

**TOMBALL INDEPENDENT SCHOOL DISTRICT**  
**RFP #998-26 Issued: May 8, 2026**  
**REQUEST FOR COMPETITIVE SEALED PROPOSALS**  
**FOR THE EXPANSION AND CONSTRUCTION OF THE EXISTING TRANSPORTATION**  
**SITE FACILITIES**

**Addendum No. 01**

May 15, 2026

**Questions and Clarifications for the RFP Document:**

1. Administrative comment: Attached to this Addendum is an exhibit showing the limits of the partial substantial completion noted in the revised Probable Schedule of Events. This document will be added to the AIA A104 Agreement Article 7.1.7.2 as Exhibit D – Partial Substantial Completion Limits of Scope. This will be physically added to the finalized agreement document. This Partial Substantial Completion is contingent upon having a construction permit by June 15, 2026.
2. Administrative comment: Attached is a revised bid form. All breakouts for subcontractors and any alternates listed shall remain in the bid document as originally issued.
3. *Question:* The Excel file for reference submission is not showing up.  
*Response:* See this Addendum – Excel File Issued with this Addendum
4. *Question:* Is there a specification book?  
*Response:* See this Addendum – Specification Book is attached.
5. *Question:* When is the bid date? Please verify time proposals are due.  
*Response:* There was a typo in the RFP. The bid date is May 26, 2026. The time listed was correct. Proposals are due is 11:00 A.M. CST. See revised Probable Schedule of Events.

**Questions and Clarifications regarding the Construction Documents:**

1. Refer to the Engineer's response attached.

**Questions and Clarifications regarding the Specifications:**

1. Refer to the Engineer's response attached.

**End of Addendum**

# TOMBALL INDEPENDENT SCHOOL DISTRICT

RFP #998-26 Issued: May 8, 2026

## REQUEST FOR COMPETITIVE SEALED PROPOSALS FOR THE EXPANSION AND CONSTRUCTION OF THE EXISTING TRANSPORTATION SITE FACILITIES

### I. PROBABLE SCHEDULE OF EVENTS –(REVISED 05-15-2026)

	<u>Date</u>	<u>Time</u>	<u>Event</u>
A.	May 8, 2026 May 8, 2026 May 15, 2026		1st Advertisement Posted for this CSP. RFP Posted on TISD Website above. 2nd Advertisement Posted for this CSP.
B.	May 19, 2026	1:00 P.M.	<b>List of Your References due to:</b> Chelsea Randle Email: <a href="mailto:clrandle@lan-inc.com">clrandle@lan-inc.com</a> Phone: (713) 821-0395
C.	May 18, 2026	11:00 A.M.	<b>Pre-Proposal Conference (Optional)</b> 1110 Baker Drive Tomball, Texas 77375 Site Visit may follow this conference
D.	May 19, 2026	5:00 P.M.	<b>Deadline for questions</b>
E.	May 21, 2026	2:00 P.M.	<b>Final Addendum Posted</b>
F.	<b>May 26, 2026</b>	11:00 P.M.	<b>Submission of Proposals Due</b> Attn: Mr. Zachery Boles, CFO 1110 Baker Drive Tomball, Texas 77375
G.	June 2, 2026		<b>Anticipated approval by Board of Trustees</b>
H.	June 5, 2026 (approximate)		<b>Anticipated Notice to Proceed</b>
I.	<b>August 1, 2026</b>	<b>11:59 P.M.</b>	<b>Partial Substantial Completion Date</b>
J.	<b>November 20, 2026</b>	<b>11:59 P.M.</b>	<b>Full Project Substantial Completion Date</b>



## ADDENDUM NUMBER ONE (001)

Date: May 15, 2026

### Tomball ISD Transportation Facility Parking

Tomball ISD  
310 S. Cherry St.  
Tomball, Texas 77375

GLS JOB NO: 364003

#### NOTICE TO BIDDERS:

This addendum shall be considered a part of the contract documents for the above-named project and incorporated with the issued documents and specifications dated April 2, 2026, and all addenda issued thereof. This Addendum Number 001 dated May 15, 2026 shall govern and take precedence. This Addendum consists of Three (3) drawings and the updated bid schedule.

#### CLARIFICATION:

The electrical site plan and pertinent electrical details were added to the plan set. Bid schedule was updated to reflect electrical plan additions.

#### SPECIFICATION:

1. Bid Schedule
  - a. Issued in its entirety to include electrical items

#### DRAWINGS:

1. Cover Sheet
  - a. Replaced in its entirety to include electrical drawings
2. E9.11 – Electrical Site Plan
  - a. Added to the plan set
3. E9.12 – Electrical Details
  - a. Added to the plan set

Sincerely,

Michael Holmes, PE

Civil Engineer

MH/ac

**364003 - Bid Form Addendum 1  
Tomball ISD  
Transportation Facility Parking**

Item	Description	QTY	Unit	Unit Price	Total
<b>A. GENERAL ITEMS</b>					
1	Project mobilization, insurance, overhead for duration of project including related items and appurtenances, complete in place	1	LS		
2	Storm Water Pollution Plan (SWPP) and Erosion Control Plan, all TCEQ forms & requirements, Notice of Intent (N.O.I.), silt fencing, inlet protection, etc., including related items and appurtenances, complete in place.	1	LS		
3	Site preparation, including all dirtwork and preparation for proposed construction within project limits, including all related items and appurtenances, complete in place	1	LS		
4	Site clean-up of areas disturbed by construction including sod, topsoil, final grading, and related items and appurtenances, complete in place.	22	AC		
5	Field locate existing utilities and service lines for construction of the proposed improvements, including related items and appurtenances, complete in place	1	LS		
6	Plant Sweet Gum Tree(6" Caliper or Larger) 100 Gal, including related items and appurtenances, complete in place.	58	EA		
7	Remove existing sign post and sign foundation, including related items and appurtenances, complete in place	5	EA		
8	Install Construction Entrance/Exit including all related items and appurtenances, complete in place	1	EA		
<b>Total General Items.....</b>				<b>\$</b>	
<b>B. DEMOLITION ITEMS</b>					
9	Remove & dispose of existing concrete pavement, including sawcutting, related items and appurtenances, complete in place.	4,519	SY		
10	Remove & dispose of existing concrete curb and gutter, including sawcutting, related items and appurtenances, complete in place.	348	LF		

**364003 - Bid Form Addendum 1  
Tomball ISD  
Transportation Facility Parking**

<b>Item</b>	<b>Description</b>	<b>QTY</b>	<b>Unit</b>	<b>Unit Price</b>	<b>Total</b>
11	Remove and dispose of existing overhead cover and shed, including related items and appurtenances, complete in place	1	LS		
12	Remove and dispose of chain link fence, including related items and appurtenances, complete in place	3,768	LF		
13	Remove and dispose of existing concrete pavement, including related items and appurtenances	56	SY		
14	Remove & dispose of existing concrete sidewalk, including sawcutting, related items and appurtenances, complete in place	106	SY		
15	Remove and dispose of existing light pole and dispose of existing light pole base, including related items and appurtenances, complete in place	4	EA		
14	Remove and dispose of 10" Concrete Post, including related items and appurtenances, complete in place	2	EA		
15	Remove and dispose of existing steel frame, including related items and appurtenances, complete in place	1	EA		
16	Remove and dispose of ex tree including root ball(as needed), including related items and appurtenances, complete in place	9	AC		
17	Remove and dispose of ex pavement marking, including related items and appurtenances, complete in place	1	LS		
18	Sawcut existing Concrete Pavement, including related items and appurtenances, complete in place	4	EA		
19	Remove and dispose of existing 18" RCP storm sewer, including related items and appurtenances, complete in place	56	LF		
20	Remove and dispose of existing 24" RCP storm sewer, including related items and appurtenances, complete in place	83	LF		
21	Remove and dispose of existing 36" CMP storm sewer, including related items and appurtenances, complete in place	97	LF		
22	Remove and dispose of existing rip rap, including related items and appurtenances, complete in place	278	SY		
23	Remove and dispose of existing Storm Sewer Structure, including related items and appurtenances, complete in place	4	EA		
24	Construction Entrance/Exit, including related items and appurtenances, complete in place	1	EA		
<b>Total Demolition Items.....</b>				<b>\$</b>	<b>-</b>

**364003 - Bid Form Addendum 1  
Tomball ISD  
Transportation Facility Parking**

<b>Item</b>	<b>Description</b>	<b>QTY</b>	<b>Unit</b>	<b>Unit Price</b>	<b>Total</b>
<b>C. Site Plan and Erosion Control Items</b>					
25	6" thick, 3500 PSI concrete paving w/ steel reinforcement, expansion joints, control joints, joint sealer, curing compound, including related items and appurtenances, complete in place.	36,780	SY		
26	Stabilized Subgrade, including related items and appurtenances, complete in place	37,808	SY		
27	Concrete to Concrete Tie-in, including related items and appurtenances, complete in place	12	EA		
28	4" concrete sidewalk with sand cushion per detail, including ADA ramps w/ detectable warning pavers, including related items and appurtenances, complete in place.	594	SY		
29	Concrete to Asphalt tie in, including related items and appurtenances, complete in place	1	EA		
30	6" monolithic curb, including related items and appurtenances, complete in place.	5,782	LF		
31	4" Concrete Slope Paving, including related items and appurtenances, complete in place	1,839	SY		
32	4" wide white parking striping, including related items and appurtenances, complete in place	27,680	LF		
33	ADA striping for parking spaces, including related items and appurtenances, complete in place	2	EA		
34	Sign foundation and post per detail (excludes signage), including related items and appurtenances, complete in place	2	EA		
35	Concrete wheelstops, including related items and appurtenances, complete in place	2	EA		
36	Concrete rip rap for crossing culverts, related items and appurtenances, complete in place.	709	SY		
37	6" thick, concrete flume paving, including related items and appurtenances, complete in place	893	SY		
38	6' Chainlink Fence, including related items and appurtenances, complete in place	4,136	LF		
39	Chanlink Fence & Gate See sheet C5.03 for detail, including related items and appurtenances, complete in place	1	EA		
<b>Total Paving and Traffic Items.....</b>				<b>\$</b>	<b>-</b>

**364003 - Bid Form Addendum 1  
Tomball ISD  
Transportation Facility Parking**

<b>Item</b>	<b>Description</b>	<b>QTY</b>	<b>Unit</b>	<b>Unit Price</b>	<b>Total</b>
<b>D. Grading Plan and Drainage Items</b>					
40	12" N-12 HDPE storm sewer, including structural backfill full depth, including related items and appurtenances, complete in place	64	LF		
41	18" N-12 HDPE storm sewer, including structural backfill full depth, including related items and appurtenances, complete in place	380	LF		
42	24" N-12 HDPE storm sewer, including structural backfill full depth, including related items and appurtenances, complete in place	851	LF		
43	30" N-12 HDPE storm sewer, including structural backfill full depth, including related items and appurtenances, complete in place	525	LF		
44	36" N-12 HDPE storm sewer, including structural backfill full depth, including related items and appurtenances, complete in place	75	LF		
45	36" RCP storm sewer, including structural backfill, including related items and appurtenances, complete in place	64	LF		
45	24" RCP storm sewer, including structural backfill, including related items and appurtenances, complete in place	80	LF		
46	3' X 3' Grate Inlet, including related items and appurtenances, complete in place	4	LS		
47	4' X 4' Grate Inlet, including related items and appurtenances, complete in place	9	EA		
48	15'x6' cast in place curb inlet box, including top, ring, lid, grouting of bottom, including related items and appurtenances, complete in place	1	EA		
49	Precast Safety End Treatment (4:1), including related items and appurtenances, complete in place	6	EA		
50	Connect Ex 30" pipe through void left by removal of curb inlet(secure with concrete collar	1	EA		
<b>Total Grading Plan and Drainage Items.....</b>				<b>\$</b>	<b>-</b>

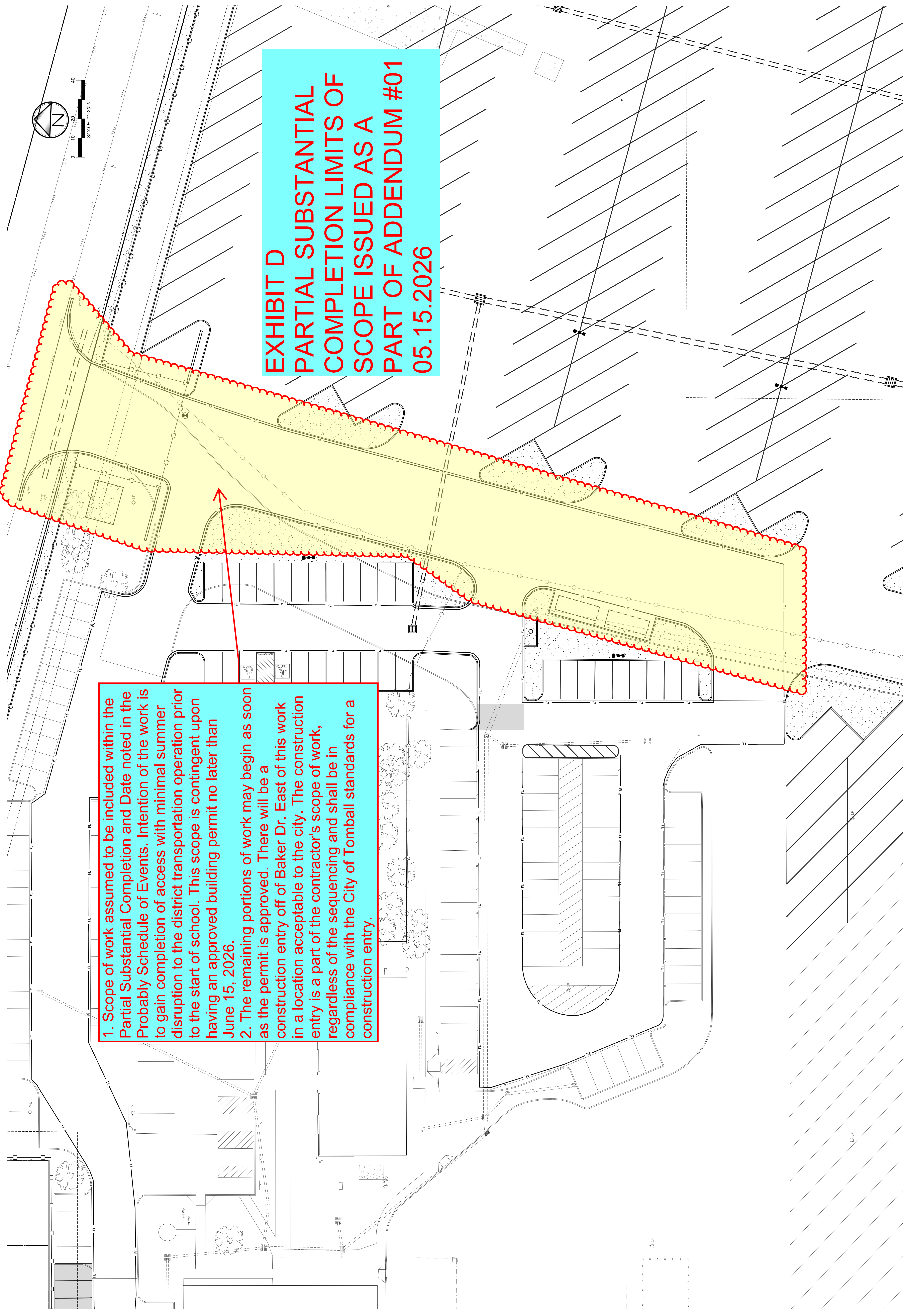
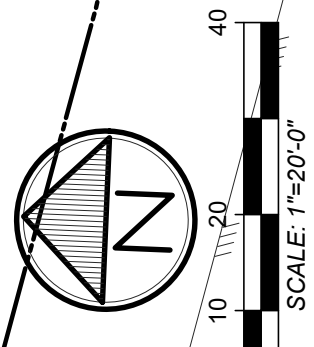
**364003 - Bid Form Addendum 1  
Tomball ISD  
Transportation Facility Parking**

Item	Description	QTY	Unit	Unit Price	Total
<b>E. Electrical</b>					
51	Underground conduit and wiring including all related items, & appurtenances, complete in place.	2,897	LF		
52	Replacement of existing pole light fixture on single head poles including all related items, & appurtenances, complete in place	2	EA		
53	Replacement of existing pole light fixture on dual head poles including all related items, & appurtenances, complete in place	12	EA		
54	New site/area light including 20 foot pole, single fixture, connection to existing foundation including all related items, & appurtenances, complete in place	1	EA		
55	New site/area light including 20 foot pole, dual fixture, connection to existing foundation including all related items, & appurtenances, complete in place	3	EA		
56	New site/area light including 30 foot pole, dual fixture, foundation including all related items, & appurtenances, complete in place	18	EA		
57	Circuit breakers in existing panelboard including all related items, & appurtenances complete in place	2	EA		
58	Conduit and wiring for controls and building management system including all related items, & appurtenances, complete in place	1	LS		
59	Lighting contactors including all related items, & appurtenances complete in place	1	LS		
<b>Total Electrical.....</b>				\$	
<b>TOTAL (Base Bid Package).....</b>				\$	
<b>ALTERNATE #1 - Asphalt Paving In-Lieu of Concrete Paving</b>					
60	6' Chainlink Fence with Barbed-Wire Attachment, including related items and appurtenances, complete in place	4,136	LF		
<b>Subtotal - Alternate #1 - Asphalt Paving In-Lieu of Concrete Paving</b>				\$	-
<b>TOTAL CONSTRUCTION COST (BASE &amp; ALTERNATE #1).....</b>					

1. Scope of work assumed to be included within the Partial Substantial Completion and Date noted in the Probably Schedule of Events. Intention of the work is to gain completion of access with minimal summer disruption to the district transportation operation prior to the start of school. This scope is contingent upon having an approved building permit no later than June 15, 2026.

2. The remaining portions of work may begin as soon as the permit is approved. There will be a construction entry off of Baker Dr. East of this work in a location acceptable to the city. The construction entry is a part of the contractor's scope of work, regardless of the sequencing and shall be in compliance with the City of Tomball standards for a construction entry.

**EXHIBIT D  
PARTIAL SUBSTANTIAL  
COMPLETION LIMITS OF  
SCOPE ISSUED AS A  
PART OF ADDENDUM #01  
05.15.2026**



**TISD SCHOOL BOARD**

Mark Lewandowski.....President  
 John E. McStravick.....Vice President  
 Dr. Michael J. Pratt.....Secretary  
 Amanda Bass.....Member  
 Jennifer Kratky.....Member  
 Coco White.....Member  
 Patrick Beecher.....Member

**ADMINISTRATION**

Dr. Martha Salazar-Zamora.....Superintendent  
 Dr. Army Schindewolf.....Deputy Superintendent  
 Zack Boles.....Chief Financial Officer

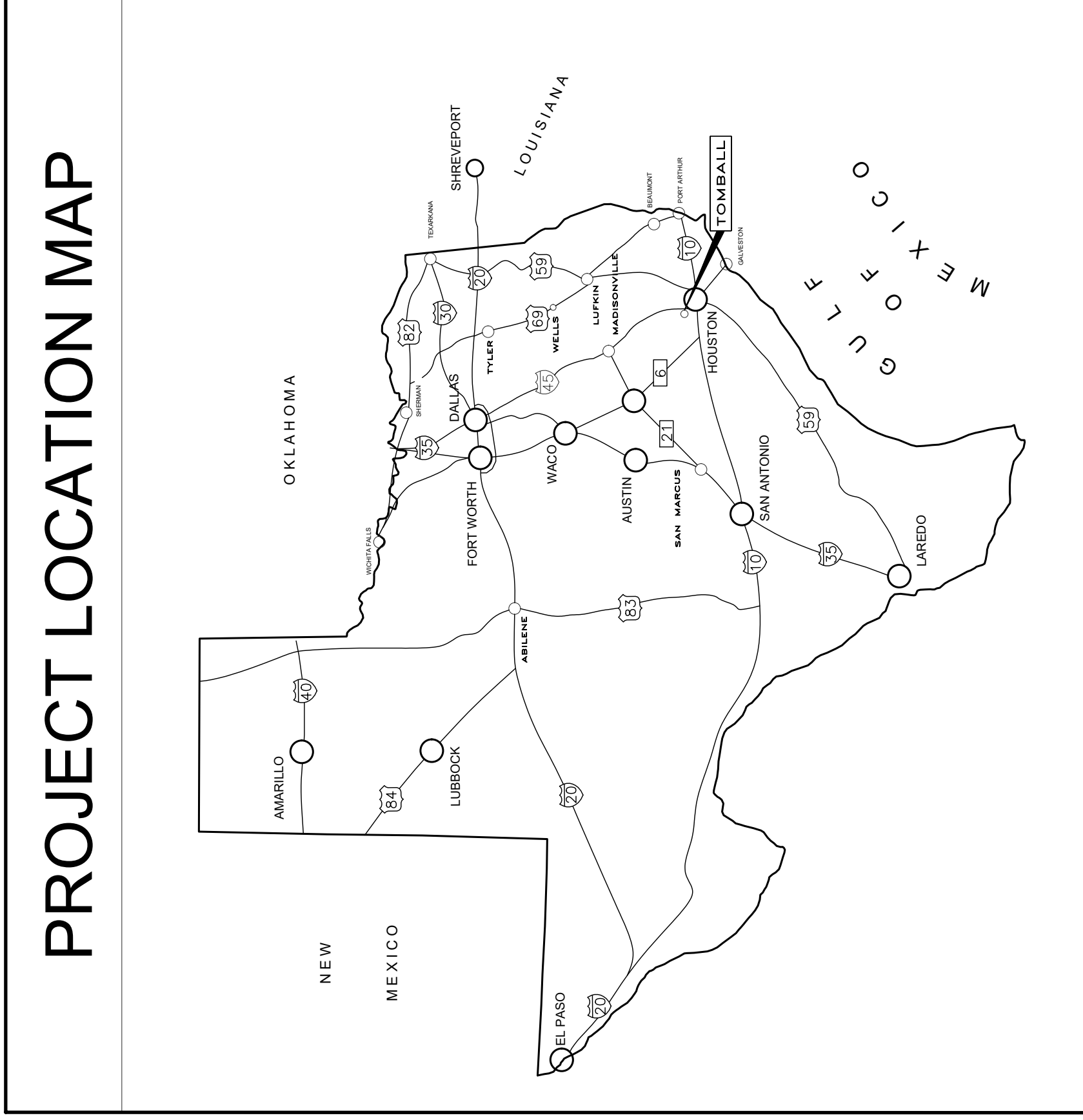
**CONSTRUCTION PLANS  
FOR**



1055 Baker Dr., Tomball, TX 77375  
Harris County

**TOMBALL I.S.D.  
BUS BARN PAVING & DETENTION**

GLS JOB #364003  
APRIL, 2026

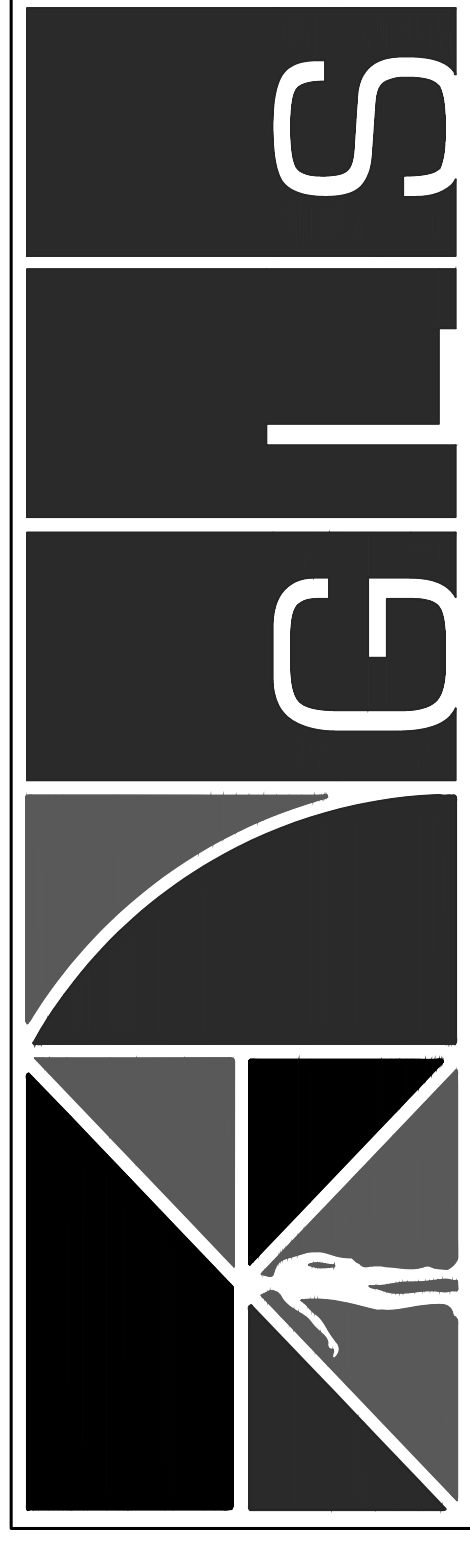


*Michael Holmes*

4/17/2026

Submitted: Michael Holmes, P.E.  
G.L.S.

