August 7, 2023
AVO 37449.004

Ms. Ramie Hammonds
Development Services Director/Building Official
City of Sanger
201 Bolivar Street
P.O. Box 1729
Sanger, Texas 76266

Re: **Bentley Addition Drainage Study/Downstream Assessment -Review #1**

Dear Ms. Hammonds,

Halff Associates, Inc. was requested by the City of Sanger to review the drainage study in support of the engineering plans for the Bentley Addition located near the intersection of FM 2450 and FM 455 W. The subject tract is located within the City of Sanger's ETJ. The submittal was prepared by Triangle Engineering LLC and dated June 21, 2023.

Rules and Regulation citations have been provided in this letter. Our preliminary comments are as follows:

General Comments

1. Please address comments on attached markups and provide annotated responses on markups. Please note, not all comments are written on letter since some comments are easier to show and explain on the markups. Please annotate markup with responses.
2. Please address construction plans comments provided separately. Please note, an accepted drainage study is required prior to plans acceptance.

Hydrology and Hydraulics

1. Please note a Downstream Assessment will be needed to verify no negative impacts for the Hydrology.
2. Please note an Environmental Assessment will be needed on the existing channel to determine existing impact on wetlands.
3. Existing and proposed ditches and channels will need to be analyzed using a computation model. HEC-RAS is recommended. For specific requirements, refer to Denton County Subdivision Rules and Regulations –> Section VIII Engineering Plans –> IV. Drainage Design.
4. Channel improvement shall conform to Denton County Subdivision Rules and Regulations, or City of Sanger Code of Ordinances 10.106(d)(9), whichever is more restrictive. Please review, revise, and provide channel design information.
5. The Drainage Area Maps (between Sheet C-4.0 and C-5.0) were for FM Hwy 2450 hydraulic calculation's purpose. Please include extra offsite drainage area per mark-ups on Sheet C-5.0.
6. The hydrologic parameters shall be consistent with Denton County Subdivision Rules and Regulations IV.1.2 Rational Method. Please review and revise.

7. Please include calculations for the existing time of Concentration (Tc). If proposed Tc uses the minimum Tc, no calculations are needed, but please specify.
8. Please note 10-year storm calculations shall be included for closed storm sewer systems per City of Sanger Code of Ordinances 10.106(d)(3). Please add it to your calculations/analysis.

The Engineer shall revise the hydrologic study and/or plans in accordance with the above comments and/or provide a written response that addresses each comment. If you have any questions or need additional information, please do not hesitate to call me at (214) 937-3921.

Sincerely,
HALFF
TBPELS Firm No. 312

Yangbin Tong, CFM
Project Manager

Parker C Moore, PE, CFM
Project Manager

Attachments:

- Plans markups

SITE DEVELOPMENT PLANS

FOR

DOLLAR GENERAL

NE QUADRANT OF FM 2450 & CHAPMAN ROAD
CITY OF SANGER ETJ
DENTON COUNTY, TEXAS 76266
JAMES B.P. JANUARY SURVEY ABSTRACT NO # 658
1.064 ACRES

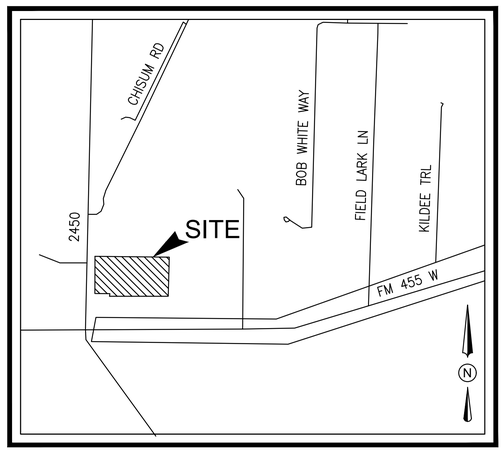
BENCHMARKS
SITE BENCH MARK IS A MAG NAIL WITH A WASHER STAMPED "JPH LAND BENCHMARK" SET IN A CONCRETE SLAB IN THE NORTHEAST CORNER OF THE INTERSECTION OF F.M.HIGHWAY 455 AND F.M.HIGHWAY 2450.BENCHMARK ELEVATION=677.33' . SEE SURVEY FOR GENERAL LOCATION.

PROJECT CONTACT LIST	
ENGINEER TRIANGLE ENGINEERING LLC 1782 McDERMOTT DR ALLEN, TX. 75013 KARTAVYA PATEL 214-609-9271	OWNER/DEVELOPER VAQUERO DG FM 2450 PARTNERS, LP 2627 TILLAR ST, STE 111 FORT WORTH, TX 76107 KELLY AGNOR 512-983-1793
SURVEYOR JPH LAND SURVEYING,INC 785 LONESOME DOVE TRAIL, HURST, TX 76054 JEWEL CHADD 817-431-4971	ARCHITECT FRANZ ARCHITECTS 4055 INTERNATIONAL PLAZA, STE 100 FORT WORTH, TX 76109 AVI KAIKOV 817-632-0079

FLOOD PLAIN NOTE
THIS PROPERTY LIES WITHIN ZONE(S) X (UNSHADED) OF THE FLOOD INSURANCE RATE MAP FOR DENTON COUNTY, TEXAS AND INCORPORATED AREAS, MAP NO.48121C0205G, DATED 2011/04/18, VIA SCALED MAP LOCATION AND GRAPHIC PLOTTING AND/OR THE NATIONAL FLOOD HAZARD LAYER (NFHL) WEB MAP SERVICE (WMS) AT http://hazards.fema.gov.

TXDOT GENERAL NOTES

1. "ALL CONSTRUCTION WITHIN THE STATE RIGHT OF WAY WILL REQUIRE COMPLIANCE TO TxDOT STANDARD SPECIFICATIONS, STANDARD PLANS, AND TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES"
2. BY SEALING AND SIGNING THERE PERMIT PLANS AS A PROFESSIONAL CIVIL ENGINEER LICENSED TO PRACTICE IN THE STATE OF TEXAS , I CERTIFY THAT THE PROPOSED DRIVEWAY OR PUBLIC STREET CONNECTIONS TO THE STATE ROADWAY MEETS OR EXCEEDS THE MINIMUM STOPPING SIGHT DISTANCE REQUIRED FOR A DESIGN SPEED OR 55 MILES PER HOUR, BASED ON THE MOST RECENT ON-LINE TXDOT ROADWAY DESIGN MANUAL REQUIREMENT.
3. POSTED SPEED LIMIT IS 40 MILES PER HOUR
4. "SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014, AND SPECIFICATION ITEMS LISTED AS FOLLOWS SHALL GOVERN ON THIS PROJECT FOR ALL WORK WITHIN THE STATE RIGHT OF WAY"
5. TRAFFIC CONTROL MUST BE MAINTAINED THROUGHOUT THE DURATION OF WORK WITHIN TXDOT ROW
6. ALL DISTRIBUTED ROW MUST BE RE-VEGETATED WITH SOD AND MAINTAINED UNTIL VEGETATION IS RE-ESTABLISHED.
7. ALL LANE ENCLOSURE MUST BE COORDINATED WITH BOTH TXDOT AND MUNICIPALITY INSPECTORS.
8. NO CONSTRUCTION SHALL BE PERMITTED WITHIN TEXAS DEPARTMENT OF TRANSPORTATION(TXDOT) RIGHT OF WAY PRIOR TO TXDOT APPROVAL AND ISSUANCE OF PERMIT.
9. ANY UTILITY RELOCATION UNDER TXDOT ROW , REQUIRED SEPERATE "UIR" PERMIT.



VICINITY MAP
N.T.S.

SHEET LIST TABLE	
C-1.0	COVER SHEET
	SURVEY
C-1.1	GENERAL NOTES
C-2.0	DEMOLITION PLAN
C-3.0	SITE PLAN
C-3.1	SITE DETAILS
C-3.2	DIMENSION CONTROL PLAN
C-4.0	GRADING PLAN
	DRAINAGE AREA MAP(TXDOT AS BUILT)
	24" PIPE CULVERT DATA (TXDOT AS BUILT)
C-5.0	PRE-DRAINAGE PLAN
C-6.0	POST-DRAINAGE PLAN
C-7.0	EROSION CONTROL PLAN
C-7.1	EROSION CONTROL DETAILS
C-8.0	PAVING PLAN
C-8.1	PAVING DETAILS
C-9.0	UTILITY PLAN
C-9.1	UTILITY DETAILS
	TXDOT DETAILS
L.1	LANDSCAPE PLAN
L.2	LANDSCAPE DETAILS
L.3	IRRIGATION PLAN
L.4	IRRIGATION DETAILS

811 Know what's **below.** **Call** before you dig.

NO.	DATE	DESCRIPTION	BY
1	06-08-23	1st CITY SUBMITTAL	AP
2	06-21-23	REVISED PER CLIENT COMMENT	AP
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STATE OF TEXAS
KARTAVYA S. PATEL
97534
LICENSED PROFESSIONAL ENGINEER
06/21/2023

COVER SHEET

DOLLAR GENERAL

NE QUADRANT OF FM 2450 & CHAPMAN ROAD

CITY OF SANGER ETJ

DENTON COUNTY, TEXAS 76266

JAMES B.P. JANUARY SURVEY ABSTRACT NO # 658

TRIANGLE ENGINEERING LLC
T: 469.331.8566 | F: 469.213.7145 | E: info@triangle-engr.com
W: triangle-engr.com | O: 1784 McDermott Drive, Suite 110, Allen, TX 75013
Planning | Civil Engineering | Construction Management

P.E.	DES.	DATE	SCALE	PROJECT NO.	SHEET NO.
KP	AP	06-02-23	SEE SCALE BAR	050-23	C-1.0

TX. P.E. FIRM #11525

Field:AT
Drafter:ML-DFW6203
Revision:
Revision:

LEGEND OF SYMBOLS

- air conditioner
- borehole
- CATV cable tv
- EM electric meter
- fence or handrail
- FDC fire dept. connection
- FH fire hydrant
- FIRE LANE fire lane
- guard rail
- GR grease trap
- GP bollard
- GI grate inlet
- GM gas meter
- GAS gas line
- GUY utility pole anchor
- IR irrigation valve
- landscape or tree line
- LEB landscape electric box
- LSL landscape light
- LP light pole
- MB mailbox
- MW monitoring well
- OU overhead utility lines
- PE pool equipment
- road sign
- RD roof drain
- silt fence
- 356.7' spot elevation
- SSMH sanitary sewer manhole
- sanitary sewer pipe
- SDMH storm water manhole
- storm water pipe
- TMH telephone manhole
- TFL tank fill lid
- TR telephone riser
- traffic signal pole
- UMH unknown manhole
- UCO utility clean out
- UC utility cabinet
- UV utility vault
- UP utility pole
- UP/UG-S utility pole with riser
- utility sign
- WS water shutoff
- WV water valve
- water manhole
- WM water meter
- well
- water line
- one-foot contour lines
- tree trunk (with canopy)
- caliper inches at breast height
- ornamental tree
- (M) multiple trunks
- Google 360 Hyperlink

NOTE - Some items may not pertain to this survey. The identification is subject to interpretation, verification may be required.

UTILITY WARNING

Regarding Table A items 11(a) & 11(b), unless otherwise stated, the client or client's representative did not provide JPH with plans and/or reports, and JPH did not coordinate a private utility locate request. If these Table A items are listed in the certification, the client, being aware of the factors listed above, has agreed for these Table A item(s) to be addressed from a combination of online GIS maps, markings from locate request(s) to municipalities and 811 and observed evidence of utilities. The client is aware locate requests to 811 and the like, may be ignored or result in an incomplete response, in which case utilities may not have been marked, or not completely marked, at the time the fieldwork was performed. Therefore, utilities may exist which are not shown on this survey. Lacking excavation and/or a private utility locate request, the exact location of underground features cannot be accurately, completely, and reliably depicted.

FLOOD ZONE CLASSIFICATION

This property lies within ZONE(S) X (UNSHADED) of the Flood Insurance Rate Map for Denton County, Texas and Incorporated Areas, map no. 48121C0205G, dated 2011/04/18, via scaled map location and graphic plotting and/or the National Flood Hazard Layer (NFHL) Web Map Service (WMS) at http://hazards.fema.gov.

MONUMENTS / DATUMS / BEARING BASIS

Monuments are found if not marked MNS or CRS.

- CRS 1/2" rebar stamped "JPH Land Surveying" set
- MNS Mag nail & washer stamped "JPH Land Surveying" set
- TBM Site benchmark (see vicinity map for general location)
- "+" "+" cut in concrete
- Vertex or common point (not a monument)

Coordinate values, if shown, are US.SyFt./TxCS,'83,NCZ
Elevations, if shown, are NAVD'88 (Geoid 18)
Bearings are based on the TxCS,'83,NCZ
Distances & areas shown are represented in surface values

- TYPE I TxDOT Right of Way tapered concrete monument.
- TYPE II TxDOT Right of Way bronze cap in concrete.
- TYPE III TxDOT Right of Way aluminum cap.

LEGEND OF ABBREVIATIONS

US.SyFt.	United States Survey Feet
TxCS,'83,NCZ	Texas Coordinate System of 1983, North Central Zone
NAVD'88	North American Vertical Datum of 1988
P.R.D.C.T.	Plat Records of Denton County, Texas
O.P.R.D.C.T.	Official Public Records of Denton County, Texas
D.R.D.C.T.	Deed Records of Denton County, Texas
VOL/PG/INST#	Volume/Page/Instrument Number
POB/POC	Point of Beginning/Point of Commencing
ESMT/BL	Easement/Building Line
PVC/RCP	Polyvinyl Chloride Pipe/Reinforced Concrete Pipe

TEXAS811 MARKED UTILITY LEGEND

- ELECTRIC
- ELECTRICGAS-OIL-STEAM
- COMMUNICATION-CATV
- WATER
- SEWER

NOTE REGARDING UTILITIES:

Utility locations are per observed evidence and sources listed below:
TEXAS811 - ticket number(s) 2351205691.
https://portal.texas811.org/#/ticket/2351205691
UTILITY MAPS - Provided by Katy Hall, Customer Service Representative (Katy@bolivarwaterse.com)

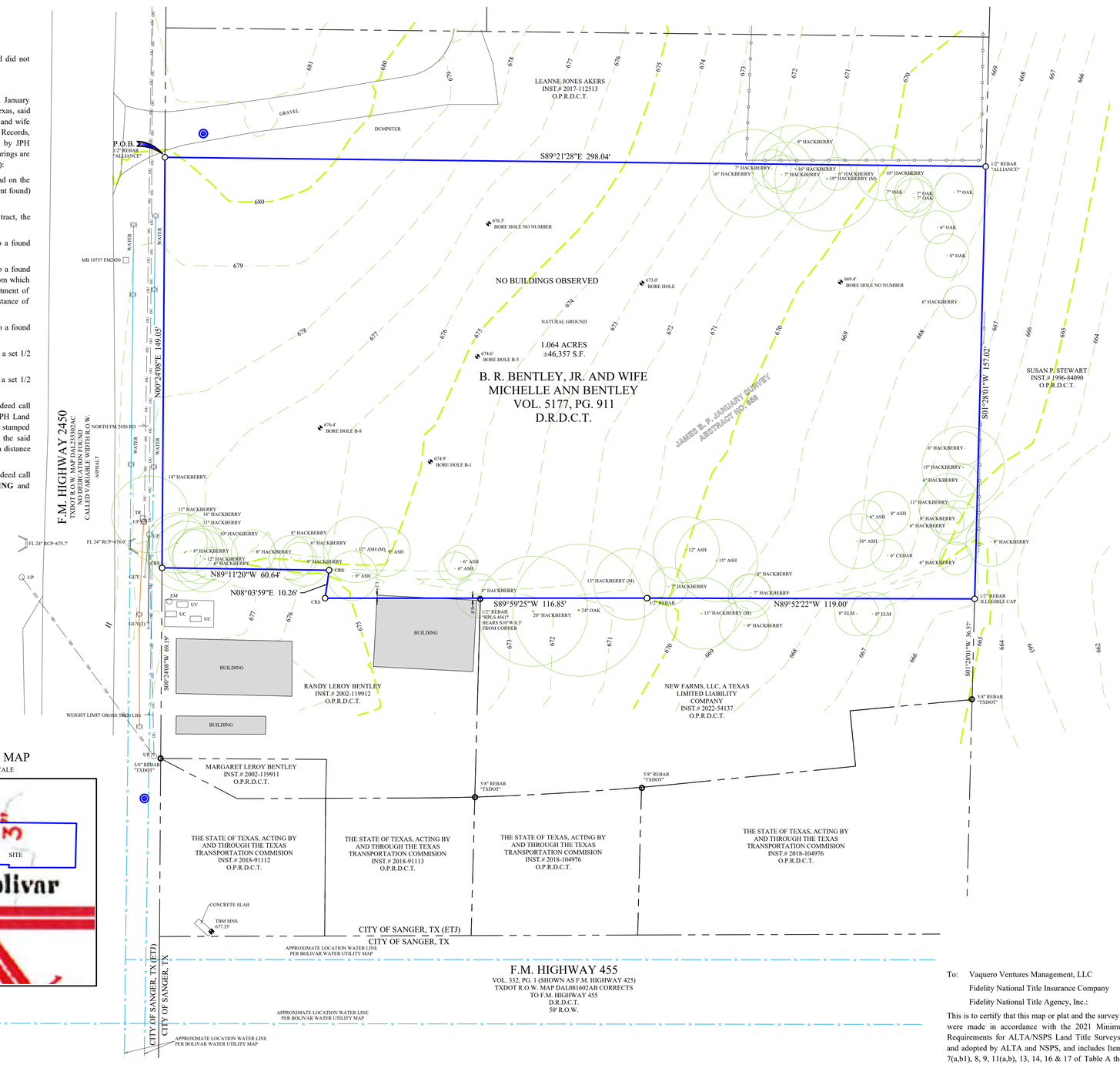
SURVEYED DESCRIPTION: Written because the recorded deed did not close by 1.7 feet.

FIELD NOTES to that certain tract situated in the James B. P. January Survey, Abstract No. 658, City of Sanger ETJ, Denton County, Texas, said tract being the same tract described in the deed to B. R. Bentley, and wife Michelle Ann Bentley, recorded in Volume 5177, Page 911, Deed Records, Denton County, Texas (D.R.D.C.T.); the subject tract, surveyed by JPH Land Surveying, Inc., is more particularly described as follows (bearings are based on the Texas Coordinate System of 1983, North Central Zone):

BEGINNING at a 1/2 inch capped rebar stamped "Alliance" found on the monumented east line of FM Highway 2450 (no dedicating document found) at the northwest corner of said Bentley tract;

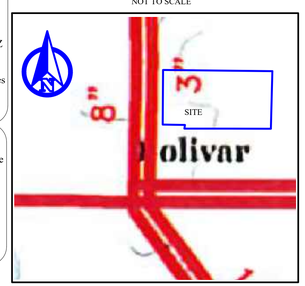
THENCE with the perimeter and to the corners of the Bentley tract, the following calls:

1. SOUTH 89°21'28" EAST, a distance of 298.04 feet to a found 1/2 inch capped rebar stamped "Alliance";
2. SOUTH 01°28'01" WEST, a distance of 157.02 feet to a found 1/2 inch capped rebar stamped with an illegible cap, from which a found 5/8 inch capped rebar stamped "Texas Department of Transportation" bears SOUTH 01°28'01" WEST a distance of 36.57 feet;
3. NORTH 89°52'22" WEST, a distance of 119.00 feet to a found 1/2 inch capped rebar;
4. SOUTH 89°59'25" WEST, a distance of 116.85 feet to a set 1/2 inch capped rebar stamped "JPH Land Surveying";
5. NORTH 08°03'59" EAST, a distance of 10.26 feet to a set 1/2 inch capped rebar stamped "JPH Land Surveying";
6. NORTH 89°11'20" WEST, a distance of 60.64 feet (deed call 60.00 feet) to a set 1/2 inch capped rebar stamped "JPH Land Surveying", from which a found 5/8 inch capped rebar stamped "Texas Department of Transportation" monumenting the said east line of FM 2450 bears SOUTH 00°24'08" WEST a distance of 69.19 feet;
7. NORTH 00°24'08" EAST, a distance of 149.05 feet (deed call 149.95 feet) returning to the **POINT OF BEGINNING** and enclosing 1.064 acres (± 46,357 square feet).



UTILITY MAP

NOT TO SCALE



JPH Land Surveying, Inc.

0 20' 40'
Scale: 1" = 20'

JPH Job/Drawing No. (see below)
2023.022.001 FM 2450 Sanger, Denton Co., Tx - ALTA.dwg

785 Lonesome Dove Trail, Hurst, Texas 76054
Telephone (817) 431-4971 www.jphlandsurveying.com
TBPELS Firm #10019500
DFW | Central Texas | West Texas | Houston

CLICK FOR PICS

DOCS

TITLE COMMITMENT NOTES:

This survey was performed with the benefit of a title commitment provided by Fidelity National Title Insurance Company, GF# FT-44122-9001222202680-TW, Commitment # 9001222202680, effective August 29, 2022, and issued September 8, 2022. Complete copies of the record description of the property, any record easements benefiting the property, the record easements or servitudes and covenants affecting the property ("Record Documents"), documents of record referred to in the Record Documents, and any other documents containing desired appropriate information affecting the property being surveyed and to which the survey shall make reference were not provided to this surveyor for notation on the survey **except for those items listed within Schedule B of said commitment**. Therefore, easements, agreements, or other documents, either recorded, or unrecorded may exist that affect the subject property that are not shown on this survey.

