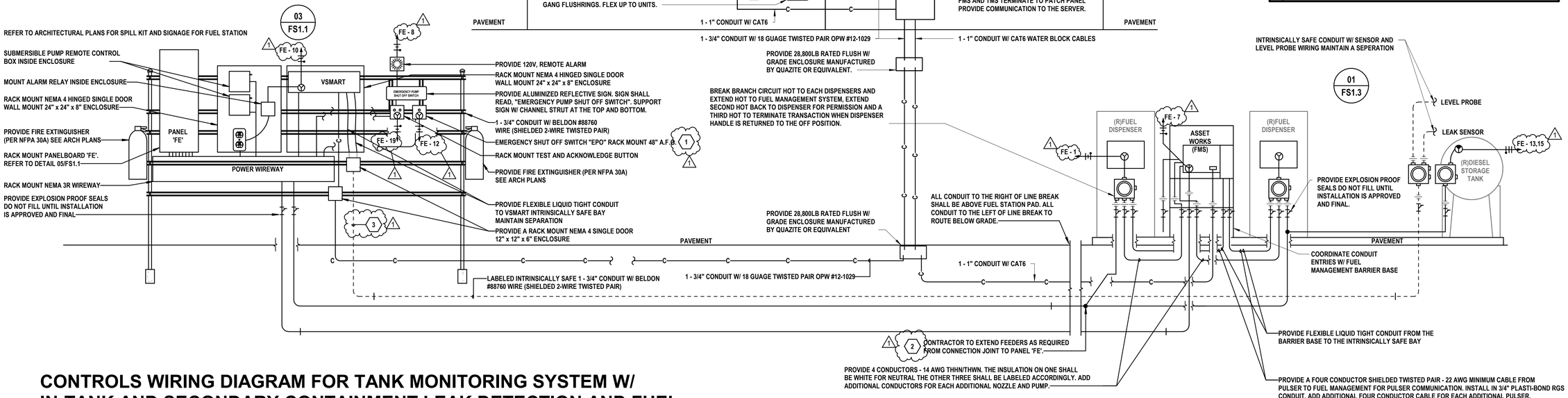
NOTE: PROVIDE A STATIC DISCHARGE CABLE REEL SPRING DRIVEN CABLE REEL WITH HIGH IMPACT HANDLE WITH STAINLESS STEEL CABLE IN ORANGE VINYL CABLE COVER WITH A 50 AMP GROUNDING CLAMP BOND TO TANK GROUNDING SYSTEM.

03 TANK FUEL DISPENSER/GROUNDING SYSTEM
SCALE: NONE

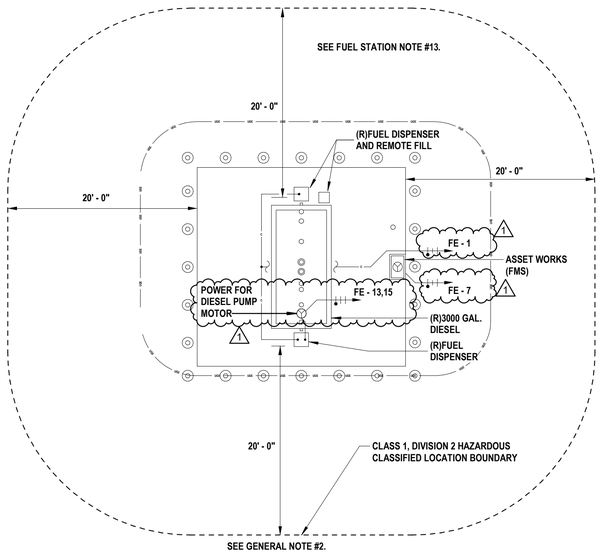


02 STUB UP TO SAFETY SWITCH
SCALE: NONE

04 FUEL STATION POWER AND SPECIAL SYSTEMS
SCALE: NONE



01 CONTROLS WIRING DIAGRAM FOR TANK MONITORING SYSTEM W/ IN-TANK AND SECONDARY CONTAINMENT LEAK DETECTION AND FUEL MANAGEMENT SYSTEM.
SCALE: NONE