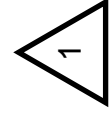
PREPARED BY:



ARCHITECTURE - ENGINEERING - INTERIORS  
LANDSCAPE - SURVEYING

1609 S. CHESTNUT ST. STE. 202 - LUFKIN, TEXAS 75901 - (936) 637-4900  
 4077 CROSS PARK DR. STE. 100 - BRYAN, TEXAS 77802 - (979) 776-9700  
 455 RICE ROAD STE. 107 - TYLER, TEXAS 75703 - (903) 581-3805  
 613 AUSTIN AVE - WACO, TEXAS 76701 - (254) 218-1544

Sheet List Table	
Sheet #	Sheet Title
-	General
-	Cover
C0.01	Project Notes & Information
Existing Conditions & Demolition Plan	
C1.00	Overall Site & Tree Clearing Plan
C1.01	Existing Conditions & Demolition Plan
C1.02	Existing Conditions & Demolition Plan
C1.03	Existing Conditions & Demolition Plan
C1.04	Existing Conditions & Demolition Plan
C1.05	Existing Conditions & Demolition Plan
C1.06	Existing Conditions & Demolition Plan
Site & Erosion Control Plan	
C2.00	Site and Erosion Control Plan
C2.01	Site and Erosion Control Plan
C2.02	Site and Erosion Control Plan
C2.03	Site and Erosion Control Plan
C2.04	Site and Erosion Control Plan
C2.05	Site and Erosion Control Plan
C2.06	Coordinate Table
Grading & Utility Plan	
C3.00	Grading & Utility Plan
C3.01	Grading & Utility Plan
C3.02	Grading & Utility Plan
C3.03	Grading & Utility Plan
C3.04	Grading & Utility Plan
C3.05	Grading & Utility Plan
Storm Sewer Profiles	
C4.00	Storm Sewer Profile
C4.01	Storm Sewer Profiles
Civil Details	
C5.00	Civil Paving Details
C5.01	Civil Drainage Details
C5.02	Civil Misc. Details
Landscape Site Plan	
C6.00	Landscape Site Plan
Electrical Site Plan	
E9.11	Electrical Site Plan
E9.12	Electrical Details



#	DATE	ADDENDUM #	REVISIONS
1	5/15/26		
2			
3			
4			

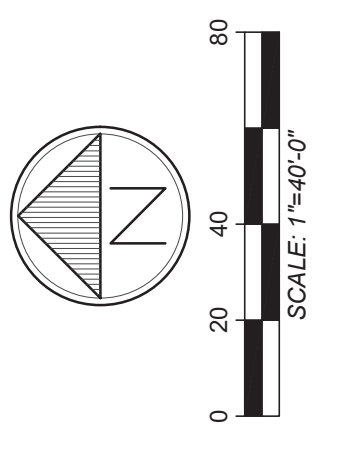
ISSUED: 4/10/26  
 DRAWN BY: JRF  
 CHECKED BY: JRF  
 T.B.P.E.L.S. PRM NO. 4-413  
 T.A.B.L.E. PRM NO. BR-00003

ARCHITECTURE · ENGINEERING · INTERIORS  
**T.B.P.E.L.S.**  
 459 S. CHERRY ST. SUITE 107, FLYER, TEXAS 76799 (817) 897-4400  
 4727 CROSS PARK DR. SUITE 100, FRYAN, TEXAS 76799 (817) 276-9200  
 1508 S. LAMAR, SUITE 100, WAXAHACH, TEXAS 75090 (972) 578-4400  
 813 ALSTON AVE. WACO, TEXAS 76707 (817) 818-1044

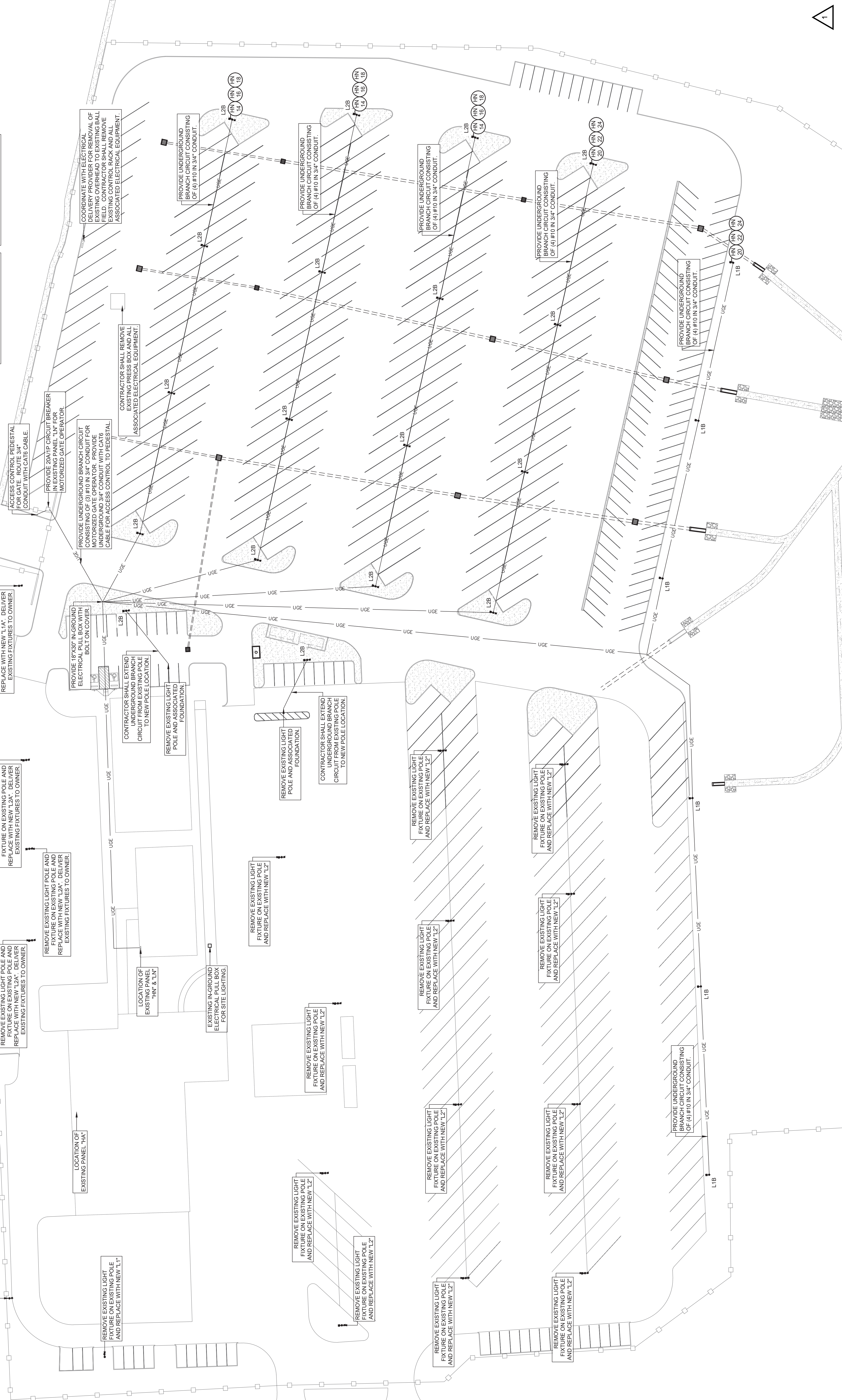


Transportation Facility Improvements  
 Tomball I.S.D.  
 Tomball, Texas  
 Electrical Site Plan

JOB NUMBER: 364003  
 SHEET NO.: E9.11



- CONTRACTOR SHALL REMOVE (4) EXISTING BREAKERS, REPLACE EXISTING PANEL "HN" AND REPLACE WITH (2) 30A/3P TYPE NGB CIRCUIT BREAKERS. EXISTING PANEL "HN" IS A SIEMENS PANELBOARD.
- COORDINATE WITH OWNER FOR REMOVAL OF EXISTING BALL FIELD. TO EXTENT POSSIBLE SALVAGE EXISTING FENCE AND DELIVER TO OWNER.
- COORDINATE WITH OWNER FOR REMOVAL OF EXISTING BALL FIELD. TO EXTENT POSSIBLE SALVAGE EXISTING FENCE AND DELIVER TO OWNER.
- CONTRACTOR SHALL PROVIDE 30A TYPE NGB CIRCUIT BREAKER FOR EXISTING AND NEW PARKING LOT LIGHTS. PROVIDE (3) #1/2 IN 1/2" CONDUIT TO EXISTING PANEL "LN" FOR 120V CONTROLS.
- CONTRACTOR SHALL COORDINATE WITH OWNER FOR CONNECTION TO EXISTING BUILDING MANAGEMENT SYSTEM (BMS) AND PROGRAMMING AS REQUIRED.
- CONTRACTOR SHALL COORDINATE WITH OWNER FOR REMOVAL OF EXISTING BALL FIELD. TO EXTENT POSSIBLE SALVAGE EXISTING FENCE AND DELIVER TO OWNER.
- CONTRACTOR SHALL COORDINATE WITH OWNER FOR REMOVAL OF EXISTING BALL FIELD. TO EXTENT POSSIBLE SALVAGE EXISTING FENCE AND DELIVER TO OWNER.
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1  
 1  
 1-40'-0"

Electrical Site Plan



# TOMBALL INDEPENDENT SCHOOL DISTRICT

RFP #998-26 Issued: May 8, 2026

## REQUEST FOR COMPETITIVE SEALED PROPOSALS FOR THE EXPANSION AND CONSTRUCTION OF THE EXISTING TRANSPORTATION SITE FACILITIES

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# PROJECT MANUAL

FOR

## TOMBALL ISD

### TRANSPORTATION FACILITY PARKING

**GLS**

ARCHITECTURE • ENGINEERING • INTERIORS  
LANDSCAPE • SURVEYING

CENTRAL TEXAS OFFICE:

4077 CROSS PARK DR • SUITE 100 • BRYAN, TEXAS • 77802  
[979] 776-9700

T.B.P.E.L.S FIRM REGISTRATION NO.: F-413

T.B.P.E.L.S. FIRM REGISTRATION NO.: 10110900

GLS NO.: 364003

**PROJECT MANUAL FOR:**  
**TOMBALL ISD**  
**Transportation Facility Parking**  
GLS No. 364003

**OWNER:**

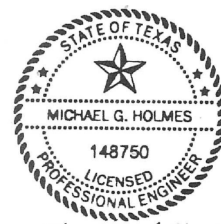
Tomball ISD  
310 S. Cherry St.  
Tomball, Texas 77375  
281-357-3100

**ENGINEER:**

GLS  
4077 Cross Park Dr., Ste. 100  
Bryan, Texas 77802  
979-776-9700  
TBPE Firm Registration No. 413



ARCHITECTURE · ENGINEERING · INTERIORS  
LANDSCAPE · SURVEYING



*Michael Holmes*

04/02/2026

CIVIL ENGINEER

# TOMBALL ISD

## TRANSPORTATION FACILITY PARKING

GLS JOB NO. 364003

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03 40 00	PRE-CAST CONCRETE
26 20 10	ELECTRICAL SERVICE & DISTRIBUTION
26 50 00	LIGHTING
31 00 01	EARTHWORK FOR PAVING
31 11 01	SITWORK – CLEARING
31 20 01	EXCAVATION & EARTHWORK
31 22 00	SITE GRADING
31 22 21	TRENCHING
31 22 43	CEMENT STABILIZED SAND
31 23 00	STRUCTURAL EXCAVATION & BACKFILL
31 25 75	PAVEMENT REPAIR AND RESURFACING
31 32 13.19	LIME STABILIZATION OF PAVEMENT SUBGRADE
31 32 13.26	LIME FLYASH STABILIZATION OF PAVEMENT SUBGRADE
31 37 00	ROCK RIPRAP
32 17 23	PAVEMENT MARKING
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32 92 23	SODDING & FERTILIZING
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33 05 33.13	CORRUGATED-WALL, SMOOTH INTERIOR HDPE GRAVITY PIPE
33 26 22	PVC PIPE & FITTINGS
33 40 01	STORM DRAINAGE SYSTEMS
33 44 02	REINFORCED CONCRETE PIPE
33 44 00	STORM UTILITY DRAINAGE PIPING

**00 32 00 - Bid Schedule  
Tomball ISD  
Transportation Facility Parking**

Item	Description	QTY	Unit	Unit Price	Total
<b>A. GENERAL ITEMS</b>					
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2	Storm Water Pollution Plan (SWPP) and Erosion Control Plan, all TCEQ forms & requirements, Notice of Intent (N.O.I.), silt fencing, inlet protection, etc., including related items and appurtenances, complete in place.	1	LS		
3	Site preparation, including all dirtwork and preparation for proposed construction within project limits, including all related items and appurtenances, complete in place	1	LS		
4	Site clean-up of areas disturbed by construction including sod, topsoil, final grading, and related items and appurtenances, complete in place.	22	AC		
5	Field locate existing utilities and service lines for construction of the proposed improvements, including related items and appurtenances, complete in place	1	LS		
6	Remove existing sign post and sign foundation, including related items and appurtenances, complete in place	5	EA		
<b>Total General Items.....</b>				<b>\$</b>	
<b>B. DEMOLITION ITEMS</b>					
7	Remove & dispose of existing concrete pavement, including sawcutting, related items and appurtenances, complete in place.	4,519	SY		
8	Remove & dispose of existing concrete curb and gutter, including sawcutting, related items and appurtenances, complete in place.	348	LF		

**00 32 00 - Bid Schedule  
Tomball ISD  
Transportation Facility Parking**

<b>Item</b>	<b>Description</b>	<b>QTY</b>	<b>Unit</b>	<b>Unit Price</b>	<b>Total</b>
9	Remove and dispose of existing overhead cover and shed, including related items and appurtenances, complete in place	1	LS		
10	Remove and dispose of chain link fence, including related items and appurtenances, complete in place	3,768	LF		
11	Remove and dispose of existing concrete pavement, including related items and appurtenances	56	SY		
12	Remove & dispose of existing concrete sidewalk, including sawcutting, related items and appurtenances, complete in place	106	SY		
13	Remove and dispose of existing light pole and dispose of existing light pole base, including related items and appurtenances, complete in place	4	EA		
14	Remove and dispose of 10" Concrete Post, including related items and appurtenances, complete in place	2	EA		
15	Remove and dispose of existing steel frame, including related items and appurtenances, complete in place	1	EA		
16	Remove and dispose of ex tree including root ball(as needed), including related items and appurtenances, complete in place	9	AC		
17	Remove and dispose of ex pavement marking, including related items and appurtenances, complete in place	1	LS		
18	Sawcut existing Concrete Pavement, including related items and appurtenances, complete in place	4	EA		
19	Remove and dispose of existing 18" RCP storm sewer, including related items and appurtenances, complete in place	56	LF		
20	Remove and dispose of existing 24" RCP storm sewer, including related items and appurtenances, complete in place	83	LF		
21	Remove and dispose of existing 36" CMP storm sewer, including related items and appurtenances, complete in place	97	LF		
22	Remove and dispose of existing rip rap, including related items and appurtenances, complete in place	278	SY		
23	Remove and dispose of existing Storm Sewer Structure, including related items and appurtenances, complete in place	4	EA		
24	Construction Entrance/Exit, including related items and appurtenances, complete in place	1	EA		
<b>Total Demolition Items.....</b>				<b>\$</b>	<b>-</b>

**00 32 00 - Bid Schedule  
Tomball ISD  
Transportation Facility Parking**

Item	Description	QTY	Unit	Unit Price	Total
<b>C. Site Plan and Erosion Control Items</b>					
25	6" thick, 3500 PSI concrete paving w/ steel reinforcement, expansion joints, control joints, joint sealer, curing compound, including related items and appurtenances, complete in place.	36,780	SY		
26	Stabilized Subgrade, including related items and appurtenances, complete in place	37,808	SY		
27	Concrete to Concrete Tie-in, including related items and appurtenances, complete in place	12	EA		
28	4" concrete sidewalk with sand cushion per detail, including ADA ramps w/ detectable warning pavers, including related items and appurtenances, complete in place.	594	SY		
29	Concrete to Asphalt tie in, including related items and appurtenances, complete in place	1	EA		
30	6" monolithic curb, including related items and appurtenances, complete in place.	5,782	LF		
31	4" Concrete Slope Paving, including related items and appurtenances, complete in place	1,839	SY		
32	4" wide white parking striping, including related items and appurtenances, complete in place	27,680	LF		
33	ADA striping for parking spaces, including related items and appurtenances, complete in place	2	EA		
34	Sign foundation and post per detail (excludes signage), including related items and appurtenances, complete in place	2	EA		
35	Concrete wheelstops, including related items and appurtenances, complete in place	2	EA		
36	Concrete rip rap for crossing culverts, related items and appurtenances, complete in place.	709	SY		
37	6" thick, concrete flume paving, including related items and appurtenances, complete in place	893	SY		
38	6' Chainlink Fence, including related items and appurtenances, complete in place	4,136	LF		
39	Chanlink Fence & Gate See sheet C5.03 for detail, including related items and appurtenances, complete in place	1	EA		
<b>Total Paving and Traffic Items.....</b>				<b>\$</b>	<b>-</b>

**00 32 00 - Bid Schedule  
Tomball ISD  
Transportation Facility Parking**

Item	Description	QTY	Unit	Unit Price	Total
<b>D. Grading Plan and Drainage Items</b>					
40	12" N-12 HDPE storm sewer, including structural backfill full depth, including related items and appurtenances, complete in place	64	LF		
41	18" N-12 HDPE storm sewer, including structural backfill full depth, including related items and appurtenances, complete in place	380	LF		
42	24" N-12 HDPE storm sewer, including structural backfill full depth, including related items and appurtenances, complete in place	851	LF		
43	30" N-12 HDPE storm sewer, including structural backfill full depth, including related items and appurtenances, complete in place	525	LF		
44	36" N-12 HDPE storm sewer, including structural backfill full depth, including related items and appurtenances, complete in place	75	LF		
45	36" RCP storm sewer, including structural backfill, including related items and appurtenances, complete in place	64	LF		
45	24" RCP storm sewer, including structural backfill, including related items and appurtenances, complete in place	80	LF		
46	3' X 3' Grate Inlet, including related items and appurtenances, complete in place	4	LS		
47	4' X 4' Grate Inlet, including related items and appurtenances, complete in place	9	EA		
48	15'x6' cast in place curb inlet box, including top, ring, lid, grouting of bottom, including related items and appurtenances, complete in place	1	EA		
49	Precast Safety End Treatment (4:1), including related items and appurtenances, complete in place	6	EA		
50	Connect Ex 30" pipe through void left by removal of curb inlet(secure with concrete collar	1	EA		
<b>Total Grading Plan and Drainage Items.....</b>				<b>\$</b>	<b>-</b>

**00 32 00 - Bid Schedule  
Tomball ISD  
Transportation Facility Parking**

Item	Description	QTY	Unit	Unit Price	Total
<b>E. Electrical</b>					
51	Underground conduit and wiring including all related items, & appurtenances, complete in place.	2,897	LF		
52	Replacement of existing pole light fixture on single head poles including all related items, & appurtenances, complete in place	2	EA		
53	Replacement of existing pole light fixture on dual head poles including all related items, & appurtenances, complete in place	12	EA		
54	New site/area light including 20 foot pole, single fixture, connection to existing foundation including all related items, & appurtenances, complete in place	1	EA		
55	New site/area light including 20 foot pole, dual fixture, connection to existing foundation including all related items, & appurtenances, complete in place	3	EA		
56	New site/area light including 30 foot pole, dual fixture, foundation including all related items, & appurtenances, complete in place	18	EA		
57	Circuit breakers in existing panelboard including all related items, & appurtenances complete in place	2	EA		
58	Conduit and wiring for controls and building management system including all related items, & appurtenances, complete in place	1	LS		
59	Lighting contactors including all related items, & appurtenances complete in place	1	LS		
<b>Total Electrical.....</b>				<b>\$</b>	
<b>TOTAL (Base Bid Package).....</b>				<b>\$</b>	
<b>ALTERNATE #1 - Asphalt Paving In-Lieu of Concrete Paving</b>					
60	6' Chainlink Fence with Barbed-Wire Attachment, including related items and appurtances, complete in place	4,136	LF		
<b>Subtotal - Alternate #1 - Asphalt Paving In-Lieu of Concrete Paving</b>				<b>\$</b>	<b>-</b>
<b>TOTAL CONSTRUCTION COST (BASE &amp; ALTERNATE #1)....</b>					





## SECTION 01 42 29

### TESTING LABORATORY SERVICES

#### PART 1—GENERAL

##### 1.1 LABORATORY SELECTION

- A. An independent testing laboratory representing the Owner's interest.
- B. The lab shall be proposed by the Contractor, with Architect's approval to inspect and test the materials and methods of construction as hereinafter specified for compliance with the Specification requirements of the Contract Documents and to perform such other specialized technical services as may be required by the Owner.
- C. The testing laboratory reports shall name the Owner as the client. Reports shall be sent to the Owner, Architect and Contractor.
- D. Payment for the testing services shall be sent to the Architect for review and approval. Upon approval the Architect will forward billing to the Contractor for payment from the testing allowance.

##### 1.2 QUALIFICATION OF LABORATORY

- A. The testing laboratory selected shall meet the basic requirements of ASTM E 329 "Standard of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as used in Construction", and shall submit to the Architect a copy of the report of inspection of their facilities made by the Materials Reference Laboratory of the National Bureau of Standards during the most recent tour of such inspections, and also shall submit a memorandum stating steps taken to remedy all deficiencies reported by this inspection.
- B. Testing machines shall be calibrated at intervals not exceeding 12 months by devices of accuracy traceable to the National Bureau of Standards.
- C. EXCEPTION: The testing laboratory is only required to have testing facilities for Work included in this Project.

##### 1.3 AUTHORITIES AND DUTIES OF THE LABORATORY

- A. The laboratory is not authorized to revoke, alter, relax, enlarge, or release any requirement of the Specifications, or to approve or accept any portion of the Work. When it appears that the material furnished or Work performed by the Contractor fails to fulfill Specification requirements, the laboratory shall notify the Architect and Contractor of such deficiencies by phone immediately to be followed with a written report of such deficiencies.
- B. Copies of all laboratory tests and inspection reports shall be issued by email promptly and directly to owner, architect/engineer and contractor. Paper copies are not required. In addition, testing agency shall promptly and directly notify all parties of all tests and inspections whose results deviate from the requirements outlined in the specifications and project documents. All Notifications of deviations shall be provided in a separate document from the original test and/or inspection reports. If the testing agency fails to properly notify

all parties, then the agency will assume all liabilities associated with deviations.

## **PART 2—PRODUCTS**

(NOT USED)

## **PART 3—EXECUTION**

### 3.1 EXTENT OF SERVICES

A. All work mentioned herein may not be required for this Project. Refer to the Contract Documents for applicability and extent.

#### **B. STRUCTURAL CONCRETE**

1. Aggregate Tests: Check the proposed aggregate in accordance with ASTM C 33.
2. Mix Design: Check the proposed mixes for proportions, water cement ratio and slump in accordance with ACI 613 and 318.
3. Slump Tests: Take slump tests per ASTM C 143 at the beginning of each day's pouring operations and whenever water adjustments or noticeable change of slump occurs.
4. Sampling:
  - a. During the progress of the work, testing lab shall make standard cylinders in accordance with ASTM C31. Make the required number of cylinders from each pour or from each 50 cubic yards, whichever quantity is less. Cylinders shall be identified to show the date made, the slump, and the general location in the structure from which the sample was taken. *The Architect may furnish a pdf file of the building footprint to the testing laboratory. Every test report shall include the building footprint with the numbered location on the footprint correlating to the testing number.*
  - b. The test cylinders shall be cured by the testing laboratory. Test one cylinder at 7 days, two at 28 days, and one spare. Once a test cylinder reaches the specified strength no further testing is required in that test batch. The Testing laboratory should not bill for any further testing of materials that have met the required strength unless authorized by the Architect/Engineer. The laboratory shall furnish a report to the Contractor, the Owner and to the Architect/Engineer indicating the results obtained from each cylinder.
  - c. Should the Contractor desire to remove the forms at a time prior to the 7-day test, make two additional cylinder tests to verify that the concrete has attained the strength required for form removal. The cost of these additional cylinders shall be paid for by the Contractor.
  - d. A strength test shall be the average of the strengths of at least two 6 by 12 in. cylinders or at least three 4" x 8" cylinders made from the same sample of concrete and tested at 28 days or at test age designated for determination of  $f'_c$ .
5. Testing: Test cylinders for compression in accordance with ASTM C 39.
  - a. Laboratory cure cylinders in accordance to ASTM C 192.
  - b. Test one cylinder at 7 days and two 6" x 12" cylinders (or three 4" x 8" cylinders) at 28 days, average 28-day test results.

#### **C. SOILS TESTS:**

1. Soils Analysis Method: Perform a minimum of one test for every 10,000 square feet of building pad for every other lift.
  - a. Liquid limit.

- b. Plastic limit.
  - c. Plasticity index.
  - d. Maximum laboratory density tests (ASTM D 698).
2. Soil Compaction:
- a. Perform a minimum of one test per 3,500 sq. ft. of paving area.
  - b. Perform a minimum of one test per 2,500 sq. ft. of building pad, or a minimum of three (3) tests, whichever is greater. Seventy-five percent (75%) of soil compaction tests shall be performed within 5' of the perimeter of the building foundation.
  - c. Perform tests for every other six inches of compacted lift.
3. Building pad shall be defined as the area to be over excavated under and outside the foundation as required in the geotechnical report, and the drawings whichever is greater. This shall include the "full depth select fill pad" & "transition zone"
4. Every test report shall include the building footprint with the numbered location on the footprint correlating to the testing number.

**D. LOW DENSITY CONCRETE FILL:**

1. Type of Tests:
- a. Field: Wet density.
  - b. Lab: Dry density and 28 day compressive strength.
2. Number of Test Sets:
- a. One per 5,000 square feet.
  - b. Not less than one for each day's work.

**END OF SECTION**

## SECTION 01 57 13

### STORM WATER AND POLLUTION PREVENTION

#### PART 1—GENERAL

The work consists of installing measures or performing work to control erosion and minimize the production of sediment and other pollutants to water and air from construction activities.

#### PART 2—PRODUCTS

All material furnished shall meet the requirements of the material specifications listed in the Drawings in coordination with the issued Storm Water Pollution Prevention Plan in the Contract Documents (where applicable).

#### PART 3—EROSION AND SEDIMENT CONTROL MEASURES AND WORKS

The measures and works shall include, but are not limited to, the following:

**Staging of earthwork activities**—The excavation and moving of soil materials shall be scheduled to minimize the size of areas disturbed and unprotected from erosion for the shortest reasonable time.

**Seeding**—Seeding to protect disturbed areas shall occur as soon as reasonably possible following completion of that earthwork activity.

**Mulching**—Mulching to provide temporary protection of the soil surface from erosion.

**Diversions**—Diversions to divert water from work areas and to collect water from work areas for treatment and safe disposition. They are temporary and shall be removed and the area restored to its near original condition when the diversions are no longer required or when permanent measures are installed.

**Stream crossings**—Culverts or bridges where equipment must cross streams. They are temporary and shall be removed and the area restored to its near original condition when the crossings are no longer required or when permanent measures are installed.

**Sediment basins**—Sediment basins collect, settle, and eliminate sediment from eroding areas from impacting properties and streams below the construction site(s). These basins are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures are installed.

**Sediment filters**—Straw bale filters or geotextile sediment fences trap sediment from areas of limited runoff. Sediment filters shall be properly anchored to prevent erosion under or around them. These filters are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures are installed.

**Waterways**—Waterways for the safe disposal of runoff from fields, diversions, and other structures or measures. These works are temporary and shall be removed and the area restored to its original

condition when they are no longer required or when permanent measures are installed.

**Other**—Additional protection measures as specified in section 8 of this specification or required by Federal, State, or local government.

#### **PART 4—CHEMICAL POLLUTION**

The contractor shall provide watertight tanks or barrels or construct a sump sealed with plastic sheets to collect and temporarily contain chemical pollutants, such as drained lubricating or transmission fluids, grease, soaps, concrete mixer wash water, or asphalt, produced as a by-product of the construction activities. Pollutants shall be disposed of in accordance with appropriate State and Federal regulations. At the completion of the construction work, tanks, barrels, and sumps shall be removed and the area restored to its original condition. Sump removal shall be conducted without causing pollution.

Sanitary facilities, such as chemical toilets, or septic tanks shall not be located next to live streams, wells, or springs. They shall be located at a distance sufficient to prevent contamination of any water source. At the completion of construction activities, facilities shall be disposed of without causing pollution specification.

#### **PART 5—AIR POLLUTION**

The burning of brush or slash and the disposal of other materials shall adhere to state and local regulations.

Fire prevention measures shall be taken to prevent the start or spreading of wildfires that may result from project activities. Firebreaks or guards shall be constructed and maintained at locations shown on the drawings.

All public access or haul roads used by the contractor during construction of the project shall be sprinkled or otherwise treated to fully suppress dust. All dust control methods shall ensure safe construction operations at all times. If chemical dust suppressants are applied, the material shall be a commercially available product specifically designed for dust suppression and the application shall follow manufacturer's requirements and recommendations. A copy of the product data sheet and manufacturer's recommended application procedures shall be provided to the engineer 5 working days before the first application.

#### **PART 6—MAINTENANCE, REMOVAL AND RESTORATION**

All pollution control measures and temporary works shall be adequately maintained in a functional condition for the duration of the construction period. All temporary measures shall be removed and the site restored to near original condition.

#### **PART 7—MEASUREMENT & PAYMENT**

For items of work for which lump sum prices are established in the contract, payment will be prorated and provided in equal amounts on each monthly progress payment estimate. The number of months used for pro-rating shall be the number estimated to complete the work as outlined in the contractor's approved construction schedule. The final month's prorate amount will be provided with the final contract payment. Payment as described will constitute full compensation for completion of the work.