The following Schedule B items were addressed according to the Minimum Standard Detail Requirements for ALTA/NSPS Land Title Surveys Section 6(c)ii and identified by the tract designator listed in the title commitment.

			If more than one tract is being addressed, the chart below will use the tract designators used in the title commitment.								
Schedule B Exception #	Recording Information (may include grantee and exception type)	Label Grid Location (see edge of sheet for grid values)	its location is shown	lies within, crosses, or touches the indicated tract	it is not on, does not touch, and/or closest on its land description - based on its land description indicated tract	it is a blanket	its location could not be determined from the record	there was no observed evidence at the time of the fieldwork	it limits access to an otherwise abutting right of way	documents are illegible	may have been released or otherwise terminated
10.f	Oil, Gas and Mineral Lease Vol. 355, Pg. 201, D.R.D.C.T.			X		X					
10.g*	Right-of-way Easement for Oil & Gas Transmission Vol. 386, Pg. 339, D.R.D.C.T.					X	X	X			
10.h	Oil, Gas and Mineral Lease Vol. 595, Pg. 484, D.R.D.C.T.			X		X					
10.i*	Right-of-way Easement for a Water Line Vol. 639, Pg. 558, D.R.D.C.T.			X			X	X			

10.g*: Document does not describe a specific location of oil/gas pipeline. Texas Railroad Commission GIS (https://gis.rrc.texas.gov/GISViewer/) does not show a pipeline near subject property.
10.i*: Document does not describe a specific location of water line. Boliva Water utility map and water lines marked per Texas 8ll ticket indicate 2 lines within the right-of-way of F. M. Highway 2450.

SURVEYOR'S NOTES:

1. Parent tract's record description's error of closure, 1.68'.
2. Zoning District: No Zoning according to the Property Requirements Report provided by Zoning-Info, Inc., Zoning-info.com (817) 886-85964. Dated: February 8, 2023.
3. Site benchmark is a mag nail with a washer stamped "JPH BENCHMARK" set in a concrete slab in the northeast corner of the intersection of F. M. Highway 455 and F. M. Highway 2450. Benchmark Elevation = 677.33'. See vicinity map for general location.
4. No evidence of ongoing earth moving work, building construction, or building addition on site were observed in the process of conducting the fieldwork.
5. There are no visible marked parking spaces or fire lane striping within the limits of the surveyed property.
6. There are no visible evidence of physical access (e.g. curb cuts, driveways) to any abutting streets, highways, or other public or private ways.
7. The site lies on the east side of F. M. Highway 2450, approximately 200' north of the intersection of F. M. Highway 2450 and F. M. Highway 455.
8. No evidence of existing building(s) were observed in the process of conducting the fieldwork.
9. Texas Department of Transportation's Project Tracker lists F. M. Highway 2450 as "Construction begins within 4 years". Project id 235302026, with a description of Reconstruct Existing Roadway. No evidence of ongoing street or sidewalk construction or repairs were observed in the process of conducting the fieldwork.

ZONING REQUIREMENTS

NO ZONING

Zoning

Denton - Texas

NZR

Denton County only has zoning restrictions in place in the land areas immediately surrounding Lake Ray Roberts. All other areas of the ETJ are considered "No Zoning" and follow any local HOA bylaws and/or deed restrictions.

Allowed Uses/Parking

Bulk Requirements

Table 1: NZR Bulk Requirements Table

Requirement	Minimum	Maximum

To: Vaquero Ventures Management, LLC
Fidelity National Title Insurance Company
Fidelity National Title Agency, Inc.:

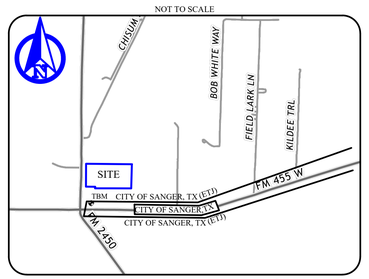
This is to certify that this map or plat and the survey on which it is based were made in accordance with the 2021 Minimum Standard Detail Requirements for ALTA/NSPS Land Title Surveys, jointly established and adopted by ALTA and NSPS, and includes Items 1, 2, 3, 4, 5, 6(a), 7(a,b1), 8, 9, 11(a,b), 13, 14, 16 & 17 of Table A thereof. The fieldwork was completed on February 10, 2023.

Jewel Chadd
Registered Professional
Land Surveyor No. 5754
jewel@jphls.com
February 20, 2023

STATE OF TEXAS REGISTERED JEWEL CHADD 5754 PROFESSIONAL LAND SURVEYOR

VICINITY MAP

NOT TO SCALE



ALTA / NSPS LAND TITLE SURVEY

1.064 ACRES

SITUATED IN THE

JAMES B. P. JANUARY SURVEY ABSTRACT NO. 658

CITY OF SANGER ETJ, TEXAS
DENTON COUNTY, TEXAS

ADDRESS: NO ADDRESS ASSIGNED (CENTRAL APPRAISAL DISTRICT)

DEMOLITION GENERAL NOTES

1. ANY DEMOLITION IS TO BE PERFORMED IN STRICT CONFORMANCE WITH ALL APPLICABLE CITY, COUNTY AND STATE, AND/OR GOVERNING BODY'S STANDARDS.

2. EROSION AND SEDIMENT CONTROL MEASUREMENTS SHALL BE MAINTAINED AT ALL TIMES DURING DEMOLITION.

3. THE PURPOSE OF THIS DRAWING IS TO CONVEY THE OVERALL SCOPE OF WORK AND IT IS NOT INTENDED TO COVER ALL DETAILS OR SPECIFICATIONS REQUIRED TO COMPLY WITH GENERALLY ACCEPTED DEMOLITION PRACTICES. CONTRACTOR SHALL THOROUGHLY GET FAMILIARIZED WITH THE SITE, SCOPE OF WORK, AND ALL EXISTING CONDITIONS AT THE JOB SITE PRIOR TO BIDDING AND COMMENCING THE WORK. THE DEMOLITION CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR MEANS, METHODS, TECHNIQUES, OR PROCEDURES USED TO COMPLETE THE WORK IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS AND IS LIABLE FOR THE SAFETY OF THE PUBLIC OR CONTRACTOR'S EMPLOYEES DURING THE COURSE OF THE PROJECT.

4. THE DEMOLITION PLAN IS INTENDED TO SHOW REMOVAL OF KNOWN SITE FEATURES AND UTILITIES AS SHOWN ON THE SURVEY. THERE MAY BE OTHER SITE FEATURES, UTILITIES, STRUCTURES, AND MISCELLANEOUS ITEMS BOTH BURIED AND ABOVE GROUND THAT ARE WITHIN THE LIMITS OF WORK THAT MAY NEED TO BE REMOVED FOR THE PROPOSED PROJECT THAT ARE NOT SHOWN HEREON. THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING THE CITY, ENGINEER AND/OR OWNER PRIOR TO REMOVING ITEMS NOT SHOWN ON THE PLANS.

5. THE CONTRACTOR SHALL CONTACT RESPECTIVE UTILITY COMPANIES PRIOR TO DEMOLITION TO COORDINATE DISCONNECTION AND REMOVAL OF EXISTING UTILITIES WITHIN THE AREA OF WORK.

6. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ANY DAMAGE TO EXISTING UTILITIES THAT ARE INTENDED TO CONTINUE TO PROVIDE SERVICE WHETHER THESE UTILITIES ARE SHOWN ON THE PLAN OR NOT.

7. UPON DISCOVERY OF ANY UNDERGROUND TANKS, CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OWNER'S REPRESENTATIVE. NO REMOVAL OF TANKS SHALL OCCUR UNTIL AUTHORIZED BY OWNER.

8. BUILDING AND APPURTENANCES DESIGNATED FOR DEMOLITION SHALL NOT BE DISTURBED BY THE CONTRACTOR UNTIL HE HAS BEEN FURNISHED WITH NOTICE TO PROCEED BY THE OWNER. AS SOON AS SUCH NOTICE HAS BEEN GIVEN, THE CONTRACTOR SHALL PERFORM THE DEMOLITION, UNDER THE DIRECTION OF THE OWNER'S REPRESENTATIVE.

9. DEBRIS SHALL NOT BE BURIED ON THE SUBJECT SITE. ALL UNSUITABLE MATERIAL AND DEBRIS SHALL BE REMOVED FROM THE SITE AND DISPOSED OF IN ACCORDANCE WITH ALL CITY, STATE, AND FEDERAL LAWS AND ORDINANCES.

10. AS SOON AS DEMOLITION WORK HAS BEEN COMPLETED, THE FINAL GRADE OF BACKFILL IN DEMOLITION AREAS SHALL BE COMPACTED PER THE GEOTECHNICAL REPORT. CONTRACTOR TO PREVENT WATER FROM DRAINING ONTO ADJACENT PROPERTIES.

11. EXISTING TREES TO REMAIN SHOULD BE PROTECTED FROM DAMAGE DURING DEMOLITION AND CONSTRUCTION.

EROSION CONTROL GENERAL NOTES

1. EVERY SOIL DISTURBING ACTIVITY SHALL HAVE AN ACCOMPANYING EROSION CONTROL PLAN .

2. THE STORM WATER POLLUTION PREVENTION PLAN (SWP3) SHALL BE READILY AVAILABLE FOR REVIEW BY FEDERAL, STATE, OR LOCAL OFFICIALS.

3. NO SOIL DISTURBING ACTIVITIES WILL OCCUR PRIOR TO THE SWP3 AND ASSOCIATED BEST MANAGEMENT PRACTICES (BMP) BEING FULLY IMPLEMENTED AND THEN INSPECTED.

4. THE CONTRACTOR SHALL COMPLY WITH THE CITY'S STORM WATER ORDINANCE, THE TPDES GENERAL CONSTRUCTION PERMIT TXR150000 AND ANY OTHER STATE AND/OR LOCAL REGULATIONS.

5. THE SITE SHALL BE INSPECTED BY THE CONTRACTOR OR HIS REPRESENTATIVE WEEKLY, AND AFTER ANY MAJOR STORM. ADJUSTMENTS/REPAIRS TO THE EROSION CONTROL MEASURES SHOULD BE MADE AS NEEDED.

6. CONTRACTOR SHALL VEGETATE ALL DISTURBED AREAS IMMEDIATELY UPON COMPLETION OF GRADING ACTIVITIES. FINAL ACCEPTANCE OF A SITE SHALL BE CONTINGENT UPON VEGETATION BEING ESTABLISHED IN ALL DISTURBED AREAS.

7. ADEQUATE MEASURES SHALL BE TAKEN TO PREVENT EROSION. IN THE EVENT THAT SIGNIFICANT EROSION OCCURS AS A RESULT OF CONSTRUCTION THE CONTRACTOR SHALL RESTORE THE ERODED AREA TO ORIGINAL CONDITION OR BETTER.

8. TEMPORARY STONE STABILIZED CONSTRUCTION ENTRANCE SHALL HAVE THE FOLLOWING MINIMUM DIMENSIONS: 24' WIDE X 50' LONG X 6" DEEP. (3"-5" COARSE AGGREGATE). PLACE FILTER FABRIC UNDER STONE .

9. THE CONCRETE WASHOUT AREA IS TO BE USED AS A VEHICLE WASH DOWN AREA FOR DEBRIS AND SOIL REMOVAL PRIOR TO EXITING THE SITE.

ADA GENERAL NOTES

1. MAXIMUM SLOPE OF CURB RAMP SHALL BE 1:12 (8.33%). 5% RECOMMENDED.

2. MAXIMUM SLOPE OF CURB RAMP "FLARED SIDES" SHALL BE (8.33%) MAX.

3. SLOPE AND CROSS SLOPE OF A SIDEWALK LEADING INTO A CURB RAMP'S SYSTEM SHALL BE A MAXIMUM OF 1:20 (5%) AND 1:50 (2%) CROSS SLOPE.

4. MAXIMUM SLOPE OF A HANDICAPPED ACCESSIBLE ROUTE ALONG A SIDEWALK LEADING INTO A CURB RAMP, BEFORE IT MUST BE CONSIDERED A RAMP IS 1:20 (5%) AND 1:50 (2%) CROSS SLOPE.

5. ALL SLOPED SURFACES AT CURB RAMP SYSTEMS MUST HAVE A "SIGNIFICANT COLOR CONTRAST" FOR THE SEEING IMPAIRED. THEREFORE ALL SUCH SLOPES MUST HAVE "INTEGRAL COLOR IN CONCRETE" OR "STAINED" (SCOFFIELD), COMPARED TO THE ADJACENT "FLAT" SIDEWALK/PAVING SURFACE.

6. SLOPED CURB-RAMP SURFACE TO HAVE TEXTURE (IE. FORMED/SAWCUT GROVES 3/4" WIDE X 1/4" DEEP @ 2" ON-CENTER). FORMED PERPENDICULAR TO PATH OF TRAVEL FOR THE BLIND TO FEEL TEXTURE BENEATH THEIR FEET & FOR WHEELCHAIR TRACTION. ARRANGED SO WATER WILL NOT ACCUMULATE.

7. MAXIMUM SLOPE AND CROSS SLOPE OF HANDICAPPED ACCESSIBLE PARKING SPACE & ADJACENT ACCESS AISLE IS 1:50 (2%) IN ANY DIRECTION.

SITE GENERAL NOTES

1. ALL CONSTRUCTION SHALL BE IN STRICT ACCORDANCE WITH THE CITY OR LOCAL JURISDICTION STANDARDS.

2. THE LOCATION OF UNDERGROUND UTILITIES INDICATED ON THE PLANS IS TAKEN FROM AS-BUILTS, UTILITY PLANS OR SURVEY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAKE ARRANGEMENTS WITH THE OWNERS OF SUCH UNDERGROUND UTILITIES PRIOR TO WORKING IN THE AREA TO CONFIRM THEIR EXACT LOCATION AND TO DETERMINE WHETHER ANY ADDITIONAL UTILITIES OTHER THAN THOSE SHOWN ON THE PLANS MAY BE PRESENT. THE CONTRACTOR SHALL PRESERVE AND PROTECT ALL UNDERGROUND UTILITIES. IF EXISTING UNDERGROUND UTILITIES ARE DAMAGED, THE CONTRACTOR WILL BE RESPONSIBLE FOR THE COST OF REPAIRING THE UTILITY.

3. WHERE EXISTING UTILITIES OR SERVICE LINES ARE CUT, BROKEN OR DAMAGED, THE CONTRACTOR SHALL REPLACE OR REPAIR THE UTILITIES OR SERVICE LINES WITH THE SAME TYPE OF ORIGINAL MATERIAL AND CONSTRUCTION, OR BETTER, UNLESS OTHERWISE SHOWN OR NOTED ON THE PLANS, AT HIS OWN COST AND EXPENSE. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AT ONCE OF ANY CONFLICTS WITH UTILITIES.

4. ALL EXCAVATIONS, TRENCHING AND SHORING OPERATIONS SHALL COMPLY WITH THE REQUIREMENTS OF THE U. S. DEPARTMENT OF LABOR, OSHA, CONSTRUCTION SAFETY AND HEALTH REGULATIONS AND ANY AMENDMENTS THERETO.

5. THE CONTRACTOR SHALL RESTORE ALL AREAS DISTURBED BY CONSTRUCTION TO ORIGINAL CONDITION OR BETTER. RESTORED AREAS INCLUDE, BUT ARE NOT LIMITED TO TRENCH BACKFILL, SIDE SLOPES, FENCES, DRAINAGE DITCHES, DRIVEWAYS, PRIVATE YARDS AND ROADWAYS.

6. ANY CHANGES NEEDED AFTER CONSTRUCTION PLANS HAVE BEEN RELEASED, SHALL BE APPROVED BY THE CITY ENGINEER. THESE CHANGES MUST BE RECEIVED IN WRITING.

7. THE CONTRACTOR SHALL PROVIDE "RED LINED" MARKED PRINTS TO THE ENGINEER PRIOR TO FINAL INSPECTION INDICATING ALL CONSTRUCTION WHICH DEVIATED FROM THE PLANS OR WAS CONSTRUCTED IN ADDITION TO THAT INDICATED ON THE PLANS.

8. ALL CURB RADIUS TO BE 10' OR 2' UNLESS OTHERWISE NOTED ON THE SITE PLAN.

PAVING GENERAL NOTES

1. STRIP & REMOVE FROM THE CONSTRUCTION AREA ALL TOPSOIL, ORGANICS & VEGETATION TO A MINIMUM DEPTH OF 6 INCHES.

2. CONTROL JOINTS FORMED BY SAWING ARE RECOMMENDED BOTH LONGITUDINAL AND TRANSVERSE DIRECTIONS. CONTROL JOINT SHALL BE SAWED WITHIN 3 HOURS AFTER PLACING CONCRETE. JOINTS SHALL BE PROPERLY CLEANED AND SEALED AS SOON AS POSSIBLE AFTER JOINTS ARE CUT.

3. DRAINAGE SHOULD BE MAINTAINED AWAY FROM THE FOUNDATION, BOTH DURING AND AFTER CONSTRUCTION. WATER SHOULD NOT BE ALLOWED TO POND NEAR THE FOUNDATION. THE FOLLOWING ITEMS SHOULD PROVIDE FOR POSITIVE DRAINAGE OF WATER AWAY FROM THE FOUNDATION: SIDEWALKS AND OTHER CONCRETE FLAT WORK, PARKING AREAS, DRIVEWAYS AND OTHER SURFACE DRAINAGE FEATURES, AND LANDSCAPING.

4. FRENCH DRAINS ARE RECOMMENDED AROUND ANY SLABS WHERE SEEPING GROUND WATER IS ENCOUNTERED DURING CONSTRUCTION.

5. SIDEWALK AROUND THE BUILDING SHALL NOT BE STRUCTURALLY CONNECTED TO THE BUILDING FOUNDATION UNLESS IT'S NOTED ON THE STRUCTURAL PLANS.

6. ALL EXPANSION JOINTS AND CRACK CONTROL JOINTS SHOULD BE SEALED TO PREVENT THE INFILTRATION OF WATER INTO THE SUBSURFACE. THIS IS PARTICULARLY IMPORTANT AROUND IRRIGATED LANDSCAPING AND ALONG THE DRAINAGE PATH OF ROOF DOWNSPOUTS.

7. LANDSCAPE ISLANDS SHOULD BE BACKFILLED WITH LOW PLASTICITY CLAYS TO REDUCE WATER INTRUSION INTO THE SUBSURFACE PAVEMENT STRUCTURES. CURBS SHOULD BE PROVIDED WITH WEEP HOLES IN LANDSCAPE AREAS TO REDUCE THE BUILD UP OF HYDROSTATIC PRESSURE AND TO REDUCE THE INTRUSION OF WATER INTO THE SUBSURFACE MATERIAL.

8. CURB AND GUTTER SHALL CONSIST OF STEEL REINFORCED CONCRETE AND SHALL BE SIX (6") INCHES HIGH, UNLESS OTHERWISE NOTED ON THE SITE/GRADING PLANS.

9. THE CONTRACTOR SHALL PROCEED WITH PAVING NO MORE THAN SEVENTY-TWO (72) HOURS AFTER DENSITY/MOISTURE TESTS HAVE BEEN TAKEN AND PASSED BY A REGULAR TESTING FIRM.

10. MANHOLE RIM ELEVATIONS, CLEAN-OUTS, VALVE BOXES, ETC. SHALL BE ADJUSTED TO FINISHED GRADE BY THE PAVING CONTRACTOR AT THE TIME OF PAVING.

11. SEE IRRIGATION PLAN FOR IRRIGATION SLEEVE PLACEMENT PRIOR TO PAVING CONSTRUCTION.

DIMENSION CONTROL GENERAL NOTES

1. ALL DIMENSIONS ARE MEASURED TO FACE OF CURB AS SHOWN. CONTACT ENGINEER/ARCHITECT IF THERE IS ANY DISCREPANCIES IN THE DIMENSIONS.

2. REFER TO ARCHITECTURAL FLOOR PLAN FOR EXACT BUILDING DIMENSIONS.

3. LIGHTED MONUMENT SIGN SHALL BE BY SEPARATE PERMIT.

4. BARRIER-FREE RAMPS ARE REQUIRED ON ALL STREET FRONTAGES. RAMPS WITH DETECTABLE WARNING SURFACES ARE REQUIRED AT ALL INTERSECTIONS.

GRADING GENERAL NOTES

1. ALL SURPLUS EXCAVATION AND WASTE MATERIAL SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND IT SHALL BE HIS SOLE RESPONSIBILITY TO REMOVE SUCH SURPLUS EXCAVATION AND WASTE MATERIAL FROM THE SITE TO A PUBLIC DUMP SITE APPROVED FOR THE DISPOSAL OF SUCH MATERIALS. IF SURPLUS EXCAVATION IS REMOVED FROM THIS SITE TO ANOTHER PROPERTY, IT SHALL BE PLACED ON SUCH PROPERTY WITH THE WRITTEN CONSENT OF THE OWNER(S) OF SUCH PROPERTY. A COPY OF SUCH WRITTEN CONSENT SHALL BE PROVIDED TO THE OWNER. IF THE CONTRACTOR WISHES TO DISPOSE OF SURPLUS EXCAVATION ON-SITE, IT SHALL BE ONLY WITH THE PRIOR APPROVAL OF THE OWNERS PROJECT REPRESENTATIVE AND CARE SHOULD BE TAKEN TO AVOID BLOCKING NATURAL DRAINAGE AND INCREASING STEEP SLOPES. IF ANY OF THE HAULED EXCAVATION MATERIAL IS TAKEN TO ANOTHER LOCATION WITHIN THE CITY LIMITS, THE OWNER OF THE PROPERTY IS REQUIRED TO OBTAIN A LOT GRADING PERMIT BEFORE MATERIAL IS DELIVERED.