GENERAL NOTES

1. CONTRACTOR SHALL BE TCEQ CERTIFIED FOR UNDERGROUND TANK INSTALLATIONS AND REMOVALS, AND CERTIFIED BY THE TANK MANAGEMENT SYSTEM MANUFACTURER. CONTRACTOR SHALL PROVIDE CERTIFICATIONS FOR SUBMITTALS. FUEL SYSTEM PROVIDER SHALL PROVIDE FUEL DISPENSION SYSTEM AS PART OF THE ELECTRICAL CONTRACTORS SCOPE OF WORK. CONTRACTOR SHALL PROVIDE A COMPLETE AND ALL INCLUSIVE SET OF FUEL STATION SHOP DRAWINGS FOR REVIEW PRIOR TO START OF CONSTRUCTION AND INSTALLATION. CONTRACTOR SHALL FOLLOW THE MANUFACTURER'S RECOMMENDATIONS FOR INSTALLATION REQUIREMENTS. IT IS THE CONTRACTORS RESPONSIBILITY TO INSTALL AND PROVIDE A FULLY FUNCTIONAL SYSTEM INCLUDING ALL NECESSARY FITTINGS AND HARDWIRE SENSORS, PROBES, TANK MONITORING AND LEAK SENSING SYSTEM, RISERS, RISER CAPS AND ATTACHMENTS FOR A COMPLETE FUNCTIONING SYSTEM. CONTRACTOR SHALL PROGRAM NEW TANK MANAGEMENT SYSTEM TO COMMUNICATE WITH OWNER PROVIDED FUEL MANAGEMENT SYSTEM TO SPEAK/ COMMUNICATE VEEDER-ROOT. PROVIDE AND SET UP RECONCILIATION WITH THE TMS AND FMS SYSTEM. PROVIDE RACK MOUNT EPO - EMERGENCY POWER OFF SWITCH TO ACTIVATE ALL SHUNT TRIP BREAKERS IN PANEL ON PEDESTAL PER NEC 48" A.F.G. EPO SWITCH SHALL BE LOCATED WITHIN 20 TO 100 FT FROM THE DIESEL DISPENSER. PROVIDE RACK MOUNTED TEST AND ACKNOWLEDGE BUTTON, FIRE EXTINGUISHER, DIESEL PUMP CONTROL BOX, AND ALARM RELAYS. ALL ENCLOSURES ARE TO BE NEMA 4 WITH LIQUID TIGHT CONDUIT.
2. REFER TO ARCHITECTURAL DRAWINGS FOR LOCATION AND ORIENTATION.
3. ALL ADHESIVES, COVERINGS, INSULATION, JACKETS, MASTICS, PIPING, SEALERS, AND WIRING SHALL BE PLENUM RATED, HAVING A FLAME-SPREAD INDEX OF 25 OR LESS, AND SMOKE- DEVELOPED INDEX OF 50 OR LESS, AS REQUIRED BY CODE.

KEYED NOTES BY SYMBOL "⬡"

1. RACK MOUNT EPO - EMERGENCY POWER OFF SWITCH TO ACTIVATE ALL SHUNT TRIP BREAKERS IN PANEL "FE" ON PEDESTAL PER NEC 48" A.F.G. EPO SWITCH SHALL BE LOCATED W/ IN 20 TO 100FT FROM THE DIESEL AND LPG DISPENSORS. COORDINATE LOCATION W/ OTHER DISIPLINES. AND SITE CONDITIONS. REFERENCE ELECTRICAL SITE PLAN FOR ACTUAL LOCATION. REFERENCE DETAIL 03/FS1.1 FOR SHUNT TRIP WIRING DIAGRAM.
2. PROVIDE (1) 3/4" CONDUIT FROM FUEL DISPENSER CONNECTION JOINT TO PANEL 'FE. CONTRACTOR TO FIELD COORDINATE INSTALLATION BASED ON EXISTING INSTALLATION PRIOR TO INSTALLATION OF NEW CONDUITS.
3. ABOVE GROUND 3/4" CONDUITS W/ BELDEN WIRE PER TANK MANAGEMENT SYSTEM MANUFACTURER RECOMMENDATIONS. EXTEND FROM TANK WELLS FOR IN-TANK LEVEL PROBES AND INTERSTITUAL TANK MONITORING SENSERS TO LABELED INTRINSICALLY SAFE EXPLOSION PROOF JUNCTION BOXES. ANCHOR AND SUPPORT CONDUITS AND BOXES W/ CHANNEL STRUT. INTRINSICALLY SAFE CONDUIT SHALL BE LABELED PER NEC 504.80.