## SECTION 02 41 00

### DEMOLITION

#### PART 1—GENERAL

##### 1.1 DESCRIPTION

- A. The extent of demolition is shown on the Drawings.
- B. Provide all labor, materials and equipment required to complete all demolition.
- C. Remove all items shown to be demolished on drawings or encountered in the building including, but not limited to concrete foundation, concrete floors, terrazzo, walls, ceilings, door frames, doors, plumbing, mechanical, electrical and miscellaneous which are not part of the final systems and which interfere with the completion of the project as shown or are otherwise noted for removal. Any demolition or damage of materials, etc., which are part of final complete project shall be replaced or repaired at Contractor's expense. All existing trees with a trunk diameter greater than 4" must remain unharmed by demolition work.
- D. Take whatever precautions are necessary to phase demolition of services so as to provide the Owner with necessary services during phased occupancy.
- E. Work with the Owner to remove demolition debris from the premises immediately and dispose of at Contractor's expense. Salvage items requested to be turned over to the Owner shall be delivered where directed by the Owner.
- F. In the event the Contractor encounter on the site material reasonably believed to be asbestos or polychlorinated biphenyl (PCB) which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and Architect in writing. The Work in the affected area shall be resumed in the absence of asbestos or polychlorinated biphenyl (PCB).

##### 1.2 REFERENCED STANDARDS

Perform demolition Work in compliance with applicable requirements of governing authorities having jurisdiction, including EPA, TDH, and et.al.

##### 1.3 PROTECTION

- A. The Contractor shall protect any existing work subject to damage during the Demolition of specified work. Existing materials or adjacent facilities that are readily subject to damage by this work or environmental conditions shall be protected by the Contractor.
- B. Barricade openings and provide temporary lockable gates as required by the Owner.

##### 1.4 CONDITIONS OF WORK-IN-PLACE

- A. Examine work-in-place on which specified work is in any way dependent. Report, in writing, to the Contractor and Architect/Engineer any defects which may influence

satisfactory completion and performance of specified work. The absence of such notification shall be construed as acceptance of work-in-place.

- B. Should incorrectly charted piping or other utilities be encountered during demolition, consult the Architect/ Engineer immediately for directions as to procedure. Cooperate with Owner in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of Owner.
- C. Data on indicated conditions are not intended as representations or warrants of continuity of such conditions. It is expressly understood that the Owner will not be responsible for interpretations or conclusions drawn therefrom by Contractor. Data are made available for the convenience of the Contractor.
- D. Additional exploratory operations may be made by Contractor at no additional cost to Owner, provided such operations are acceptable to Architect/Engineer.
- E. Take precautions and provide necessary bracing to guard against movements or settlement of existing improvements or new construction. Contractor is entirely responsible for strength and adequacy of bracing, and for safety and support of construction from damage or injury caused by the lack thereof or by movement.

#### 1.5 SALVAGE ITEMS

- A. All salvage and refuse items other than those called out in the drawings will become property of the Contractor to be removed from the site before new construction begins.
- B. Notify the Architects/Engineers of any items removed that may be of value to the Owners before disposing of it.
- C. All salvage items removed are to be removed with the greatest of care not to damage their finish or shape. Store in a manner that will protect each item from damage.

#### 1.6 DISPOSAL OF WASTE MATERIALS

Remove all waste materials and rubbish from the Site. Do not stockpile on site. All materials shall be disposed of as required by law.

#### 1.7 NOTIFICATION

Prior to any demolition occurring, file with Texas Department of Health “**Demolition/Renovation Notification Form**”, Contact TDH at 512/834-6610 or 800/572-5548 Texas Department of Health, Division of Occupational Health, Asbestos Programs Branch, 1100 West 49<sup>th</sup> Street, Austin, Texas 78756, or download at [www.tdh.state.tx.us/bch/asbestos](http://www.tdh.state.tx.us/bch/asbestos)

**END OF SECTION**

# SECTION 03 30 01

## CONCRETE

### PART 1—GENERAL

#### 1.1 DESCRIPTION

- A. This item governs for construction of concrete structures, foundations, and slabs-on-ground.
- B. Contractor assumes responsibility for design of concrete.

#### 1.2 RELATED WORK

- A. Structural Excavation and Backfill
- B. Lightweight Concrete Structures
- C. Steel Structures
- D. Pavement Repair and Resurfacing

#### 1.3 QUALITY ASSURANCE

- A. Submittals
  - 1. Submit mix designs for strength.
  - 2. Samples - Submit samples of the following for testing:
    - (a) Aggregate samples indicating full range of size and type.
    - (b) Admixes proposed for use.
    - (c) Cement proposed for use.
- B. Tests - Make test specimens to maintain check on concrete strength throughout job.

#### 1.4 REFERENCE STANDARDS

ACI 211	Recommended Practice for Selecting Proportions for Normal Weight Concrete.
ACI 301	Specifications for Structural Concrete for Buildings.
ACI 305	Recommended Practice for Hot Weather Concreting.
ACI 306	Recommended Practice for Cold Weather Concreting.
ACI 315	Detailing Reinforced Concrete Structures.
ACI 318	Building Code Requirements for Reinforced Concrete.
ASTM A185	Specifications for Welded Wire Fabric.
ASTM A615	Specifications for Deformed Reinforcing Steel.
ASTM C33	Specifications for Concrete Aggregates.
ASTM C94	Specifications for Ready-Mixed Concrete.
ASTM C150	Specifications for Portland Cement.
ASTM C260	Specifications for Air-Entraining Admixtures for Concrete.
ASTM C494	Specifications for Chemical Admixtures for Concrete.
ASTM D994	Specification for Preformed Bituminous Expansion Joint Filler.
ASTM D1751	Specification for Preformed Expansion Joint Filler. (Non-Extruding & Resilient Bituminous Types)
ASTM D1752	Specification for Preformed Sponge Rubber & Cork Expansion Joint Filler.

## PART 2—PRODUCTS

### 2.1 CONCRETE

Ready mixed conforming to ASTM C94 or site mixed.

- A. Cement - ASTM C150, Type 1; no caked cement; one brand for one structure; deliver in bags for site mixing.
- B. Water - Free from oils, acids, alkalis, organic matter, salts, or other deleterious substances.
- C. Coarse Aggregate - ASTM C33. Refer to ACI 301-3.6 for maximum size, other than the following:
  - 1. Slabs-on-Ground - 1-1/2 inches maximum.
  - 2. Grade Beams - 1 inch maximum.
  - 3. Drilled Piers - 1 inch maximum.
- D. Fine Aggregate - Natural sand meeting requirements of ASTM C33.
- E. Admixture
  - 1. Water Reducer and Set Retarder - ASTM C494; A, B, or D. Do not use chlorides.
  - 2. Air Entrainer - ASTM C260.
  - 3. Approved Manufacturers - Obtain written approval for admixture manufacturers other than:
    - (a) Gifford-Hill.
    - (b) W.R. Grace.
    - (c) Sika Chemical Corp.
  - 4. Super Plasticizer - (Contractor's Option) Provide a high range water reducer conforming to ASTM C494, Type F. Use amount recommended by the manufacturer.
    - (a) "PSI Super" as manufactured by Gifford Hill, Inc.
    - (b) "WRDA-19" as manufactured by W.R. Grace.
    - (c) "Sikament" as manufactured by Sika Chemical Corp.
- F. Classification

Class	Type	Min.28-day Compress. Strength (Lbs. per sq. in.)	Max. Water Content per bag Cement (Gal.)	Min. Cement (Bags/ Cu.Yd.)	Consistenc y Range in Slump (In.)	Air Content (%)
A	Structural Foundations, Slab- on-Ground, Curbs, Walks, Paving, Slope Paving	3,500	6.25	5.0	2½ to 5½	4 to 6
B	Structural Foundations, Slab- on-Ground	4,000	6.25	5.50	2½ to 5½	4 to 6
C	Fill, Pipe Blocking, or Seal Slabs	2,000	8.5	4.25	3 to 6	

Include in maximum water, free water in aggregate minus absorption of aggregate based on a thirty-minute absorption period. Class "A" Structural concrete is to be

used for structures, foundations, and slabs unless otherwise specified on plans. Slump ranges may be exceeded when super plasticizers are used.

## 2.2 REINFORCING STEEL

- A. Bars - ASTM A615 (Deformed).
  - 1. No. 3 Bars - Grade 60 in slab or main reinforcing.
  - 2. No. 3 Bars - Grade 40 in stirrups and ties.
  - 3. No. 4 and Larger Bars - Grade 60.
- B. Welded Wire Fabric - ASTM A185.

## 2.3 EXPANSION JOINT

- A. Unless otherwise shown expansion joint material to be asphalt or asphalt impregnated fiber joint in accordance with ASTM D994 or ASTM D1751 respectively.
- B. Preformed rubber or cork in accordance with ASTM D1752.

## 2.4 CURING MATERIAL

- A. Water - Free from oils, acids, alkalis, salts, or other deleterious materials.
- B. Cotton Mats - Filling material of cotton "bat" (min. 12 oz. per sq. yd.) with unsized cloth covering (min. 6 oz. per sq. yd.)

## 2.5 FORM LUMBER

- A. Seasoned, of good quality, and free from loose or unsound knots, knot holes, twists, shakes or decay.

## 2.6 GROUT

- A. Grout - One part Portland Cement to two parts sand.
- B. Non-Shrinking Grout - Pre-mixed grout which is non-metallic, non-corrosive, and non-staining; containing specially selected silica sands, cement, shrinkage compensating agents, plasticizing and water reducing agents.
  - 1. Conform to requirements of Corps of Engineers CRD-C588. Test method CRD-C589.
  - 2. Yield of 0.9 cubic foot to 1.0 cubic foot per 100 pounds.
  - 3. Mixing water per 100 pounds:
    - Stiff - 2 gallons
    - Plastic - 2-1/4 gallons
    - Flowable - 2-1/2 gallons
  - 4. Minimum 28 day compressive strength of 8,000 psi.
  - 5. Maintain grout temperature during placement between 50° F and 90° F.

## 2.7 PERMANENT MOISTURE BARRIER

- A. Provide polyethylene film with minimum thickness of .006 inch (six mils) and high impact-strength rating.

## 2.8 CONCRETE BONDING AGENT

- A. "Daraweld-C" as manufactured by W.R. Grace and Company, or "Bond Crete-S" as manufactured by Burke Concrete Accessories, Inc.

## **PART 3—EXECUTION**

### 3.1 FORMS

- A. Lumber - Mortar tight; smooth surface; true to line and grade, and adequately braced.
- B. Provide plywood or Masonite surfaces for concrete faces to be rub finished.
- C. Remove dirt, sawdust, nails, and other foreign material from formed spaces.

### 3.2 BUILT-IN ITEMS

- A. Install pipe sleeves, bolts, anchors, and other cast-in-place items securely. Use templates to set built-in items accurately.

### 3.3 JOINTS

- A. No horizontal joints will be permitted in concrete Work except as shown on the Drawings. Make stops in concrete placing with vertical bulkheads at locations approved by the Engineer prior to placement.

### 3.4 REINFORCING STEEL

- A. Bend, clean, place and tie in accordance with ACI Standards. Support slab steel on chairs as approved by Engineer.
- B. Splice bars with calculated stress in accordance with ACI Standards, Class C, unless noted.
- C. Lap bars not carrying design stress 30 diameters, but not less than 12 inches.
- D. Lap welded wire fabric by one full pattern width in each direction.

### 3.5 INSPECTION

- A. Do not place concrete until forming, reinforcement, and built-in items have been inspected and approved by the Engineer.

### 3.6 SUBGRADE

- A. Dampen subgrades not covered with membrane by sprinkling immediately before placing concrete. Omit when subgrade is already damp.
- B. Dry out soggy subgrade before placing slabs unless wetting is uniform and placing can be done without damage to subgrade.
- C. Place slab screeds to precise elevations.
- D. Obtain the Engineer's approval of subgrade and screeds prior to concrete placement.

### 3.7 MIXING CONCRETE

- A. Mix and deliver in accordance with ASTM C94.
- B. Clean and maintain equipment for good operation.
- C. Job mix concrete in approved type mixer for minimum of one and one-half minutes for one cubic yard batch. Add 15 seconds for each half yard increase over one yard batch.

### 3.8 PLACING CONCRETE

#### A. General Requirements

- 1. Give notice before placement.
- 2. Place in daylight hours.
- 3. Discharge within one hour after start of mixing.

#### B. Handling and Transporting

- 1. Use method to prevent segregation.
- 2. Use buckets, chutes, buggies, pipes, troughs, or pumping.
- 3. Protect against sun and wind, to prevent loss of slump and workability.
- 4. Use of aluminum equipment not permitted.

#### C. Depositing

- 1. Continuous horizontal layers twelve inches thick in structures and foundations.
- 2. Slabs and Flatwork
  - Drop concrete in position; do not draw or rake concrete laterally to position.
  - Place concrete continuously in any one part of the Work. If a whole part of the Work cannot be placed monolithically, place to construction joints indicated on Drawings, or as approved. Retighten forms, clean hardened surfaces, and cover with bonding compound before placing against hardened concrete.
  - Place sloped concrete from bottom up.
  - Use temporary screeds to maintain levels and slopes as required. Provide adequate support for screeds to maintain accurate elevations.
- 3. Limit free fall to five feet.
- 4. Use tremies for free fall over five feet.
- 5. Maintain temperature above 50° F.
- 6. Use retarding agent for air temperatures above 85° F.
- 7. Provide thermometer for temperature verification.

### 3.9 CURING CONCRETE

- A. Cure for six consecutive curing days.
- B. Cure high-early-strength concrete for three consecutive curing days.
- C. "Curing Day" is a calendar day whose temperature is above 50° F for at least 19 hours.

### 3.10 FORM REMOVAL

- A. Remove forms under slabs, beams, or girders after seven days.
- B. Remove all other forms after two days.

### 3.11 PATCHING CONCRETE

- A. Patch honeycomb and tie holes.

### 3.12 DEFECTIVE WORK

- A. Repair or replace immediately after form removal at Contractor's expense.

### 3.13 SLAB FINISH

- A. Floor Slabs - Steel trowel finish.
- B. Sidewalks - Steel trowel and broom finish.
- C. Foundations - Wood float finish.

### 3.14 RUB-FINISHED SURFACES

- A. Rub-finish exposed vertical and battered surface from six inches below final ground line or low water to top.
- B. No rubbing required for structures extending twelve inches or less above ground or water.
- C. Prove two rubbings.
  - First with No. 16 carborundum stone.
  - Second with No. 30 carborundum stone.
- D. Finish to provide clean, smooth, uniform surface.

### 3.15 CLEAN-UP

- A. Clean area from time to time during construction, and clean area completely after completion of work.

**END OF SECTION**

## SECTION 03 40 00

### ARCHITECTURAL PRE-CAST CONCRETE

#### PART 1—GENERAL

##### 1.1 DESCRIPTION

###### A. Work Included:

The specifications establish general criteria for materials, engineering design, production, erection and evaluation of architectural precast concrete as required for subsequent related sections of these specifications. The work to be performed shall include all labor, material, equipment, related services, and supervision required for the manufacture and erection of the architectural precast concrete units shown on the contract drawings and schedules.

##### 1.2 QUALITY ASSURANCE

###### A. Manufacturer qualifications: The precast concrete manufacturing plant shall be certified by the Precast/Prestressed Concrete Institute Plant Certification Program. Manufacturer shall be certified at the time of bidding. Acceptable manufacturers include:

1. Meridian Precast & Granite, Waco, Texas (254/776-9690)
2. Speed Fab-Crete Corp., Kennedale, Texas (817/478-1137)
3. Approved Equals.

###### B. Erector qualifications: Regularly engage for at least five (5) years in erection of architectural precast concrete units similar to those required on this project.

###### C. Welder qualifications: In accordance with AWS D1.1.

###### D. Testing: In general compliance with testing provisions in MNL-117, *Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products*.

###### E. Testing Agency:

1. Not less than five (5) years experience in performing concrete tests of type specified in this section.
2. Capable of performing testing in accordance with ASTM E 329.
3. Inspected by Cement and Concrete Reference laboratory of the National Institute of Standards and Technology.

###### F. Requirements of regulatory agencies: Manufacture and installation of architectural precast concrete to meet requirements of International Building Code 2000 and local building code or other governing codes relating to precast concrete.

###### G. Allowable tolerances: Manufacture and install wall panels so that each panel after erection complies with the dimensional tolerances listed in MNL-117.

###### H. Job Mockup:

1. After standard samples are accepted for color and texture, submit full-scale unit meeting design requirements.
2. Mockup to be standard of quality for architectural precast concrete work, when accepted by architect/engineer.

3. Incorporate mockup into work in a location reviewed by architect/engineer after keeping mockup in plant for 2/3 of the precast units for checking purposes.

I. Source quality control:

1. Quality control and inspection procedures to comply with applicable sections of PC1 MNL-117.
2. Water absorption test on unit shall be conducted in accordance with PC1 MNL-117.

### 1.3 SUBMITTALS

A. Samples:

1. Submit samples representative of finished exposed face showing typical range of color and texture prior to commencement of production.
2. Sample size: Approximately 12 in. X 12 in. and of appropriate thickness, representative of the proposed finished product.

B. Shop Drawings:

1. Erection Drawings:

- a) Member piece marks and completely dimensioned size and shape of each member.
- b) Plans and/or elevations locating and defining all products furnished by manufacturer.
- c) Sections and details showing connections, cast-in items and their relation to the structure.
- d) Relationship to adjacent material.
- e) Joints and openings between members and between members and structure.
- f) Description of all loose, cast-in and field hardware.
- g) Location, dimensional tolerances, and details of anchorage devices that are embedded in or attached to structure or other construction.
- h) All dead, live and other applicable loads used in the design.

2. Production Drawings:

- a) Member shapes (elevations and sections) and dimensions.
- b) Sections and details to indicate quantities and position of reinforcing steel, anchors, inserts, etc.
- c) Handling devices.
- d) Finishes.
- e) Joint and connection details.
- f) Methods for storage and transportation.

3. Shape Drawings:

- a) For members with complex configurations, complete dimensions and details that also define mold shape.

- C. Design Calculations:
  - 1. Submit complete and sealed structural design calculations performed by a registered engineer experienced in the design of architectural precast concrete.
- D. Design Modifications:
  - 1. Submit design modifications necessary to meet performance requirements and field coordination.
  - 2. Variations in details or materials shall not adversely affect the appearance, durability or strength of units.
  - 3. Maintain general design concept without altering size of members, profiles and alignment. Request for altering should be submitted in writing for approval by the Architect.

## **PART 2—PRODUCT**

### **2.1 MATERIALS**

- A. Concrete:
  - 1. Portland Cement:
    - a. ASTM C 150, type I or III, white color.
    - b. For exposed surfaces use same brand, type and source of supply throughout.
  - 2. Finish:
    - a. Material and Color: To be similar to natural limestone, white color.
  - 3. Concrete Aggregates:
    - a. ASTM C 33 or C 330.
  - 4. Water:
    - a. Free from deleterious matter that may interfere with the color, setting or strength of the concrete.
- B. Reinforcing Steel:
  - 1. Materials: Grades of reinforcing steel to be determined by the precast manufacturer for the structural design of the precast concrete units.
    - a. Bars:
      - 1) Deformed Steel: ASTM A 615, grade 60
    - b. Welded wire reinforcement:
      - 1) Sheeted, not rolled.
      - 2) Welded Plan Steel: ASTM A 185.
  - 2. Fabricated steel bar or rod mats:
- C. Cast-in Anchors:
  - 1. Materials
    - a. Structural steel: ASTM A 36.
    - b. Stainless steel: ASTM A 66, type 304
    - c. Bolts: ASTM A 307 or A 325
    - d. Welded headed studs: ASTM A 108
    - e. Deformed bar anchors: ASTM A 496 or A 706

2. Finish:
  - a. Hot-dipped galvanized: ASTM A 123
  - b. Zinc rich coating: DOD-P-21035, self curing, one component, sacrificial.

## 2.2 CONCRETE MIXES

### A. Concrete properties:

1. Water-cementitious materials ratio: Maximum 40 lbs. of water to 100 lbs. of cementitious materials.
2. Air entrainment: Amount produced by adding dosage of air entraining agent that will provide  $19\% \pm 3\%$  of entrained air in standard 1:4 sand mortar as tested according to ASTM C 185; or minimum 3%, maximum 6%.
3. Coloring agent: Not more than 10% of cementitious materials weight.
4. 28-day compressive strength: Minimum of 5000 psi when tested by 6 X 12 or 4 X 8 in cylinders; or minimum 6250 psi when tested on 4 in. cubes.

### B. Face mix:

1. Minimum thickness of face mix after consolidation shall be at least one in or a minimum of Q/S times the maximum size of aggregates used, whichever is larger.
2. Water-cementitious materials and cementitious materials-aggregate ratios of face and backup mixes shall be similar.

### C. Design mixes to achieve required strengths shall be prepared by independent testing facility or qualified personnel at precast concrete manufacturer's plant.

## 2.3 FABRICATION

### A. Manufacturing procedures shall be in general compliance with PCI MNL-117.

### B. Seismic Design: Design and detail elements and connections to resist seismic force in accordance with International Building Code 2000 code requirements and ACI 318 for Seismic Zone I.

### C. Finishes: Exposed face to match approved sample or mockup panel.

### D. Cover:

1. Provide at least 1 inch cover for reinforcing steel.
2. Do not use metal chairs, with or without coating, in the finished face.
3. Provide embedded anchors, inserts, plates, angles and other cast-in items with sufficient anchorage and embedment for design requirements.

### E. Molds:

1. Use rigid molds to maintain units within specified tolerances conforming to the shape, lines, and dimensions shown on the approved shop drawings.
2. Construct molds to withstand vibration method selected.

### F. Concreting:

1. Convey concrete from the mixer to place of final deposit by methods which will prevent separation, segregation or loss of material.
2. Consolidate all concrete in the mold by high frequency vibration, either internal or external or a combination of both, to eliminate unintentional cold joints, honeycomb and to minimize entrapped air on vertical surfaces.

G. Curing:

1. Precast concrete units shall be cured until the compressive strength is high enough to ensure that stripping does not have an effect on the performance or appearance of the final product.

H. Panel Identification:

1. Mark each precast panel to correspond to identification mark on shop drawings for panel location. Marks shall be located on concealed face upon final erection.
2. Mark each precast panel with date cast.

I. Acceptance:

1. Architectural precast units which do not meet the color and texture range or the dimensional tolerances may be rejected at the option of the architect, if they cannot be satisfactorily corrected.

## 2.4 CONCRETE TESTING

A. Make one compression test at 28 days for each day's production of each type of concrete.

B. Specimens:

- 1) Provide two test specimens for each compression test.
- 2) Obtain concrete for specimens from actual production batch.
- 3) 6 in X 12 in or 4 in X 8 in concrete test cylinder, ASTM C 31.
- 4) Cure specimens using the same methods used for the precast concrete units until the units are stripped, then moist cure specimens until tested.

C. Keep quality control records available for the architect upon request for two years after final acceptance.

## PART 3—EXECUTION

### 3.1 INSPECTION

A. Before erecting architectural precast concrete, the contractor shall verify that structure and anchorage inserts required to support panels are within tolerances.

B. Determine field conditions by actual measurements.

### 3.2 ERECTION

A. Clear, well-drained unloading areas and road access around and in the structure (where appropriate) shall be provided and maintained by the general contractor to a degree that the hauling and erection equipment for the architectural precast concrete products are able to operate under their own power.

B. General contractor shall erect adequate barricades, warning lights or sign to safeguard traffic in the immediate area of hoisting and handling operations.

C. Erect members without damage. Replace or repair damaged members.

D. Maintain temporary bracing in place until final support is provided.

E. Set vertical units dry, without grout, attaining joint dimension with lead or plastic spacers.

F. Grout underside of column bearing plates and joints between members at floor locations.

- G. Set precast units level, plumb, square and true within the allowable tolerances. General contractor shall be responsible for providing lines, center and grades in sufficient detail to allow installation. General contractor shall verify that bearing surfaces comply with specifications and, if not in compliance, shall make necessary corrections prior to start of erection.
- H. Provide temporary supports and bracing as required to maintain position, stability and alignment as units are being permanently connected.
- I. Tolerances for location of precast units shall be in accordance with PCI Handbook.
- J. Set non-load bearing units dry without mortar, attaining specified joint dimension with stainless steel or plastic spacing shims.
- K. Fasten precast units in place by bolting or welding, or both, completing drypacked joints, grouting sleeves and pockets, and/or placing cast-in-place concrete joints as indicated on approved erection drawings.
- L. Temporary lifting and handling devices cast into the precast concrete units shall be completely removed or, if protectively treated, left in place unless they interfere with the work of any other trade. Lifting and handling devices shall not be placed in exposed faces, backs or side, unless submitted in writing for approval by the Architect.

### 3.3 REPAIR

- A. Repair exposed exterior surface to match color and texture of surrounding concrete and to minimize shrinkage. If approved by Architect (See 3.02/H) and repairs are not visible.
- B. Adhere large patch to hardened concrete with bonding agent.

### 3.4 CLEANING

- A. After installation, clean soiled precast concrete surfaces in accordance with precast concrete manufacture's recommendation.
- B. Use extreme care to prevent damage to precast concrete surfaces and to adjacent materials.
- C. Rinse thoroughly with clean water immediately after using cleaner.

**END OF SECTION**

# SECTION 26 20 10

## ELECTRICAL SERVICE AND DISTRIBUTION

### PART 1—GENERAL

#### 1.1 DESCRIPTION

This section governs for furnishing, installing, testing and placing in service electrical systems.

#### 1.2 QUALITY ASSURANCE

- A. Comply with all National Electrical Code (NEC) requirements, local ordinances, and State and Federal regulations as applicable to this project.
- B. Manufacturer – Furnish products of manufacturers named unless otherwise approved.

#### 1.3 STORAGE AND HANDLING

Maintain materials and equipment in like-new condition. Prevent accumulation of construction dirt and excess condensation.

#### 1.4 INSPECTIONS AND TESTS

- A. Pre-Energization and Operating Tests – The complete electrical system shall be performance tested when first installed on-site. Each protective, switching, and control circuit shall be adjusted in accordance with the recommendations of the protective device study and tested by actual operation using current injection or equivalent methods as necessary to ensure that each and every such circuit operates correctly to the satisfaction of the authority having jurisdiction.
  - 1. Instrument Transformers – All instrument transformers shall be tested to verify correct polarity and burden.
  - 2. Protective Relays – Each protective relay shall be demonstrated to operate by injecting current or voltage, or both, at the associated instrument transformer output terminal and observing that the associated switching and signaling functions occur correctly and in proper time and sequence to accomplish the protective function intended.
  - 3. Switching Circuits – Each switching circuit shall be observed to operate the associated equipment being switched.
  - 4. Control and Signal Circuits – Each control or signal circuit shall be observed to perform its proper control function or produce a correct signal output.
  - 5. Metering Circuits – All metering circuits shall be verified to operate correctly from voltage and current sources, similarly to protective relay circuits.
  - 6. Acceptance Tests – Complete acceptance tests shall be performed, after the station installation is completed, on all assemblies, equipment, conductors, and control and protective systems, as applicable, to verify the integrity of all the systems.
  - 7. Relays and Metering Utilizing Phase Differences – All relays and metering that use phase

differences for operation shall be verified by measuring phase angles at the relay under actual load conditions after operation commences.

- B. Test Report – A test report covering the results of the tests required in NEC 225.56(A) shall be delivered to the authority having jurisdiction prior to energization.