2. THE CONTRACTOR IS REQUIRED TO PROVIDE HIS OWN STAKING AND TO VERIFY PROJECT ELEVATIONS. "MATCH EXISTING" SHALL BE UNDERSTOOD TO APPLY TO BOTH VERTICAL ELEVATION AND HORIZONTAL ALIGNMENT.

3. THE CONTRACTOR SHALL PREPARE ALL LANDSCAPE AREAS INCLUDING STREET RIGHT-OF-WAY AREAS TO AN ACCEPTABLE SUBGRADE CONDITION IN ACCORDANCE WITH THE LANDSCAPE PLANS. IF THE CONTRACTOR IS NOT EMPLOYED TO PROVIDE AND INSTALL LANDSCAPING, HE SHALL PREPARE A FINISHED AND COMPACTED SUB-GRADE IN THE LANDSCAPING AREAS.

4. NO SLOPES TO EXCEED 3H:1V WITHOUT SLOPE STABILIZATION.

UTILITY GENERAL NOTES

1. ALL CONSTRUCTION SHALL BE IN STRICT ACCORDANCE WITH THE CITY/UTILITY COMPANY STANDARDS.

2. FIELD VERIFY LOCATION OF EXISTING WATER MAIN , SEWER MAIN, GAS, TELEPHONE AND ELECTRICAL LINE. POT HOLE RECOMMENDED PRIOR TO CONSTRUCTION BEGIN. CONTRACTOR SHALL BE RESPONSIBLE TO COORDINATE WITH UTILITY SERVICE PROVIDERS.

3. THE LOCATION OF UNDERGROUND UTILITIES INDICATED ON THE PLANS IS TAKEN FROM AS-BUILTS, UTILITY PLANS OR SURVEY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAKE ARRANGEMENTS WITH THE OWNERS OF SUCH UNDERGROUND UTILITIES PRIOR TO WORKING IN THE AREA TO CONFIRM THEIR EXACT LOCATION AND TO DETERMINE WHETHER ANY ADDITIONAL UTILITIES OTHER THAN THOSE SHOWN ON THE PLANS MAY BE PRESENT. THE CONTRACTOR SHALL PRESERVE AND PROTECT ALL UNDERGROUND UTILITIES. IF EXISTING UNDERGROUND UTILITIES ARE DAMAGED, THE CONTRACTOR WILL BE RESPONSIBLE FOR THE COST OF REPAIRING THE UTILITY.

4. WHERE EXISTING UTILITIES OR SERVICE LINES ARE CUT, BROKEN OR DAMAGED, THE CONTRACTOR SHALL REPLACE OR REPAIR THE UTILITIES OR SERVICE LINES WITH THE SAME TYPE OF ORIGINAL MATERIAL AND CONSTRUCTION, OR BETTER, UNLESS OTHERWISE SHOWN OR NOTED ON THE PLANS, AT HIS OWN COST AND EXPENSE. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AT ONCE OF ANY CONFLICTS WITH UTILITIES.

5. ALL EXCAVATIONS, TRENCHING AND SHORING OPERATIONS SHALL COMPLY WITH THE REQUIREMENTS OF THE U. S. DEPARTMENT OF LABOR, OSHA, CONSTRUCTION SAFETY AND HEALTH REGULATIONS AND ANY AMENDMENTS THERETO.

6. ADEQUATE MEASURES SHALL BE TAKEN TO PREVENT EROSION. IN THE EVENT THAT SIGNIFICANT EROSION OCCURS AS A RESULT OF CONSTRUCTION THE CONTRACTOR SHALL RESTORE THE ERODED AREA TO ORIGINAL CONDITION OR BETTER.

7. THE CONTRACTOR SHALL RESTORE ALL AREAS DISTURBED BY CONSTRUCTION TO ORIGINAL CONDITION OR BETTER. RESTORED AREAS INCLUDE, BUT ARE NOT LIMITED TO TRENCH BACKFILL, SIDE SLOPES, FENCES, CULVERT PIPES, DRAINAGE DITCHES, DRIVEWAYS, PRIVATE YARDS AND ROADWAYS.

8. ANY CHANGES NEEDED AFTER CONSTRUCTION PLANS HAVE BEEN RELEASED, SHALL BE APPROVED BY THE CITY ENGINEER. THESE CHANGES MUST BE RECEIVED IN WRITING.

9. THE CONTRACTOR SHALL PROVIDE "RED LINED" MARKED PRINTS TO THE ENGINEER PRIOR TO FINAL INSPECTION INDICATING ALL CONSTRUCTION WHICH DEVIATED FROM THE PLANS OR WAS CONSTRUCTED IN ADDITION TO THAT INDICATED ON THE PLANS.

STORM SEWER GENERAL NOTES

1. ALL STORM DRAIN CONSTRUCTION, TESTING, AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CITY'S CURRENT STANDARDS, DETAILS, AND SPECIFICATIONS UNLESS OTHERWISE NOTED.

2. CONTRACTOR SHALL VERIFY EXISTING LOCATIONS, SIZES AND FLOW LINES FOR ALL STORM SEWER SYSTEMS AND DRAINAGE STRUCTURES SHOWN ON THE PLANS PRIOR TO CONNECTING PROPOSED STORM SEWER PIPES.

3. TWO WEEKS PRIOR TO CONNECTING TO EXISTING STORM DRAIN LINES, THE CONTRACTOR SHOULD INSPECT THE EXISTING LINE AND CONTACT THE STORM WATER INSPECTOR SHOULD THE LINE NEED TO BE CLEANED.

4. CONTRACTOR SHOULD INSPECT ALL STORM DRAIN OUTFALLS NO EARLIER THAN TWO WEEKS PRIOR TO FINAL INSPECTION AND REMOVE ALL SILT AND DEBRIS.

811 Know what's **below.** **Call** before you dig.

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STATE OF TEXAS · KARTAVYA S. PATEL · 97534 · LICENSED PROFESSIONAL ENGINEER

06/21/2023

GENERAL NOTES

DOLLAR GENERAL

NE QUADRANT OF FM 2450 & CHAPMAN ROAD

CITY OF SANGER ETJ

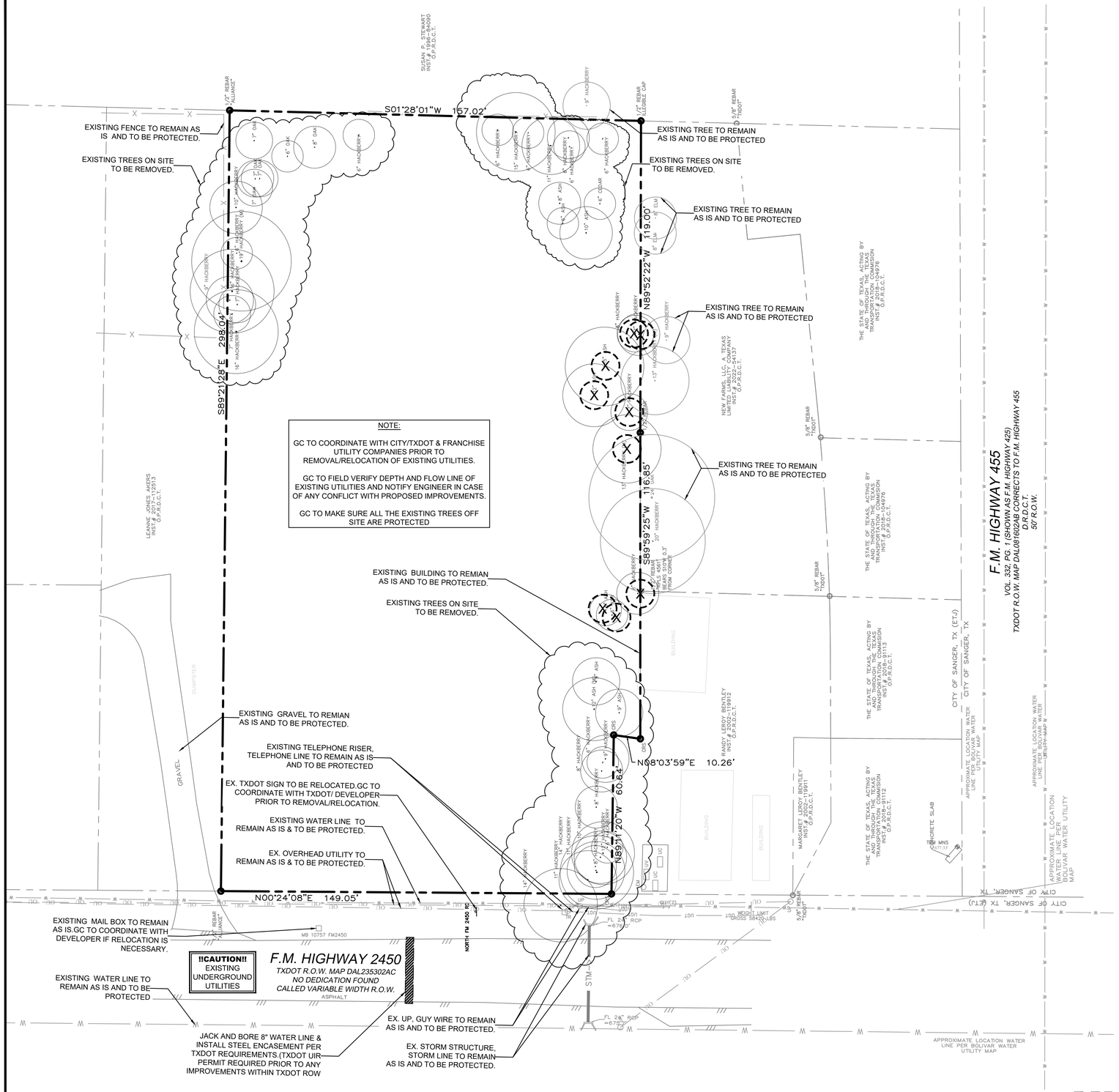
DENTON COUNTY, TEXAS 76266

JAMES B.P. JANUARY SURVEY ABSTRACT NO # 658

TRIANGLE ENGINEERING LLC
T: 469.331.8566 | F: 469.213.7145 | E: info@triangle-engr.com
W: triangle-engr.com | O: 1784 McDermott Drive, Suite 110, Allen, TX 75013
Planning | Civil Engineering | Construction Management

P.E.	DES.	DATE	SCALE	PROJECT NO.	SHEET NO.
KP	AP	06-02-23	SEE SCALE BAR	050-23	C-1.1

TX. P.E. FIRM #11525



EXISTING LEGEND

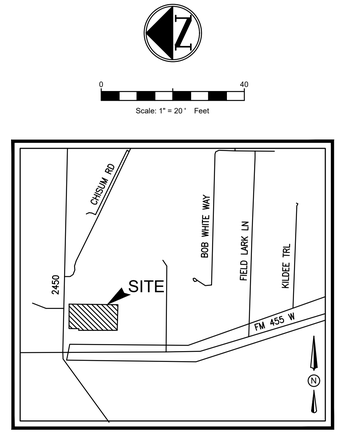
- air conditioner
- borehole
- cable tv
- electric meter
- fence or handrail
- fire dept. connection
- fire hydrant
- fire lane
- guard rail
- grease trap
- bollard
- grate inlet
- gas meter
- gas line
- utility pole anchor
- irrigation valve
- landscape or tree line
- landscape electric box
- landscape light
- light pole
- mailbox
- monitoring well
- overhead utility lines
- pool equipment
- road sign
- roof drain
- silt fence
- spot elevation
- sanitary sewer manhole
- sanitary sewer pipe
- storm water manhole
- storm water pipe
- telephone manhole
- tank fill lid
- telephone riser
- traffic signal pole
- unknown manhole
- utility clean out
- utility cabinet
- utility vault
- utility markings (line color = color of markings)
- utility pole
- utility pole with riser
- utility sign
- water shutoff
- water valve
- water manhole
- water meter
- well
- water line
- one-foot contour lines
- tree trunk (with canopy)
- caliper inches at breast height
- ornamental tree multiple trunks
- Google 360 Hyperlink

DEMOLITION LEGEND

- SAWCUT LINE
- AREA TO BE REMOVED
- TREES TO BE REMOVED

DEMOLITION GENERAL NOTES

1. ANY DEMOLITION IS TO BE PERFORMED IN STRICT CONFORMANCE WITH ALL APPLICABLE CITY, COUNTY AND STATE, AND/OR GOVERNING BODY'S STANDARDS.
2. EROSION AND SEDIMENT CONTROL MEASUREMENTS SHALL BE MAINTAINED AT ALL TIMES DURING DEMOLITION.
3. THE PURPOSE OF THIS DRAWING IS TO CONVEY THE OVERALL SCOPE OF WORK AND IT IS NOT INTENDED TO COVER ALL DETAILS OR SPECIFICATIONS REQUIRED TO COMPLY WITH GENERALLY ACCEPTED DEMOLITION PRACTICES. CONTRACTOR SHALL THOROUGHLY GET FAMILARIZED WITH THE SITE, SCOPE OF WORK, AND ALL EXISTING CONDITIONS AT THE JOB SITE PRIOR TO BIDDING AND COMMENCING THE WORK. THE DEMOLITION CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR MEANS, METHODS, TECHNIQUES, OR PROCEDURES USED TO COMPLETE THE WORK IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS AND IS LIABLE FOR THE SAFETY OF THE PUBLIC OR CONTRACTOR'S EMPLOYEES DURING THE COURSE OF THE PROJECT.
4. THE DEMOLITION PLAN IS INTENDED TO SHOW REMOVAL OF KNOWN SITE FEATURES AND UTILITIES AS SHOWN ON THE SURVEY. THERE MAY BE OTHER SITE FEATURES, UTILITIES, STRUCTURES, AND MISCELLANEOUS ITEMS BOTH BURIED AND ABOVE GROUND THAT ARE WITHIN THE LIMITS OF WORK THAT MAY NEED TO BE REMOVED FOR THE PROPOSED PROJECT THAT ARE NOT SHOWN HEREON. THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING THE CITY, ENGINEER AND/OR OWNER PRIOR TO REMOVING ITEMS NOT SHOWN ON THE PLANS.
5. THE CONTRACTOR SHALL CONTACT RESPECTIVE UTILITY COMPANIES PRIOR TO DEMOLITION TO COORDINATE DISCONNECTION AND REMOVAL OF EXISTING UTILITIES WITHIN THE AREA OF WORK.
6. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ANY DAMAGE TO EXISTING UTILITIES THAT ARE INTENDED TO CONTINUE TO PROVIDE SERVICE WHETHER THESE UTILITIES ARE SHOWN ON THE PLAN OR NOT.
7. UPON DISCOVERY OF ANY UNDERGROUND TANKS, CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OWNER'S REPRESENTATIVE. NO REMOVAL OF TANKS SHALL OCCUR UNTIL AUTHORIZED BY OWNER.
8. BUILDING AND APPURTENANCES DESIGNATED FOR DEMOLITION SHALL NOT BE DISTURBED BY THE CONTRACTOR UNTIL HE HAS BEEN FURNISHED WITH NOTICE TO PROCEED BY THE OWNER. AS SOON AS SUCH NOTICE HAS BEEN GIVEN, THE CONTRACTOR SHALL PERFORM THE DEMOLITION, UNDER THE DIRECTION OF THE OWNER'S REPRESENTATIVE.
9. DEBRIS SHALL NOT BE BURIED ON THE SUBJECT SITE. ALL UNSUITABLE MATERIAL AND DEBRIS SHALL BE REMOVED FROM THE SITE AND DISPOSED OF IN ACCORDANCE WITH ALL CITY, STATE, AND FEDERAL LAWS AND ORDINANCES.
10. AS SOON AS DEMOLITION WORK HAS BEEN COMPLETED, THE FINAL GRADE OF BACKFILL IN DEMOLITION AREAS SHALL BE COMPACTED PER THE GEOTECHNICAL REPORT. CONTRACTOR TO PREVENT WATER FROM DRAINING ONTO ADJACENT PROPERTIES.
11. EXISTING TREES TO REMAIN SHOULD BE PROTECTED FROM DAMAGE DURING DEMOLITION AND CONSTRUCTION.



VICINITY MAP
N.T.S.

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STATE OF TEXAS — KARTAVYA S. PATEL — 97534 — LICENSED PROFESSIONAL ENGINEER
06/21/2023

DEMOLITION PLAN

DOLLAR GENERAL

NE QUADRANT OF FM 2450 & CHAPMAN ROAD

CITY OF SANGER ETJ

DENTON COUNTY, TEXAS 76266

JAMES B.P. JANUARY SURVEY ABSTRACT NO # 658

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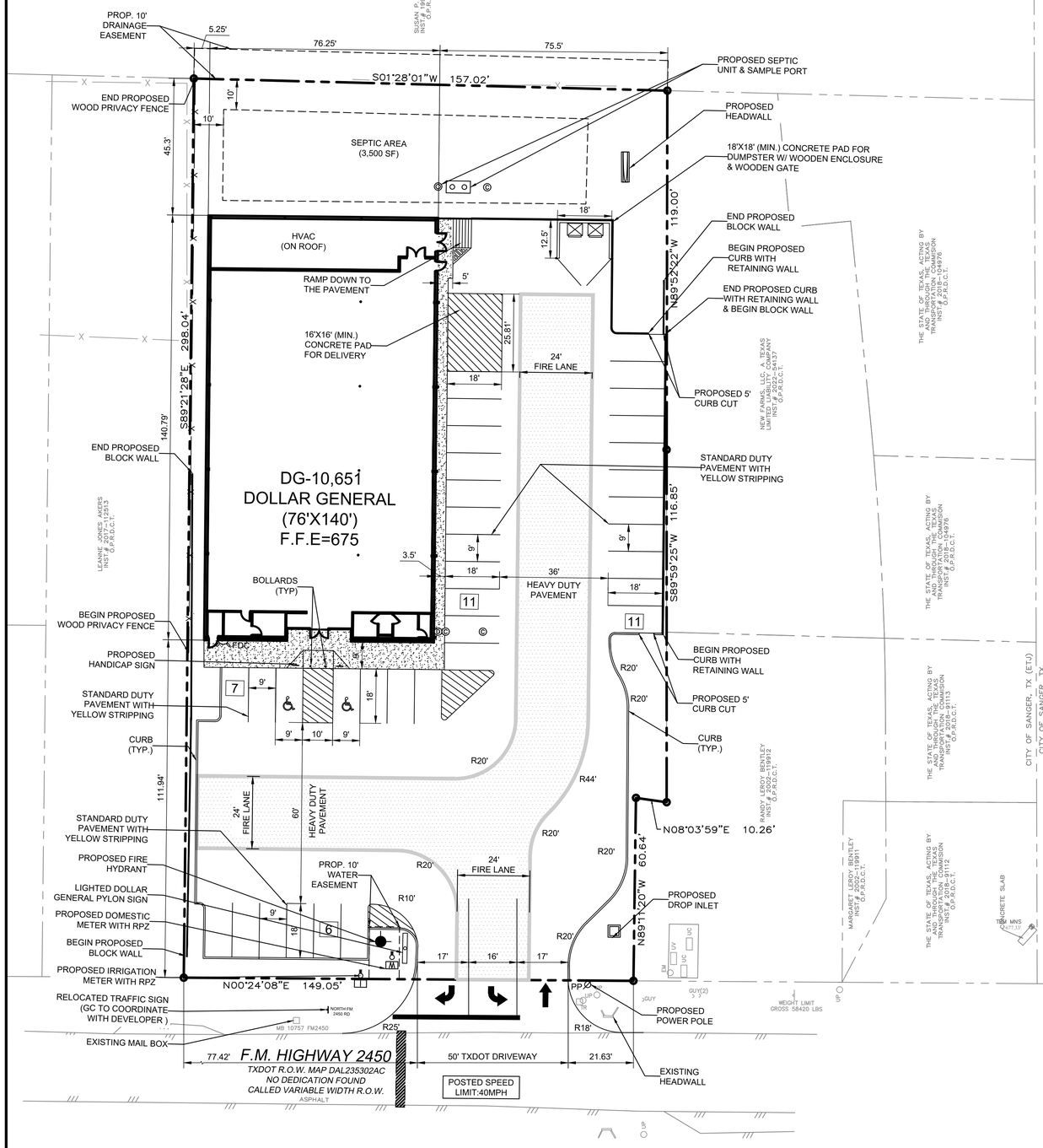

NOTES

ALL WORK WITHIN TXDOT REQUIRE SEPERATE PERMIT ISSUED BY TXDOT

EXISTING LEGEND

- air conditioner
- borehole
- cable tv
- electric meter
- fence or handrail
- fire dept. connection
- fire hydrant
- fire lane
- guard rail
- grease trap
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- grate inlet
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- water meter
- well
- water line
- one-foot contour lines
- tree trunk (with canopy)
- caliper inches at breast height
- ornamental tree multiple trunks
- Google 360 Hyperlink

SITE DATA SUMMARY TABLE

SITE ACREAGE:	1.064 ACRES (46,357 S.F.)
ZONING:	-
PROPOSED USE:	RETAIL STORE-DOLLAR GENERAL
BUILDING AREA:	10,651 S.F.
NUMBER OF STORIES:	1
BUILDING HEIGHT:	18'-0"
BUILDING COVERAGE:	22.9%
FLOOR AREA RATIO:	0.22
IMPERVIOUS AREA:	35,372 S.F. (76.30%)
PERVIOUS/LANDSCAPE AREA:	10,985 S.F. (23.69%)
REGULAR PARKING REQUIRED: 1 SP PER 300 S.F.	35 SPACES
REGULAR PARKING PROVIDED:	33 SPACES
HANDICAP PARKING REQUIRED:	2 SPACES (1 VAN ACCESSIBLE)
HANDICAP PARKING PROVIDED:	2 SPACES (1 VAN ACCESSIBLE)
TOTAL PARKING PROVIDED:	35 SPACES

SITE LEGEND

- CONCRETE CURB
- SAW-CUT LINE
- FENCE
- FIRE LANE
- STRIPING
- PARKING SPACES
- MONUMENT/PYLON SIGN
- WHEEL STOPS
- HANDICAP LOGO
- HANDICAP SIGN
- RAMP
- BOLLARD
- TRAFFIC ARROW
- FIRE HYDRANT
- DUMPSTER
- SANITARY SEWER MANHOLE
- SANITARY SEWER CLEANOUT
- SANITARY SEWER DOUBLE CLEANOUT
- SANITARY SEWER SAMPLE PORT
- SEPTIC UNIT
- DOMESTIC WATER METER
- IRRIGATION METER
- GAS METER

FLOOD PLAIN NOTE

THIS PROPERTY LIES WITHIN ZONE(S) X (UNSHADED) OF THE FLOOD INSURANCE RATE MAP FOR DENTON COUNTY, TEXAS AND INCORPORATED AREAS, MAP NO.48121C0205G, DATED 2011/04/18, VIA SCALED MAP LOCATION AND GRAPHIC PLOTTING AND/OR THE NATIONAL FLOOD HAZARD LAYER (NFHL) WEB MAP SERVICE (WMS) AT http://hazards.fema.gov.