GENERAL NOTES - FUEL STATION

1. IT IS THE CONTRACTORS RESPONSIBILITY TO PROVIDE A FULLY FUNCTIONAL SYSTEM, ENSURE A COMPLETE WORKING SYSTEM WHICH SHALL COMPLY W/ MANUFACTURER'S INSTRUCTIONS, NFPA 30, NFPA 30A, NFPA 58, AND NFPA 70, OSHA REQUIREMENTS AND TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, (TCEQ) FOR ABOVE GROUND AND BELOW GROUND STORAGE TANKS.
2. ALL BRANCH CIRCUIT WIRING FROM PANEL 'FE' TO THE FUEL STATION SHALL BE TYPE THHN GASOLINE & OIL RESISTANT SOLID WIRE A MINIMUM OF #12 WIRE IN 3/4"C. ALL ABOVE GROUND CONDUIT SHALL BE RIGID GALVANIZED STEEL (R.G.S.). ALL ABOVE GROUND CONDUIT BODIES AND PULL BOXES SHALL BE EXPLOSION PROOF. ALL BELOW GRADE CONDUIT SHALL BE RIGID NONMETALIC CONDUIT ENCASED IN RED CONCRETE 3" THICK MINIMUM. ALL LONG RADIUS 90° ELBOWS EMERGING FROM THE EARTH OR CONCRETE SHALL BE RIGID GALVANIZED STEEL AND DOUBLE WRAPPED W/ 3M CORROSSION RESISTANT TAPE. CONTRACTOR SHALL INSTALL EXPLOSION-PROOF SEALS IN ALL CONDUITS EMERGING ABOVE GRADE COMMUNICATING W/ THE FUEL ISLAND AT BOTH ENDS UNLESS THE CONDUIT IS EMPTY OR THE CONDUIT IS THE INTRINSICALLY SAFE CONDUIT. THE FIRST FITTING ABOVE GRADE SHALL BE AN N.E.C. APPROVED EXPLOSION-PROOF SEAL.
3. THE ELECTRICAL INSTALLATION FOR THE FUEL ISLAND, INCLUDING POWER AND COMMUNICATIONS, SHALL COMPLY W/ THE NATIONAL ELECTRICAL CODE, ARTICLES 500, 501, 502, 504, 514, AND ALL RELATED ARTICLES THEREOF.
4. PROVIDE AND INSTALL A INTEGRATED TANK MONITORING SYSTEM W/ SMART IN-TANK LEVEL PROBES AND SMART SECONDARY CONTAINMENT LEAK DETECTION PER SCHEDULE W/ AN EXTERNAL ALARM AND TEST / ACKNOWLEDGE BUTTON. IF A DIFFERENT SYSTEM IS PROVIDED, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE THE CORRECT TYPE AND QUANTITY OF COMMUNICATION CABLING AND CONDUITS FOR THAT SYSTEM.
5. CONTRACTOR SHALL FOLLOW THE MANUFACTURER'S RECOMMENDATIONS FOR INSTALLATION REQUIREMENTS. IT IS THE CONTRACTORS RESPONSIBILITY TO INSTALL AND PROVIDE A FULLY FUNCTIONAL SYSTEM INCLUDING ALL THE NECESSARY FITTINGS AND HARDWARE SENSORS, PROBES, RISERS, RISER CAPS AND ATTACHMENTS FOR A COMPLETE FUNCTIONING SYSTEM. ALL CAPS AND RISERS SHALL BE THE QUICK RELEASE TYPE.
6. NO SPLICES SHALL BE MADE IN THE WIRE RUN BETWEEN A SENSOR OR PROBE JUNCTION BOX AND THE VSMART MODULE.