## **PART 2—PRODUCTS**

### **2.1 ELECTRICAL**

- A. Conductors – To be copper unless otherwise specified and of size and type to conform to the requirements of National Electric Safety Code for loading and location
- B. Switches and Controls – To be the size specified and comply with the National Electric Manufacturers Association (NEMA) standards. Devices, controls and material shall be subject to applicable codes and regulations. Deviation from plans and specifications shall have the prior approval of the Engineer.
- C. Conduit-Outdoor
  - 1. Underground and Under Foundations and Slabs – Schedule 40 electrical grade PVC for horizontal runs. At stub-ups from underground, install galvanized heavy wall rigid steel (UL) for the last three feet of horizontal run, radius, and vertical riser, unless noted otherwise. Install 9” wide yellow “Electrical Warning” tape 6” directly above underground conduit.
  - 2. Outdoor Exposed – Galvanized heavy wall rigid steel (UL) conduit.
- D. Conduit-Indoor – Inside buildings, covered or protected areas use Electrical Metallic Tubing (EMT) conduit.
- E. Flexible Conduit – "Sealtite," type US, by American Brass Company or Anaconda.
- F. Conduit Fittings – Crouse-Hinds, Appleton, or Killark. Unless noted otherwise, provide setscrew connections and couplings.
- G. Electrical Panels – Plug-in type circuit breakers with capacity as required. Approved Manufacturers: G.E., Westinghouse, Cutler-Hammer, Square-D, or Allen-Bradley.
- H. Indoor Receptacles – Heavy Duty, 20A min. “specification” grade, with wiring clamps with large head screws for positive clamping of wiring for back and side wiring method, equal to Hubbell 5362. Finish to match existing receptacles where applicable. Finish per Architect for new construction.
- I. Switches – Heavy Duty, 20A min. “specification grade,” equal to Hubbell 1221. Where show on plans 3-way switches shall be Heavy Duty, 20A min. “specification grade,” equal to Hubbell 1223. Finish to match existing switches where applicable. Finish per Architect for new construction.
- J. Outdoor Receptacles – Weatherproof spring cover and conduit box (code approved) with GFCI protection.
- K. Photoelectric/Timer Lighting Controls

1. Photocells
  - a. Photocells to be U.L. listed and electronic.
  - b. Load capacity to be 1800 VA minimum but not less than 125% of load including power factor correction.
  - c. Photocells to have integral surge/lightning protection.
  - d. Photocell to have delay action to prevent de-energizing load due to light from headlights or lightning.
  - e. Acceptable brand names include: Tork, Paragon, & Intermatic. Photocell brand to match timer brand.
2. Timers
  - a. Timers to be U.L. listed and mechanical.
  - b. Load capacity to be rated at a minimum of 125% of load including power factor correction.
  - c. Timer to provide 24-hour control. Provide one ON and one OFF tripper; timer to be capable of at least 3 on/off operations by adding additional trippers.
  - d. Provide manual override.
  - e. Acceptable brand names: Tork, Paragon, & Intermatic. Timer brand to match photocell brand.
3. Installation – Install all controls per manufacturer's recommendations.
  - a. Relays can be eliminated if contacts are rated for the actual load.
  - b. Do not use latching contactors.
  - c. Mount photocells in an upright position facing toward natural light and away from artificial lights, tree shadows, and building shadows.

## **PART 3—EXECUTION**

### **3.1 GENERAL**

- A. Install all equipment and materials in accordance with recommendations of each equipment manufacturer.
- B. Space allocations and utility rough-ins have been designed on the basis of equipment items named by manufacturer and model number. If any equipment not so named is offered which differs substantially in dimensions or configuration from the named equipment, provide scaled shop drawings showing that the substitute can be installed in the same space available without interfering with other trades or with access for operation and maintenance in the completed project. The Installer shall coordinate final rough-in locations with actual equipment furnished.
- C. Use only workmen skilled in this type of work.

### **3.2 INSTALLATION**

#### **A. CONDUIT**

1. Steel Conduit Installation Practices: AISI Handbook "Steel Electrical Raceways" for steel.
2. Sleeves through footings for exterior runs to be "OZ" Series FSK, WSK, G and W, or 3M.

3. Exposed raceways to be installed parallel or perpendicular to walls, structural members of intersections, or vertical planes and ceilings.
4. Screw clamp backs to be used with conduits run on walls or ceilings.
5. Place an approved (OZ, Crouse-Hinds, Appleton) expansion fitting where crossing building expansion joints.
6. Install 9" wide yellow "Electrical Warning" tape 6" above outdoor buried conduit.

#### B. WIRE AND CABLE

1. Size – Type THHN or THWN stranded, 75°C min. not smaller than No. 12 AWG, except control wire to be as required by the manufacturer. No. 12 AWG may be stranded or solid.
2. Branch circuit grounding conductors in conduit to be insulated unless otherwise noted.
3. Color coding – In accordance with NEC for color code control wires.
4. Connections and Splices in Dry Locations – For circuits loaded at less than 600 Volts AC, pressure connectors may be used (except for motors). Use compression lugs at motor terminals. Use compression sleeves for splices of No. 8 AWG and larger. Use electrical spring connectors (Scotchlock or 3M) for connections and wire joints in lighting and receptacle outlet boxes, and control junction boxes with terminal strips. Maximum wire size No. 8 AWG for spring connectors. Cover all splices, joints, and free ends of conductors with insulation equivalent to that of conductors or with insulating device suitable for the purpose.

#### C. PANELS

1. Top operating handle not to exceed 6 feet and 6 inches from finished floor.
2. Label all circuits on director card with embossing tape prior to job completion.
3. Three layer laminated nameplates shall be 3/32" inch thick, lengths as required to accommodate lettering, and in 3/4" and 1 1/4" widths. Each plate shall have adhesive backing with pull-apart resistance of at least 100 PSI and be attached to panels with screws. Plates shall be laminated type with black background and white letters.
4. All sub panels shall have nameplate installed inside panel door stating the panel it is powered from.

#### D. FLEXIBLE CONDUIT CONNECTIONS

Minimum of 2 feet to be provided for equipment subject to vibration or movement and to all motors. Arrange to facilitate motor removal.

**END SECTION**

## SECTION 26 50 00

### LIGHTING

#### PART 1—GENERAL

##### 1.1 SCOPE

- A. Work of this Section shall include the following items:
  - 1. Interior LED
  - 2. Exterior LED
  - 3. Emergency Lighting System

##### 1.2 SUBMITTALS

- A. Submittals that deviate or substitute products or items differing from those specified shall provide cut sheets of both the specified item and the proposed substitution for product comparison. **Submittals not following this procedure will not be reviewed.**

#### PART 2—PRODUCTS

##### 2.1 LIGHTING FIXTURES AND LAMPS

- A. Provide fixtures including interior and exterior fixtures and emergency battery pack type fixtures as indicated on the plans and described in the schedule.
- B. All battery packs supplying emergency lighting fixtures shall be capable of sustained operation for at least 90 minutes without any degradation in performance and without going into deep cell discharge.
  - 1. When the fixture is powered by the battery pack, at least one third of the normal light output shall be available for emergency lighting unless otherwise noted on the plans.
  - 2. All emergency lights shall have a lighted push-to-test button clearly visible and accessible.
  - 3. All battery packs shall be NICAD unless noted otherwise on the plans.
- C. Fixtures shall be complete with lamps as indicated, internal wiring, drivers, transformers, brackets, fittings, lenses, louvers, guards, reflectors, pole supports and accessories as required, indicated or detailed.
- D. Fixture make and model designations are shown in the lighting schedule on the Project drawings. Acceptable manufacturers are Lithonia Lighting, Cooper Lighting, Cree, Philips, RAB Lighting, and Hubbell/Prescolite provided substitutions meet the design intent and specifications of the scheduled fixtures including, but is not limited to color, shape, size, and output. Substitutions for products other than those stipulated will be considered by the Architect up to 3 days before the receipt of bids. The burden of proof of equality rests with the Prime Bidder. **Substitutions shall be by Architect's written approval only and may require submission of samples.**
- E. Provide a transformer/driver for LED lights that meets the manufacturer's requirements. Verify with the manufacturer the minimum and maximum number of fixtures that can be powered

from a single transformer/driver so as to provide stable, flicker-free operation and long life.

## 2.2 CONTROLS

- A. Provide controls as indicated on the plans and described in the schedule.
- B. Power packs shall be furnished with dual voltage transformer (120/277 VAC) to 15 VDC for powering remote sensors. Each power pack shall be capable of switching lighting loads on and off using internal relays. Installation of power packs shall be connected via elongated chase nipple mounted directly through a 1/2" knockout into a junction box with wire leads connected to 18 to 22 AWG low voltage cable running to the sensors. For plenum rated ceilings the power pack shall be enclosed in an adjacent junction box. All power packs shall be capable of powering a minimum of 10 sensors.
- C. Ceiling mounted sensors shall be dual technology large motion (360°). Each shall be capable of mounting to finished ceilings (e.g. ceiling tiles, sheetrock, plaster). Dual technology shall be consider as Passive Infrared (PIR) and Microphonic where occupants are stationary for long periods of time. All sensors shall have a radial coverage of approximately 2000 ft<sup>2</sup> when mounted at 9 feet.
- D. Wall or corner mounted sensors shall be dual technology capable of detection of movements up to 40 feet away.
- E. Sensor shall be capable of being wired together or along with any other low voltage sensors.
- F. Wall switches with sensor shall be low profile, soft-click buttons, and provide small motion detection up to 20 feet utilizing dual technology. Switches shall also be compatible with 0-10V dimming luminaries.

## PART 3—EXECUTION

### 3.1 LIGHTING FIXTURES

- A. Installation methods for each fixture shall be as indicated or detailed and as recommended by the fixture manufacturer for the application. Supports such as mounting brackets, hangers, clamp, etc., shall be provided in the best practical manner consistent with good workmanship and appearance.
- B. Any fixture damaged during construction prior to final acceptance of the project shall be replaced or repaired to the satisfaction of the Engineer.
- C. Contractor shall note architectural finish schedules and existing conditions and furnish proper mounting accessories or trim as required to properly mount each fixture type.
- D. Recessed fixtures shall be provided with mounting frames or rings and shall finish flush to the ceiling without light leaks. Fixtures shall be connected by means of 3/8" flexible metal conduit (max 6'-0" length) from outlet boxes mounted above or alongside the fixture. "Daisy-chaining" will not be permitted
- E. Fixtures exposed to outdoor temperatures shall be rated for 0 degree Fahrenheit operation.

**END OF SECTION**

# SECTION 31 00 01

## EARTHWORK FOR PAVING

### PART 1 - GENERAL

#### 1.1 SCOPE

- A. Earthwork consists of operations required for the excavation of materials on site; excavation of borrow material from designated areas; compaction of natural subgrades; placement and compaction of embankments to grade; finish grading; disposal of excess or unsuitable materials; and other required operations. Earthwork must conform with dimensions and typical sections shown, and within lines and grades established on the drawings.
- B. The contractor shall inform and satisfy himself as to character, quantity and distribution of material to be excavated.

#### 1.2 EXISTING UTILITIES

- A. The contractor shall contact the local gas, electric, telephone, water, sanitary sewer and cable television utility companies and pipeline companies to verify the location of their underground lines within the work areas.

#### 1.3 CLASSIFICATIONS

The following are brief definitions of classification of earthwork.

- A. Topsoil – Top 6 inches of natural surface soil possessing the characteristics of representative soils on the site that produce growths of grass or other vegetation. Topsoil includes grasses and other vegetation.
- B. Subgrade – Consists of that portion of the surface on which a compacted embankment or pavement is constructed.
- C. Compacted Embankment – Earth fill placed and compacted between the top of compacted subgrade and underside of pavement and fill areas adjacent to paving within limits shown on Typical Cross Sections.
- D. Borrow – Material taken from designated areas to make up any deficit of excavated material.
- E. Finish Grading – Operations required for smoothing disturbed areas that are not overlaid with pavement.
- F. Stripping of Ground Surface – All vegetation, all decayed vegetable matter, rubbish and other unsuitable material within the areas to be graded, not removed by clearing, shall be stripped or otherwise removed to ground level before grading or other earthwork is started. In no case will such material be allowed to remain in or on the areas to be graded.
- G. Excavation – After all necessary stripping has been done, excavation of every description and of whatever substances encountered within the grading limits of the project shall be performed to the lines and grades indicated on the drawings.

- H. Compaction – Compaction of soil materials shall be measured as a percent of Standard Proctor density as determined by the ASTM Standard D-698 procedure.

## **PART 2 - PRODUCTS**

### **2.1 EQUIPMENT**

Use only equipment that has been approved for this project.

- A. Grading Equipment – Furnish, operate and maintain such equipment as is necessary to produce uniform layers, section and smoothness of grade for compaction and drainage.
- B. Tamping Rollers:
  - 1. Use tamping rollers with one or more cylindrical drums. Each cylinder must be at least 48 inches long and 40 inches in diameter.
  - 2. The minimum weight per lineal foot of drum length must be 1500 pounds weighted and 1000 pounds empty.
  - 3. For tamping rollers with multiple cylinders, each cylinder must rotate independently and the cylinders must be pivoted on the main frame so that the units can adapt to irregularities in the ground surface.
  - 4. On each cylinder provide approximately 2.7 tamping feet per square foot of drum surface. Stagger the feet uniformly over the cylinder surface. Each foot should have a face area between 5 and 7 square inches and a clear projection from the cylinder surface of 7 to 9 inches. Equip each unit with device for cleaning the feet as the cylinders rotate.
  - 5. Use a crawler tractor with sufficient power to pull the tamping roller at a speed of approximately 3.0 miles per hour.
- C. Rubber Tire Rollers:
  - 1. Use rubber tire rollers having two axles and not less than a total of nine wheels with pneumatic tires.
  - 2. Mount the wheels so that the rear tires will not follow in the tracks of the forward tires and so the unit will give uniform compaction over the entire width of coverage.
  - 3. Mount the axles in a rigid frame with a loading plat form or body suitable for being ballasted to a specified gross weight between 10 and 50 tons loading.
  - 4. If the roller is not self-propelled, the towing equipment must also have pneumatic tires.
- D. Sprinkling Equipment – Use tank trucks, pressure distributors, or other equipment designed to apply water uniformly and in controlled quantities to variable surface widths.
- E. Miscellaneous Equipment – Scarifiers, disks, spring tooth or spike tooth harrows, earth hauling equipment, and other equipment must be suitable for construction of fills.

### **2.2 EARTH FILL**

- A. Source – Obtain embankment fill from required excavation or, if excavated material is not sufficient, from borrow areas designated by the Engineer.
- B. Suitability - Use the best material available from excavation or borrow. Suitability of fill material is subject to the engineer's approval.

- C. Quality - Fill material must be free of excessive silts. Do not use soil containing brush, roots, sod or similar perishable material.
- D. Plasticity Index – Embankment material must have a plasticity index between 15 and 30 inclusive.

### **PART 3 - EXECUTION**

#### **3.1 REMOVAL OF TOPSOIL**

- A. Remove topsoil within limits of the roadway section and stockpile for future distribution. Protect stockpiled topsoil from other excavated materials.

#### **3.2 EXCAVATION**

- A. Objective – As shown on the drawings, excavate to lines, grades and elevations required for subsequent construction of embankments or pavement. Remove materials within the indicated limits and dispose as directed.
- B. Drainage – During excavation, maintain grades for complete drainage. When directed, install temporary drains or drainage ditches to intercept or divert surface water and prevent interference or delay of the work.
- C. Stockpiling – If at time of excavation it is not possible to place material in the proper section of permanent construction, stockpile the material in approved areas for later use.
- D. Stone or Rock – Stones or rock fragments larger than 2 inches in their greatest dimension will not be permitted in top 6 inches of subgrade.
- E. Dressing – Uniformly dress cut and fill slopes to slope, cross section and alignment, as shown.

#### **3.3 SUBGRADE UNDER PAVEMENTS**

- A. After excavation is made to subgrade lines under proposed pavements, remove and replace soft or undesirable material with select material as specified for embankments. Stabilize and compact the subgrade, if required, as stated in the section on Lime Stabilization of Pavement Subgrade.

#### **3.4 TREATMENT OF NATURAL SUBGRADE UNDER EMBANKMENTS**

- A. After excavation is made to lines under proposed embankments, remove soft or undesirable material to a depth determined by the Engineer. Breakdown sides of holes or depressions to flatten the slopes.
- B. Fill each depression with the appropriate soil for the materials to be placed on the subgrade. Place the fill in layers moistened and compacted as specified in this section.
- C. After depressions have been filled and immediately before placement of compacted fill in a section of the embankment, thoroughly loosen the foundation material to a depth of 6 inches. Remove roots and debris turned up while loosening the soil.
- D. Compact the surface of the embankment subgrade as specified in the following paragraph.

- E. Take care to prepare the embankment so that planes of seepage or weakness are not induced. Should the engineer suspect such a deficiency, the material must be thoroughly broken and re-compacted before proceeding with construction.

### 3.5 PLACING EMBANKMENT FILL

- A. Inspection of Subgrade – Do not place fill on any part of the embankment subgrade until the subgrade preparation has been approved by the engineer.
- B. Removing Debris – During the dumping and spreading process, remove all roots, stones and debris that is uncovered in the embankment material.
- C. Spreading Fill – After dumping, spread the material in horizontal layers over the entire fill area. The thickness of each layer before compaction must not exceed 8 inches unless otherwise directed. As soon as possible after placement begins, crown the surface to drain freely and maintain such conditions throughout construction.
- D. Attaining Proper Bond – If the compacted surface of a layer is too smooth to bond with succeeding layers, loosen the surface by harrowing or other approved method before continuing the work.
- E. Embankment Stabilization – Stabilize and compact the embankment fills under pavement sections, if required, as specified in the section on Lime Stabilization of Pavement Subgrade.

### 3.6 MOISTURE CONTROL

- A. Intent – Developing the maximum density obtainable with the natural moisture of the embankment material is preferred. However, the moisture content must not vary from the optimum, as determined by ASTM Test Method D-698, by more than 3 percent or less than 1 percent.
- B. Adjustment – If the moisture content is too high, adjust to within the specified limits by spreading the material and permitting it to dry. Assist the drying process by discing or harrowing if necessary. When the material is too dry, sprinkle each layer with water. Work the moisture into the soil by harrowing or other approved method.

### 3.7 COMPACTION

- A. Compact each layer of embankment with suitable rollers as necessary to secure a minimum of 95 percent density within the specified range of the moisture content, according to ASTM D-698.

### 3.8 DISTRIBUTION OF TOPSOIL

- A. Preparation:
  - 1. Prior to placing topsoil, scarify the subgrade to a depth of 2 inches to provide effective bonding of the topsoil with the subgrade. Use a chisel plow with the chisels sets 10 inches apart.
  - 2. Shape all areas designated for grading, including cut and fill areas, to receive a minimum of 4 inches of topsoil.
  - 3. In areas that require only blading and dressing, the adequacy of existing topsoil will be determined by the engineer.

- B. Placement:
  - 1. Do not haul or place wet topsoil. Also prohibited is placement of topsoil on a subgrade that is excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading or proposed planting.
  - 2. Distribute topsoil uniformly and spread evenly to an average thickness of 4 inches. Do not compact topsoil. Correct irregularities in the surface to prevent formation of depressions where water could stand.
  - 3. Perform the spreading operation so that planting can proceed with little additional tillage or soil preparation. Leave the area smooth, suitable for lawn planting.
- C. Maintenance – Where any portion of the surface becomes eroded or otherwise damaged, repair the affected area to establish the condition and grade prior to topsoil placement; then replace topsoil.

### 3.9 MATERIAL DISPOSAL

- A. Excess Material – Remove excess excavated material and excess topsoil from the area before substantial completion. Excess material is property of contractor and should be disposed of away from site.
- B. Waste Material – Dispose of waste material without causing expense or damage to the Owner. The owner's waste disposal site may be used for prescribed waste material at the established rate per load.

### 3.10 TESTING

- A. Laboratory Services – Contractor will appoint a commercial testing laboratory as outlined in SECTION 01410, and payment shall be by Contractor for testing. Retests of failed areas shall be by Contractor. Laboratory will:
  - 1. Prepare optimum moisture/density relationship for subgrade.
  - 2. Make density tests to determine degree of compaction for subgrade.
  - 3. "Back-scatter" density tests will not be accepted.

**END OF SECTION**

## **SECTION 31 11 01**

### **SITWORK – CLEARING**

#### **PART 1—GENERAL**

##### 1.1 DESCRIPTION

- A. Work Included: Removal and disposal of trees, stumps, brush, logs, rubbish, and other objectionable matter within proposed right-of-ways or site.

##### 1.2 UTILITIES

- A. Prior to beginning any excavation work, contact “Texas One Call System” 1-800-245-4545.
- B. Comply with Underground Facility Damage Prevention and Safety Act - Texas HB 2295.
- C. Protect and preserve in operating condition all active utility services that traverse or border the Project Site. Repair any damage resulting from this work at no expense to the Owner.
- D. Report unrecorded utilities to the Architect/Engineer when encountered.
- E. Abandoned underground utilities, including manholes, shall be removed from the building limits. Remove abandoned overhead utilities from entire Project Site. Fill & compact to density of surrounding soil all abandoned manholes and similar voids outside of the building limits.

#### **PART 2—PRODUCTS**

##### 2.1 EQUIPMENT AND MATERIALS

- A. Contractor may use equipment and materials necessary to properly complete clearing.

#### **PART 3—EXECUTION**

##### 3.1 GENERAL

- A. Construction Methods: Entire area of construction shall be cleared of all trees, stumps, brush, logs, and rubbish.
- B. Clearing: Clearing consists of the removal and disposal of trees, stumps, brush, logs, rubbish and other objectionable materials within the construction area.

##### 3.2 PROTECTION

- A. Protection of Existing Utilities

Contractor shall verify the existence and location of all underground utilities and structures along the route of the work. Omission from or inclusion of utility locations on plans shall not be considered as the non-existence of or a definite location of existing underground utilities and structures.

Contractor shall protect all existing utilities and structures from damage due to his operations. Any damage to the utilities and structures due to Contractor's operations shall be repaired to a condition equal or better prior to the damage, at Contractor's expense.

### 3.3 FINAL CLEAN-UP

- A. Upon completion of the work and before acceptance and final payment, Contractor shall remove rubbish, unused materials and temporary structures from the limits of the project and restore, in a manner acceptable to the Engineer, all property both public and private that has been damaged during the prosecution of the work, and shall level and grade all portions of the work where the surface of the natural ground has been disturbed during construction and shall leave the site of the work in a neat and presentable condition, free from ruts or holes.
- B. Material cleared from the limits of the project shall not be deposited on adjacent property unless prior approval is obtained from the property owner involved.
- C. Unless otherwise specified, cleared material becomes property of Contractor, to be removed from the work site or disposed of in manner not to damage the Owner. Burning of cleared material on the Owner's property may be permitted if allowed for by local regulations and property owner.

### 3.4 INSPECTION

- A. The areas and conditions under which work of this section will be performed will be examined and subject to approval by the Engineer.

## **PART 4—LANDSCAPING**

### 4.1 TOP SOIL STRIPPING AND STORAGE

- A. Remove to depth of six inches (6") from areas to be graded, excavated or built over and stockpile in area designated on drawings or by Architect/Engineer. No soil shall be hauled away from the site until final grading is complete. Topsoil shall be redistributed at time of final grading. Remove and dispose excess site soil off-site in accordance with all regulatory requirements.

### 4.2 SHRUB AND TREE REMOVAL

- A. Remove trees and other vegetation, including stumps and roots, from fill areas and within building limits. Remove same to depth of 2'-0" below finished grade in areas to be fine graded, paved or landscaped. Remove trees adjacent to, but outside of, building limits upon Architect's/Engineer's approval.
- B. Remove above material from Site and satisfactorily dispose of in accordance with governing authorities.

### 4.3 TREE PRUNING

- A. Personnel normally engaged in this type of work shall perform all pruning work required or necessary to the construction work.

**END OF SECTION**

# SECTION 31 21 01

## EXCAVATION & EARTHWORK

### PART 1—GENERAL

#### 1.1 SCOPE

- A. Earthwork consists of operations required for the excavation of materials on site; excavation of borrow material from designated areas; compaction of natural subgrades; placement and compaction of embankments to grade; finish grading; disposal of excess or unsuitable materials; and other required operations. Earthwork must conform with dimensions and typical sections shown, and within lines and grades established on the drawings.
- B. The contractor shall inform and satisfy himself as to character, quantity and distribution of material to be excavated.

#### 1.2 EXISTING UTILITIES

The contractor shall contact the local gas, electric, telephone, water, sanitary sewer and cable television utility companies and pipeline companies to verify the location of their underground lines within the work areas.

#### 1.3 CLASSIFICATIONS

The following are brief definitions of classification of earthwork.

- A. Topsoil - Top 6 inches of natural surface soil possessing the characteristics of representative soils on the site that produce growths of grass or other vegetation. Topsoil includes grasses and other vegetation.
- B. Subgrade - Consists of that portion of the surface on which a compacted embankment or pavement is constructed.
- C. Compacted Embankment - Earth fill placed and compacted between the top of compacted subgrade and underside of pavement and fill areas adjacent to paving within limits shown on Typical Cross Sections.
- D. Borrow - Material taken from designated areas to make up any deficit of excavated material.
- E. Finish Grading - Operations required for smoothing disturbed areas that are not overlaid with pavement.
- F. Stripping of Ground Surface - All vegetation, all decayed vegetable matter, rubbish and other unsuitable material within the areas to be graded, not removed by clearing, shall be stripped or otherwise removed to ground level before grading or other earthwork is started. In no case will such material be allowed to remain in or on the areas to be graded.
- G. Excavation - After all necessary stripping has been done, excavation of every description and of whatever substances encountered within the grading limits of the project shall be performed to the lines and grades indicated on the drawings.

- H. Compaction - Compaction of soil materials shall be measured as a percent of Standard Proctor density as determined by the ASTM Standard D-698 procedure.

## **PART 2—PRODUCTS**

### **2.1 EQUIPMENT**

Use only equipment that has been approved for this project.

- A. Grading Equipment - Furnish, operate and maintain such equipment as is necessary to produce uniform layers, section and smoothness of grade for compaction and drainage.
- B. Tamping Rollers:
  - 1. Use tamping rollers with one or more cylindrical drums. Each cylinder must be at least 48 inches long and 40 inches in diameter.
  - 2. The minimum weight per lineal foot of drum length must be 1500 pounds weighted and 1000 pounds empty.
  - 3. For tamping rollers with multiple cylinders, each cylinder must rotate independently and the cylinders must be pivoted on the main frame so that the units can adapt to irregularities in the ground surface.
  - 4. On each cylinder provide approximately 2.7 tamping feet per square foot of drum surface. Stagger the feet uniformly over the cylinder surface. Each foot should have a face area between 5 and 7 square inches and a clear projection from the cylinder surface of 7 to 9 inches. Equip each unit with device for cleaning the feet as the cylinders rotate.
  - 5. Use a crawler tractor with sufficient power to pull the tamping roller at a speed of approximately 3.0 miles per hour.
- C. Rubber Tire Rollers:
  - 1. Use rubber tire rollers having two axles and not less than a total of nine wheels with pneumatic tires.
  - 2. Mount the wheels so that the rear tires will not follow in the tracks of the forward tires and so the unit will give uniform compaction over the entire width of coverage.
  - 3. Mount the axles in a rigid frame with a loading plat form or body suitable for being ballasted to a specified gross weight between 10 and 50 tons loading.
  - 4. If the roller is not self-propelled, the towing equipment must also have pneumatic tires.
- D. Sprinkling Equipment - Use tank trucks, pressure distributors, or other equipment designed to apply water uniformly and in controlled quantities to variable surface widths.
- E. Miscellaneous Equipment - Scarifiers, disks, spring tooth or spike tooth harrows, earth hauling equipment, and other equipment must be suitable for construction of fills.

### **2.2 EARTH FILL**

- A. Source - Obtain embankment fill from required excavation or, if excavated material is not sufficient, from borrow areas designated by the engineer.
- B. Suitability - Use the best material available from excavation or borrow. Suitability of fill material is subject to the engineer's approval.