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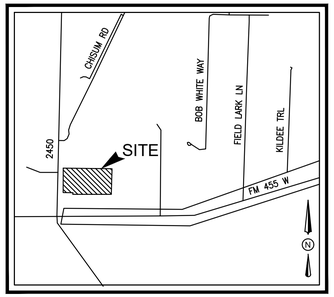
Scale: 1" = 20 ' Feet



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8. ALL CURB RADIUS TO BE 10' OR 2' UNLESS OTHERWISE NOTED ON THE SITE PLAN.

PROJECT CONTACT LIST

ENGINEER	OWNER/DEVELOPER
TRIANGLE ENGINEERING LLC 1782 McDERMOTT DR ALLEN, TX. 75013 KARTAVYA PATEL 214-609-9271	VAQUERO DG FM 2450 PARTNERS, LP 2627 TILLAR ST, STE 111 FORT WORTH, TX 76107 KELLY AGNOR 512-983-1793
SURVEYOR	ARCHITECT
JPH LAND SURVEYING,INC 785 LONESOME DOVE TRAIL, HURST, TX 76054 JEWEL CHADD 817-431-4971	FRANZ ARCHITECTS 4055 INTERNATIONAL PLAZA, STE 100 FORT WORTH, TX 76109 AVI KAIKOV 817-632-0079

BENCHMARKS

SITE BENCH MARK IS A MAG NAIL WITH A WASHER STAMPED "JPH LAND BENCHMARK" SET IN A CONCRETE SLAB IN THE NORTHEAST CORNER OF THE INTERSECTION OF F.M.HIGHWAY 455 AND F.M.HIGHWAY 2450.BENCHMARK ELEVATION=677.33' . SEE SURVEY FOR GENERAL LOCATION.

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STATE OF TEXAS — KARTAVYA S. PATEL — 97534 — LICENSED PROFESSIONAL ENGINEER

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SITE PLAN

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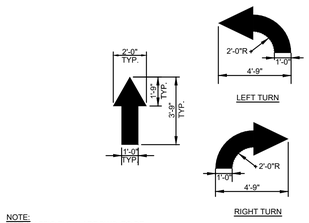
Planning | Civil Engineering | Construction Management

P.E.	DES.	DATE	SCALE	PROJECT NO.	SHEET NO.
KP	AP	06-02-23	SEE SCALE BAR	050-23	C-3.0

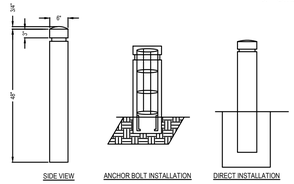
TX. P.E. FIRM #11525



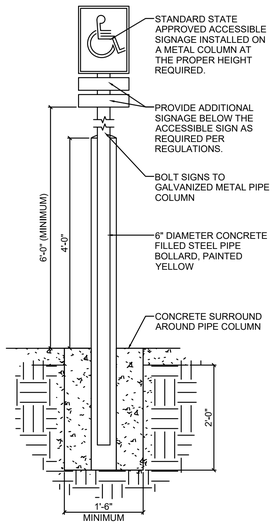
NOTE:
ALL TRAFFIC FLOW ARROWS TO BE SOLID WHITE REFLECTIVE TRAFFIC PAINT PER DIMENSIONS ABOVE.

TRAFFIC FLOW ARROW DETAIL
N.T.S.

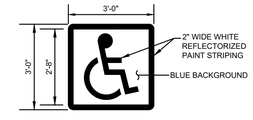
NOTES:
1. ALL DIMENSIONS ARE CONSIDERED TRUE AND REFLECT MANUFACTURER'S SPECIFICATIONS.
2. DO NOT SCALE DRAWING.
3. ONE YEAR WARRANTY AGAINST MANUFACTURER DEFECTS.
4. MATERIALS CONSIST OF 3/8" STEEL REBAR, TYPE 3 PORTLAND CEMENT CONFORMING TO ASTM C31 SPECIFICATIONS.
5. WEIGHT: 30 LBS PER FOOT.
6. STRESS LOAD: 5,000 PSI AT 28 DAYS.



6" DIA. PIPE BOLLARD DETAIL
N.T.S.

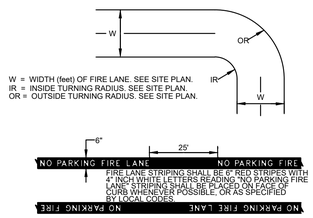


HANDICAP SIGN DETAILS
N.T.S.



NOTES:
1. STENCIL ONE SYMBOL ONTO PARKING SURFACE IN EACH ACCESSIBLE STALL.
2. LOCATE PER ACCESSIBLE PARKING STALL DETAIL(S).
3. ALL LINES 2" WIDE PAINTED ON WHITE ON BLUE BACKGROUND.

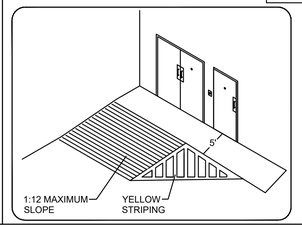
ACCESSIBLE PARKING EMBLEM DETAIL
N.T.S.



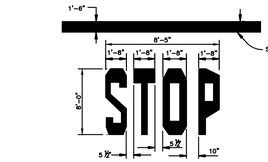
FIRE LANE MARKING

FIRE LANE DETAIL
N.T.S.

STRIPING LEGEND	
YELLOW CURBING AND BOLLARDS - PARKING LOT	SURFACES SHOULD BE CLEAN, DRY AND METAL SURFACES FREE OF HEAVY RUST 2 COATS SHERWIN WILLIAMS - KEM 4000 ACRYLIC ALKYD ENAMEL SAFETY YELLOW B55Y300
STRIPING - PARKING LOT	SURFACES SHOULD BE CLEAN, DRY. TOP COAT SHERWIN WILLIAMS - PROMAR TRAFFIC MARKING PAINT YELLOW TM5495
HANDICAP STRIPING - PARKING LOT	SURFACES SHOULD BE CLEAN, DRY. TOP COAT SHERWIN WILLIAMS - PROMAR TRAFFIC MARKING PAINT "H.C." BLUE

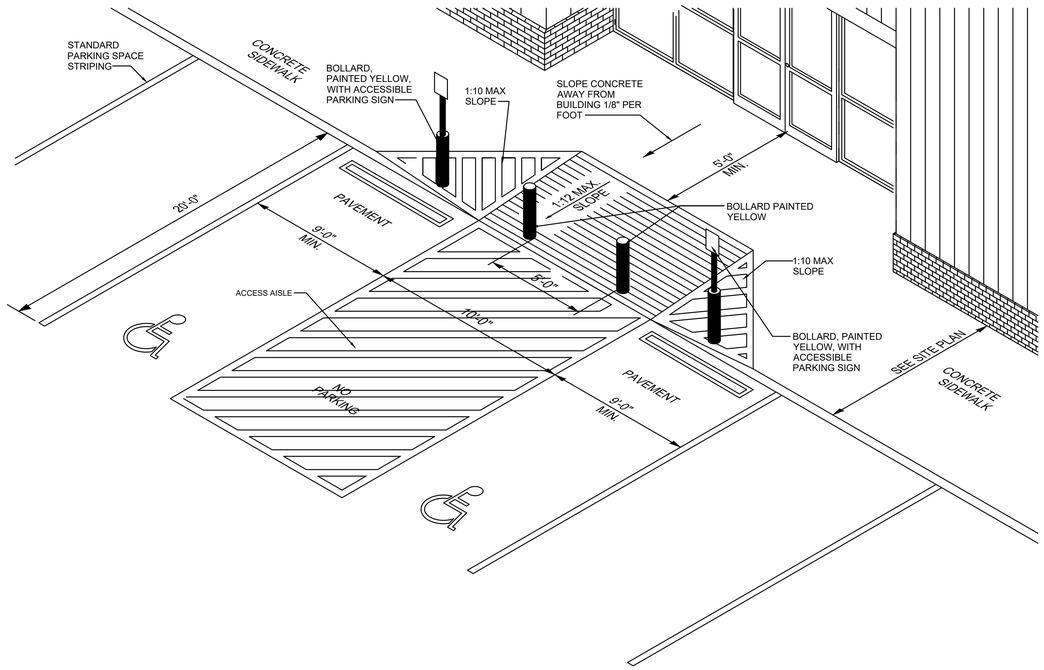


DELIVERY RAMP & RECEIVING DOOR DETAILS
N.T.S.

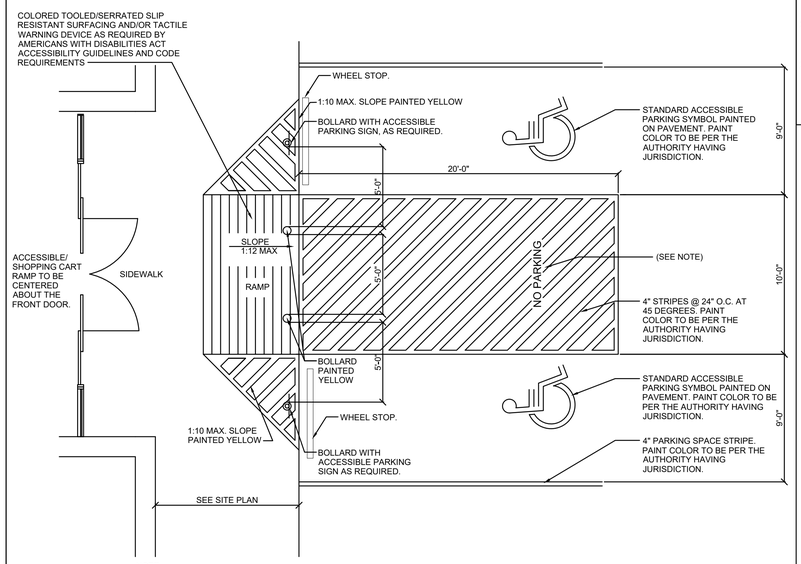


NOTE:
STOP BAR TO BE SOLID YELLOW REFLECTIVE TRAFFIC PAINT PER DIMENSIONS ABOVE.

STOP BAR DETAIL
N.T.S.



ACCESSIBLE PARKING , RAMP & ACCESS AISLE DETAILS
N.T.S.



NOTE:
ALL ACCESSIBLE RAMPS AND ACCESS AISLES SHALL MEET ALL CODES AND ADAAG REGULATIONS.

NOTE
1. "NO PARKING" SHALL BE PAINTED ON THE ACCESS AISLE IN CAPITAL LETTERS WITH HEIGHT OF ATLEAST 12" AND A STROKE OF AT LEAST 2" CENTERED WITHIN THE AISLE
2. A SIGN MUST BE PROVIDED STATING" VIOLATORS SUBJECT TO FINE AND TOWING" IN A HEIGHT OF ATLEAST 1" MOUNTED ON POLE OR WALL,INSTALLED SO THAT THE BOTTOM EDGE OF THE SIGN IS NO LOWER THAN 18" AND NO HIGHER THAN 80" ABOVE GROUND LEVEL.

NO.	DATE	DESCRIPTION	BY
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2	06-21-23	REVISED PER CLIENT COMMENT	AP
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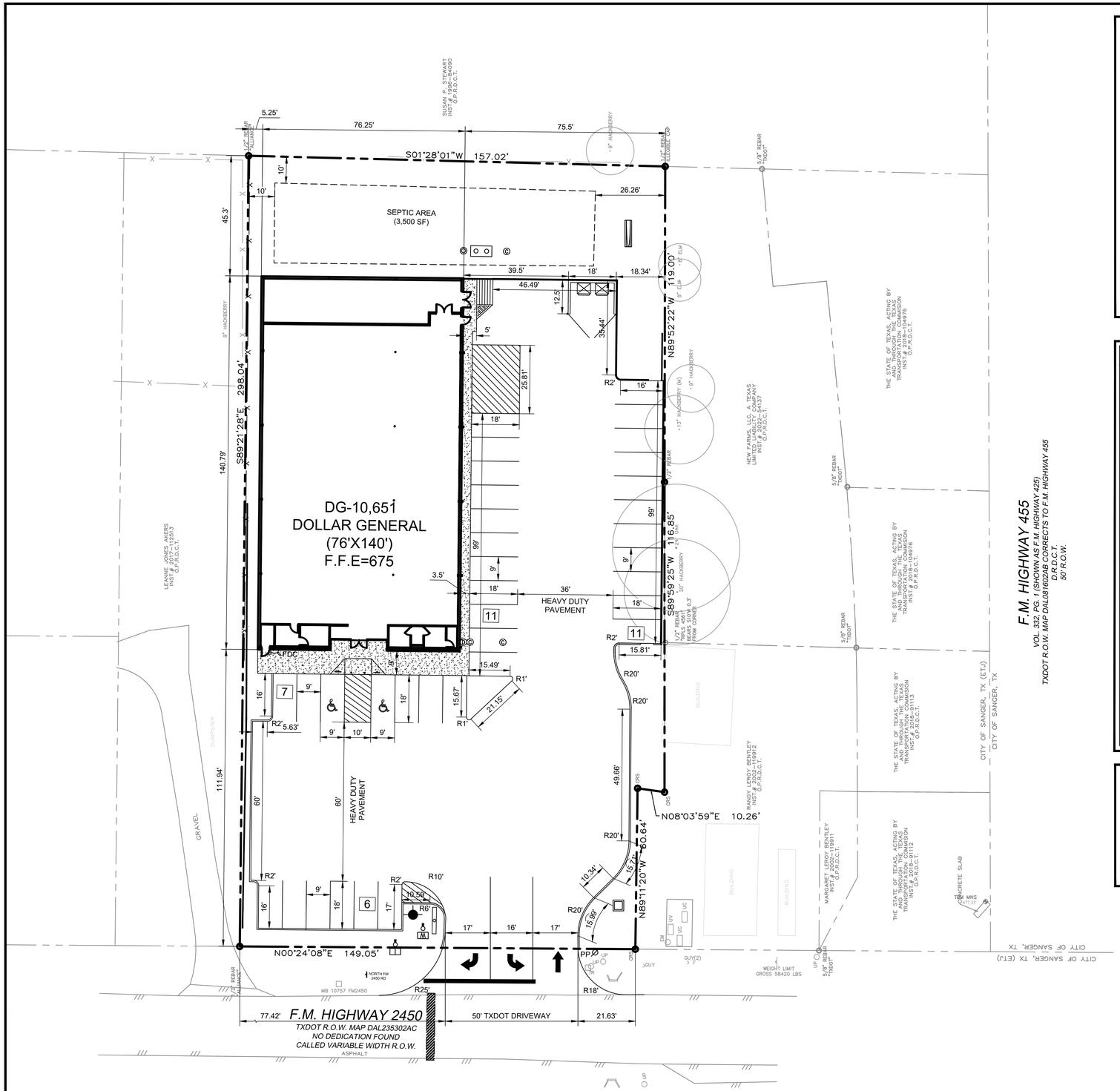
STATE OF TEXAS
KARTAVYA S. PATEL
97534
LICENSED PROFESSIONAL ENGINEER
06/21/2023

SITE DETAILS
DOLLAR GENERAL
NE QUADRANT OF FM 2450 & CHAPMAN ROAD
CITY OF SANGER ETJ
DENTON COUNTY, TEXAS 76266
JAMES B.P. JANUARY SURVEY ABSTRACT NO #658

TRIANGLE ENGINEERING LLC
T: 469.331.8566 I F: 469.213.7145 I E: info@triangle-engr.com
W: triangle-engr.com I O: 1784 McDermott Drive, Suite 110, Allen, TX 75013
Planning | Civil Engineering | Construction Management

P.E.	DES.	DATE	SCALE	PROJECT NO.	SHEET NO.
KP	AP	06-02-23	SEE SCALE BAR	050-23	C-3.1

TX. P.E. FIRM #11525



EXISTING LEGEND

- air conditioner
- borehole
- cable tv
- electric meter
- fence or handrail
- fire dept. connection
- fire hydrant
- fire lane
- guard rail
- grease trap
- bollard
- grate inlet
- gas meter
- gas line
- utility pole anchor
- irrigation valve
- landscape or tree line
- landscape electric box
- landscape light
- light pole
- mailbox
- monitoring well
- overhead utility lines
- pool equipment
- road sign
- roof drain
- silt fence
- spot elevation
- sanitary sewer manhole
- sanitary sewer pipe
- storm water manhole
- storm water pipe
- telephone manhole
- tank fill lid
- telephone riser
- traffic signal pole
- unknown manhole
- utility clean out
- utility cabinet
- utility vault
- utility markings (line color = color of markings)
- utility pole
- utility pole with riser
- utility sign
- water shutoff
- water valve
- water manhole
- water meter
- well
- water line
- one-foot contour lines
- tree trunk (with canopy)
- caliper inches at breast height
- ornamental tree multiple trunks
- Google 360 Hyperlink

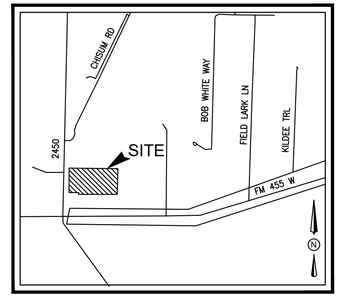
DIMENSION CONTROL LEGEND

- CONCRETE CURB
- SAW-CUT LINE
- FENCE
- STRIPING
- PARKING SPACES
- MONUMENT/PYLON SIGN
- WHEEL STOPS
- HANDICAP LOGO
- HANDICAP SIGN
- RAMP
- BOLLARD
- TRAFFIC ARROW
- FIRE HYDRANT
- DUMPSTER
- LIGHT POLE
- SANITARY SEWER MANHOLE
- SANITARY SEWER CLEANOUT
- SANITARY SEWER DOUBLE CLEANOUT
- SANITARY SEWER SAMPLE PORT
- SEPTIC UNIT
- DOMESTIC WATER METER
- IRRIGATION METER
- GAS METER

DIMENSION CONTROL GENERAL NOTES

1. ALL DIMENSIONS ARE MEASURED TO FACE OF CURB AS SHOWN. CONTACT ENGINEER/ARCHITECT IF THERE IS ANY DISCREPANCIES IN THE DIMENSIONS.
2. REFER TO ARCHITECTURAL FLOOR PLAN FOR EXACT BUILDING DIMENSIONS.
3. LIGHTED MONUMENT SIGN SHALL BE BY SEPARATE PERMIT.
4. BARRIER-FREE RAMPS ARE REQUIRED ON ALL STREET FRONTAGES. RAMPS WITH DETECTABLE WARNING SURFACES IS REQUIRED AT ALL INTERSECTIONS.

Scale: 1" = 20' Feet



VICINITY MAP
N.T.S.

Know what's below. Call before you dig.