7. ALL ELECTRICAL POWER TO THE FUEL ISLAND W/ IN THE BOUNDS OF THE CLASS 1 DIVISION 1 &2 AREA SHALL BE TIED INTO AN EPO SWITCH. EACH EPO SWITCH SHALL DISCONNECT SIMULTANEOUSLY FROM THE SOURCE OF SUPPLY, ALL CONDUCTORS OF THE CIRCUIT, INCLUDING THE GROUNDED CONDUCTOR PER N.E.C., ARTICLE 514-11(A) "CIRCUIT DISCONNECTS".
8. EACH EMERGENCY POWER-OFF SWITCH (EPO) SHALL BE A MOMENTARY PUSH BUTTON CLEARLY IDENTIFIED AND EASILY ACCESSIBLE AND BE INSTALLED IN A REMOTE LOCATION MORE THAN 20 FEET BUT LESS THAN 100 FEET FROM THE DISPENSER UNITS AND ALSO IN LINE OF SIGHT OF THE DISPENSER UNITS. THE EMERGENCY STOP BUTTON SHALL BE A MANUFACTURED EMERGENCY STOP CONTROL STATION COMPLETE KIT W/ A CLEAR COVER AND EMERGENCY STOP SIGNAGE W/ IN ENCLOSURE BY POWER INTEGRITY #IA-ESOC.
9. PROVIDE TWO HOURS OF TRAINING FOR TXDOT SELECTED PERSONNEL FOR ALL EQUIPMENT.
10. FUEL STATION CONTRACTOR SHALL SUBMIT TO THE OWNER A COPY OF WARRANTY LETTER OR CERTIFICATION LETTER SENT TO THE TANK MONITORING SYSTEM MANUFACTURER STATING THE SYSTEM IS FUNCTIONING AND INSTALLED PROPERLY TO OBTAIN WARRANTY.
11. INTRINSICALLY SAFE INPUT WIRING SHALL BE INSTALLED PER N.E.C. ARTICLE 504. NON-TRINSICALLY SAFE WIRING ON THIS PROJECT SHALL NOT SHARE OTHER WIRES OF ANY TYPE IN RACEWAYS, CONDUIT BODIES, JUNCTION BOXES OR GUTTERS W/ INTRINSICALLY SAFE WIRING. INTRINSICALLY SAFE WIRING SHALL REMAIN SEPARATED IN ALL CASES. INTRINSICALLY SAFE CONDUIT SHALL BE LABELED PER NEC 504.80. CONTRACTOR SHALL WORK W/ EXISTING CONDITIONS.
12. REFER TO STRUCTURAL DRAWINGS FOR FUEL STATION FOUNDATION AND BOLLARD REQUIREMENTS.
13. SIZE OF FUEL TANKS WILL VARY DEPENDING ON TANK PROVIDED. CONTRACTOR SHALL USE DIMENSIONS OF TANK SUPPLIED TO FINALIZE SIZE AND DIMENSIONS OF LAYOUT FUEL STATION BOLLARDS, SLAB TANK, AND EQUIPMENT WITHIN THE RESTRICTIVE DIMENSIONS SHOWN ON SHEET FS1.4.

Texas Department of Transportation

DFW Consulting Group, Inc.
1616 Corporate Court, Suite 100
Irving, Tx 75038
(972) 929-1199
www.dfwcgi.com
Project No. 20004
Firm Registration No. 720

STATE OF TEXAS
JOHN HALEY
112905
LICENSED
PROFESSIONAL ENGINEER
05/17/2021

DALLAS DISTRICT (18)
COLLIN COUNTY
McKinney Area Engineering and Maintenance Facility
2205 TX-5, McKinney, TX 75069
PROJECT NO. 18-47042012

ISSUED: 2021.05.17
DRAWN BY: DFWCGI
REVISIONS:
1 05/17/21

FUEL STATION DETAILS

FS1.1

THIS DRAWING CREATED FOR PRODUCTION ON 22"x34" SHEET SIZE. DO NOT SCALE PRINTS.