- C. Quality - Fill material must be free of excessive silts. Do not use soil containing brush, roots, sod or similar perishable material.
- D. Plasticity Index - Embankment material must have a plasticity index between 15 and 30 inclusive.

### **PART 3—EXECUTION**

#### **3.1 REMOVAL OF TOPSOIL**

Remove topsoil within limits of the roadway section and stockpile for future distribution. Protect stockpiled topsoil from other excavated materials.

#### **3.2 EXCAVATION**

- A. Objective - As shown on the drawings, excavate to lines, grades and elevations required for subsequent construction of embankments or pavement. Remove materials within the indicated limits and dispose as directed.
- B. Drainage - During excavation maintain grades for complete drainage. When directed, install temporary drains or drainage ditches to intercept or divert surface water and prevent interference or delay of the work.
- C. Stockpiling - If at time of excavation it is not possible to place material in the proper section of permanent construction, stockpile the material in approved areas for later use.
- D. Stone or Rock - Stones or rock fragments larger than 2 inches in their greatest dimension will not be permitted in top 6 inches of subgrade.
- E. Dressing - Uniformly dress cut and fill slopes to slope, cross section and alignment, as shown.

#### **3.3 SUBGRADE UNDER PAVEMENTS**

After excavation is made to subgrade lines under proposed pavements, remove and replace soft or undesirable material with select material as specified for embankments. Stabilize and compact the subgrade, if required, as stated in the section on Lime Stabilization of Pavement Subgrade.

#### **3.4 TREATMENT OF NATURAL SUBGRADE UNDER EMBANKMENTS**

- A. After excavation is made to lines under proposed embankments, remove soft or undesirable material to a depth determined by the Engineer. Break down sides of holes or depressions to flatten the slopes.
- B. Fill each depression with the appropriate soil for the materials to be placed on the subgrade. Place the fill in layers moistened and compacted as specified in this section.
- C. After depressions have been filled and immediately before placement of compacted fill in a section of the embankment, thoroughly loosen the foundation material to a depth of 6 inches. Remove roots and debris turned up while loosening the soil.
- D. Compact the surface of the embankment subgrade as specified in the following paragraph.

- E. Take care to prepare the embankment so that planes of seepage or weakness are not induced. Should the engineer suspect such a deficiency, the material must be thoroughly broken and recompacted before proceeding with construction.

### 3.5 PLACING EMBANKMENT FILL

- A. Inspection of Subgrade - Do not place fill on any part of the embankment subgrade until the subgrade preparation has been approved by the engineer.
- B. Removing Debris - During the dumping and spreading process, remove all roots, stones and debris that is uncovered in the embankment material.
- C. Spreading Fill - After dumping, spread the material in horizontal layers over the entire fill area. The thickness of each layer before compaction must not exceed 8 inches unless otherwise directed. As soon as possible after placement begins, crown the surface to drain freely and maintain such conditions throughout construction.
- D. Attaining Proper Bond - If the compacted surface of a layer is too smooth to bond with succeeding layers, loosen the surface by harrowing or other approved method before continuing the work.
- E. Embankment Stabilization - Stabilize and compact the embankment fills under pavement sections, if required, as specified in the section on Lime Stabilization of Pavement Subgrade.

### 3.6 MOISTURE CONTROL

- A. Intent - Developing the maximum density obtainable with the natural moisture of the embankment material is preferred. However, the moisture content must not vary from the optimum, as determined by ASTM Test Method D-698, by more than 3 percent or less than 1 percent.
- B. Adjustment - If the moisture content is too high, adjust to within the specified limits by spreading the material and permitting it to dry. Assist the drying process by discing or harrowing if necessary. When the material is too dry, sprinkle each layer with water. Work the moisture into the soil by harrowing or other approved method.

### 3.7 COMPACTION

Compact each layer of embankment with suitable rollers as necessary to secure a minimum of 95 percent density within the specified range of the moisture content, according to ASTM D-698.

### 3.8 DISTRIBUTION OF TOPSOIL

- A. Preparation:
  - 1. Prior to placing topsoil, scarify the subgrade to a depth of 2 inches to provide effective bonding of the topsoil with the subgrade. Use a chisel plow with the chisels sets 10 inches apart.
  - 2. Shape all areas designated for grading, including cut and fill areas, to receive a minimum of 4 inches of topsoil.
  - 3. In areas that require only blading and dressing, the adequacy of existing topsoil will be determined by the engineer.

- B. Placement:
  - 1. Do not haul or place wet topsoil. Also prohibited is placement of topsoil on a subgrade that is excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading or proposed planting.
  - 2. Distribute topsoil uniformly and spread evenly to an average thickness of 4 inches. Do not compact topsoil. Correct irregularities in the surface to prevent formation of depressions where water could stand.
  - 3. Perform the spreading operation so that planting can proceed with little additional tillage or soil preparation. Leave the area smooth, suitable for lawn planting.
- C. Maintenance - Where any portion of the surface becomes eroded or otherwise damaged, repair the affected area to establish the condition and grade prior to topsoil placement; then replace topsoil.

### 3.9 MATERIAL DISPOSAL

- A. Excess Material - Remove excess excavated material and excess topsoil from the area before substantial completion. Excess material is property of contractor and should be disposed of away from site.
- B. Waste Material - Dispose of waste material without causing expense or damage to the Owner. The owner's waste disposal site may be used for prescribed waste material at the established rate per load.

### 3.10 TESTING

- A. Laboratory Services. Contractor will appoint a commercial testing laboratory as outlined in SECTION 01410, and payment shall be by Contractor for testing. Retests of failed areas shall be by Contractor. Laboratory will:
  - 1. Prepare optimum moisture/density relationship for subgrade.
  - 2. Make density tests to determine degree of compaction for subgrade.
  - 3. "Back-scatter" density tests will not be accepted.

# SECTION 31 22 00

## SITE GRADING

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Earthwork consists of operations for the excavation of materials on site; excavation of borrow material from designated areas; compaction of natural subgrades; placement and compaction of embankments to grade; finish grading; disposal of excess of unsuitable materials; and other required operations. Earthwork must conform with dimensions and typical sections shown, and within lines and grades established on the drawings.

#### 1.2 RELATED WORK

STRUCTURAL EXCAVATION AND BACKFILL

#### 1.3 EXISTING UTILITIES

- A. The plans show the approximate location of all known underground utility lines and structures. Where pipes, ducts and other structures are encountered in the excavation but are not shown on the plans, immediately notify the engineer.

#### 1.4 CLASSIFICATIONS

The following are brief definitions of classification of earthwork.

- A. Topsoil – Top 6 inches of natural surface soil possessing the characteristics of representative soils on the site that produce growths of grass or other vegetation. Topsoil does not include grasses and other vegetation.
- B. Borrow – Material taken from designated areas to make up any deficit of excavated material.
- C. Finish Grading – Operations required for smoothing disturbed areas.
- D. Stripping – Removal of topsoil in areas under roads, foundations, or fill areas.
- E. Excavation – After all necessary stripping has been done, excavation of every description and of whatever substances encountered shall be performed to the lines and grades indicated on the drawings.
- F. Compaction – Compaction of soil materials shall be measured as a percent of ASTM Standard D698 procedure.

### PART 2 - PRODUCTS

#### 2.1 EQUIPMENT

Use only equipment that has been approved for this project.

- A. Grading Equipment – Furnish, operate and maintain such equipment as is necessary to produce uniform layers, section and smoothness of grade for compaction and drainage.

- B. Rubber Tire Rollers – Use rubber tire rollers having two axles and not less than a total of nine wheels with pneumatic tires with sufficient weight to accomplish the required compaction.

## 2.2 EARTH FILL

- A. Source – Obtain embankment fill from required excavation or, if excavated material is not sufficient, from borrow areas designated by the Engineer.
- B. Suitability – Use the best material available from excavation or borrow. Suitability of fill material is subject to the Engineer's approval.
- C. Quality – Fill material must be free from excessive silts. Do not use soil containing brush, roots, sod or similar perishable material.
- D. Plasticity Index – Embankment material must have a plasticity index less than 20.

## PART 3 - EXECUTION

### 3.1 REMOVAL OF TOPSOIL

- A. Remove topsoil within limits of foundations and roads and stockpile the topsoil as determined by the Engineer for future distribution. Protect stockpiled topsoil from other excavated materials.

### 3.2 EXCAVATION

- A. Objective – As shown on the drawings, excavate to the lines, grades and elevations required for subsequent construction. Remove materials within the indicated limits and dispose as directed.
- B. Drainage – During excavation maintain grades for complete drainage. When directed, install temporary drains or drainage ditches to intercept or divert surface water and prevent interference or delay of the work.
- C. Stockpiling – If at time of excavation, it is not possible to place material in the proper section of permanent construction, stockpile the material in approved areas as specified by the Engineer for later use.
- D. Stone or Rock – Stones or rock fragments larger than 2 inches in their greatest dimension will not be permitted in top 6 inches of subgrade.
- E. Dressing – Uniformly dress, cut and fill to slope, cross section and alignment, as shown.

### 3.3 PLACING FILL

- A. Inspection of Subgrade – Do not place fill on any part of the subgrade until the subgrade preparation has been inspected by the Engineer.
- B. Removing Debris – During the dumping and spreading process, remove all roots, stones and debris that is uncovered in the material.
- C. Spreading Fill – After dumping, spread the material in horizontal layers over the entire fill area. The thickness of each layer before compaction must not exceed 8 inches, unless

otherwise directed. As soon as possible after placement begins, crown the surface to drain freely and maintain such conditions throughout construction.

- D. Attaining Proper Bond – If the compacted surface of a layer is too smooth to bond with succeeding layers, loosen the surface by harrowing or other approved method before continuing the work.

### 3.4 MOISTURE CONTROL

- A. Intent – Developing the maximum density obtainable with the natural moisture of the material is preferred. However, the moisture content must not vary from the optimum by more than 3 percent or less than 1 percent.
- B. Adjustment – If the moisture content is too high, adjust to within the specified limits by spreading the material and permitting it to dry. Assist the drying process by disking or harrowing if necessary. When the material is too dry, sprinkle each layer with water. Work the moisture into the soil by harrowing or other approved method.

### 3.5 COMPACTION

Compact each layer with suitable rollers as necessary to secure a minimum of 95 percent density within the specified range of the moisture content according to ADTM D698.

- A. Preparation:
  - 1. Shape all areas designated for grading, including cut and fill areas, to receive a maximum of 4 inches of topsoil.
  - 2. In areas that require only blading and dressing, the adequacy of existing topsoil will be determined by the Engineer.
- B. Placement:
  - 1. Do not haul or place wet topsoil. Also prohibited is placement of topsoil on a subgrade that is excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading or proposed planting.
  - 2. Distribute topsoil uniformly and spread evenly to a thickness of 4 to 6 inches. Do not compact topsoil. Correct irregularities in the surface to prevent formation of depressions where water could stand.
  - 3. Perform the spreading operation so that planting can proceed with little additional tillage or soil preparation. Leave the area smooth, suitable for lawn planting.
- C. Maintenance – Where any portion of the surface becomes eroded or otherwise damaged, repair the affected area to establish the condition and grade prior to topsoil placement; then replace topsoil.

### 3.6 MATERIAL DISPOSAL

- A. Excess Material – Remove excess excavated material and excess topsoil from the area before substantial completion. Stockpile materials separately in areas as designated by the Engineer.
- B. Waste Material – Dispose of waste material without causing expense or damage to the Owner. The Owner's waste disposal site may be used for prescribed waste material.

### 3.7 TESTING

Owner will appoint a commercial testing laboratory and payment shall be by Owner as outlined in the Section on Testing Laboratory Services. Laboratory will:

- A. Prepare optimum moisture/density relationship for subgrade.
- B. Make density tests to determine degree of compaction for subgrade.
- C. Make comments and recommendations on the test results.

### **PART 4 - MEASUREMENT AND PAYMENT**

No separate measurement and payment will be made for work covered herein and costs in connection therewith shall be included in related items of work.

**END OF SECTION**

# SECTION 31 22 21

## TRENCHING

### PART 1—GENERAL

#### 1.1 DESCRIPTION

This section governs for excavation, trenching and backfilling for utility systems.

#### 1.2 RELATED WORK

PVC PIPE  
SANITARY SEWERS  
CONCRETE

CASED ROAD AND RAILROAD CROSSINGS  
POLYETHYLENE PIPE

#### 1.3 PROTECTION

- A. Existing Facilities - Adequately protect existing facilities and permanent objects, including existing utilities, trees and shrubs prior to beginning any earthwork operations. The Contractor is to bear replacement or repair costs resulting from damage to permanent facilities due to negligence or inadequate protection.
- B. Restoration of Surfaces - Replace or repair to original condition sidewalks, driveway, culverts, inlets, curbing, gutters, shrubbery, trees, fences, sod, and other facilities disturbed.

#### 1.4 QUALITY ASSURANCE

- A. Minimum Standards - Meet requirements of Texas Natural Resource Conservation Commission and these Plans.
- B. Reference Standards
  - ASTM D 698 Test Methods for Moisture Density Relations of Soils and Soil-Aggregate Mixtures Using 5.516 (2.49 kg) Rammer and 12-inch (305 mm) Drop
  - ASTM D 1556 Test Method for Density of Soil in Place by the Sand-Cone Method
  - ASTM D 2321 Underground Installation of Flexible Thermoplastic Sewer Pipe
  - ASTM D 2412 Test Method for External Loading Properties of Plastic Pipe by Parallel - Plate Loading
  - ASTM D 2487 Test Method for Classification of Soils for Engineering Purposes
  - ASTM D 2488 Recommended Practice for Description of Soils (Visual-Manual Procedure)
- C. Terminology - The following terms are used to described the various elements of pipe embedment:

- 1) Foundation - Area beneath pipe bedding within confines of trench. Refer to embedment details to determine if required.
- 2) Bedding - Area in contact with bottom of pipe to depth as specified in embedment details.
- 3) Haunching - Area from bottom of pipe (top of bedding) to at least the spring line of pipe. Refer to embedment details for required haunching depth.
- 4) Initial Backfill - Area from top of haunching to at least twelve (12) inches above top of pipe.

## **PART 2—PRODUCTS**

### **2.1 EMBEDMENT MATERIALS**

- A. General - Embedment materials listed herein include a number of processed materials plus the soil classifications listed under the Unified Soil Classification System (USCS) (Test Method D 2487 and Recommended Practice D 2488). Materials are grouped into five broad categories according to their suitability for this application.
- B. Class I - Angular, 6 to 40-mm (1/4 to 1-1/2 inch), graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, crushed shells, and crushed gravel shall consist of particles with not less than 60 weight % of the portion retained on a No. 4 (4.75-mm) sieve and have at least two fractured faces.
- C. Class II - Coarse sands and gravels with maximum particle size of 40 mm (1-1/2 inch), including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class.
- D. Class III - Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures. Soil Types GM, GC, SM, and SC are included in this class.
- E. Concrete - Refer to Section entitled "CONCRETE".
- F. Excavated Material - Suitable materials from excavation may be used as trench backfill if the materials conform to the required embedment Class. Objectionable material encountered including rocks larger than 1-1/2-inch, peat, silt, muck, organic materials or debris will be rejected.

## **PART 3—EXECUTION**

### **3.1 RIGHT-OF-WAY**

Entry upon private property for performance of work thereon is prohibited until notified by the Engineer that an easement or right-of-way has been obtained.

### **3.2 CLEARING**

Clear timber and brush as is necessary for construction of utility system unless otherwise noted. The width of the area cleared shall not extend outside the construction easement as shown on the plans. Trees and timber within the area of the permanent easement may be removed unless shown otherwise on the plans. Dispose of trees and timber removed in a manner approved by the Engineer.

### 3.3 EXCAVATION

- A. Depth - Excavate to the depth shown on the drawings.
- B. Over-excavation - Excess excavation below the required level are to be backfilled sand, gravel or concrete, as directed by the Engineer.
- C. Groundwater - Remove accumulated water in excavation by pumping or other approved means.
- D. Disposal - Remove unstable soil and replace with an acceptable compacted backfill material. Remove and dispose of excavated materials not required for fill or backfill.
- E. Equipment - Excavations to be by open cut with trenching machine or back hoe. Where machines other than ladder or wheel type trenching machines are used, excavated material composed of large chunks, clods, or rocks larger than 6-inch shall not be used for backfilling.
- F. Trench Safety - Provide trench safety system in accordance with Occupational Safety and Health Administration (OSHA) Publication Standard - Excavations, 29 CFR Part 1926 (Latest Revision) where excavation exceeds five (5) feet depth. Federal and Texas State Law requires that Trench Safety be incorporated in the contractor's operations for trench depths exceeding 5 feet. A separate bid item titled Trench Safety is included in the Bid Schedule as required by this law. The contractor shall plan on following the applicable standards regarding Trench Safety to meet the Federal and State Law and to also provide safety for his workers and protect the excavation under all conditions. Contractor is to provide a trench safety plan prior to construction.
- G. Trench Side Slopes
  - 1. To 1 foot above top of pipe - Vertical
  - 2. To 4 foot total depth - Vertical
  - 3. Over 4 foot total depth - Slope sides of trench on a 1 to 1 slope (45° Angle) from 1 foot above top of pipe, or as required to maintain a safe stable slope. Alternatively, trench shoring may be used at contractor's option. Shoring is required at locations where space limitations do not allow trench sides to be sloped.
  - 4. Over 5 Foot Total Depth - Contractor shall use a trench safety system conforming to the Occupational Safety and Health Administration's publication Standard - Excavations 29 CFR Part 1926 (Latest Revision).
- H. Trench Width

1. Complete and shape trench to provide free working space and to permit thorough tamping of bedding, haunching, and backfill around pipe.
  2. 6-inch and smaller pipes - Provide 4-inch minimum clearance on each side of pipe.
  3. Larger than 6-inch Pipes - Provide 6-inch minimum clearance on each side of pipe.
  4. Wall Stability - Trenches considered to be stable by the Engineer to be constructed at a width which will provide free working space and permit proper installation of pipe and embedment materials. Maximum clearance for this condition to be 12-inches on each side of pipe trenches considered unstable (i.e. running soil, excavation below ground water/may require use of sheeting, stay bracing, trench box, or any approved safety method by OSHA 2226. Where sheeting or similar methods are not used, trench width should be a minimum of five (5) pipe diameters.
- I. Unstable Trench Bottom - When encountering an unstable condition (i.e. soil not conforming to the required embedment Class, below ground water) the unsuitable soil is to be removed to sufficient depth and replaced with foundation and bedding of processed stone or gravel, suitably graded, and acting as an impervious mat into which the unstable soil will not penetrate. Depth of foundation and bedding depends upon severity of instability. Foundation and bedding material to be installed in six (6) inch layers compacted to 90% Standard Proctor Density.
  - J. Over-excavated Width - Trenches excavated to widths greater than six (6) pipe diameters from either side of pipe require that haunching and initial backfill be compacted to 2.5 pipe diameters from either side of pipe.
  - K. Excavated Material - Keep excavated material piles so that it will not endanger work or obstruct roads and driveways.
  - L. Drainage - Keep drainage channels clear or provide other satisfactory means for drainage. Water lines may not be used as drainage pipes.
  - M. Rock Excavation - Rock excavation to be carried 6 inches below bottom of pipe. Well graded gravel or bank sand are to be used for bedding. Rock excavation is to include removal of boulders, ledge rock, concrete or masonry structures that require drilling or blasting.
  - N. Traffic Control - Provide temporary bridges or crossings as required to maintain traffic.
  - O. Cover - Refer to plans.

### 3.4 BEDDING

- A. General - Pipe to be bedded true to line and grade with uniform and continuous support from a firm base. Blocking shall not be used to bring the pipe to grade. Remove rubbish, rock, or debris encountered at grade to depth of at least 6

inches below bottom of pipe and reshape and compact trench bottom. Compaction to be to a minimum of 85% Standard Proctor Density (Class II) and 90% Standard Proctor Density (Class III) attained by hand and/or mechanical tamping.

- B. Class I Embedment - A minimum depth of four (4) inches is required with bedding depth being dictated by soil conditions and the Engineers recommendations. Class I haunching is required if Class I bedding is utilized to avoid any loss of support resulting in migration of Class II or III haunching into the material. (This Class of bedding is to be utilized where unstable soil conditions exist and where groundwater is encountered requiring dewatering.
- C. Class II Embedment - Depth of compacted bedding to be as specified in details. A minimum depth of four (4) inches is required. Compact to a minimum of 85% Standard Proctor Density using hand and/or mechanical tamping. Avoid saturation of Class II material which could result in instability.
- D. Class III Embedment - Depth of compacted bedding to be as specified in details. Compact to a minimum of 90% Standard Proctor Density using and/or mechanical tamping. Avoid excessive moisture in Class III bedding.
- E. Bell Holes - Bell holes to be of ample size to make the joint and relieve the bell of all load. Dig bell holes after preparation of bedding.

### 3.5 HAUNCHING/INITIAL BACKFILL

- A. Refer to plans for bedding details.
- B. Grade bedding to elevations shown on plans. Shape bedding to diameter of pipe.
- C. Class I Embedment - Areas where pipe will be subjected to existing or future groundwater inundation require placement of Class I haunching material (i.e.: crushed angular stone) to the top of the pipe.  
  
Dry areas require placement of haunching material to spring line of the pipe. (Insure that the Class I material is worked completely under the haunch of the pipe to provide side support.
- D. Class II Embedment - Place haunching material to spring line of pipe and initial backfill in two (2) stages: (1) to top of pipe, and (2) to point at least six (6) inches over top of pipe Compact each stage of haunching and initial backfill material to a minimum of 85% Standard Proctor Density with hand and/or mechanical tamping. If remaining backfill material contains large particles (greater than four (4) inches in diameter) increase second stage of initial backfill to point at least twelve (12) inches over top of pipe.
- E. Class III Embedment - Place haunching material to spring line of pipe and compact both haunching and initial backfill material to a minimum of 90% Standard Proctor Density with hand and/or mechanical tamping. Initial backfill material to be placed as outlined for Class II embedment.

- F. All embedment classes require that special care be taken not to allow pipe movement when material is placed and compacted, especially under the lower haunch area.

### 3.6 BACKFILLING

- A. General - After pipe joints have been inspected and approved, backfill trench to lines and grades indicated on drawings. Suspend backfill operations during times of inclement weather or other conditions when satisfactory results cannot be obtained.
- B. Open Areas
  - 1. Pipe Zone - Backfill material to be deposited in 8-inch maximum thickness layers and compacted as specified for the applicable embedment Class.
  - 2. Above Pipe Zone. - Deposit approved materials in 12-inch layer and compact completed backfill to be at density comparable to undisturbed soil.
- C. Pavement Sections - Deposit backfill material in 8-inch maximum thickness layers and compact with mechanical hand tampers to 95 percent of maximum density defined by ASTM D698. Backfill material to consist of gravel or select material with Plasticity Index (PI) of between four (4) and fifteen (15) placed at optimum moisture content. Special care shall be taken not to damage the coating or wrapping of pipes.
- D. Backfill Settlement - Contractor is to be responsible for all settlement of backfill which may occur within a period of one year after the date of final completion of contract. Replace or repair backfill and related items within 30 days after notice by the Engineer or Owner.

### 3.7 APPROVALS

Compaction testing of any portion of the embedment material may be required by the OWNER and ENGINEER with initial testing to be paid by OWNER. Any areas failing tests and requiring re-testing will be paid by CONTRACTOR.

**END OF SECTION**

## SECTION 31 22 43

### CEMENT STABILIZED SAND

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

This section provides for the use of cement stabilized sand as bedding material under sewer pipes; for backfilling material around sewer pipes, manholes, inlets and drainage structures as required; and for backfill in other locations as indicated on the drawings.

##### 1.2 RELATED WORK

Trenching  
Sanitary Sewers

#### PART 2 - PRODUCTS

##### 2.1 MATERIALS

- A. Sand - Provide sand from approved source free of clay lumps, loam, rubbish, vegetative matter or other deleterious material. Not more than 40 percent of sand to pass No. 200 sieve and having a plasticity index of 4 or less, when tested by standard laboratory methods.
- B. Portland Cement - ASTM C150, Type 1; no caked cement; one brand for project; deliver in bags for site mixing.
- C. Water - Free from oils, acids, alkalis, organic matter, salts, or other deleterious substances.

#### PART 3 - EXECUTION

##### 3.1 PROPORTIONING AND MIXING

Add not less than 2.0 sacks of Portland cement per cubic yard of sand mixture. Add required amount of water and mix thoroughly in an approved pug mill type mixer. Stamp batch ticket with the time of loading. Material will be rejected if not in place within 1-1/2 hours after loading or if the mixture has dried out.

##### 3.2 BEDDING

- A. Place cement-stabilized sand in a trench prepared for sewer pipe to the depth shown on the drawings. Depth of cement-stabilized sand bedding may vary depending upon the stability of the undisturbed trench bottom prior to application of sand.
- B. After bedding material is in place, set pipes in position to proper grade.

- C. Add additional cement-sand material around pipe, filling to at least the spring line of the pipe or full depth to natural ground as noted on Plans. Place cement-sand material at optimum moisture content and in layers not to exceed 6-inches measured loose.
- D. Compact with mechanical hand tamps to at least 95 percent of AASHTO density, Test Method T-99-74.

### 3.3 FOUNDATIONS

Use cement-sand for stabilizing the foundation for manholes, inlets or concrete structures, if required by OWNER.

### 3.4 BACKFILL

- A. Place cement-stabilized sand in sewer trenches to within 12-inches of the pavement bottom for sewers under existing or future pavement. Use cement-sand material as backfill material around manholes if the structure adjoins pavement.
- B. Place cement-sand material at optimum moisture content in layers not to exceed 6-inches, measured loose.
- C. Compact with mechanical hand tamps to at least 95 percent of prescribed AASHTO density, Test Method T-99-74.

### 3.5 ACCEPTANCE

Compaction tests may be performed on the finished bedding at locations selected by the ENGINEER. It will be the CONTRACTOR's responsibility to correct any unsatisfactory bedding at no additional cost to the OWNER.

**END OF SECTION**

## SECTION 31 20 01

### STRUCTURAL EXCAVATION AND BACKFILL

#### PART 1—GENERAL

##### 1.1 DESCRIPTION

- A. This item governs excavation for placing structures; disposal of such excavated material; and backfilling around completed structures to the level of original ground or finished grade.
- B. Work to include all necessary pumping or bailing, sheeting, drainage, construction, and removal of any required cofferdams.
- C. Unless otherwise provided, work to provide for removal of old structures or portions thereof, trees, and all other obstructions necessary to the proposed construction.

##### 1.2 QUALITY ASSURANCE

- A. Contractor to be responsible for incorporating recommendations contained in the soil report.
- B. Unless specified otherwise excavation is not permitted outside a horizontal distance from footing line equal to depth of footing.

#### PART 2—PRODUCTS

##### 2.1 BACKFILL

- A. Excavated Material: Natural excavated materials free of peat, muck, silt, organic materials, debris or other extraneous material.
- B. Select Fill: When required as a result of unacceptable natural material or by plans, provide select fill with a Plasticity Index (PI) of between 4 and 15, a Liquid Limit (LL) of less than 35, and a maximum of 45 percent passing the No. 200 sieve U.N.O. in Geotechnical Report.

##### 2.2 TOPSOIL

Strip topsoil to full depth and stockpile where directed by Owner. After grading work is completed, distribute topsoil uniformly to a minimum 4" depth.

##### 2.3 GRADING

- A. Fill as required with approved material and compact and slope grade away from building and slabs for positive drainage. Hold finish grades 1.5" below walks and drives and 6" below building finished floor unless indicated otherwise. Slope away from building and slabs one foot in twelve.