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STATE OF TEXAS
KARTAVYA S. PATEL
97534
LICENSED PROFESSIONAL ENGINEER
06/21/2023

DIMENSION CONTROL PLAN

DOLLAR GENERAL
NE QUADRANT OF FM 2450 & CHAPMAN ROAD
CITY OF SANGER ETJ
DENTON COUNTY, TEXAS 76266
JAMES B.P. JANUARY SURVEY ABSTRACT NO # 658

TRIANGLE ENGINEERING LLC
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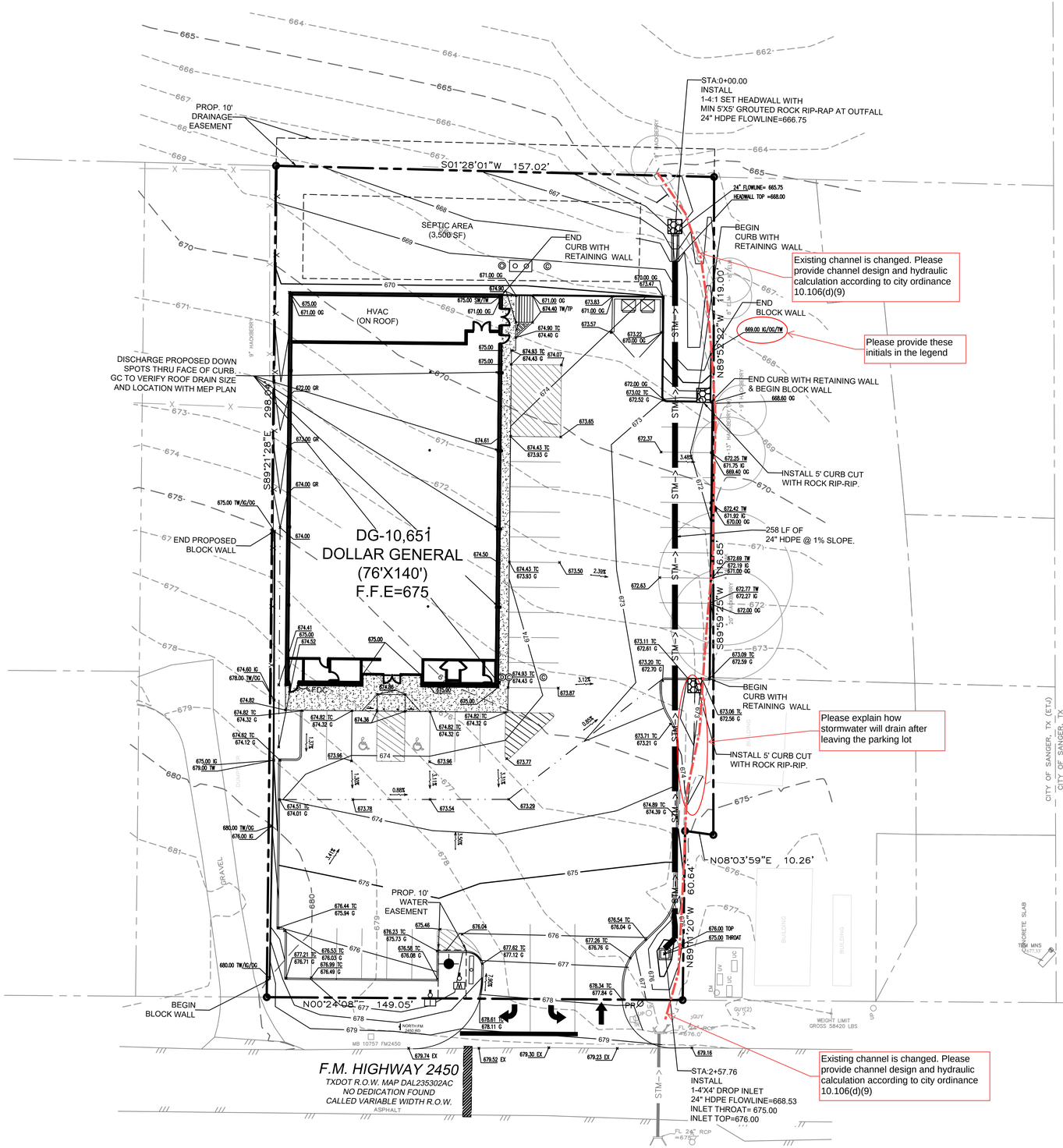
W: triangle-engr.com | O: 1784 McDermott Drive, Suite 110, Allen, TX 75013
Planning | Civil Engineering | Construction Management
TX. P.E. FIRM #11525

P.E.	DES.	DATE	SCALE	PROJECT NO.	SHEET NO.
KP	AP	06-02-23	SEE SCALE BAR	050-23	C-3.2



EXISTING LEGEND

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- borehole
- cable tv
- electric meter
- fence or handrail
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- fire hydrant
- fire lane
- guard rail
- grease trap
- bollard
- grate inlet
- gas meter
- gas line
- utility pole anchor
- irrigation valve
- landscape or tree line
- landscape electric box
- landscape light
- light pole
- mailbox
- monitoring well
- overhead utility lines
- pool equipment
- road sign
- roof drain
- silt fence
- spot elevation
- sanitary sewer manhole
- sanitary sewer pipe
- storm water manhole
- storm water pipe
- telephone manhole
- tank fill lid
- telephone riser
- traffic signal pole
- unknown manhole
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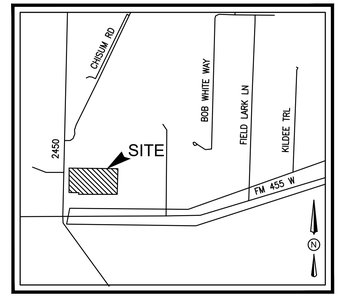
- utility cabinet
- utility vault
- utility markings (line color = color of markings)
- utility pole
- utility pole with riser
- utility sign
- water shutoff
- water valve
- water manhole
- water meter
- well
- water line
- one-foot contour lines
- tree trunk (with canopy)
- caliper inches at breast height
- ornamental tree multiple trunks
- Google 360 Hyperlink

GRADING LEGEND

EXISTING ELEVATION	464.00 EX
EXISTING MINOR CONTOURS	464
EXISTING MAJOR CONTOURS	465
MINOR CONTOURS	464
MAJOR CONTOURS	465
SWALE	
HIGH POINT	HP
STORM PIPE	STM
RETAINING WALL	
RIP RAP	
FINISH FLOOR ELEVATION	467.00 FF
TOP OF CURB ELEVATION	466.00 TC
GUTTER ELEVATION	465.50 G
SIDEWALK ELEVATION	465.00 SW
TOP OF PAVEMENT	464.00 TP
GROUND ELEVATION	463.00 GR
DRAINAGE FLOW DIRECTION	1%
CURB INLET	
STORM MANHOLE	Ⓓ
STORM CLEANOUT	
SANITARY SEWER MANHOLE	Ⓢ
SANITARY SEWER CLEANOUT	©
SANITARY SEWER DOUBLE CLEANOUT	©©
SANITARY SEWER SAMPLE PORT	
SEPTIC UNIT	
DOMESTIC WATER METER	W
IRRIGATION METER	
GAS METER	G
TRANSFORMER	T
LIGHT POLE	
POWER POLE	

0 20 40
Scale: 1" = 20 ' Feet



VICINITY MAP
N.T.S.

BENCHMARKS

SITE BENCH MARK IS A MAG NAIL WITH A WASHER STAMPED "JPH LAND BENCHMARK" SET IN A CONCRETE SLAB IN THE NORTHEAST CORNER OF THE INTERSECTION OF F.M.HIGHWAY 455 AND F.M.HIGHWAY 2450.BENCHMARK ELEVATION=677.33' . SEE SURVEY FOR GENERAL LOCATION.

FLOOD PLAIN NOTE

THIS PROPERTY LIES WITHIN ZONE(S) X (UNSHADED) OF THE FLOOD INSURANCE RATE MAP FOR DENTON COUNTY, TEXAS AND INCORPORATED AREAS, MAP NO.48121C0205G, DATED 2011/04/18, VIA SCALED MAP LOCATION AND GRAPHIC PLOTTING AND/OR THE NATIONAL FLOOD HAZARD LAYER (NFHL) WEB MAP SERVICE (WMS) AT http://hazards.fema.gov.

GRADING GENERAL NOTES

1. ALL SURPLUS EXCAVATION AND WASTE MATERIAL SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND IT SHALL BE HIS SOLE RESPONSIBILITY TO REMOVE SUCH SURPLUS EXCAVATION AND WASTE MATERIAL FROM THE SITE TO A PUBLIC DUMP SITE APPROVED FOR THE DISPOSAL OF SUCH MATERIALS. IF SURPLUS EXCAVATION IS REMOVED FROM THIS SITE TO ANOTHER PROPERTY, IT SHALL BE PLACED ON SUCH PROPERTY WITH THE WRITTEN CONSENT OF THE OWNER(S) OF SUCH PROPERTY. A COPY OF SUCH WRITTEN CONSENT SHALL BE PROVIDED TO THE OWNER. IF THE CONTRACTOR WISHES TO DISPOSE OF SURPLUS EXCAVATION ON-SITE, IT SHALL BE ONLY WITH THE PRIOR APPROVAL OF THE OWNERS PROJECT REPRESENTATIVE AND CARE SHOULD BE TAKEN TO AVOID BLOCKING NATURAL DRAINAGE AND INCREASING STEEP SLOPES. THE CONTRACTOR IS REQUIRED TO PROVIDE HIS OWN STAKING AND TO VERIFY PROJECT ELEVATIONS. "MATCH EXISTING" SHALL BE UNDERSTOOD TO APPLY TO BOTH VERTICAL ELEVATION AND HORIZONTAL ALIGNMENT.
2. THE CONTRACTOR SHALL PREPARE ALL LANDSCAPE AREAS INCLUDING STREET RIGHT-OF-WAY AREAS TO AN ACCEPTABLE SUBGRADE CONDITION IN ACCORDANCE WITH THE LANDSCAPE PLANS. IF THE CONTRACTOR IS NOT EMPLOYED TO PROVIDE AND INSTALL LANDSCAPING, HE SHALL PREPARE A FINISHED AND COMPACTED SUB-GRADE IN THE LANDSCAPING AREAS.
3. NO SLOPES TO EXCEED 3H:1V WITHOUT SLOPE STABILIZATION.

Know what's **below.**
Call before you dig.

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STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER
06/21/2023

GRADING PLAN
DOLLAR GENERAL
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JAMES B.P. JANUARY SURVEY ABSTRACT NO # 658

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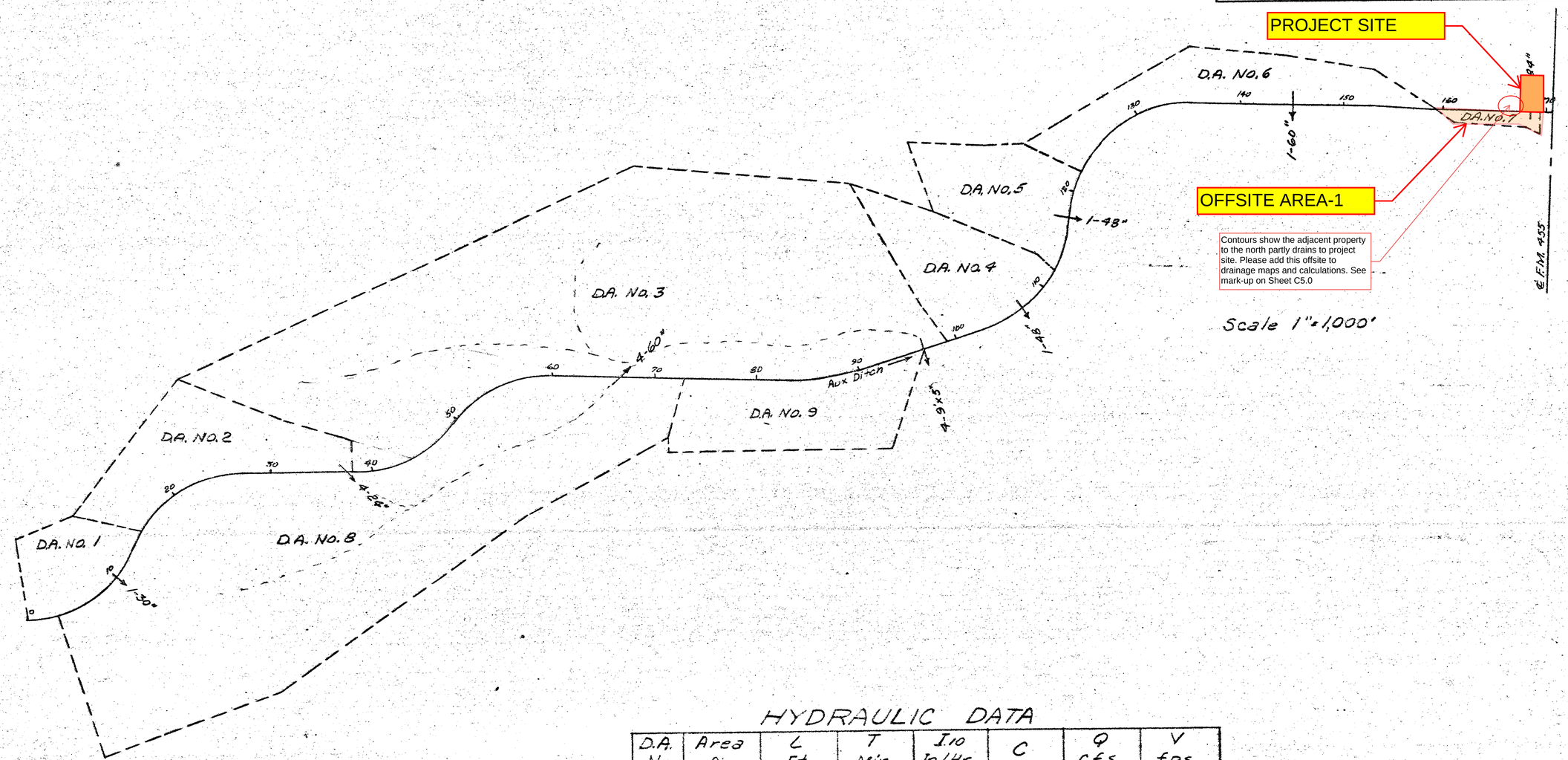
TX. P.E. FIRM #11525

F. R. DIV. 6	TEXAS	S-2259(1)	SHEET 7
Denton COUNTY	FM HWY. 2450	CONT. 2353-2-1	



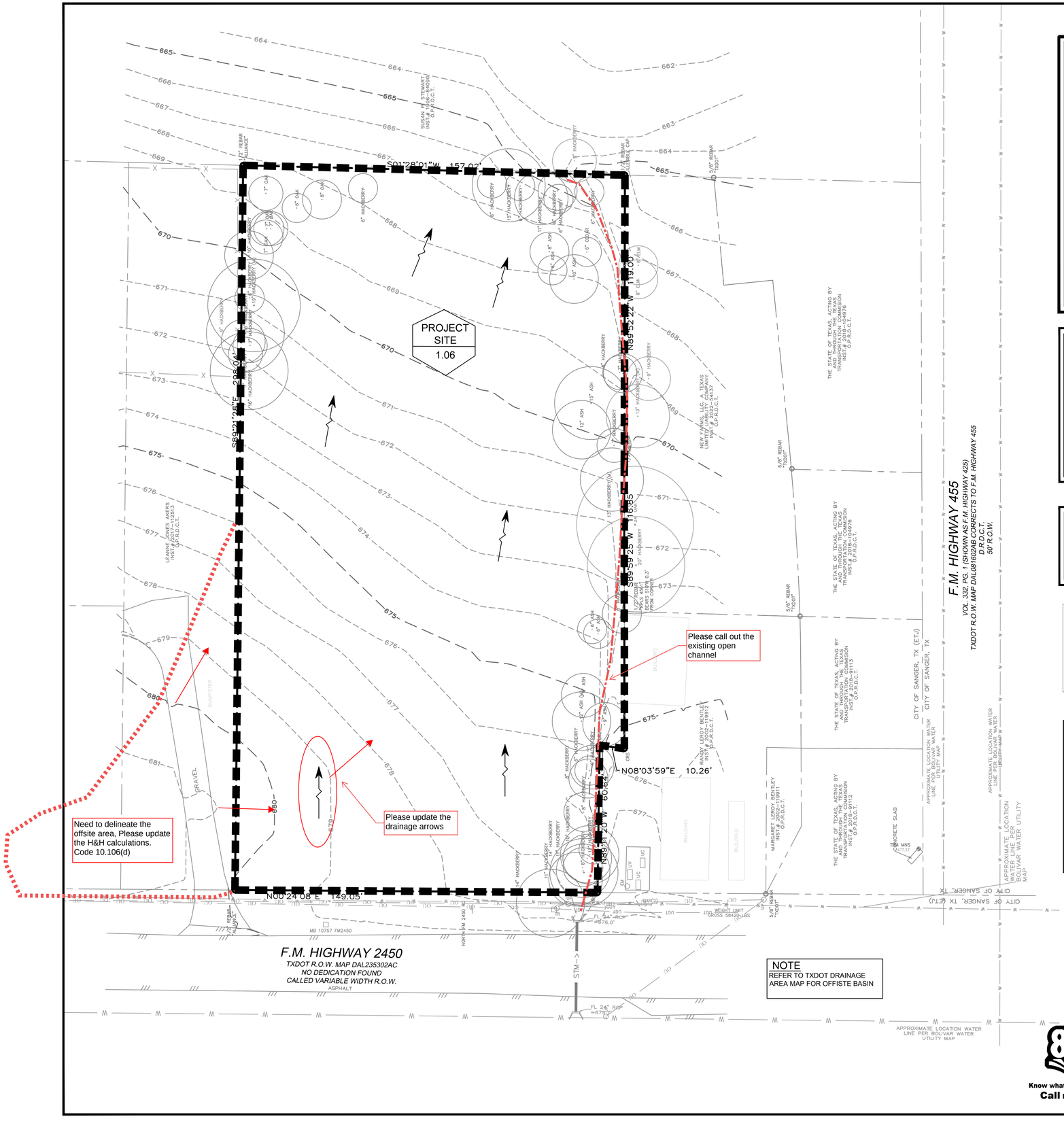
HYDRAULIC DATA

D.A. No.	Area Ac.	L Ft.	T Min.	I.10 In./Hr.	C	Q C.f.s.	V f.p.s.
1	18	1050	30	3.7	0.50	33	8.0
2	43	3130	30	3.7	0.45	72	6.5
1,2+8	280	6650	55	2.8	0.45	353	8.2*
1,2,3+8	525	9700	81	2.3	0.45	544	7.9
4	30	2050	30	3.7	0.40	45	7.0
5	30	1780	30	3.7	0.50	56	8.0
6	34	2700	30	3.7	0.50	63	7.3
7	3	950	30	3.7	0.50	6	4.6
9	39	2750	30	3.7	0.45	65	5.6

*Outfall channel is rock bottom

DRAINAGE AREA MAP


SHEET 17
CONT. 2353-2-1
F.A. DIV. 8 TEXAS S 2259 (1) SHEET 18
Denton COUNTY FM HWY. 2450 CONT. 2353-2-1
25' Lt. Sta 157+50
Prop. 1-18"x52' R.C.P.
Res.
8"x17' Metal Pipe
To remain in place
8"x15' Metal Pipe
To remain in place
18"x 31' Conc. Pipe
to be removed
STA. 170+27.5
END PROJECT
C-2353-2-1
160
165
S 3°38'E
170
Equation:
Sta. 170+37.5= 226+46.0
on F.M.455 C-816-2
Sta. 168+71 Proposed
1-24"x 38' RC. Pipe
with CH-II-B Hdwls
Invert U.S. Toewall
12"x18" Conc. Pipe
to remain in place
ROW FM 455
PI 157+00
El 688.08
VC 600'
C 0.3753
PI 162+00
El 685.23
V.C. 100'
C 0.795
PI 168+00
El 679.58
V.C. 100'
C 0.275
PI 169+50
El 678.98
V.C. 100'
C 0.70
690
680
670
0.56%
-0.95%
-0.40%
-1.80%
19'
19'
USFL 676.29
DSFL 676.10
Sta 168+71
BM #1 X-Mark on NW corner conc.
porch 38' Rt. Sta. 227+09 of FM 455
Elev = 681.50
160
170



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- water line
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- tree trunk (with canopy)
- caliper inches at breast height
- ornamental tree multiple trunks
- Google 360 Hyperlink

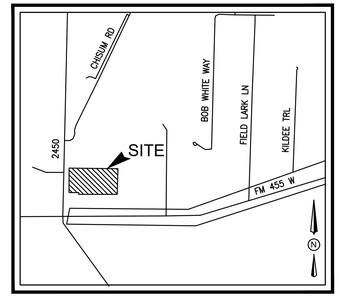
PRE-DRAINAGE LEGEND

EXISTING MINOR CONTOURS 464
EXISTING MAJOR CONTOURS 465
DRAINAGE DIVIDE
DRAINAGE AREA NO. PROJECT SITE 1.06
DRAINAGE AREA ACREAGE
DRAINAGE FLOW DIRECTION

FLOOD PLAIN NOTE

THIS PROPERTY LIES WITHIN ZONE(S) X (UNSHADED) OF THE FLOOD INSURANCE RATE MAP FOR DENTON COUNTY, TEXAS AND INCORPORATED AREAS, MAP NO.48121C0205G, DATED 2011/04/18, VIA SCALED MAP LOCATION AND GRAPHIC PLOTTING AND/OR THE NATIONAL FLOOD HAZARD LAYER (NFHL) WEB MAP SERVICE (WMS) AT http://hazards.fema.gov.

Scale: 1" = 20' Feet



VICINITY MAP
N.T.S.

Please match Denton County Subdivision Rules and Regulations IV.1.2 Rational Method

Table 3- Rainfall Intensity Data

Duration	Rainfall Intensity (inch/hr)		
	1-year	25-year	100-year
5-min	5.06	9.73	12.0
15-min	3.37	6.45	7.90
30-min	2.34	4.45	5.45
60-min	1.52	2.92	3.59
2-hr	0.928	1.86	2.32
3-hr	0.683	1.41	1.78
6-hr	0.403	0.859	1.10
12-hr	0.235	0.507	0.651
24-hr	0.137	0.298	0.383

NOTE
REFER TO DOWNSTREAM ASSESSMENT REPORT FOR DOLLAR GENERAL PREPARED BY TRIANGLE ENGINEERING DATED JUN 06/08/2023 FOR MORE DETAILS

Please submit this

Table 1 -Existing Hydrologic Parameters

Sub Basin	Area (ac)	Area(mi^2)	C	Time of concentration (min)
Offsite 1	3	0.0046	0.5	30
Project Site	1.06	0.0016	0.35	30

Please match Denton County Subdivision Rules and Regulations IV.1.2 Rational Method

Table 4- Existing Peak Discharge (cfs)

Hydrologic Element	Peak Discharge (cfs)		
	1-year	25-year	100-year
Offsite 1	3.510	6.675	8.175
Project Site	0.868	1.651	2.022

811 Know what's **below.** **Call** before you dig.

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STATE OF TEXAS · KARTAVYA S. PATEL · 97534 · LICENSED PROFESSIONAL ENGINEER
06/21/2023

PRE-DRAINAGE PLAN

DOLLAR GENERAL
NE QUADRANT OF FM 2450 & CHAPMAN ROAD
CITY OF SANGER ETJ
DENTON COUNTY, TEXAS 76266
JAMES B.P. JANUARY SURVEY ABSTRACT NO # 658

TRIANGLE ENGINEERING LLC
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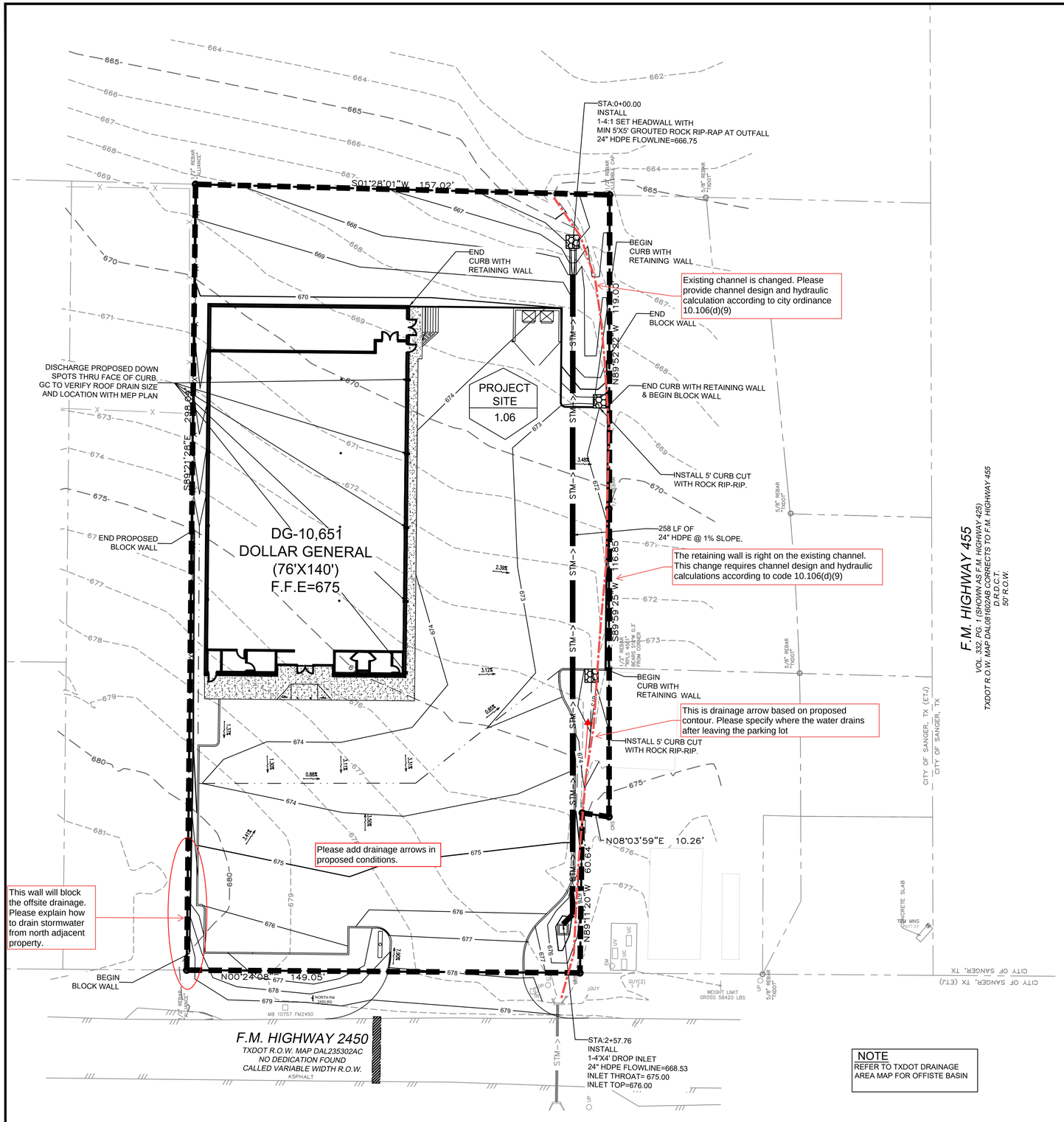
W: triangle-engr.com | O: 1784 McDermott Drive, Suite 110, Allen, TX 75013

Planning | Civil Engineering | Construction Management

P.E.	DES.	DATE	SCALE	PROJECT NO.	SHEET NO.
KP	AP	06-02-23	SEE SCALE BAR	050-23	C-5.0

TX. P.E. FIRM #11525



NOTE
REFER TO TXDOT DRAINAGE AREA MAP FOR OFFISTE BASIN

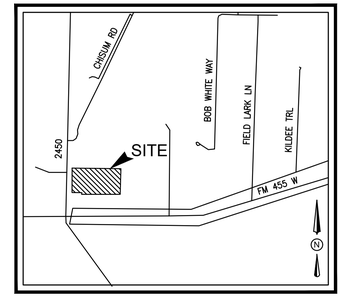
EXISTING LEGEND

- air conditioner
- borehole
- cable tv
- electric meter
- fence or handrail
- fire dept. connection
- fire hydrant
- fire lane
- guard rail
- grease trap
- bollard
- grate inlet
- gas meter
- gas line
- utility pole anchor
- irrigation valve
- landscape or tree line
- landscape electric box
- landscape light
- light pole
- mailbox
- monitoring well
- overhead utility lines
- pool equipment
- road sign
- roof drain
- silt fence
- spot elevation
- sanitary sewer manhole
- sanitary sewer pipe
- storm water manhole
- storm water pipe
- telephone manhole
- tank fill lid
- telephone riser
- traffic signal pole
- unknown manhole
- utility clean out
- utility cabinet
- utility vault
- utility markings (line color = color of markings)
- utility pole
- utility pole with riser
- utility sign
- water shutoff
- water valve
- water manhole
- water meter
- well
- water line
- one-foot contour lines
- tree trunk (with canopy)
- caliper inches at breast height
- ornamental tree multiple trunks
- Google 360 Hyperlink

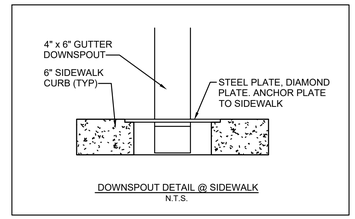
POST-DRAINAGE LEGEND

- EXISTING MINOR CONTOURS 464
- EXISTING MAJOR CONTOURS 465
- MINOR CONTOURS 464
- MAJOR CONTOURS 465
- DRAINAGE DIVIDE
- HIGH POINT HP HP HP HP
- Please show the drainage area value
- DRAINAGE AREA NO. — PROJECT SITE
- DRAINAGE AREA ACREAGE
- This is grading slope, not site drainage arrows
- DRAINAGE FLOW DIRECTION — 1%

Scale: 1" = 20' Feet



VICINITY MAP
N.T.S.



DOWNSPOUT DETAIL @ SIDEWALK
N.T.S.

Table 2 -Proposed Hydrologic Parameters

Sub Basin	Area (ac)	Area (mi^2)	C	Time of concentration (min)
Offsite 1	3	0.0046	0.5	30
Project Site	1.06	0.0016	0.75	10

Please match Denton County Subdivision Rules and Regulations IV.1.2 Rational Method

Table 5- Proposed Peak Discharge (cfs)

Hydrologic Element	Peak Discharge (cfs)		
	1-year	25-year	100-year
Offsite 1	3.510	6.675	8.175
Project Site	3.198	6.09	7.469

Rates of runoff in proposed conditions are much higher than existing conditions. Please explain the plan to reduce them. Otherwise, it's against the city code of ordinance 10.106(d).

FLOOD PLAIN NOTE

THIS PROPERTY LIES WITHIN ZONE(S) X (UNSHADED) OF THE FLOOD INSURANCE RATE MAP FOR DENTON COUNTY, TEXAS AND INCORPORATED AREAS, MAP NO.48121C0205G, DATED 2011/04/18, VIA SCALED MAP LOCATION AND GRAPHIC PLOTTING AND/OR THE NATIONAL FLOOD HAZARD LAYER (NFHL) WEB MAP SERVICE (WMS) AT http://hazards.fema.gov.

NOTE
REFER TO DOWNSTREAM ASSESSMENT REPORT FOR DOLLAR GENERAL PREPARED BY TRIANGLE ENGINEERING DATED JUN 06/08/2023 FOR MORE DETAILS

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STATE OF TEXAS
KARTAVYA S. PATEL
97534
LICENSED
PROFESSIONAL ENGINEER
06/21/2023

POST-DRAINAGE PLAN

DOLLAR GENERAL

NE QUADRANT OF FM 2450 & CHAPMAN ROAD

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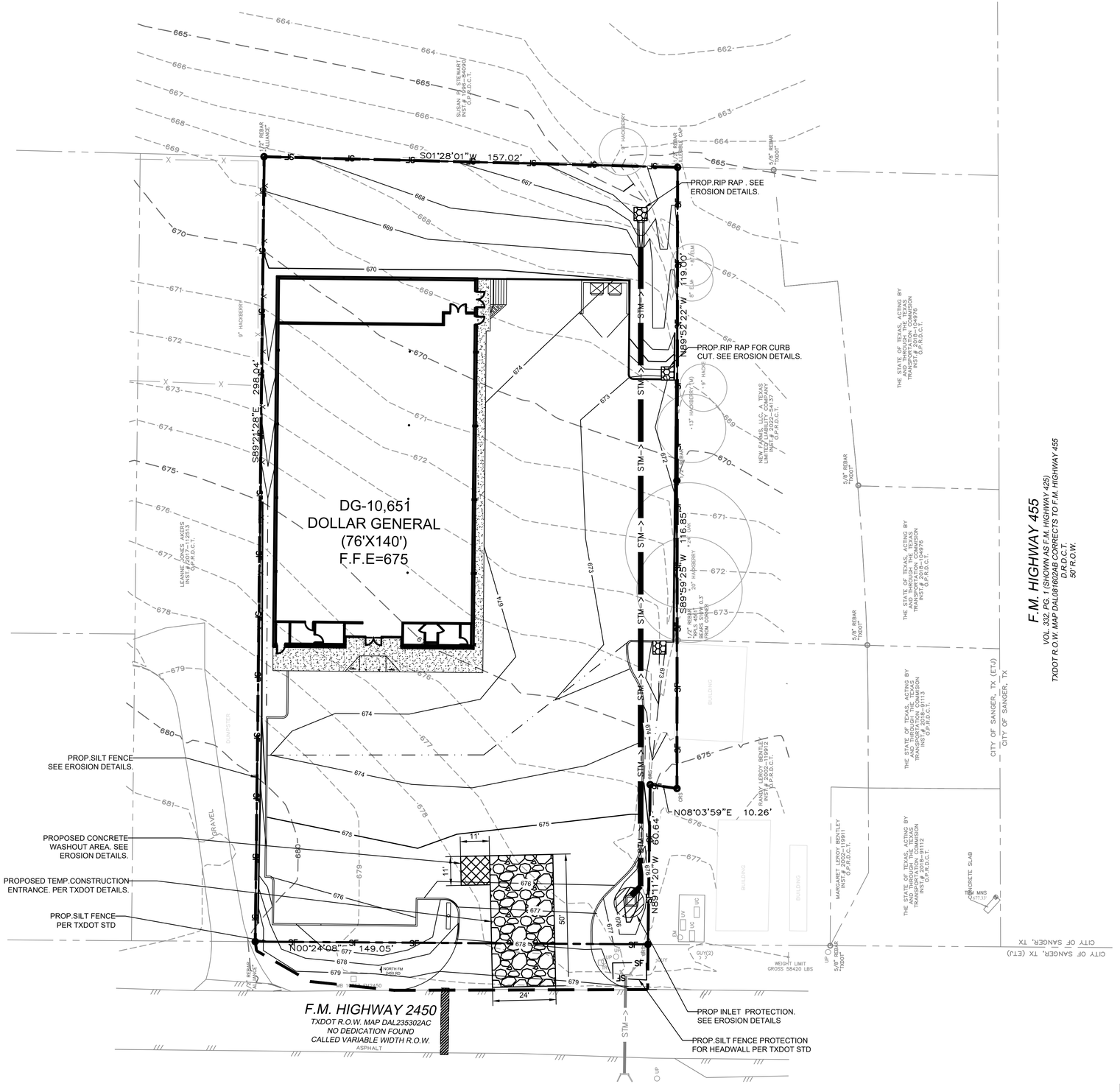

EXISTING LEGEND

- air conditioner
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- electric meter
- fence or handrail
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- fire hydrant
- fire lane
- guard rail
- grease trap
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- storm water pipe
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- unknown manhole
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- water valve
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- water meter
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- water line
- one-foot contour lines
- tree trunk (with canopy)
- caliper inches at breast height
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- Google 360 Hyperlink

EROSION CONTROL LEGEND

- TEMPORARY CONSTRUCTION ENTRANCE
- TEMPORARY CONCRETE WASHOUT AREA
- RIP RAP
- TEMPORARY SILT FENCE (SF)
- TEMPORARY COMPOST FILTER SOCK (FS)
- HIGH POINT (HP)
- LIMITS OF DISTURBANCE
- TEMPORARY INLET PROTECTION
- ROCK BERM

EROSION & SEDIMENT CONTROLS

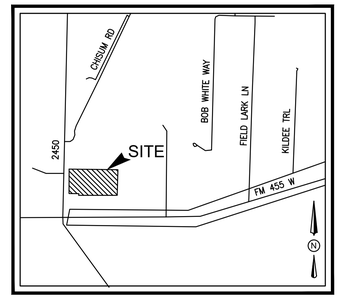
SOIL STABILIZATION PRACTICES:
SELECT T = TEMPORARY OR P = PERMANENT
(AS APPLICABLE)

- ___ MULCHING (HAY OR STRAW)
- ___ BUFFER ZONES
- P PLANTING
- T SEEDING
- P SODDING
- ___ PRESERVATION OF NATURAL RESOURCES
- ___ FLEXIBLE CHANNEL LINER
- ___ RIGID CHANNEL LINER
- ___ SOIL RETENTION BLANKET
- ___ COMPOST MANUFACTURED TOPSOIL
- ___ EROSION CONTROL BLANKET

EROSION CONTROL SUMMARY

PROJECT DESCRIPTION:	SITE GRADING, CONSTRUCTION OF PARKING LOT, UNDERGROUND AND ABOVE GROUND UTILITIES & CONSTRUCTION OF PROPOSED BUILDING.
SEQUENCE OF ACTIVITIES:	THE CONTRACTOR WILL SCHEDULE THE PROJECT IN A SERIES OF PHASES. IN GENERAL, THE SEQUENCE OF THESE PHASES WILL CONSIST OF: 1. INSTALL EROSION CONTROL BMP'S. 2. BEGIN EARTHWORK. 3. INSTALL WET AND DRY UTILITIES. 4. INSTALL STORM SEWER LINES AND INLETS. 5. BEGIN SITE GRADING. 6. INSTALL CURBS, DRIVEWAY AND PARKING LOT. 7. POUR BUILDING FOUNDATION PAD. 8. BEGIN VERTICAL BUILDING CONSTRUCTION. 9. INSTALL TREES, SHRUBS, ETC. AND RESTORE ALL DISTURBED VEGETATION. 10. REMOVAL OF EXISTING EROSION CONTROL BMP'S & INSTALLATION OF PERMANENT EROSION CONTROL BMP'S.
SOIL DISTURBING ACTIVITIES:	SOIL DISTURBING ACTIVITIES WILL INCLUDE CLEARING & GRUBBING, GRADING, TRENCHING IN PREPARATION FOR INSTALLING UTILITIES, BUILDING PAD, PARKING LOT, EROSION & SEDIMENTATION CONTROLS AND TOPSOIL WORK FOR FINAL PLANTING AND SEEDING.
TOTAL PROJECT AREA:	1.064 ACRES
TOTAL DISTURBED AREA:	1.1 ACRES

Scale: 1" = 20' Feet



VICINITY MAP
N.T.S.

EROSION CONTROL GENERAL NOTES

1. EVERY SOIL DISTURBING ACTIVITY SHALL HAVE AN ACCOMPANYING EROSION CONTROL PLAN .
2. THE STORM WATER POLLUTION PREVENTION PLAN (SWP3) SHALL BE READILY AVAILABLE FOR REVIEW BY FEDERAL, STATE, OR LOCAL OFFICIALS.
3. NO SOIL DISTURBING ACTIVITIES WILL OCCUR PRIOR TO THE SWP3 AND ASSOCIATED BEST MANAGEMENT PRACTICES (BMP) BEING FULLY IMPLEMENTED AND THEN INSPECTED.
4. THE CONTRACTOR SHALL COMPLY WITH THE CITY'S STORM WATER ORDINANCE, THE TPDES GENERAL CONSTRUCTION PERMIT TXR150000 AND ANY OTHER STATE AND/OR LOCAL REGULATIONS.
5. THE SITE SHALL BE INSPECTED BY THE CONTRACTOR OR HIS REPRESENTATIVE WEEKLY, AND AFTER ANY MAJOR STORM. ADJUSTMENTS/REPAIRS TO THE EROSION CONTROL MEASURES SHOULD BE MADE AS NEEDED.
6. CONTRACTOR SHALL VEGETATE ALL DISTURBED AREAS IMMEDIATELY UPON COMPLETION OF GRADING ACTIVITIES. FINAL ACCEPTANCE OF A SITE SHALL BE CONTINGENT UPON VEGETATION BEING ESTABLISHED IN ALL DISTURBED AREAS.
7. ADEQUATE MEASURES SHALL BE TAKEN TO PREVENT EROSION. IN THE EVENT THAT SIGNIFICANT EROSION OCCURS AS A RESULT OF CONSTRUCTION THE CONTRACTOR SHALL RESTORE THE ERODED AREA TO ORIGINAL CONDITION OR BETTER.
8. TEMPORARY STONE STABILIZED CONSTRUCTION ENTRANCE SHALL HAVE THE FOLLOWING MINIMUM DIMENSIONS: 24' WIDE X 50' LONG X 6" DEEP. (3"-5" COURSE AGGREGATE). PLACE FILTER FABRIC UNDER STONE .
9. THE CONCRETE WASHOUT AREA IS TO BE USED AS A VEHICLE WASH DOWN AREA FOR DEBRIS AND SOIL REMOVAL PRIOR TO EXITING THE SITE.

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STATE OF TEXAS — KARTAVYA S. PATEL 97534 — LICENSED PROFESSIONAL ENGINEER
06/21/2023

EROSION CONTROL PLAN

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NE QUADRANT OF FM 2450 & CHAPMAN ROAD
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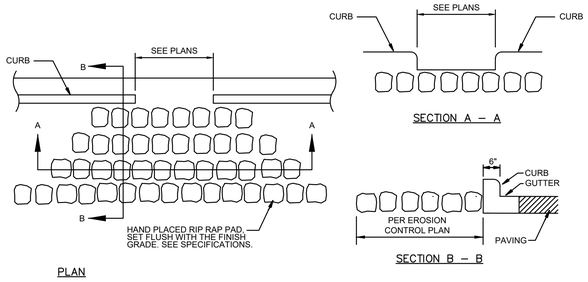


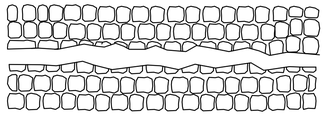
PLAN

SECTION A – A

SECTION B – B

CURB CUT WITH RIP RAP

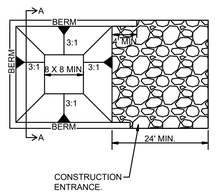
N.T.S.



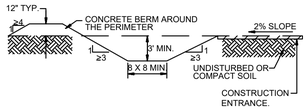
PLACE RIP-RAP IN ALL AREAS INDICATED ON THE DRAWING.THE STONE SHALL CONSIST OF FIELD STONE OR ROUGH, UNHEWN QUARRY STONE AS NEARLY UNIFORM IN SECTION AS IS PRACTICAL. THE STONES SHALL BE DENSE, RESISTANT TO THE ACTION OF AIR AND WATER, AND SUITABLE IN ALL ASPECTS FOR THE PURPOSE INTENDED. UNLESS OTHERWISE SPECIFIED, ALL STONES USED AS RIP-RAP SHALL WEIGH BETWEEN 50-150 POUNDS EACH, AND AT LEAST 60 PERCENT OF THE STONES SHALL WEIGH MORE THAN 100 POUNDS EACH.