##### 2.4 SEAL SLABS

Concrete to meet provisions of Concrete Specifications in these documents.

## PART 3—EXECUTION

### 3.1 CONSTRUCTION METHODS

#### A. General

1. Make excavation to lines and depths indicated or established by Engineer. Excavate below bottom of structural slab elevation shown for seal slab when required.
2. Furnish supports for piping and structures within excavated area at no cost to Owner.
3. Where necessary to increase or decrease footing depths, make changes in details of structure as directed.
4. Where structure is to rest on excavated surface other than rock, bottom of excavation not to be disturbed, and removal of foundation material to final grade to be accomplished just prior to placement of seal slab when required.
5. Protect excavations from rainfall and surface water. If supporting soils are affected by exposure to excessive water or drying, excavate deeper and/or wider to sound material at no cost to Owner. Prior to such additional work, notify Engineer immediately and obtain approval before continuing.
6. Remove all loose rock or other hard material from excavation, and cut to form surface either level, stepped, or serrated. Clean out seams and fill with concrete or approved structural fill prior to time of footing placement.
7. Store excavated materials to be used for future backfill in piles at locations convenient for rehandling, and locate so as not to interfere with other work. Locate edge of storage pile a horizontal distance from edge of excavation a minimum of 1.0 times the depth of excavation.
8. Provide site drainage and/or groundwater control procedures to protect excavations. Use site grading, cofferdams, ditches, and/or other means to prevent surface water from flowing into excavations or ponding on areas where foundations or pavement will be located. Maintain groundwater and surface water control continuously until structure is complete and ground surface has been brought to final grade.

#### B. Cofferdams

1. Cofferdam is a temporary or removable structure to contain surrounding earth, water, or both out of excavation, and may be earth, timber, steel, concrete, or combination thereof. Cofferdam to be complete with bracing and necessary pumps, well points, or other procedures to control groundwater and surface water.
2. Provide cofferdams for excavations where necessary to control water conditions or to prevent sliding and caving of walls of excavation.
3. When required, submit drawings showing proposed method of ground and surface water control, and cofferdam construction.
4. Extend sheet pile cofferdams below bottom of footings sufficiently to prevent "blow outs". Provide adequate bracing and make as watertight as practicable.
5. Adjust cofferdams which tilt or move laterally, at no cost to Owner. Such movement may indicate subsoil failure and is to be brought to the attention of the Engineer immediately.
6. Unless otherwise provided, remove cofferdams after completion of construction so as not to disturb or mar structure. As directed, cofferdam may be partially removed, or be left entirely in place.

C. Pumping or Bailing

1. Pump or bail from interior of cofferdam and avoid movement of water through or along concrete being placed.
2. Do not pump or bail during concrete placement, or for minimum of 24 hours thereafter, unless from suitable sump separated from concrete by watertight wall.
3. Do not pump or bail to dewater cofferdam for minimum of 36 hours after seal slab has set.

D. Fill Placement Under Structures

1. Backfill excavated areas immediately after undesirable materials or stripping is removed.
2. Approved fill for placement under structures is select fill or other materials as approved by Structural Engineer.
3. Compact material mechanically in loose lifts not exceeding 8 inches.
4. Compact to 95 percent of maximum density as determined by Standard Proctor, ASTM D698 at a moisture content within three percent (3%) of optimum moisture or as recommended by Geotechnical Consultant.
5. Building pads for structures are to include area under building including porches, porte-cocheres, and other parts of foundation as shown on structural details, and extending five feet (5') minimum from face of foundation. Depth requirements shall be defined by geotechnical report or structural details and notes whichever is greater.

E. Structural Backfilling

1. Backfill excavated areas not occupied by permanent structure as soon as such backfill will not interfere with progress of work.
2. Unless otherwise specified, compact backfill mechanically in loose lifts not exceeding 8 inches.
3. Compact to 95 percent of maximum density as determined by Standard Proctor, ASTM D698 at a moisture content within two percent (2%) of optimum moisture.
4. Do not place backfill against walls for minimum of 7 days after structure has been in place.
5. Place backfill against walls of partially completed structure only after approval of Engineer.
6. Prevent wedge action of backfill against structure, and step or serrate slopes bounding excavation. Do not use heavy or intense compaction against structure, and backfill within 55 feet of structure to be subject to light but full compaction.

**END OF SECTION**

## **SECTION 31 25 75**

### **PAVEMENT REPAIR AND RESURFACING**

#### **PART 1—GENERAL**

##### **1.1 DESCRIPTION**

This section provides for repairing street, highway, and service drive and other pavements which have been cut, broken, or otherwise damaged before and during construction.

##### **1.2 RELATED WORK**

- A. Section 02260 Flexible Base.
- B. Section 02513 Asphaltic Concrete Paving.
- C. Section 02500 Curbs, Walks, and Concrete Paving.

##### **1.3 GUARANTEE**

Workmanship and materials required in this section must be specifically covered in the guarantee of the work as stated in the General Conditions.

#### **PART 2—PRODUCTS**

- A. Flexible Base - Obtain crushed limestone material from an approved source and provide in accordance with the section on Flexible Base.
- B. Pavement - Furnish hot-mix asphaltic concrete paving in accordance with the section on Asphaltic Concrete Paving.
- C. Curbs and Gutters - Furnish concrete curbs and gutters in accordance with the section on Curbs, Walks and Concrete Paving.

#### **PART 3—EXECUTION**

##### **3.1 PARKING AREAS, DRIVEWAYS, SERVICE DRIVES, CURBS AND SIDEWALKS**

Where concrete, asphalt gravel and shell parking areas, driveways, service drives, sidewalks and curbs and gutters are cut or damaged, replace them with material similar to the existing material.

##### **3.2 STREET PAVEMENTS**

Repair street pavements cut or damaged with new material. Use new flexible base material, bituminous prime coat, and asphaltic concrete surface.

### 3.3 ASPHALTIC CONCRETE PAVEMENT

- A. Where additional or new base material is required and placing is authorized, furnish the new material in accordance with the type of material specified for flexible base replacement.
- B. Where existing flexible base has been surfaced with bitumen, the base replaced under this section will be surfaced with hot-mix asphaltic concrete paving in accordance with the provisions of the section on Asphaltic Concrete Paving.

**END OF SECTION**

# SECTION 31 32 13.19

## LIME STABILIZATION OF PAVEMENT SUBGRADE

### PART 1 – GENERAL

#### 1.1 SCOPE

This section specifies adding lime to natural subgrade material and compacted embankments to stabilize them.

#### 1.2 ACCEPTABLE METHOD

Use dry placing of lime or commercial lime slurry to stabilize the natural in-place subgrade. Pelletized lime is acceptable; however, multiple pass mixing will be required when pelletized lime is used.

### PART 2 – PRODUCTS

#### 2.1 HYDRATED LIME

- A. Type - Dry powder obtained by mixing lime with enough water to satisfy its chemical affinity to water under conditions of hydration. Provide a material consisting essentially of calcium hydroxide, or of a mixture of calcium hydroxide and small allowable percentages of calcium oxide, magnesium oxide and magnesium hydroxide. Specifications for hydrated lime apply specifically to the normal hydrate of lime made from high-calcium type limestone.
- B. Chemical Composition - Furnish material which, when sampled and tested according to prescribed TxDOT procedure, conforms to the following requirements as to chemical composition.

<u>Ingredient</u>	<u>Percentage Allowable</u>
Hydrate Alkalinity, percent by weight $Ca(OH)_2$	90, minimum
Unhydrated lime content, percent by weight $CaO$	5.0, maximum
Free water content, percent by weight $H_2O$	4.0, maximum

- C. Allowable Residue - Percent by weight of residue retained must meet the following requirements.

<u>Sieve</u>	<u>Maximum Percent Retained Residue</u>
No.6 (3360 micron)	0.0
No.10 (2000 micron)	1.0

No.30 (590 micron)

2.5

## 2.2 COMMERCIAL LIME SLURRY

Provide a commercial lime slurry with a dry solids content of at least 36 percent by weight of slurry, and forming a pumpable suspension of solids in water.

- A. Water - Provide water containing dissolved matter not injurious or objectionable, either in quantity or in quality.
- B. Solids - the solids portion of the mixture must consist principally of hydrated lime meeting the following requirements:
  - 1. The solids content of the lime slurry must have a hydrate alkalinity ( $\text{Ca}(\text{OH})_2$ ) of not less than 90 percent by weight.
  - 2. Provide that the percent by weight of residue retained of the solids content of lime slurry conform to the following:

<u>Sieve</u>	<u>Maximum Percent Retained Residue</u>
No.6 (3360 micron)	0.0
No.10 (2200 micron)	1.0

## 2.3 EQUIPMENT

- A. Provide approved placing and mixing equipment in satisfactory working condition.
- B. Store lime in weatherproof containers, bins or buildings. Protect lime from any dampness or moisture.
- C. Weigh lime furnished in trucks on approved scales.
- D. Furnish bagged lime bearing the manufacturer's certified weight.

## PART 3 – EXECUTION

### 3.1 PREPARING SUBGRADE

Prepare subgrade properly before beginning lime treatment. Scarify or excavate to the depth shown, providing the machine required. Stabilize unstable material below indicated depth by proper compaction.

### 3.2 APPLICATION

- A. Dry Placing
  - 1. Place lime using approved screw type spreader box or distribute uniformly by bag at the percentage indicated on the plans by dry weight. Do not place more than can be initially mixed during the same working day. Do not spread with a maintainer or motor grader.

2. Cover or mix lime within 6 hours after application. Do not place lime during windy or other adverse weather. Lime may be sprinkled lightly with water to reduce dusting.

### 3.3 MIXING

A. Procedures - Mixing procedures for either dry placing or slurry placing are the same.

B. Preliminary Mixing

1. Pulverize soil to minus 2 inches.
2. Add water to bring moisture content of the soil and lime mixture at least 5 percent above optimum.
3. Rotary mix soil, lime and water to required depth, using approved single-pass or multiple-pass rotary speed mixer.
4. After initial mixing, shape the subgrade to the appropriate section. Compact it lightly for preliminary curing.

C. Final Mixing

1. After preliminary curing, uniformly mix soil and lime to required depth. Use an approved single-pass or multiple-pass rotary speed mixer.
2. Add water to bring moisture content of soil-lime mixture to at least 5 percent above optimum.
3. Continue mixing and pulverizing soil until all clods are broken down to pass a 1 3/4 -inch screen. At least 85% should pass a 3/4-inch sieve and at least 60 percent should pass a No. 4 sieve, non-slaking fractions excluded.
4. After final mixing, shape subgrade to final section, compact and cure.

D. Exception - If pulverization requirements of final mixing can be met during preliminary mixing, then preliminary curing and final mixing can be eliminated.

### 3.4 COMPACTION

A. Preliminary Compaction - Seal surface of subgrade by rolling lightly with light pneumatic rollers. Sealing is done as a precaution against heavy rainfall.

B. Final Compaction

1. Attain optimum moisture content.
2. Begin compaction immediately after final mixing.
3. Begin compacting at the bottom, using approving heavy pneumatic or vibrating rollers, or a combination of tamping roller and light pneumatic roller, until entire depth is uniformly compacted.
4. Compact treated material so as not to mix it with underlying subgrade material.
5. Spread and shape so that stabilized subgrade will have a finished thickness as specified when compacted.
6. Correct all irregularities or weak spots immediately by replacing bad material with stabilized soil and re-compacting.
7. Maintain smooth surface until base course or pavement is placed. Attain at least 95 percent of ASTM D-698 density, at optimum moisture content of treated

- material.
8. Use light pneumatic roller for final surface rolling.

### 3.5 CURING

- A. Preliminary Curing - Cure soil-lime material for 2 to 4 days. Keep subgrade moist during cure.
- B. Cure the lime-stabilized subgrade for 3 to 7 days, as directed. Keep traffic off subgrade during cure, other than a light pneumatic roller. Do not permit vehicles heavier than 10 tons on the subgrade. Use moist curing or membrane curing for final cure.
  1. Moist Cure - Keep subgrade surface damp by sprinkling. Roll with light pneumatic roller to keep surface knit together.
  2. Membrane Cure
    - (a) Apply two coats of asphalt emulsion to subgrade surface the first day after final compaction.
    - (b) Apply one coat each day thereafter for three days.
    - (c) Total applications will be 0.25 gallons of asphalt emulsion per square yard of subgrade surface.

**END OF SECTION**

# SECTION 31 32 13.26

## LIME / FLY ASH STABILIZATION OF PAVEMENT SUBGRADE

### PART 1 – GENERAL

#### 1.1 SCOPE

This section specifies adding lime and fly ash materials to natural subgrade material and compacted embankments to stabilize them. Stabilization materials shall be “Stabil-Mix”, “Tru-Blend” or approved equal.

#### 1.2 ACCEPTABLE METHOD

Use dry placing of lime and fly ash to stabilize the natural in-place subgrade. Blend with soil at concentrations specified and compact stabilized material.

### PART 2 – PRODUCTS

#### 2.1 HYDRATED LIME

- A. Type - Dry powder obtained by mixing lime with enough water to satisfy its chemical affinity to water under conditions of hydration. Provide a material consisting essentially of calcium hydroxide, or of a mixture of calcium hydroxide and small allowable percentages of calcium oxide, magnesium oxide and magnesium hydroxide. Specifications for hydrated lime apply specifically to the normal hydrate of lime made from high-calcium type limestone.
- B. Chemical Composition - Furnish material which, when sampled and tested according to prescribed TxDOT procedure, conforms to the following requirements as to chemical composition.

<u>Ingredient</u>	<u>Percentage Allowable</u>
Hydrate Alkalinity, percent by weight $Ca(OH)_2$	90, minimum
Un-hydrated lime content, percent by weight $CaO$	5.0, maximum
Free water content, percent by weight $H_2O$	4.0, maximum

- C. Allowable Residue - Percent by weight of residue retained must meet the following requirements.

<u>Sieve</u>	<u>Maximum Percent Retained Residue</u>
No.6 (3360 micron)	0.0
No.10 (2000 micron)	1.0
No.30 (590 micron)	2.5

## 2.2 FLYASH

Provide dry fluidized bed class C fly ash material from an approved source. Furnish documentation for material.

## 2.3 PUG MILL MIXING

Lime and fly ash to be blended at the pug mill plant to provide accurate ratio of lime to fly ash prior to delivery to the project site.

## 2.4 EQUIPMENT

- A. Provide approved placing and mixing equipment in satisfactory working condition.
- B. Weigh blended lime and fly ash furnished in trucks on approved scales.

## **PART 3 – EXECUTION**

### 3.1 PREPARING SUBGRADE

Prepare subgrade properly before beginning lime and fly ash treatment. Scarify or excavate to the depth shown, providing the machine required. Stabilize unstable material below indicated depth by proper compaction.

### 3.2 APPLICATION

- A. Dry Placing
  - 1. Place lime and fly ash using approved screw type spreader box at the percentage indicated on the plans by dry weight. Do not place more than can be initially mixed during the same working day. Do not spread with a maintainer or motor grader.
  - 2. Cover or mix lime / fly ash within 6 hours after application. Do not place during windy or other adverse weather. Lime / fly ash may be sprinkled lightly with water to reduce dusting.

### 3.3 MIXING

- A. Final Mixing
  - 1. Uniformly mix soil and lime / fly ash to required depth. Use an approved single-pass or multiple-pass rotary speed mixer.
  - 2. Add water to bring moisture content of mixture to at least 5 percent above optimum.
  - 3. Continue mixing and pulverizing soil until all clods are broken down to pass a 1-inch screen and a homogeneous friable mixture is obtained. At least 60 percent should pass a No. 4 sieve, non-slaking fractions excluded.
  - 4. After final mixing, shape subgrade to final section, compact and cure.

### 3.4 COMPACTION

- A. Final Compaction
  - 1. Attain optimum moisture content.

2. Begin compaction immediately after final mixing.
3. Begin compacting at the bottom, using approved heavy pneumatic or vibrating rollers, or a combination of tamping roller and light pneumatic roller, until entire depth is uniformly compacted.
4. Compact treated material so as not to mix it with underlying subgrade material.
5. Spread and shape so that stabilized subgrade will have a finished thickness as specified when compacted.
6. Correct all irregularities or weak spots immediately by replacing bad material with stabilized soil and re-compacting.
7. Maintain smooth surface until base course or pavement is placed. Attain at least 95 percent of ASTM D-698 density, at optimum moisture content of treated material.
8. Use light pneumatic roller for final surface rolling.

### 3.5 CURING

- A. Cure the lime-fly ash stabilized subgrade for 7 days, as directed. Keep traffic off subgrade during cure, other than a light pneumatic roller. Do not permit vehicles heavier than 10 tons on the subgrade. Use moist curing or membrane curing for final cure.
  1. Moist Cure - Keep subgrade surface damp by sprinkling. Roll with light pneumatic roller to keep surface knit together.
  2. Membrane Cure
    - (a) Apply two coats of asphalt emulsion to subgrade surface the first day after final compaction.
    - (b) Apply one coat each day thereafter for three days.
    - (c) Total applications will be 0.25 gallons of asphalt emulsion per square yard of subgrade surface.

**END OF SECTION**

## SECTION 31 37 00

### ROCK RIPRAP

#### PART 1—GENERAL

The work shall consist of the construction of rock riprap revetments and blankets, including filter or bedding where specified.

#### PART 2—PRODUCTS

##### 2.1 Stone Riprap

- A. Stone riprap shall conform to either TxDOT Item 432 Protection Riprap or NRCS Material Specification 523, "Rock for Riprap," Rock Type 1.

Rock shall be free from dirt, clay, sand, rock fines, and other material not meeting the required gradation limits. The rocks shall be dense, resistant to weathering and water action, and free from cracks, seams, organic material, and other defects conducive to accelerated weathering. Shale, chalk, and limestone with shale or chalk seams shall not be acceptable. Except as otherwise specified, the rock fragments shall be angular to subrounded. Rounded rock (river rock) shall not be acceptable.

- B. Bulk specific gravity

Bulk specific gravity (saturated surface-dry basis) shall not be less than 2.5 when tested in accordance with ASTM C 127 on samples prepared as described for soundness testing.

- C. Durability

Provide rock that, when tested in accordance with ASTM D5240 or Tex-411-A, has weight loss of no more than 18% after 5 cycles of magnesium sulfate solution.

- D. Gradation

The size and grading of the rock shall be as specified on the plans. Neither the width nor the thickness of a single rock shall be less than one third of its length.

The rock riprap material shall be provided as a gradation of larger and smaller rock sizes associated with a rock class or median diameter ( $D_{50}$ ) as specified in the drawings. Rock diameter for angular material represents the length of the intermediate axis of an individual rock. The material gradation shall conform to table below for the class sizes corresponding to the  $D_{50}$ . The  $D_{15}$ ,  $D_{50}$ ,  $D_{85}$ , and  $D_{100}$  are the rock sizes for which 15%, 50%, 85%, and 100% of the total sample are of equal size or smaller, respectively.

ROCK RIPRAP GRADATION TABLE								
Rock Riprap Class by Median Particle Diameter (D50)		D15 (in)		D50 (in)		D85 (in)		D100 (in)
Class	Diameter (in.)	Min.	Max.	Min.	Max.	Min.	Max.	Max.
I	6	3.7	5.2	5.7	6.9	7.8	9.2	12.0
II	9	5.5	7.8	8.5	10.5	11.5	14.0	18.0
III	12	7.3	10.5	11.5	14.0	15.5	18.5	24.0
IV	15	9.2	13.0	14.5	17.5	19.5	23.0	30.0
V	18	11.0	15.5	17.0	20.5	23.5	27.5	36.0
VI	21	13.0	18.5	20.0	24.0	27.5	32.5	42.0
VII	24	14.5	21.0	23.0	27.5	31.0	37.0	48.0
VIII	30	18.5	26.0	28.5	34.5	39.0	46.0	60.0
IX	36	22.0	31.5	34.0	41.5	47.0	55.5	72.0
X	42	25.5	36.5	40.0	48.5	54.5	64.5	84.0

1. Reference: NCHRP Report 568
2. Conversion to weight-based gradation:  $W = 0.85D^3\gamma_s$  where W is rock size in lbs, D corresponds to the intermediate (B) axis of the rock in feet, and  $\gamma_s$  is the particle density of the rock.

If deemed necessary by the Owner or Engineer, in order to verify the gradation of the rock riprap, a particle size analysis shall be performed in accordance with ASTM D5519, Test Method A or B. The analysis shall be performed at the work site on a test pile of representative rock. The mass of the test pile shall be at least 20 times the mass of the largest rock in the pile. The results of the test shall be compared to the gradation required for the project. Test pile results that do not meet the construction specifications shall be cause for the rock to be rejected. The test pile that meets contract requirements shall be left on the job site as a sample for visual comparison. The test pile shall be used as part of the last rock riprap to be placed.

Breakage during handling and transportation should be taken into account.

## 2.2 Bedding Stone

Sand, gravel, or crushed stone or mixtures thereof meeting the gradation requirements shown in the table below or as otherwise shown on the plans. Aggregates shall be composed of clean, hard, durable, mineral particles free from organic matter, clay balls, soft particles, or other substances that would interfere with the free draining properties of the aggregates. Aggregates from crushed limestone shall be thoroughly washed and screened to remove limestone dust, limestone fines, and fine soil particles.

Bedding Stone to meet the size distribution in the table below in accordance with ASTM D6913.

Protection Riprap Bedding Material Gradation Requirements:

Sieve Size (Sq. Mesh)	% by Weight Passing
3"	100
1-1/2"	50-80
3/4"	20-60
#4	0-15
#10	0-5

## 2.3 Filter Fabric

### A. General Requirements

Filter Fabric to be a non-woven geotextile fabric consisting exclusively of manmade thermoplastic fibers. Fabric fibers are to be continuous and random throughout the fabric. The fabric shall be mildew resistant and rot-proof, and satisfactory for use in a wet soil and aggregate environment.

### B. Physical Requirements

Geotextile filter fabric shall meet the physical requirements of either TxDOT material specification DMS-6200, "Filter Fabric," Type 2, or NRCS Material Specification 592, "Geotextile," Class I.

### C. Sampling and Testing

The geotextile shall meet the specified requirements (TxDOT DMS-6200 Type 2 or NRCS Material Specification 592 Class I) for the product style shown on the label. Product properties as listed in the latest edition of the "Specifiers Guide," Geosynthetics, (Industrial Fabrics Association International, 1801 County Road B, West Roseville, MN 55113-4061 or at <http://www.geosindex.com>) and that represent minimum average roll values, are acceptable documentation that the product style meets the requirements of these specifications.

For products that do not appear in the above directory or do not have minimum average roll values listed, typical test data from the identified production run of the geotextile will be required for each of the specified tests.

### D. Shipping and Storage

The geotextile shall be shipped/transported in rolls wrapped with a cover for protection from moisture, dust, dirt, debris, and ultraviolet light. The cover shall be maintained undisturbed to the maximum extent possible before placement.

### E. Identification

Identify each roll with a tag or label affixed to the outside of the roll on one end. List the following information on the tag or label:

- Name of manufacturer;
- Product identification;
- Roll dimensions (roll width in inches; and roll length in yards);
- Lot number or control numbers;
- Date of manufacture

## **PART 3—EXECUTION**

### 3.1 Subgrade Preparation

The subgrade surface on which the rock riprap, filter, bedding, or geotextile is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved material and shall conform to the requirements of the specified class of earth fill.

Rock riprap, filter, bedding, or geotextile shall not be placed until the foundation preparation is completed and the subgrade surface has been inspected and approved by Owner or Owner's Representative.

### 3.2 Geotextile Filter

The geotextile shall be placed directly on the prepared area, in intimate contact with the subgrade. The geotextile should be rolled or spread out directly on the prepared area and shall be free of folds or wrinkles. The rolls shall not be dragged, lifted by one end, or dropped. The geotextile should be placed in such a manner that placement of the overlying materials (riprap and/or bedding stone) will not excessively stretch or tear the geotextile.

Place geotextile with the length running up and down the slope unless otherwise approved. Overlaps shall be in the direction of flow wherever possible. The geotextile shall be placed so that upstream strips overlap downstream strips. The longitudinal and transverse joints shall be overlapped a minimum of 2 ft. Secure fabric with nails or pins. Use nails at least 3 in. long with washers or U-shaped pins with legs at least 9 in. long. Space nails or pins at a maximum of 10 ft. in each direction and 5 ft. along the seams. Alternative anchorage and spacing may be used when approved.

After geotextile placement, the work area shall not be trafficked or disturbed in a manner that might result in a loss of intimate contact between the riprap stone, the geotextile, and the subgrade. The geotextile shall not be left exposed longer than the manufacturer's recommendation to minimize potential damage due to ultraviolet radiation; therefore, placement of the overlying materials should be conducted as soon as practicable.

### 3.3 Bedding Stone

Bedding Stone should be placed within 48 hours after the geotextile is placed. Placement of the bedding stone should be placed from the bottom working toward the top of the slope so that rolling and/or segregation does not occur. Riprap should be placed over the geotextile by methods that do not stretch, tear, puncture, or reposition the fabric. Equipment should be operated to minimize the drop height to less than 1 ft without the equipment contacting and damaging the geotextile. Compaction of bedding aggregate is not required, but the surface of such material shall be finished reasonably smooth and free of mounds, dips, or windrows.

### 3.4 Stone Riprap

The rock riprap shall be placed by equipment on the surface and to the depth specified. It shall be installed to the full course thickness in one operation and in such a manner as to avoid serious displacement of the underlying material.

Obtain the desired distribution of the various sizes of stones throughout the mass by selective loading of material at the quarry or other source or by other methods of placement that will produce the specified results. Rearrange individual stones by mechanical equipment or by hand if necessary to obtain a reasonably well-graded distribution of stone sizes and a neat and uniform surface.

Rock riprap shall be placed in a manner to prevent damage to structures. Hand placing is required as necessary to prevent damage to any new and existing structures. Do not place riprap in layers, and do not place it by dumping it into chutes, dumping it from the top of the slope, pushing it from the top of the slope, or any method likely to cause segregation of the various sizes.

## SECTION 32 17 23

### PAVEMENT MARKING

#### PART 1—GENERAL

##### 1.1 SCOPE

This section specifies furnishing and installing white or yellow pigmented binders and glass spheres to produce a reflective pavement marking.

##### 1.2 SUBMITTALS

- A. Provide manufacturer's production information and rates and methods of application.
- B. Provide certification that materials meet or exceed the requirements of these specifications.

##### 1.3 PRODUCT DELIVERY, DATA AND SAMPLES

Deliver materials to project site with manufacturer's labels intact and legible.

#### PART 2—PRODUCTS

##### 2.1 MATERIALS

- A. Provide system pre Sherwin Williams Pro-Park Waterborne Traffic Marking paint B97 Series or equal.
- B. Application rate: 330 linear feet of 4" stripe per gallon or 108sf per gallon.
- C. Colors: White, Yellow, Blue, Red or Black.
- D. Drying to heavy traffic 2 hours.

#### PART 3—EXECUTION

- A. Cleaning. Dry and free surface from oil, grease and dirt.
- B. New asphalt surfaces should be allowed to age several months before striping. Check adhesion by applying a test strip to determine the readiness for painting.
- C. Preparation. Thoroughly mix ingredients before application.
- D. Temperature. Do not apply when temperature is below 40°F or above 110°F.
- E. Humidity. Do not apply when relative humidity is greater than 85 percent.
- F. Line Widths. Provide line widths not deviating more than 1/8 inch from width shown.

##### 3.1 PAINTING

- A. Pavement marking on all roadways shall conform to the 1980 Texas MUTCD, Latest Edition, and shall be Type "A" material.