RIP-RAP PAD FOR SLOPE PROTECTION DETAIL

N.T.S.



NOTES
1. SEE PLAN VIEW FOR CWA INSTALLATION LOCATION.
2. DO NOT LOCATE AN UNLINED CWA WITHIN 400' OF ANY NATURAL DRANAIGE PATHWAY OR WATERBODY. DO NOT LOCATE WITHIN 1,000' OF ANY WELLS OR DRINKING WATER SOURCES. IF SITE CONSTRAINTS MAKE THIS WITH INFEASIBLE, OR IF HIGHLY PERMEABLE SOILS EXIST ON SITE, THE CWA MUST BE INSTALLED WITH AN IMPERMEABLE LINER (16 MIL MIN. THICKNESS) OR SURFACE STORAGE ALTERNATIVES USING PREFABRICATED CONCRETE WASHOUT DEVICES OR A LINE ABOVE GROUND STORAGE SHOULD BE USED.
3. THE CWA SHALL BE INSTALLED PRIOR TO CONCRETE PLACEMENT ON SITE
4. CWA SHALL INCLUDE FLAT SUBSURFACE PIT THAT IS AT LEAST 8' x 8' SLOPES LEADING OUT OF THE SUBSURFACE PIT SHALL BE 3:1 OR FLATTER. THE PIT SHALL BE AT LEAST 3' DEEP.
5. BERM SURROUNDING SIDES AND BACK OF THE CWA SHALL HAVE MINIMUM HEIGHT OF 1'.
6. VEHICLE TRACKING PAD SHALL BE SLOPED 2% TOWARDS THE CWA.
7. SIGNS SHALL BE PLACED AT THE CONSTRUCTION ENTRANCE, AT THE CWA, AND ELSEWHERE AS NECESSARY TO CLEARLY INDICATE THE LOCATION OF THE CWA TO OPERATORS OF CONCRETE TRUCKS AND PUMP RIGS.
8. USE EXCAVATED MATERIAL FOR PERIMETER BERM CONSTRUCTION.
9. INSPECT BMPs EACH WORKDAY, AND MAINTAIN IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
10. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
11. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
12. THE CWA SHALL BE REPAIRED, CLEANED, OR ENLARGED AS NECESSARY TO MAINTAIN CAPACITY FOR CONCRETE WASTE. CONCRETE MATERIALS, ACCUMULATED IN PIT, SHALL BE REMOVED ONCE THE MATERIALS HAVE REACHED A DEPTH OF 2'.
13. CONCRETE WASHOUT WATER, WASTED PIECES OF CONCRETE AND ALL OTHER DEBRIS IN SHALL BE TRANSPORTED FROM THE JOB SITE IN A CONTAINER AND DISPOSED OF PROPERLY.
14. THE CWA SHALL REMAIN IN PLACE UNTIL ALL CONCRETE FOR THE PROJECT IS PLACED.
15. WHEN THE CWA IS REMOVED, COVER THE DISTURBED AREA WITH TOP SOIL, SEED AND MULCH OR OTHERWISE STABILIZED IN A MANNER APPROVED BE THE LOCAL JURISDICTION.



CONCRETE WASHOUT AREA DETAIL

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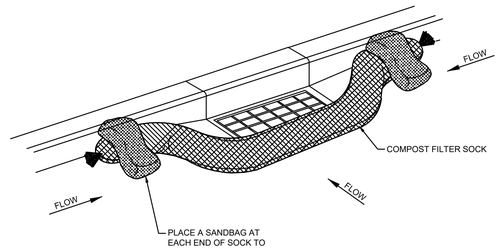
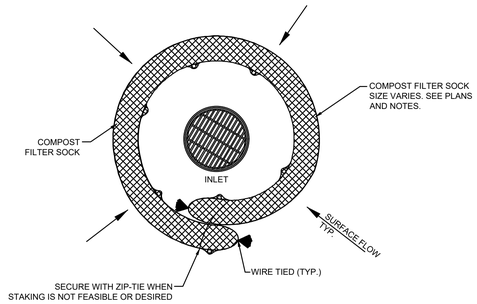


CURB INLET PROTECTION DETAIL

COMPOST FILTER SOCK DETAIL

N.T.S.



AREA/GRATE INLET PROTECTION DETAIL

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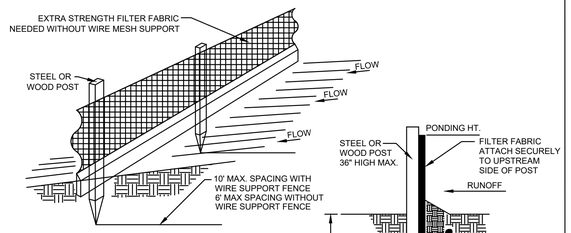

NOTES:
1. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY.
2. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.
3. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.

STANDARD DETAIL
TRENCH WITH NATIVE BACKFILL

SILT FENCE DETAIL

N.T.S.

USAGE NOTES:
1. ANCHORING STAKES SHALL BE SIZED, SPACED, AND BE OF A MATERIAL THAT EFFETIVELY SECURES THEFILTER SOCK. STAKE SPACING SHALL BE A MAXIMUM OF THREE FEET.
2. OVERLAP ENDS OF SOCK PER MANUFACTURES RECOMMENDATIONS. (1'MIN. 3'MAX.)
3. USE 8" TO 12" DIA. SOCK ON CUBSIDE IN TRAFFIC AREAS.
4. USE 12" - 18" DIA. SOCK IN NON-TRAFFIC AREAS OR AREAS WHERE SAFETY IS NOT A CONCERN.

DESIGN CRITERIA:
COMPOST FILTER SOCKS ARE DESIGNED TO RETAIN SEDIMENT TRANSPORTED IN SHEET FLOW FROM DISTURBED AREAS. COMPOST FILTER SOCKS PERFORM THE SAME FUNCTION AS SILT FENCE, ALLOW A HIGHER FLOW RATE, AND ARE USUALLY FASTER AND CHEAPER TO INSTALL. WHERE ALL RUNOFF IS TO BE TREATED BY THE COMPOST FILTER SOCK THE MAXIMUM SLOPE LENGTH BEHIND THE COMPOST FILTER SOCK SHALL NOT EXCEED THOSE SHOWN IN TABLE 1. THE DRAINAGE AREA SHALL NOT EXCEED ¼ ACRE FOR EVERY 100 FT OF COMPOST FILTER SOCK.

THE SEDIMENT AND POLLUTANT REMOVAL PROCESS CHARACTERISTIC TO COMPOST FILTER SOCKS COMBINES BOTH FILTERING AND DEPOSITION FROM SETTLING SOLIDS.THIS IS DIFFERENT THAN METHODS THAT RELY ON PONDING FOR DEPOSITION OF SOLIDS FOR SEDIMENT CONTROL,SUCH AS SILT FENCE. PONDING OCCURS WHEN WATER FLOWING TO THE COMPOST FILTER SOCK ACCUMULATES FASTER THAN THE HYDRAULIC FLOW THROUGH RATE OF THE COMPOST FILTER SOCK. HYDRAULIC FLOW-THROUGH RATS FOR COMPOST FILTER SOCKS ARE 50% GREATER THAN SILT FENCE FILTER FABRIC. GREATER HYDRAULIC FLOW-THROUGH RATES REDUCE PONDING. COMPOST FILTER SOCKS SHALL MEET THE NETTING SPECIFICATIONS IN TABLE 22. COMPOST FILTER SOCKS SHALL MEET THE SPECIFICATIONS IN TABLE 3. COMPOST USED IN COMPOST FILTER SOCKS SHALL MEET THE SPECIFICATION DESCRIBED UNDER COMPOST FILTER MEDIA SPECIFICATIONS.

A 12 INCH DIAMETER COMPOST FILTER SOCK SHALL BE USED ON DEVELOPMENTS WHERE THE LIFE OF THE PROJECT IS GREATER THAN OR EQUAL TO SIX MONTHS. A 12 INCH DIAMETER COMPOST FILTER SOCK MAY ALSO BE USED ON MINOR PROJECTS, SUCH AS RESIDENTIAL HOME SITES OR SMALL COMMERCIAL DEVELOPMENTS.

COMPOST FILTER MEDIA SPECIFICATIONS:
COMPOST USED FOR COMPOST FILTER SOCK FILLER MATERIAL (FILTER MEDIA) SHALL BE WEED FREE AND DERIVED FROM A WELL-DECOMPOSED SOURCE OF ORGANIC MATTER. THE COMPOST SHALL BE PRODUCED USING AN AEROBIC COMPOSTING PROCESS MEETING CFR 503 REGULATIONS INCLUDING TIME AND TEMPERATURE DATA. THE COMPOST SHALL BE FREE OF ANY REFUSE, CONTAMINANTS OR OTHER MATERIALS TOXIC TO PLANT GROWTH. NON-COMPOSTED PRODUCTS WILL NOT BE ACCEPTED. TEST METHODS FOR THE ITEMS BELOW SHOULD FOLLOW US COMPOSTING COUNCIL TEST METHODS FOR THE EXAMINATION OF COMPOSTING AND COMPOST GUIDELINES FOR LABORATORY PROCEDURES:

A. PH _5.0-8.0 IN ACCORDANCE WITH TMECC 04.11-A, "ELECTROMETRIC PH DETERMINATIONS FOR COMPOST"
B. PARTICLE SIZE -99% PASSING A 2 IN (50MM) SIEVE AND A MAXIMUM OF 40% PASSING A ⅜ IN (9.5MM) SIEVE, IN ACCORDANCE WITH TMECC 02.02-B, "SAMPLE SIEVING FOR AGGREGATE SIZE CLASSIFICATION". (NOTE- IN THE FIELD, PRODUCT COMMONLY IS BETWEEN ½ IN [12.5MM] AND 2 IN [50MM] PARTICLE SIZE.)
C. MOISTURE CONTENT OF LESS THAN 60% IN ACCORDANCE WITH STANDARDIZED TEST METHODS FOR MOISTURE DETERMINATION.
D. MATERIAL SHALL BE RELATIVELY FREE (<1% BY DRY WEIGHT) OF INERT OF FOREIGN MAN MADE MATERIALS.
E. A SAMPLE SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO BEING USED AND MUST COMPLY WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS,

CONSTRUCTION SPECIFICATIONS:
THE COMPOST FILTER SOCK SHALL BE INSTALLED ACCORDING TO THIS SPECIFICATION, AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
1. COMPOST FILTER SOCKS SHOULD BE INSTALLED PARALLEL TO THE BASE OF THE SLOPE OR OTHER DISTURBED AREA. IN EXTREME CONDITIONS (I.E., 2:1 SLOPES), A SECOND COMPOST FILTER SOCK SHALL BE CONSTRUCTED AT THE TOP OF THE SLOPE.
2. STAKES SHALL BE INSTALLED THROUGH THE MIDDLE OF THE COMPOST FILTER SOCK ON 10 FT (3M) CENTERS, USING 2 IN (50MM) BY 2 IN (50MM) BY 3 FT (1M) WOODEN STAKES. IN THE EVENT STAKING IS NOT POSSIBLE, I.E., WHEN COMPOST FILTER SOCKS ARE USED ON PAVEMENT, HEAVY CONCRETE BLOCKS SHALL BE USED BEHIND THE COMPOST FILTER SOCKS TO HELP STABILIZE DURING RAINFALL/RUNOFF EVENTS.
3. STAKING DEPTH FOR SAND AND SILT LOAM SOILS SHALL BE 12 IN (300MM), AND 8 IN (200MM) FOR CLAY SOILS.
4. LOOSE COMPOST MAY BE BACKFILLED ALONG THE UPSLOPE SIDE OF THE COMPOST FILTER SOCK, FILLING THE SEAM BETWEEN THE SOIL SURFACE AND THE DEVICE, IMPROVING FILTRATION AND SEDIMENT RETENTION.
5. IF THE COMPOST FILTER SOCK IS TO BE LEFT AS A PERMANENT FILTER OR PART OF THE NATURAL LANDSCAPE, IT MAY BE SEEDED AT TIME OF INSTALLATION FOR ESTABLISHMENT OF PERMANENT VEGETATION. THE ENGINEER WILL SPECIFY SEED REQUIREMENTS.
6. COMPOST FILTER SOCKS ARE NOT TO BE USED IN PERENNIAL, EPHEMERAL, OR INTERMITTENT STREAMS.

MAINTENANCE:
SEDIMENT SHALL BE REMOVED ONCE IT HAS ACCUMULATED TO ONE-HALF THE ORIGINAL HEIGHT OF THE BARRIER. COMPOST FILTER SOCKS SHALL BE REPLACED WHENEVER IT HAS DETERIORATED TO SUCH AN EXTENT THAT THE EFFECTIVENESS OF COMPOST FILTER SOCK IS REDUCED. COMPOST FILTER SOCKS SHALL REMAIN IN PLACE UNTIL DISTURBED AREAS HAVE BEEN PERMANENTLY STABILIZED. ALL SEDIMENT ACCUMULATION AT THE COMPOST FILTER SOCK SHALL BE REMOVED AND PROPERLY DISPOSED OF BEFORE THE COMPOST FILTER SOCK IS REMOVED.

COMPOST FILTER SOCK NOTES

N.T.S.

NO.	DATE	DESCRIPTION	BY
1	06–08–23	1st CITY SUBMITTAL	AP
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STATE OF TEXAS
KARTAVYA S. PATEL
97534
LICENSED PROFESSIONAL ENGINEER
06/21/2023

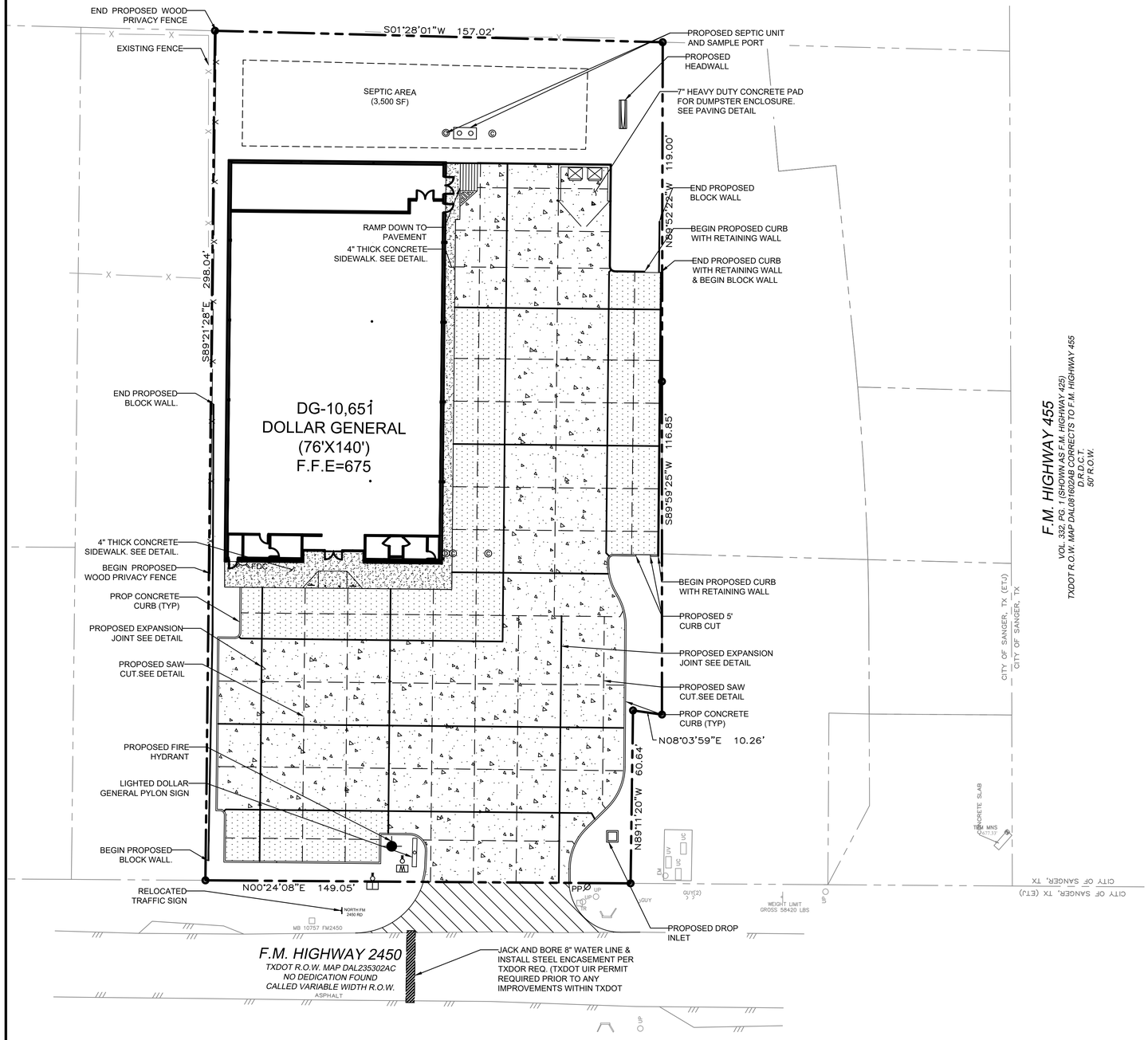
EROSION CONTROL DETAILS

DOLLAR GENERAL
NE QUADRANT OF FM 2450 & CHAPMAN ROAD
CITY OF SANGER ETJ
DENTON COUNTY, TEXAS 76266
JAMES B.P. JANUARY SURVEY ABSTRACT NO #658

TRIANGLE ENGINEERING LLC
T: 469.331.8566 I F: 469.213.7145 I E: info@triangle-engr.com
W: triangle-engr.com I O: 1784 McDermott Drive, Suite 110, Allen, TX 75013
Planning | Civil Engineering | Construction Management

P.E.	DES.	DATE	SCALE	PROJECT NO.	SHEET NO.
KP	AP	06–02–23	SEE SCALE BAR	050–23	C-7.1

TX. P.E. FIRM #11525



EXISTING LEGEND

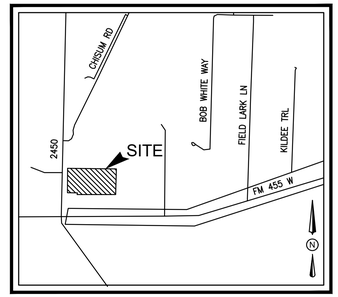
- air conditioner
- borehole
- cable tv
- electric meter
- fence or handrail
- fire dept. connection
- fire hydrant
- fire lane
- guard rail
- grease trap
- bollard
- grate inlet
- gas meter
- gas line
- utility pole anchor
- irrigation valve
- landscape or tree line
- landscape electric box
- landscape light
- light pole
- mailbox
- monitoring well
- overhead utility lines
- pool equipment
- road sign
- roof drain
- silt fence
- spot elevation
- sanitary sewer manhole
- sanitary sewer pipe
- storm water manhole
- storm water pipe
- telephone manhole
- tank fill lid
- telephone riser
- traffic signal pole
- unknown manhole
- utility clean out
- utility cabinet
- utility vault
- utility markings (line color = color of markings)
- utility pole
- utility pole with riser
- utility sign
- water shutoff
- water valve
- water manhole
- water meter
- well
- water line
- one-foot contour lines
- tree trunk (with canopy)
- caliper inches at breast height
- ornamental tree multiple trunks
- Google 360 Hyperlink

PAVING LEGEND

- EXPANSION JOINT (@ 60' MAX.)
- SAWCUT JOINT (@ 15 'MAX.)
- 4" SIDEWALK
- 5" LIGHT DUTY CONCRETE
- 7" HEAVY DUTY DUMPSTER CONCRETE
- TXDOT DRIVEWAY
- SANITARY SEWER MANHOLE
- SANITARY SEWER CLEANOUT
- SANITARY SEWER DOUBLE CLEANOUT
- SANITARY SEWER SAMPLE PORT
- SEPTIC UNIT
- DOMESTIC WATER METER
- IRRIGATION METER
- FIRE HYDRANT
- FIRE DEPARTMENT CONNECTION-FDC

PAVING GENERAL NOTES

1. STRIP & REMOVE FROM THE CONSTRUCTION AREA ALL TOPSOIL, ORGANICS & VEGETATION TO A MINIMUM DEPTH OF 6 INCHES.
2. CONTROL JOINTS FORMED BY SAWING ARE RECOMMENDED BOTH LONGITUDINAL AND TRANSVERSE DIRECTIONS. CONTROL JOINT SHALL BE SAWED WITHIN 3 HOURS AFTER PLACING CONCRETE. JOINTS SHALL BE PROPERLY CLEANED AND SEALED AS SOON AS POSSIBLE AFTER JOINTS ARE CUT.
3. DRAINAGE SHOULD BE MAINTAINED AWAY FROM THE FOUNDATION, BOTH DURING AND AFTER CONSTRUCTION. WATER SHOULD NOT BE ALLOWED TO POND NEAR THE FOUNDATION. THE FOLLOWING ITEMS SHOULD PROVIDE FOR POSITIVE DRAINAGE OF WATER AWAY FROM THE FOUNDATION: SIDEWALKS AND OTHER CONCRETE FLAT WORK, PARKING AREAS, DRIVEWAYS AND OTHER SURFACE DRAINAGE FEATURES, AND LANDSCAPING.
4. FRENCH DRAINS ARE RECOMMENDED AROUND ANY SLABS WHERE SEEPING GROUND WATER IS ENCOUNTERED DURING CONSTRUCTION.
5. SIDEWALK AROUND THE BUILDING SHALL NOT BE STRUCTURALLY CONNECTED TO THE BUILDING FOUNDATION UNLESS IT'S NOTED ON THE STRUCTURAL PLANS.
6. ALL EXPANSION JOINTS AND CRACK CONTROL JOINTS SHOULD BE SEALED TO PREVENT THE INFILTRATION OF WATER INTO THE SUBSURFACE. THIS IS PARTICULARLY IMPORTANT AROUND IRRIGATED LANDSCAPING AND ALONG THE DRAINAGE PATH OF ROOF DOWNSPOUTS.
7. LANDSCAPE ISLANDS SHOULD BE BACKFILLED WITH LOW PLASTICITY CLAYS TO REDUCE WATER INTRUSION INTO THE SUBSURFACE PAVEMENT STRUCTURES. CURBS SHOULD BE PROVIDED WITH WEEP HOLES IN LANDSCAPE AREAS TO REDUCE THE BUILD UP OF HYDROSTATIC PRESSURE AND TO REDUCE THE INTRUSION OF WATER INTO THE SUBSURFACE MATERIAL.
8. CURB AND GUTTER SHALL CONSIST OF STEEL REINFORCED CONCRETE AND SHALL BE SIX (6") INCHES HIGH, UNLESS OTHERWISE NOTED ON THE SITE/GRADING PLANS.
9. THE CONTRACTOR SHALL PROCEED WITH PAVING NO MORE THAN SEVENTY-TWO (72) HOURS AFTER DENSITY/MOISTURE TESTS HAVE BEEN TAKEN AND PASSED BY A REGULAR TESTING FIRM.
10. MANHOLE RIM ELEVATIONS, CLEAN-OUTS, VALVE BOXES, ETC. SHALL BE ADJUSTED TO FINISHED GRADE BY THE PAVING CONTRACTOR AT THE TIME OF PAVING.
11. SEE IRRIGATION PLAN FOR IRRIGATION SLEEVE PLACEMENT PRIOR TO PAVING CONSTRUCTION.
12. GC TO FOLLOW PAVEMENT & SUB GRADE THICKNESS PER GEO TECH RECOMMENDATION ON SOIL REPORT



VICINITY MAP
N.T.S.