**END OF SECTION**

## **SECTION 32 31 11.01**

### **NOTARIZED GATE OPERATORS (CANTILEVERED SLIDING GATE)**

#### **PART 1 – GENERAL**

- 1.1 Section Includes
  - A. Slide Gate Operators and Accessories
  - B. Access Controls
- 1.2 Related Sections
  - A. Section 02820 – Fences and Gates
  - B. Section 03300 – Cast-In Place Concrete – Concrete Mounting Pad
- 1.3 References
  - A. UL325 – Standard for Safety for Door, Drapery, Gate, Louver, and Window Operators and Systems
  - B. UL991 – Standard for Safety – Tests for Safety – Related Controls Employing Solid-State Devices
- 1.4 Submittals
  - A. Product Data: Equipment list, system description, block diagrams on equipment to be finished, electrical wiring diagrams for installation, and manufacturer's data sheets on each product to be used, including:
    - 1. Preparation instructions and recommendations
    - 2. Storage and handling requirements and recommendations
    - 3. Installation methods
- 1.5 Quality Assurance
  - A. Provide documentation of maintenance and repair service availability for emergency
  - B. Conditions
    - 1. Installer Qualifications: factory authorized contractor specifically trained in gate operation systems of the type found within this section

**END OF SECTION**

## SECTION 32 31 13

### CHAINLINK FENCING

#### PART 1—GENERAL

##### 1.1 DESCRIPTION

This section governs for chain link and man-proof security fencing.

##### 1.2 QUALITY ASSURANCE

- A. Product Qualifications - Product which has been manufactured and applied for a minimum of 2 years.
- B. Applicator Qualifications - Provide personnel with a minimum of 2 years-experience in application of product.

#### PART 2—PRODUCTS

##### 2.1 MANUFACTURER

Fence work shall be accomplished in accordance with the suggested standards of Cyclone Fence Sales, United States Steel Corporation, or other domestic manufacturer of chain link fence of quality herein specified.

##### 2.2 MATERIAL: All pipe is schedule 40 steel pipe for posts, rails, bracing, and gates. Pipe sizes shown are outside diameter (O.D.)

- A. All Components - Iron or steel components shall be hot-dipped galvanized after fabrication, except as specified elsewhere, and conform to ASTM-A-123 for galvanized coating.
- B. Fabric - Fabric shall be woven in 2" mesh of 9 gauge copper bearing steel wire. Height shall be as indicated on the drawings. Top and bottom edges shall be knuckled at both selvages. Minimum tensile strength of wire shall be 80,000 psi after galvanizing. Fabric shall be galvanized after weaving with a coating of 2.0 oz. per sq. ft. complying with ASTM-A-392, Class II, or Aluminum-Coated with a coating of 0.40 oz. per sq. ft. complying with ASTM-A-491, Class II.
- C. Line Posts - Line posts shall be 2" (2 3/8" O.D.) standard weight ppe (schedule 40). Set posts not less than 36" into 8" diameter concrete footing. Space posts not to exceed 10' center to center.
- D. Top Rail - Top rail shall be 1-1/4" (1 5/8" O.D.) standard weight pipe (schedule 40). Roll form section fitted with expansion joints of the outside sleeve type averaging not more than 20' center to center. Sleeves shall make rigid connection but allow expansion and contraction. Top rail to be anchored at terminal posts. Top rail is to be continuous for full length of fence passing through line post tops.
- E. Terminal Posts - End, corner or pull posts, called terminal posts herein shall be 3.0" O.D. Schedule 40 Steel Pipe. Posts shall be set not less than 48" in concrete, shall be used in

lieu of line posts at ends of runs, changes in alignment or other points of strain. Terminal posts shall be fitted with bracing between terminal post and first line post. Bracing shall consist of same material as top rail, located no lower than mid-height of fabric, and a tension member. Tension member or truss rod shall be not less than 3/8" in diameter and fitted with a tension take up device. Compression and tension members shall be secured to terminal posts and line posts with suitable fabricated devices to develop the full strength of the members.

- F. Fabric Bands - Fabric shall be securely attached to posts at not greater than 12" center to center and top rail and brace rail at not greater than 24" center to center with fabric bands on line posts and #11 gauge ties, steel, or #9 gauge ties, aluminum alloy, for top rail and braces.
- G. Ties or Clips – Fabric shall be securely attached to line posts at intervals not exceeding 15 inches and to top rails and brace rails at intervals not greater than 24 inches center to center. Ties to be #11 gauge steel or #9 gauge aluminum alloy.
- H. Bottom Rail- Provide 1 5/8" O.D. bottom rail at all corners, gates, change of direction, baseball/softball backstops, and other locations where indicated on the drawings.
- I. Tension Wire - Fabric shall be securely attached to 7 ga. bottom wire at not greater than 12" center to center secured to wire with "hog tie"
- J. Barbed Wire – Where indicated on the drawings, provide 3 strand barbed wire with:
  - 1. Supporting Arms – Supporting arms shall be set at an angle of 45° out from the enclosed area or vertical as required, and shall be fitted with slots or other means for attaching three strands of barbed wire. With 45° arms, the top wire shall be approximately 12 inches horizontally from the fence line and the other strands spaced uniformly between the top of the fence fabric and the outside strand. Barbed wire arm shall be of sufficient strength to withstand a weight of 250 pounds applied at the outer strand of barbed wire.
  - 2. Barbed Wire – Barbed wire shall consist of two strands of twisted 12 1/2-gauge wire with 14-gauge 4 point barbs on 5-inch spacing, and shall conform to one of the following:
    - a. Zinc-Coated barbed wire conforming to ASTM A-121, chain link fence grade with a coating of 0.80 oz. per sq. ft. for line wire and 0.65 oz. per sq. ft. for barbs.
    - b. Aluminum-Coated barbed wire conforming to ASTM A-585, Type I, with a coating of 0.30 oz. per sq. ft. for line wire and 0.25 oz. per sq. ft. for barbs.

## 2.3 GATES

- A. Gate Posts - Gate posts shall be round pipe; size as shown on the Drawings.

<b>Single gate</b>	<b>up to 6'</b>	<b>3.5" o.d. Schedule 40 pipe</b>
		<b>3-1/2" x 3-1/2" Roll form</b>
<b>Single gate</b>	<b>7' up to 13'</b>	<b>4" o.d. Schedule 40 pipe</b>
<b>Single gate</b>	<b>14' up to 18'</b>	<b>6-5/8" o.d. Schedule 40 pipe</b>
<b>Single gate</b>	<b>over 18'</b>	<b>8-5/8" o.d. Schedule 40 pipe</b>

Gate posts up to and including 4" o.d. to be set in not less than 54" deep concrete base,

- B. Gate Frames - Gate frames shall be not less than 1-7/8" O.D. standard weight steel pipe. Cantilever sliding gate horizontal members shall not be less than 2-7/8" O.D. schedule 40 steel pipe. Frames shall be constructed with heavy pressed steel or malleable castings or welding at the joints to produce rigid and weatherproof joints. Bracing and details of construction shall be adequate to provide a rigid non-sagging and non-twisting gate of high quality. Fabric shall be same as fence fabric and shall be securely attached, using methods equal to fence fabric and shall be securely attached, using methods equal to fence fabric attachment. Welding of fabric to frame will not be permitted. Frames shall have provision for three strands of barbed wire in vertical position, all as shown on details on the drawings.
- C. Latches - Gates shall have drop bar type latch for one leaf with automatically engaging latch for other leaf. Drop bar shall be outfitted with suitable casting set in concrete to hold gate leaf in place when drop bar is engaged. Latching devices shall be heavy duty type and shall be lockable with padlock from either side.
- D. Gate Keepers - Gates shall be equipped with gate keepers to hold gate in open position as indicated on the plans.
- E. Gates - Gates shall be of the size and type shown on the drawings.
- F. Cantilever Slide Gate - Provide Cantilevered slide gate sized where indicated on the drawings. Each gate shall have truss rod diagonal bracing within the gate fabric. The gate shall be approximately one third larger than the opening shown on the drawings. There shall be roller bearing truck assembly at the gate post and overhang post. The gate shall slide freely and easily by hand, and shall be capable of having a motor operator added in the future. The gate shall include a latch mechanism for a pad lock.

## 2.3 POST FOUNDATION

Posts shall be set in concrete as provided above. Concrete foundation shall be not less than 8" diameter x 40" depth for line posts and 12" diameter x 52" depth for terminal posts. Concrete shall extend not less than 4" below bottom of post and shall be crowned at the top to shed water. Concrete shall be 2500 psi minimum.

## 2.4 MISCELLANEOUS MATERIALS

Other miscellaneous materials required to complete the fencing in a first class manner shall be furnished as required. Miscellaneous materials shall be consistent with the fence and gate materials listed above, and shall be hot-dipped galvanized.

## 2.5 GALVANIZING

Framing materials, posts, rails, braces, truss rods, gate frames, barbed wire arms shall have a minimum coating of 2.0 oz. per square foot of surface.

# PART 3—EXECUTION

## 3.1 RECEIPT OF PRODUCT

- A. Inspect products for damage concurrent with unloading.

- B. Products to be segregated at unloading to facilitate identification in erection.

### 3.2 ERECTION

- A. General Requirements
  1. Work to be plumb and level.
  2. Work to be properly aligned.
  3. Fabric to be 2" clear of ground. Minor ground irregularities to be corrected.
- B. Installation  
Work to be performed in a "first-class" manner without sags or bulges.
- C. Field Painting and Touch-up  
Repair all surfaces damaged during shipping, handling and erection.

### 3.3 ADJUSTMENT AND CLEANING

Remove excess material, falsework, and debris after completion of work on each phase.

**END OF SECTION**

# SECTION 32 92 13

## HYDROMULCH SEEDING

### PART 1—GENERAL

#### 1.1 DESCRIPTION

"Seeding and Hydromulch Seeding for Erosion Control" shall consist of preparing ground, providing and planting seed or a mixture of seeds and furnishing and installing hydromulch material, of the kind specified along and such areas as are designated by the Engineer and in accordance with these specifications.

#### 1.2 SCOPE OF WORK

Provide hydromulch seeding at all areas where Contractor has disturbed soil at new construction.

#### 1.3 ACCEPTANCE AND APPROVAL

Final approval of grass cover will be given when:

- a) There are no bare spots larger than one square foot.
- b) Total area of bare spots does not exceed 5% of grassed area.
- c) Average grass height has reached 2-1/2-inches as determined by the Engineer.

### PART 2—PRODUCTS

#### 2.1 SEED

All seed used must carry a Texas Testing Seed Label showing purity and germination, name and type of seed and that it meets all requirements of the Texas Seed Law. Seed furnished shall be of the previous season's crop and the date of analysis shown on each tag shall be within 9 months of the time of delivery to the project. Each variety of seed shall be furnished and delivered in separate bags or containers. A sample of each variety of seed shall be furnished for analysis and testing when directed by the Engineer.

The specified seed shall equal or exceed the following percentages for purity and germination:

<u>Common Name</u>	<u>Scientific Name</u>	<u>Purity</u>	<u>Germination</u>
Bermuda Grass	Cynodon dactylon	95%	90%
Rye Grass	Lolium Multiflorum	95%	85%
Buffalo Grass	Buchloe Dactyloides	40%	40%
Blue Grama Grass	Bouteloua gracilis	30%	75%
Side-Oats Grama Grass	Bouteloua curtipendula	20%	50%
Little Bluestem Grass	Andropogon scoparius	20%	50%
Big Bluestem Grass	Andropogon furcatus	20%	50%
K-R Bluestem Grass	Andropogon species	20%	50%
Buffel Grass	Pennisetum ciliare	90%	75%
Sudan Grass	Sorghum vulgare var. Sudanese	80%	80%
Dropseed Grass	Sporobolus Texanus	90%	60%
Western Wheat Grass	Agropyron Smithii	65%	65%
Yellow Clover Oats	Melilotus officinalis	90%	90%
Oats	Avena sativa	85%	85%

Seed which has become wet, moldy or otherwise damaged in transit or storage will not be accepted.

## 2.2 FERTILIZER

### A. General:

"Fertilizer" shall consist of providing and distributing fertilizer over such areas as are designated on the plans and in accordance with these specifications.

### B. Materials:

All fertilizer used shall be delivered in bags or containers clearly labeled showing the analysis. The fertilizer is subject to testing by the State Chemist in accordance with the Texas Fertilizer Law. A pelleted or granulated fertilizer shall be used with an analysis of 16-20-0 or 16-8-8. The figures in the analysis represent the percent of nitrogen, phosphoric acid, the potash nutrients respectively as determined by the methods of the Association of Official Agricultural Chemists. Fertilizer which is powdered or caked will be rejected.

In the event it is necessary to substitute a fertilizer of a different analysis, it shall be a pelleted or granulated fertilizer with a lower concentration. The total amount of nutrients furnished and applied per acre shall equal or exceed that specified for each nutrient.

## 2.3 HYDROMULCH

Provide a cellulose-fiber mulch which contains no germination or growth inhibitors. It shall consist of an uniformly suspended homogenous slurry, with necessary additives, dyed green, which after application will allow the absorption of moisture and percolation of rainfall or mechanical watering to the underlying soil.

## PART 3—EXECUTION

### 3.1 PLANTING

All planting shall be done between the dates specified for each type except as specifically authorized in writing.

The seeds application per acre shall be as follows:

#### Type 1

Bermuda Grass - hulled	100 lb.	April through September
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#### Type 2

Bermuda Grass - unhulled	75 lb.	
Rye Grass	100 lb.	September through January

#### Type 3

Bermuda Grass - hulled	100 lb.	
Sudan Grass	20 lb.	February through May

### 3.2 HYDROMULCH APPLICATION

Apply wood fiber mulch at a rate of 2000 pounds per acre.

### 3.3 WETTING AGENT

Use a 95 percent alkyd polyethylene glycol ether at a rate of 2 quarts per acre.

### 3.4 CONSTRUCTION METHODS

After the designed areas have been completed to the lines, grades and cross sections shown on the plans and as provided for in other items of this contract seeding of the type specified shall be performed in accordance with the requirements hereinafter described.

#### A. Work Conditions

1. Site Availability. Begin no work, except excavation and soil preparation, until conflicting site work is complete or as otherwise directed by the Owner or the Owner's representative.
2. Weather Restrictions. Stop all work during inclement weather such as drought, high winds, excessive rain, extreme heat, cold or freeze. Obtain authorization before resuming work.

#### B. Planting Grass

1. Preparation. Hand rake to remove all sticks, stones and clods larger than 1-inch. Apply the final grade but do not mechanically compact the soil.
2. Seeding & Fertilizing. Apply seed or seed mixture in the quantity specified uniformly distributed over areas prepared. If the sowing of seed is by hand, rather than by mechanical means, the seed shall be sown in two directions at right angles to each other. Seed and fertilizer may be distributed at the same time provided the specified uniform rate for each is maintained. Re-seed sparse areas 4 weeks after germination is evident.
3. Hydromulching
  - a) Apply hydromulch and wetting agent in accordance with quantity specified.
  - b) Protect surrounding areas with coverings or other measures. Do not apply on days of high wind or inclement weather.
  - c) Apply water as necessary to maintain moisture in mulch. Do not oversaturate. Frequent light sprinklings are preferable to heavy application during germination period.

#### C. Watering

The seeded areas shall be watered so as to prevent washing of slopes or dislodgement of the seed. The quantity of water applied at one time must be sufficient to penetrate the soil to a depth of 8-inches at a rate which will prevent saturation of the soil.

#### D. Finishing

Where applicable, the shoulders, slopes and ditches shall be smoothed after seed bed preparation has been completed and shaped to conform to the cross sections previously provided and existing at the time planting operations were begun.

**END OF SECTION**

## SECTION 32 92 23

### SODDING AND FERTILIZING

#### PART 1 – GENERAL

##### 1.1 SCOPE

This section specifies preparing ground, furnishing and installing block sodding, and distribution of fertilizer.

##### 1.2 RELATED WORK

Hydro-mulching and turf sprigging.

##### 1.3 DELIVERY AND STORAGE

- A. Locate storage on site as directed.
- B. Sod materials shall be sprinkled with water and covered with moist burlap or other approved covering and protected from exposure to wind and direct sunlight. Covering shall be such that air can circulate and heating will not develop.

##### 1.4 ACCEPTANCE AND APPROVAL

Final approval of grasses will be given when:

- A. There are no bare spots larger than one square foot.
- B. The average height as determined by the Engineer has reached 2 1/2 inches.

#### PART 2 - PRODUCTS

##### 2.1 BLOCK SOD

- A. Obtain sod from an approved source. Use 12-inch width sod with a 1-inch thick soil base. Sods must be rich in color, uniform in size and proportion, and free of toxic weeds, insects and fungus infestations.
- B. Sod species shall be selected by owner and be 100 percent cultivated grass not less than 2 years old, cut to 2½ inches in height. See Drawings for location of each type.
- C. Use sod delivered to the site within 12 hours after harvesting and planted within 12 hours after delivery. When this cannot be met, the sod shall be inspected and approved before planting.

##### 2.2 SAND

- A. Provide sand which meets the following requirements:
  - 1. Is fertile, friable, natural, typical of the locality, and was obtained from a well-drained site free from flooding.

2. Is without admixture of subsoil or flag, and is free of stones, lumps, plants or their roots, sticks, and other extraneous matter.
3. Is not muddy when delivered.
4. Meets following criteria:
  - <10% retained #4 sieve
  - <50% passing #20 sieve
  - <10% passing #200 sieve

## 2.3 POISONS

### A. Weed Control

Provide Amino 2-4-D solution for use in lawn areas to kill broadleaf weeds.

### B. Insect Control

Provide a 25 percent emulsifiable concentrate of Sevin to kill insects in the grass.

## 2.4 FERTILIZER

A. Use a pelleted or granulated fertilizer with an analysis of 16-20-0 or 16-8-8.

B. Furnish and apply total nutrients per acre equaling or exceeding the specified rate.

C. Provide dry fertilizer in good condition. Caked or powdered fertilizer will be rejected.

## PART 3 – EXECUTION

### 3.1 WORK CONDITIONS

#### A. Site Availability

Begin no work, except excavation and soil preparation, until conflicting site work is complete or as directed.

#### B. Weather Restrictions

Stop all work during inclement weather such as excessive rain, extreme cold or freeze. Obtain authorization before resuming work.

### 3.2 PROTECTION FROM DRYING

A. Until planting, keep solid sods well covered with moist burlap.

B. Plant without delay to minimize drying from sun and air.

### 3.3 SITE PREPARATION

#### A. Subgrade and Subsoil

1. Compact subgrade to 90% maximum density per ASTM D-698.

2. Place no sand until subgrade has been approved.
3. Scarify subsoil to a depth of 3 inches.
4. Before placing sand, rake subsoil surface clear of stones, debris and rubbish.

B. Sand

1. Spread, rake and compact sand to form a layer at least 4 inches deep in lawn areas.
2. Place sand so there will be good drainage after settlement.
3. Maintain surfaces and place any additional sand necessary to replace eroded soil.
4. Avoid damage to finished paving in delivery of sand.

### 3.4 PLANTING

A. Block Sodds

Broadcast fertilizer on the area before planting sods. Lay 12-inch sod tightly together with overlap joint and press down with a tamper. For slopes steeper than 1 to 3, stake the sod with pins of ¼" diameter and 6" long, placed not more than 18 inches o.c. and driven flush with the top of the sod. Begin work at bottom of slope. Cover low areas and holes with sharp sand. Roll the turf evenly by criss-crossing the entire area. Level the area again, as necessary, using sand. Repeat fertilization in 6 weeks. Replace fungus infested sections to 2 feet outside the infested area. Excavate to 3 inches deep and sterilize the soil, before filling and re-sodding the area. Replace any dead sods.

### 3.5 FERTILIZING

- A. Apply fertilizer uniformly over the area.
- B. Apply fertilizer uniformly at the average rate of 20 pounds per 1000 square feet unless otherwise shown.
- C. Work fertilizer thoroughly into the soil by approved methods until soil and fertilizer are uniformly mixed to a depth of at least 4 inches.

### 3.6 CLEANUP

- A. Continuously and promptly remove excess and waste materials. Keep work areas clear. Take all reasonable precautions to avoid damage to existing structures and grass.
- B. Regrade and replant grass areas damaged by the work. When work is complete, leave the areas neat and clean.
- C. Protect the turf from other construction operations. Use planks or pontoons to protect turf from moving of heavy equipment or materials over the area.

### 3.7 MAINTENANCE

Until acceptance, maintain turf areas with all necessary watering, cultivating, mowing, weeding, disease and insect control, protective spraying, replacement and any other procedure consistent with good horticultural practice necessary to insure normal, vigorous and healthy growth of grasses.

**END OF SECTION.**

## **SECTION 32 93 10**

### **LANDSCAPE PLANTING**

#### **PART 1—GENERAL**

##### **1.1 REFERENCE STANDARDS**

- A. All material and installation shall comply with the latest standards of the American Nurseryman's Association.

##### **1.2 GUARANTEE AND REPLACEMENT**

- A. The Contractor shall guarantee all plants. All plants should have leafed out and be in a healthy condition to be acceptable for final payment.
- B. The replacement period will begin immediately upon final acceptance of the planting project. For plants receiving final acceptance on or before April first, the replacement period will last through October first. For plants receiving final acceptance after April first, the replacement period will last through April first of the following year or 6 months, whichever is longer. All plants which in the opinion of the Architect are in an unhealthy or badly impaired condition at the time of final acceptance, shall be replaced as soon as reasonably possible. At the conclusion of the replacement period, the Contractor will make an inspection of all plants to determine condition. All plants then not in a satisfactory condition will be noted. As soon as seasonal conditions permit, these plants will be replaced under the same contract conditions as the original planting was accomplished and at no extra cost to the Owner.
- C. Upon final acceptance of the planting, instruct the Owner in the proper care and maintenance of the planting. The Owner will assume responsibility for maintenance of the planting on the day following final acceptance. Any plant materials found to be in an unhealthy condition from what the Architect considers negligence by the Owner will not have to be replaced by the Contractor.

##### **1.3 APPROVAL**

- A. All plants shall be subject to the approval of the Architect. Plant may be inspected at place of collection. Approval of plants at the source does not alter the right of rejection at the project site.
- B. The minimum sizes of all plants shall conform to the measurements specified in the plant materials list. Plants larger in size than specified may be used only upon approval of the Architect. The use of larger plants will not increase the contract price.
- C. All plant material shall conform to the species and/or varieties specified in the plant materials list. No substitutions will be permitted unless approved by the Architect.
- D. All plant materials shall be properly inspected. All shipments of plant stock shall comply with existing State and Federal Laws and regulations governing plant diseases and infection and interstate movement of nursery stock.

## 1.2 PROTECTION

- A. Protect existing work subject to damage during the installation. Finished work that is readily subject to damage by subsequent work or environmental conditions protect immediately following the installation thereof.

## 1.3 CONDITIONS OF WORK-IN-PLACE

- A. Examine work-in-place on which specified work is in any way dependent. Report, in writing, to the Architect/Engineer any defects which may influence satisfactory completion and performance of specified work. The absence of such notification shall be construed as acceptance of work-in-place.

## **PART 2—PRODUCTS**

### 2.1 TREE

#### A. Materials

1. Trees: Trees shall be in accordance with "American Standard for Nursery Stock" as published by the American Association of Nurserymen, Inc.. For plants not covered by this Standard, Standards issued by an agency of State Government, if any, shall be used as a guide. Trees furnished shall be suitable to climate, exposure, soil conditions and unless otherwise specified, nursery grown stock. They shall be well formed specimens with growth typical of the species and varieties named and be free from injuries insects and disease. All trees shall be well established in cans.
2. The container grown roots shall contain sufficient fibrous feeding roots to permit satisfactory growth after planting. When delivered all trees not to be immediately planted shall be protected from the sun, wind and freezing temperatures.
3. Soil for Planting Backfill: Soil acceptable to the Contractor for backfilling planting pits shall be fertile and be capable of supporting plant life. It shall be free from stones, lumps, weeds, debris and other material harmful to plant growth. Do not use any clay type soil as backfill.
4. Mulch: Mulching material shall consist of bark, peat moss, or well-rotted and unleached animal manures which shall contain no straw or shavings, or similar extraneous materials.

#### B. Methods

1. Planting Pits: Each tree pit shall have vertical sides, be 12-inches greater in diameter and 6-inches greater in depth than the specified container grown roots and be not less than 24-inches deep.
2. Planting: Prior to planting, not less than 6-inches of top soil to be used as backfill shall be placed in bottom of pit and compacted. Container, if not subject to decomposition during the guarantee period, shall be removed. Each tree shall be placed in vertical position in center of pit and set at same ground level in relation to finish grade as originally grown in the nursery. The trees shall be planted by placing and working backfill soil around the roots until approximately 2/3 of backfill is completed. The planting shall then be thoroughly watered and the plant pit filled to finish grade with firmly tamped backfill soil.

3. Pruning: Approximately 1/3 of the growth of large trees (those with 2-inch caliper or over) shall be pruned. Pruning shall remove superfluous branches, as well as those which cross and run parallel. The main leader of trees shall not be cut back. Branches shall be thinned out and not merely cut back. Long side branches, however, may be shortened. Trees that have been so badly pruned as to spoil their natural form shall be removed and replaced.
4. Seasonal Limits: Planting shall be performed during the proper season and during favorable working conditions.

## 2.2 SHRUB

### A. Materials

1. Shrubs: Shrubs shall be in accordance with "American Standard for Nursery Stock" as published by the American Association of Nurserymen, Inc. For plants not covered by the Standard, Standards issued by an agency of State Government, if any, shall be used as a guide. Shrubs furnished shall be suitable to climate, exposure, soil conditions and intended use and unless otherwise specified, shall be nursery grown stock. They shall be well formed specimens with growth typical of the species and varieties named, be undamaged, and be free from injurious insects and disease. All shrubs shall be established in cans.
2. The container grown roots shall contain sufficient fibrous feeding roots to permit satisfactory growth after planting. When delivered, all shrubs not to be immediately planted shall be protected from the sun, wind and freezing temperatures.
3. Soil for Planting Backfill: Soil acceptable to the Contractor backfilling planting pits shall be fertile and be capable of supporting plant life. It shall be free from stones, lumps, weeds, debris and other material harmful to plant growth. Backfill soil used for acid loving plants shall be improved with such materials as oak leaf mold, peat moss, rotted sawdust or finely ground sphagnum moss, sufficient quantities of the selected materials being added and mixed with the backfill soil to produce a degree of acidity with a PH range of 4.5 to 5.5.
4. Mulch: Mulch material shall consist of bark, peat moss or well-rotted unleached manure containing no straw, shavings or similar extraneous material.

### B. Methods

1. Planting Pits and Beds: Excavations for pits shall have approximately vertical sides. For all shrub planting the diameter of pits shall be at least 1-1/2 times the spread of the container. Excavation for planting beds shall have approximately vertical sides and be of the size and shape as shown on the accepted planting plans.

Otherwise, the beds shall provide no less than 6-inch clearance between the top soil and the edge of the bed. Depth of the planting pits or beds shall be no less than 6-inches greater than the depth of the root system, the specified depth of the container but not less than 15-inches.

2. Prior to planting not less than 6-inches of appropriate backfill soil shall be compacted in the bottom of the pits or beds. Each plant shall be placed in an upright position and set at the same ground nursery. Cans shall be removed. The shrubs shall be planted

by placing and working the appropriate acid type top soil around the root ball or bare roots until approximately 2/3 of backfill is completed. The planting shall then be thoroughly watered and backfill completed to finished grade and firmly tamped.

3. Mulching: Soil between and around plants shall be raked smooth and the beds neatly edged. A 2-inch layer of mulch shall be applied over the entire surface of the pit or bed and saturated with water.
4. Pruning: Approximately 1/3 of the twigs of bare root deciduous shrubs shall be removed by pruning damaged or undesirable branches, or as necessary to balance the root system. Pruning shall be done in a manner to preserve the natural shape and characteristics of the shrubs. Generally, evergreens shall not be pruned except to remove dead injured branches, or to match surrounding plants.
5. Seasonal Limits: Planting shall be performed during the proper season during favorable working conditions.

### 2.3 PLANT SCHEDULE

A.	Type	Quantity	Size
	Oak, Sweet Gum, or Elm	49	6" caliper or larger

Location as shown on Landscaping Sheet C6.00.

## **PART 3—EXECUTION**

### 3.1 SITE INVESTIGATION

The Contractor acknowledges that he has satisfied himself as to the nature and location of the work and to the quality of surface and subsurface materials or obstacles insofar as this date is reasonably ascertainable from an inspection of the site. Any failure by the Contractor to acquaint himself with the available information will not relieve him from responsibility for estimating properly the difficulty or cost successfully performing the work.

### 3.2 OBSTRUCTION BELOW GROUND

Any rock or underground obstruction shall be moved to the depth necessary to permit proper plant handling according to the plans and specifications. If underground construction, obstructions, or rocks are encountered in excavation of planting areas; other locations for the planting may be selected by the Contractor.

### 3.3 INSTALLATION

Mass plantings shall be planted in neat, straight rows parallel to the nearest paving or header at intervals as specified on the plan and in accordance with an approved spacing chart. Set all plants plumb and straight. Open and remove containers in such a manner that plant-root earth remains unbroken.

**END OF SECTION**

## **SECTION 33 05 33.13**

### **CORRUGATED WALL, SMOOTH INTERIOR HDPE GRAVITY PIPE**

#### **PART 1 - GENERAL**

##### **1.1 DESCRIPTION**

- A. This item governs furnishing and installation of high density polyethylene (HDPE) corrugated pipe, smooth interior wall for storm drainage applications.

##### **1.2 SUBMITTALS**

- A. The Contractor shall submit to the Engineer material data that is sufficient to prove that the HDPE pipe, embedment, and backfill material are in accordance with these specifications. The Contractor shall also submit the manufacturer's recommendations for pipe installation.

##### **1.3 QUALITY ASSURANCE**

- A. The Contractor shall provide access, for inspection, to pipe material to the Owner upon delivery. During backfill operations the Contractor shall allow for sampling and testing of the material by the Owner.

##### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. HDPE pipe shall be shipped to the job site on drop side or flatbed trailers. Upon arrival at the jobsite, the Contractor should inspect the pipe for damage incurred during shipping. To avoid damage the pipe should not be dropped. Tie down straps or bands should not be removed until the pipe has been secured to prevent rolling or dropping the pipe.
- B. Stockpile the pipe as close as possible to its final location, but away from construction traffic and construction activities. Pipe should be stockpiled on level ground and if stacked, is should be blocked to prevent rolling. Stacked pipe should be placed with bells alternated on successive layers and the bells should overhang the layer below to prevent deformation or damage to the bell. The protective wrap on the gaskets of the spigot end should be left on the pipe until it is ready for installation.
- C. Handling should be accomplished by hand, lifting tongs, or nylon slings. When using slings, two pick points are recommended

#### **PART 2 - PRODUCTS**

##### **2.1 HDPE STORM DRAIN PIPE**

- A. The pipe material supplied shall be type N-12 Pro Link WT ® pipe as manufactured by Advanced Drainage Systems, Inc. or an approved equal. The pipe shall be constructed with a corrugated exterior and have an integrally formed smooth interior waterway. The pipe and fittings shall be made from virgin polyethylene and comply with the requirements for test methods, dimensions, and markings found in AASHTO Designations M252, M294, and MP7-97.

The pipe shall use a bell and spigot joint design with an elastomeric rubber gasket meeting ASTM F-477. The joint shall be capable of passing a laboratory pressure test of 10 psi and provide a seal that is water tight

## 2.2 EMBEDMENT AND BACKFILL MATERIALS

The backfill shall be full depth cement stabilized sand unless noted otherwise. If cement stabilized sand is not specified, the following describes embedment materials using the ASTM D-2321 nomenclature.

*Class I* – Angular crushed stone or rock, dense or open graded with little or no fines (1/4 inch to 1 ½ inches in size)

*Class II* – Clean, coarse grained materials, such as gravel, coarse sands and gravel/sand mixtures (1 ½ inches maximum size)

*Class III* – Coarse grained materials with fines including silty or clayey gravels or sands. Gravel or sand must comprise more than 50 percent of Class III materials (1 ½ inches maximum size)

*Class IV* – Fine grained materials, such as fine sand and soils containing 50 percent or more clay or silt. Soils classified as Class IVa have medium to low plasticity and are not recommended in the embedment zone. Soils classified as Class IVb have high plasticity and are not recommended for embedment materials.

*Class V* – These materials include organic silts and clays, peat and other organic materials. They are not recommended for embedment materials.

- A. Foundation: The bedding material shall be placed on a stable foundation. Unsuitable or unstable foundations shall be undercut and replaced with a suitable bedding material placed in 6" lifts.
- B. Bedding: The bedding material shall be stable and uniform. The middle of the bedding equal to 1/3 of the pipe OD should be loosely placed, with the remainder compacted to a minimum of 90 percent standard proctor density. Bedding material shall be placed at a thickness of 4 to 6 inches unless otherwise specified. Class I, II and III materials are suitable for use as bedding.
- C. Haunching: Embedment material shall be placed in the trench from the top elevation of the bedding material to the spring line elevation of the pipe. The contractor shall compact material in this area using hand operated equipment for pipes that are 24" or greater in diameter to ensure that the material under the haunches gets compacted. Haunching materials may be Class I, II, or III and must be placed and compacted in 8 inch maximum lifts. The haunching material shall be compacted to 90 percent standard proctor density.
- D. Initial Backfill: Initial backfill shall comprise of Class I, II, or III material placed and compacted in 8 inch maximum lifts to a 90 percent standard proctor density. Initial backfill shall be placed from the spring line to 6 inches above the top of the pipe for pipe diameters 15 inches or less and from the spring line to 12 inches above the top of the pipe for pipe diameters 15 inches or greater.
- E. Final Backfill: The final backfill shall consist of suitable native material previously removed from the trench. The maximum size of earth used for final backfill shall have a largest diameter of 3". Final backfill material shall be placed and compacted to the finished soil elevation of the trench in 8" lifts to a 90 percent standard proctor density.

### **PART 3 - EXECUTION**

#### **3.1 TRENCHING**

- A. Trenches excavated for the installation of HDPE pipe shall be not less than 6" nor more than 12" greater than 1.5 times the nominal pipe diameter. Trenches shall conform to OSHA or City of Bryan trench safety standards whichever is more stringent.

#### **3.2 PIPE PLACEMENT**

- A. HDPE pipe shall be handled and placed per the manufacturer's recommendations and these specifications. This is to include but is not limited to the use of manhole connections, tap connections, fittings, field connections, and installation on a curve.

#### **3.3 EMBEDMENT AND BACKFILL**

- A. The backfill of HDPE pipe shall conform to the manufacturer's recommendations and section 2.02 of these specifications.

### **PART 4 - MEASUREMENT AND PAYMENT**

#### **4.1 MEASUREMENT**

- A. HDPE Storm Drain Pipe shall be measured by the linear foot installed and in place.

#### **4.2 PAYMENT**

- A. The contract price paid per linear foot for "HDPE Storm Drain Pipe" shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in obtaining, delivering, site preparation, placing, and backfill of HDPE storm drain pipe as shown on the plans, and Contract Documents, or as specified by the Engineer and no additional compensation will be allowed

**END OF SECTION**

# SECTION 33 26 22

## PVC PIPE AND FITTINGS

### PART 1—GENERAL

#### 1.1 DESCRIPTION

This section governs for construction of polyvinyl chloride (PVC) pipe, couplings, and fittings for water mains or other pressure lines.

#### 1.2 RELATED WORK

TRENCHING  
GATE VALVES  
DUCTILE IRON PIPE AND FITTINGS

#### 1.3 QUALITY ASSURANCE

##### A. Reference Standards

ASTM D1599	Standard Specification for Short Time Burst Test
ASTM D1784	Standard Specification for Rigid Poly Vinyl Chloride (PVC) Compounds
ASTM D2152	Standard Specification for Extrusion
ASTM D2241	Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR)
ASTM D3139	Standard Specification, Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Pipe
AWWA C110	Gray Iron and Ductile Iron Fittings
AWWA C153	Ductile Iron Compact Fittings
AWWA C651	Disinfecting Water Mains
NSF 61	National Sanitation Foundation Drinking Water System Components and Related Materials

##### B. Tests

1. Hydrostatic test for leakage.
2. Bacteriological test.

#### 1.4 PRODUCT, DELIVERY, STORAGE, AND HANDLING

A. Handle material so as to prevent its injury or damage.

B. Store materials on skids or in crates above ground and keep clean, properly drained, and protected from elements causing corrosion.

### PART 2—PRODUCTS

#### 2.1 PIPE

A. Materials - PVC plastic shall conform to ASTM D1784, Standard Specifications for Rigid

- Polyvinyl Chloride Compounds and Chlorinated Polyvinyl Chloride Compounds - for Cell Classification 12454-B (Type I, Grade I). Pipe to be PVC 1120 as manufactured by Johns Manville, CertainTeed, PW Eagle, or an equal approved in writing. Only bell joint single gasket pipe will be allowed; no twin gasket collar type joints will be allowed.
- B. Classification - PVC pipe shall conform to ASTM D2241 Standard Specification for PVC Plastic Pipe - for the Standard Dimension Ratio (SDR) and Pressure Rating (PR) as indicated for pipe size. PVC pipe shall conform to SDR 21 (PR 200) or SDR 26 (PR 160).
  - C. Marking - Manufacturer's name (or Trademark) and code. It shall also include the seal of approval (or "NSF" mark) of the National Sanitation Foundation spaced at intervals specified by the laboratory for pipe intended for transporting potable water.
  - D. Bell Joint
    - 1. PVC plastic pipe shall have bell type joints for 2-inch and larger pipe. Solvent type joints may be used for smaller pipes provided expansion joints are installed at 100-foot spacing.
    - 2. The wall thickness of the bell meets appropriate commercial standards for the pipe type and size.
    - 3. The belled end must be symmetrical about the centerline axis of the pipe.

## 2.2 FITTINGS

- A. Larger than two-inch diameter pipe - Fittings to be ductile iron or cast iron conforming to the requirements of AWWA C110 / C153 and American National Standards Institute (ANSI) specifications ANSI A21.10 / A21.53. Fittings to be flanged or mechanical joint.
- B. Two-inch diameter and smaller pipe solvent welded or rubber gasket bell joint. PVC fittings are permitted.

## PART 3—EXECUTION

### 3.1 PIPE INSTALLATION

- A. Water and Sanitary Sewer Clearance
  - 1. Meet requirements of Section 290.44(e) of "Rules and Regulations for Public Water Systems" by Texas Commission on Environmental Quality
  - 2. Parallel Lines - Maintain 10' clearance between new lines.
  - 3. Crossing Lines - Refer to Section 290.44(e).
- B. Trenching - Refer to Section entitled "TRENCHING".
- C. Cover - Provide 30 inch minimum cover unless noted.
- D. Trench Width - Nominal pipe size plus 8 inches minimum and 16 inches maximum.
- E. Trench Safety - Provide trench safety system in accordance with Occupational Safety and Health Administration (OSHA) Publication OSHA 2226 (Latest Revision) where excavation exceeds five (5) feet depth.
- F. Bedding - Prepare trench bottom to be smooth and free from stones greater than 1/2" diameter, large dirt clods, and any frozen material. Generally, loose material left by the excavator on the trench bottom will be adequate for bedding the pipe barrel so that it is fully supported. Where the excavator cuts a very clean bottom, soft material can be

shaved down from the sidewalls to provide needed bedding. If the trench bottom is rocky or hard, as in shale, place a 4" layer of selected backfill material to provide a cushion for the pipe.

G. Bell Joint Pipe Assembly

1. Make certain that the ring groove in the bell is clean, with no dirt or foreign material that could interfere with proper seating of the ring.
2. Set rubber rings in proper position in bell end as recommended by pipe manufacturer.
3. Clean spigot end with a clean dry cloth from end to one inch beyond reference mark.
4. Lubricate the spigot end using only the manufacturer's lubricant supplied. Cover the entire circumference. Apply in accordance with the manufacturer's recommendations. Do not lubricate the rubber ring or the ring groove in the bell because such lubrication could cause ring displacement.
5. Insert the bevel end into the bell so that it is in contact with the ring. Hold the pipe lengths being joined close to the ground to keep the lengths in proper alignment. Brace the bell while the bevel end is pushed in under the ring, so that previously completed joints in the line will not be closed up. Push the spigot end in until the reference mark on the spigot end is flush with the end of the bell.

H. Solvent Weld Joint Pipe Assembly - Apply solvent cement in accordance with the manufacturer's recommendation. Apply lightly to the inside of the fitting and somewhat more generously to the outside of the pipe. Joint shall be made before the solvent dries. Pipe should be stabbed into fitting and given a quarter turn. Additional twisting may weaken the joint. If sufficient cement has been used, a small bead will form between the pipe and the shoulder of the fitting. Remove excess solvent with a cloth. After assembly, the joint shall not be moved until the cement weld has set up.

I. Fitting Assembly - Assemble fittings so that no strain is placed on the pipe during or after the backfill operation.

J. Insulation for Exposed Piping - Insulate exposed piping with one-inch thick fiberglass insulating material and wrapped with aluminum wrapping. The aluminum wrapping shall be fastened with suitable fasteners.

K. Plugging Pipe - Plug pipe at end of construction each day to prevent entrance of debris and unnecessary objects into pipe.

### 3.2 DISINFECTION

Before acceptance for domestic use each section of pipe is to be disinfected (sterilized) in accordance with "DISINFECTION OF WATERLINES."

### 3.3 HYDROSTATIC TESTING

A. General - A hydrostatic test is to establish that the leakage of the pipe including all joints, fittings and other appurtenances is within the applicable leakage allowance. Notify Engineer and Owner 24 hours in advance of any testing. Owner's representative (inspector) must be present during test.

B. Procedure

1. Conduct test after section of line is completed with valves, fittings and service lines and prior to installation of meters. Lines to be backfilled prior to testing.
2. Provide air relief valves in section of line to exhaust trapped air in the test section.
3. Fill pipe with water until air is exhausted.
4. Raise pressure to test pressure of pipe by means of pumping from a container.
5. Refill container and maintain pressure for a duration of test.
6. Measure water required to refill container to pre-test level.

C. Test Pressure

1. The greater of 100 psi, or 1.5 times the system operating pressure.
2. Do not exceed 1.2 times the pipe pressure rating at the lowest point of test section.

D. Duration of Test

1. Minimum of four (4) hours.
2. Continue test for a total of twelve (12) hours if leakage during first four (4) hours exceeds 75 percent of allowable leakage rate.

E. Allowable Leakage - as determined by the following formula.

$$L = 0.000135 ND (P)^{1/2}$$

L = Leakage Allowable (gal./hr.)

N = No. of pipe joints in test section

D = Nominal diameter of pipe (inches)

P = Test Pressure (psi)

F. Record of Test

Pressure test forms will be furnished by the Engineer to record the following test data and results.

1. Date of test.
2. Name of persons in attendance.
3. Pipe size and length.
4. Brand names of pipe and pressure rating.
5. Beginning and Ending times of test.
6. Test Pressure.
7. Actual and Allowable leakage.
8. Number of leaks found during testing.
9. Remarks.
10. Signature of inspector and contractor.

### 3.4 ADJUSTMENT AND CLEANING

Remove excess material and debris after completion of work.

**END OF SECTION**

## **SECTION 33 40 01**

### **STORM DRAINAGE SYSTEMS**

#### **PART 1 - GENERAL**

##### **1.1 DESCRIPTION**

- A. This Specification includes the general description of the Storm Drainage System and the components included in that system.
- B. This is a general specification which applies to the furnishing of all plant, labor, equipment, appliances and materials and in performing all operations in connection with the construction of storm drainage systems, together with the inlets, storm drain manholes, headwalls, safety end treatments, cleanout structures and other incidentals, in accordance with the plans and these specifications.

##### **1.2 MEASUREMENT AND PAYMENT**

Payment shall be made at the price bid per unit item for furnishing and installing pipe, which bid price will include all costs for the complete pipe installation, including trenching and backfill, embedment, compaction or tamping, testing, final cleanup, and all other work not otherwise provided for in the Proposal.

- A. Pipe - Payments will be made at the price bid per foot for furnishing and installing pipe, which bid price will include all costs for the complete pipe installation, including line fittings, trenching, and backfill, embedment, compaction or tamping, and all other work not otherwise provided for in bid proposal. Pipe will be measured (by horizontal distance) from the inside face of the inlet or junction box or end of pipe without adjustment for the slope of the pipe. The length of the inlet or junction box shall not constitute a payable quantity.
- B. Manholes/Junction Boxes - Payment will be made at the unit price bid per each for manhole. Manholes will be measured per each.
- C. Inlets - Payment will be made at the unit price bid per each for inlet by length and type. Inlets will be measured per each.
- D. Headwalls - Payment will be made at the unit price bid per each for headwall by type. Headwalls will be measured per each.
- E. Rock Rubble Rip Rap - Rock Rubble Rip Rap shall be measured by area as provided for in the bid proposal form.
- F. Channel Grading - Channel Grading shall be measured by area as provided for in the bid proposal form.

##### **1.3 SUBMITTALS**

- A. All submittal requirements are listed with the material specifications.

#### **PART 2 – PRODUCTS**

## 2.1 MATERIALS

- A. See: SECTION 31 78 00 - PIPE BORING, JACKING AND TUNNELING; SECTION 31 23 33 - EXCAVATING, TRENCHING, AND BACKFILLING; SECTION 03 30 00 - CONCRETE; SECTION 33 40 02 - REINFORCED CONCRETE PIPE; SECTION 33 40 03 - STANDARD STORM SEWER INLETS; SECTION 33 40 05 - REINFORCED CONCRETE HEADWALLS; SECTION 33 42 16 - PRECAST BOX CULVERTS; SECTION 33 40 04 - REINFORCED CONCRETE RIPRAP; HDPE Storm Drain Pipe (to be specified by design engineer)

## 2.2 TESTING REQUIREMENTS

- A. T.V. Camera Inspection shall be performed on all installed underground storm drain conduits longer than 20 feet before acceptance. When the Contractor performs the inspection, the City Engineer or his representative shall be notified one working day prior so that he can view the procedure. The inspection shall be in digital video format, saved to a DVD or CD (enclosed within a protective case) and shall be given to the City Engineer or his representative for review and final records.

Conduit shall be cleaned prior to T.V. inspection. All dirt/debris in the line which could cover a defect shall be removed. Jetting of the lines in conjunction with the T.V. Inspection is prohibited. If the line to be televised is discovered to contain foreign material, which prohibits an acceptable T.V. inspection, the line shall be cleaned and televised again.

Select and use closed circuit television equipment that will produce a color digital video that clearly shows pipe and joints, and shall be a self-propelled tractor-type system. Produce and use closed circuit television equipment using a panorama tilt, radial viewing, pipe inspection camera that pans plus and minus 75 degrees, rotates 360 degrees, and has optical zoom from 6 or less inches to infinity. The camera must have an accurate footage counter accurate to within 1 foot per 500 foot of pipe. Footage shall be continuously displayed on the video at all times. The camera operator shall stop at each junction box and complete a 360 degree view of the junction box slow enough to identify all defects. Glare shall be avoided and shall not interfere with viewing the pipe segment. Maximum rate of travel for the camera shall be 30 feet per minute. DVDs or CDs shall be continuous between manholes. Provide DVDs or CDs with labels indicating project number, segment number, date televised, date submitted, starting manhole number, ending manhole number, pipe diameter, pipe length and street name.

The T.V. inspection shall be used to identify defective construction such as sags, debris, separated joints, etc. The City Engineer shall make all final determinations if the severity of the defect constitutes failure and subsequent removal of the segment in question.

## PART 3 – EXECUTION

### 3.1 GENERAL

Construction methods for each material are specified in the material specifications.

- A. Minimum Cover - The minimum cover for class III storm drain pipe (12" through 60") (See SECTION 33 40 02 – REINFORCED CONCRETE PIPE) shall be two feet (2') in areas subject to vehicular loads and one foot in non-vehicular areas as measured from the outside top of pipe vertically to finished ground or pavement surface elevation.

**END OF SECTION**

## **SECTION 33 40 02**

### **REINFORCED CONCRETE PIPE**

#### **PART 1 - GENERAL**

##### 1.1 DESCRIPTION

- A. This item includes the furnishing of labor, materials, equipment, and supervision in the operations required in the laying and jointing of reinforced concrete pipe.

##### 1.2 MEASUREMENT AND PAYMENT

- A. Measurement shall be made based upon the length of pipe as laid in the field. Length of inlets and junction boxes are not included in this measurement. Pipe shall be paid for at the unit price bid in the Proposal for each size and type of pipe, which price shall be full compensation for trenching and backfilling, furnishing and laying the pipe, and furnishing all equipment, labor, materials, tools and incidentals necessary to complete the work.

##### 1.3 SUBMITTALS

- A. Submit certification from independent testing laboratory at manufacturer expense that the pipe meets the requirements of ASTM C76/C76M & ASTM C497/C497M.

#### **PART 2 – PRODUCTS**

##### 2.1 MATERIALS

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

##### **AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)**

- ASTM C76 Standard Specification for Reinforced Concrete Culvert Storm Drain and Sewer Pipe (Latest Revision)
- ASTM C443 Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Latest Revision)

##### A. Reinforced Concrete Pipe

- 1. Reinforced concrete pipe to meet the requirements of ASTM C76. The pipe shall be Class III unless otherwise shown on PLANS.
- 2. Joint reinforced for rubber gasket joints to meet the requirements of paragraph 8 of ASTM C76.
- 3. Joints shall be rubber gasket per ASTM C443 unless otherwise shown on PLANS. Lubricant materials for installation purposes to be per manufacturers recommendations. Mineral lubricants are not to be used.
- 4. Pipe coating requirements are shown on PLANS if required.

##### 2.2 TESTING REQUIREMENTS

Testing methods for the reinforced concrete pipe shall conform to the latest revision of ASTM C497 (Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile).

REJECTION: The pipe may be rejected for having defects or failure to meet requirements as follows:

- A. Variations in any dimension exceeding the permissible variations prescribed.
- B. A piece broke out of the bell or spigot end of such size that the water-tightness of the joint would be impaired.
- C. Any shattering or flaking of concrete or other conditions indicating an improper concrete mix.
- D. Lack of uniformity in placement of steel which might preclude all joints being typical of those tested.
- E. Cracks sufficient to impair the strength, durability or serviceability of the pipe.

### **PART 3 – EXECUTION**

#### 3.1 Delivery, Storage, and Handling

- A. Shipment of pipe to be in accordance with the manufacturer's recommendations. Pipe to be unloaded and store in a location where pipe will be protected from damage.

#### 3.2 Trench/Backfill

- A. Pipe trench excavation and backfill to be in accordance with Section 31 23 33 - Excavating, Trenching, and Backfilling and/or as shown on Plans or as directed by the City Engineer.

#### 3.3 Jointing of Pipe

- A. Lay pipe sections in trench to true alignment and grade. Take exceptional care in placing pipe and making field joints. Avoid bumping of pipe in trench.
- B. Properly lubricate groove end of pipe and rubber gasket with lubricant. Stretch gasket over the spigot end of the pipe. Gasket shall be "equalized" by placing a screwdriver between the gasket and spigot and run around the full joint circumference. Do not twist, roll, cut, crimp or otherwise injure gaskets or force out of position during closure of joints.
- C. Pull or push "home" pipe for closure of the joint. Correct joint rebound before backfilling of pipe.
- D. Remove foreign matter or dirt from pipe, and keep clean during and after laying.
- E. Any damages in pipe installation or prior to final acceptance is to be repaired or replaced in accordance with ASTM C76 at no additional cost to the City.
- F. Failure to conform to any of the specifications herein set forth or referenced.
- G. Failure of pipe to go completely "home" due to binding of spigot against bell.

**END OF SECTION**

## SECTION 33 44 00

### STORM UTILITY DRAINAGE PIPING

#### PART 1 – GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Storm drainage piping.
2. Accessories.
3. Underground pipe markers.
4. Catch basins and plant area drains.
5. Cleanouts.
6. Bedding and cover materials.

###### B. Related Sections:

1. Section 02221 - Trenching: Execution requirements for trenching required by this section.
2. Section 03300 - Cast-in-Place Concrete: Concrete type for [catch basin] [cleanout] base pad construction.

##### 1.2 REFERENCES

###### A. ASTM International:

1. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
2. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
4. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
5. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
6. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

##### 1.3 SUBMITTALS

- ###### A. See Section 01001: Basic Requirements for requirements for submittals.

##### 1.4 CLOSEOUT SUBMITTALS

- ###### A. Refer to: Section 01700 – Project Closeout: Requirements for submittals.

#### PART 2 – PRODUCTS

## 2.1 STORM DRAINAGE PIPING

- A. Reinforced Concrete Pipe: ASTM C76 Class I with Wall Type B; bell and spigot ends
  - 1. Fittings: Reinforced concrete.
  - 2. Joints: ASTM C443, rubber compression gasket.
- B. Plastic Pipe: ASTM D3034, SDR 26, Poly (Vinyl Chloride) (PVC) material; bell and spigot style rubber ring sealed gasket joint.
  - 1. Fittings: PVC.
  - 2. Joints: ASTM F477, elastomeric gaskets.
- C. Corrugated Steel Pipe:
  - 1. Fittings: Corrugated steel.
  - 2. Joints: Corrugated steel pipe coupling bands, galvanized steel, 0.052 inches thick x 10 inches wide; connected with two neoprene "O" ring gaskets and two galvanized steel bolts.

## 2.2 ACCESSORIES

- A. Filter Fabric: Non-biodegradable, woven
- B. Grout: Specified in Section 03300.

## 2.3 CATCH BASINS AND PLANT AREA DRAINS

- A. Catch Basin Lid and Frame Manufacturers:
  - 1. Hanson.
  - 2. Park-Environmental
  - 3. As approved by Engineer
- B. Catch Basin Lid and Frame:
  - 1. Construction: Cast iron construction.
  - 2. Nominal Lid and Frame Size: Noted on Drawings.

## 2.4 BEDDING AND COVER MATERIALS

- A. Bedding, Cover and Backfill: as specified in Section 02221

## **PART 3 – EXECUTION**

### 3.1 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with coarse aggregate.
- B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

### 3.2 BEDDING

- A. Excavate pipe trench in accordance with Section 02221 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 8 inches loose depth.
- C. Maintain optimum moisture content of bedding material to attain required compaction density.

### 3.3 INSTALLATION – PIPE

- A. Install pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints watertight.
- B. Lay pipe to slope gradients noted on drawings

### 3.4 INSTALLATION - CATCH BASINS AND CLEANOUTS

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place Cast-In-Place Concrete base pad, with provision for storm sewer pipe end sections.
- C. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.
- D. Establish elevations and pipe inverts for inlets and outlets as indicated on Drawings.
- E. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

### 3.5 FIELD QUALITY CONTROL

- A. Compaction Testing: In accordance with ASTM D698.
- B. When tests indicate work does not meet specified requirements, remove work, replace and retest.

### 3.6 PROTECTION OF FINISHED WORK

- A. Section 01700 – Project Closeout: Protecting finished Work.
- B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
  - 1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
  - 2. Repair or replace pipe that is damaged or displaced from construction operations.

**END OF SECTION**