Know what's **below.**
Call before you dig.

NO.	DATE	DESCRIPTION	BY
1	06-08-23	1st CITY SUBMITTAL	AP
2	06-21-23	REVISED PER CLIENT COMMENT	AP
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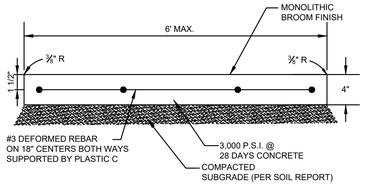
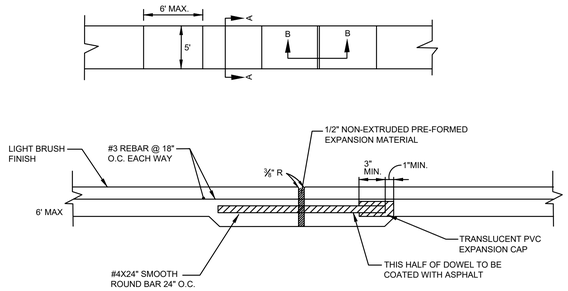
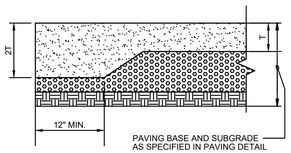


SECTION A-A

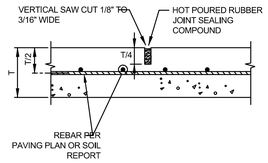


SECTION B-B

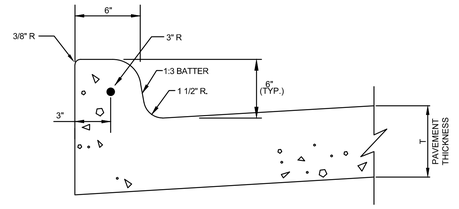
SIDEWALK DETAIL
N.T.S.



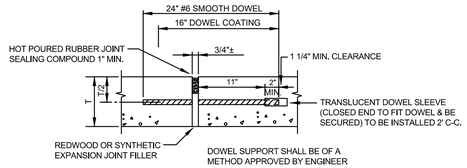
THICKENED EDGE OF PAVING DETAIL
N.T.S.



TYPICAL SAW CUT DETAIL
N.T.S.

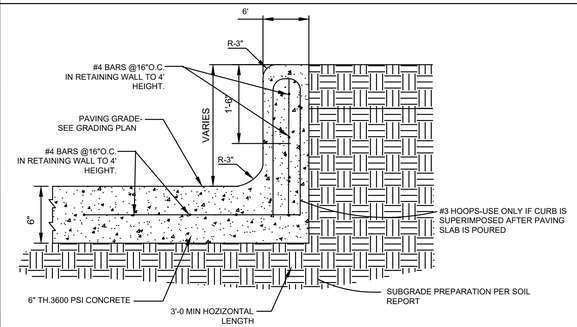


TYPICAL CURB DETAIL
N.T.S.

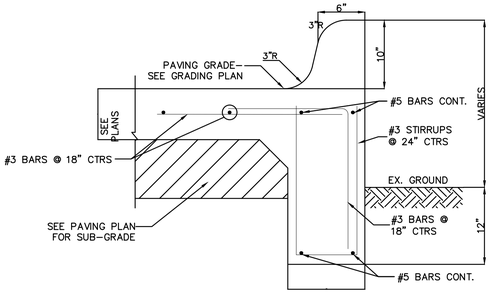


(SPACED 30 FT. MAXIMUM; LOCATE AT STRUCTURES AND AT INTERSECTION P.C.'S & P.T.'S)

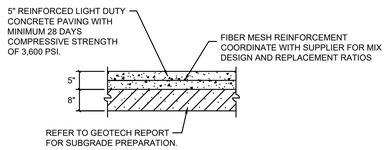
TYPICAL EXPANSION JOINT DETAIL
N.T.S.



VARIABLE HEIGHT CURB W/RETAINING WALL DETAIL
N.T.S.

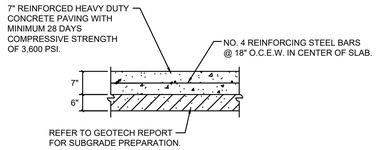


CURB W/RETAINING WALL DETAILS



NOTE:
1. CONTRACTOR TO VERIFY WITH CITY REQUIREMENTS. SHOULD THE CITY REQUIREMENTS DIFFER FROM DETAIL, THE CITY REQUIREMENTS WILL SUPERCEDE.
2. CONTRACTOR TO VERIFY REQUIREMENTS FOR INSTALLATION OF PAVEMENT IN FIRE LANE. CONTRACTOR TO INSTALL ACCORDING TO LOCAL, STATE OR GOVERNMENT JURISDICTION.

5" CONCRETE PAVEMENT
N.T.S.



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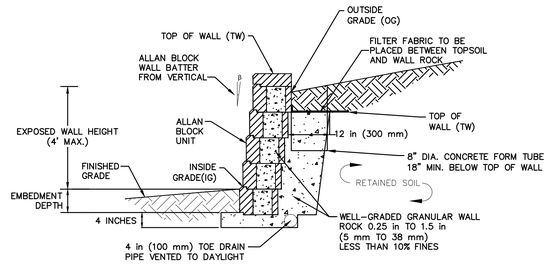
7" CONCRETE PAVEMENT
N.T.S.



VARIABLE HEIGHT BLOCK RETAINING WALL
N.T.S.

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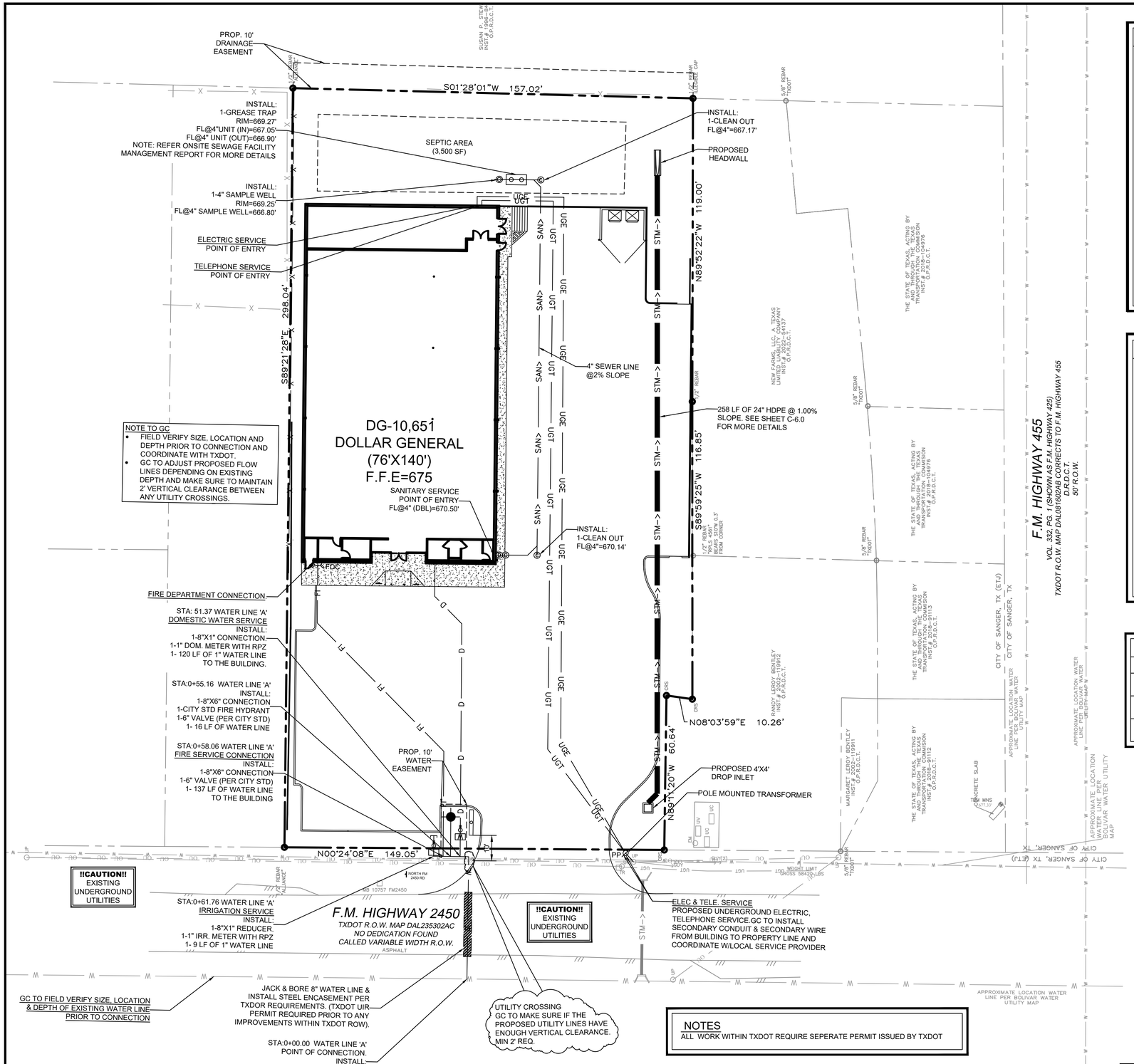

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- tree trunk (with canopy)
- caliper inches at breast height
- ornamental tree multiple trunks
- Google 360 Hyperlink

UTILITY LEGEND

UNDERGROUND TELEPHONE LINE	UGT
UNDERGROUND ELECTRIC LINE	UGE
GAS LINE	G
SANITARY SEWER LINE	SAN>
WATER MAIN	W
DOMESTIC WATER LINE	D
STORM LINE	STM–>
STORM SEWER MANHOLE	
STORM SEWER CLEANOUT	
SANITARY SEWER MANHOLE	
SANITARY SEWER CLEANOUT	
SANITARY SEWER DOUBLE CLEANOUT	
SANITARY SEWER SAMPLE PORT	
SEPTIC UNIT	
DOMESTIC WATER METER	W
IRRIGATION METER	
GAS METER	G
FIRE HYDRANT	
FIRE DEPARTMENT CONNECTION-FDC	
TRANSFORMER	T
LIGHT POLE	
POWER POLE	

WATER METER & SANITARY SEWER SCHEDULE

ID	TYPE	SIZE	NO.
D	DOMESTIC	1"	1
I	IRRIGATION	1"	1
	SANITARY SEWER	4"	

NOTES

ALL WORK WITHIN TXDOT REQUIRE SEPERATE PERMIT ISSUED BY TXDOT

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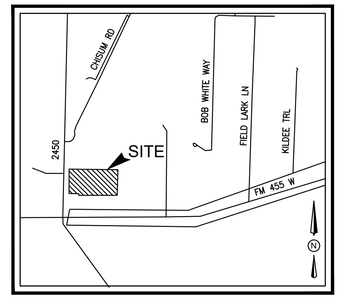
STATE OF TEXAS — KARTAVYA S. PATEL — 97534 — LICENSED PROFESSIONAL ENGINEER

06/21/2023

Scale: 1" = 20' Feet (0, 1, 40)



VICINITY MAP
N.T.S.

UTILITY GENERAL NOTES

1. ALL CONSTRUCTION SHALL BE IN STRICT ACCORDANCE WITH THE CITY/UTILITY COMPANY STANDARDS.
2. FIELD VERIFY LOCATION OF EXISTING WATER MAIN , SEWER MAIN, GAS, TELEPHONE AND ELECTRICAL LINE. POT HOLE RECOMMENDED PRIOR TO CONSTRUCTION BEGIN. CONTRACTOR SHALL BE RESPONSIBLE TO COORDINATE WITH UTILITY SERVICE PROVIDERS.
3. THE LOCATION OF UNDERGROUND UTILITIES INDICATED ON THE PLANS IS TAKEN FROM AS-BUILTS, UTILITY PLANS OR SURVEY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAKE ARRANGEMENTS WITH THE OWNERS OF SUCH UNDERGROUND UTILITIES PRIOR TO WORKING IN THE AREA TO CONFIRM THEIR EXACT LOCATION AND TO DETERMINE WHETHER ANY ADDITIONAL UTILITIES OTHER THAN THOSE SHOWN ON THE PLANS MAY BE PRESENT. THE CONTRACTOR SHALL PRESERVE AND PROTECT ALL UNDERGROUND UTILITIES. IF EXISTING UNDERGROUND UTILITIES ARE DAMAGED, THE CONTRACTOR WILL BE RESPONSIBLE FOR THE COST OF REPAIRING THE UTILITY.
4. WHERE EXISTING UTILITIES OR SERVICE LINES ARE CUT, BROKEN OR DAMAGED, THE CONTRACTOR SHALL REPLACE OR REPAIR THE UTILITIES OR SERVICE LINES WITH THE SAME TYPE OF ORIGINAL MATERIAL AND CONSTRUCTION, OR BETTER, UNLESS OTHERWISE SHOWN OR NOTED ON THE PLANS, AT HIS OWN COST AND EXPENSE. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AT ONCE OF ANY CONFLICTS WITH UTILITIES.
5. ALL EXCAVATIONS, TRENCHING AND SHORING OPERATIONS SHALL COMPLY WITH THE REQUIREMENTS OF THE U. S. DEPARTMENT OF LABOR, OSHA, CONSTRUCTION SAFETY AND HEALTH REGULATIONS AND ANY AMENDMENTS THERETO.
6. THE CONTRACTOR SHALL RESTORE ALL AREAS DISTURBED BY CONSTRUCTION TO ORIGINAL CONDITION OR BETTER. RESTORED AREAS INCLUDE, BUT ARE NOT LIMITED TO TRENCH BACKFILL, SIDE SLOPES, FENCES, CULVERT PIPES, DRAINAGE DITCHES, DRIVEWAYS, PRIVATE YARDS AND ROADWAYS.
7. ANY CHANGES NEEDED AFTER CONSTRUCTION PLANS HAVE BEEN RELEASED, SHALL BE APPROVED BY THE CITY ENGINEER. THESE CHANGES MUST BE RECEIVED IN WRITING.
8. THE CONTRACTOR SHALL PROVIDE "RED LINED" MARKED PRINTS TO THE ENGINEER PRIOR TO FINAL INSPECTION INDICATING ALL CONSTRUCTION WHICH DEVIATED FROM THE PLANS OR WAS CONSTRUCTED IN ADDITION TO THAT INDICATED ON THE PLANS.

UTILITY PLAN

DOLLAR GENERAL

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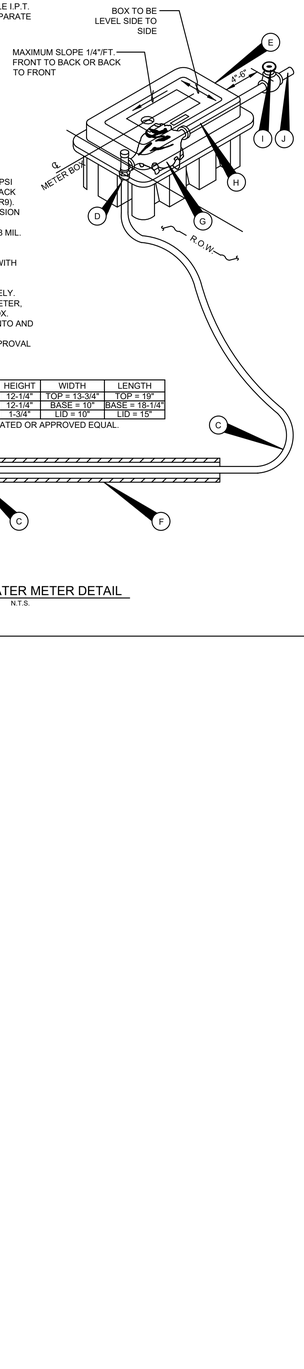
MATERIAL LIST:

A. SERVICE CLAMP REQUIRED.
B. 1" CORPORATION STOP - SERVICE PIPE OUTLET. (SEE NOTE #2)
C. 1" SERVICE PIPE.
D. LOCKING ANGLE METER STOP; SERVICE PIPE INLET X SWIVEL COUPLING NUT OUTLET:
- FOR 5/8" AND 3/4" METERS: 1" X 3/4"
- FOR 1" METERS: 1" X 1"
- SEE NOTE #2

E. PLASTIC RECTANGULAR METER BOX. (SEE TABLE BELOW)
F. PIPE CASING WHERE APPLICABLE. (AS PER DETAIL WT-01)
G. WATER METER, CENTERED IN BOX. (SEE TABLE BELOW)
H. WATER METER COUPLING; MALE I.P.T. X SWIVEL COUPLING NUT:
- FOR 5/8" AND 3/4" METERS: 3/4" X 8 1/2" LONG.
- FOR 1" METERS: LENGTH OF PIPE TO BE DETERMINED BY CONTRACTOR. EXTEND PIPE TO 4"-6" OUTSIDE OF METER BOX.

I. BRONZE GATE VALVE: NON-RISING STEM (3/4" OR 1") FEMALE I.P.T. (PROPERTY OWNERS CUT-OFF OUTSIDE METER BOX IN SEPARATE VALVE CAN WITH LID.
J. 3/4" OR 1" PIPE MEETING CITY CODE REQUIREMENTS.

METER SIZE	LENGTH
5/8"	7 1/2"
3/4"	7 1/2"
1"	11"

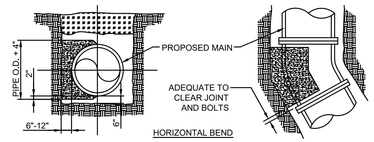


NOTES:
1. SERVICE PIPE SHALL BE COPPER TUBE SIZE. IT MAY BE 150 PSI ANNEALED SEAMLESS TYPE "K" COPPER TUBING OR 200 PSI BLACK COLORED POLYETHYLENE HAVING A DIMENSION RATIO OF 9 (DR9).
2. ALL STAINLESS STEEL INSERTS THAT COME WITH COMPRESSION FITTINGS SHALL NOT BE USED ON ANY CONNECTIONS.
3. SERVICE SADDLES SHALL BE WRAPPED COMPLETELY WITH 8 MIL. POLYETHYLENE FILM.
4. TOP OF BOXES SHALL BE 1" ABOVE FINISHED GRADE.
5. PIPING AND TUBING SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 510.3 OF THE STANDARD SPECIFICATIONS. SPECIAL ATTENTION IS CALLED TO "PIPE BEDDING ENVELOPE" AND "BACKFILLING", SECTIONS 510.3 (14) AND 510.3 (25), RESPECTIVELY.
6. AXIS OF METER ASSEMBLY (LINE THROUGH METER STOP, METER, PIPING AND OWNERS CUTOFF) SHALL BE 10" BELOW TOP OF BOX.
7. SLOTS PROVIDED IN METER BOX TO ACCOMODATE PIPING INTO AND OUT OF BOX, SHALL NOT BE MODIFIED.
8. LOCATION OF METER BOXES SHALL BE SUBJECT TO THE APPROVAL OF THE C.O.R.R.

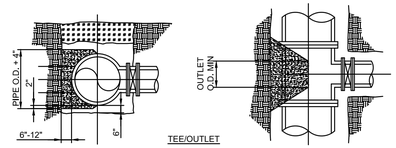
PART NUMBER	SERIES	SIZE	HEIGHT	WIDTH	LENGTH
DFW36C-BODY*	36C	STD.	12-1/4"	TOP = 13-3/4"	TOP = 19"
DFW36C-SBSM*	36C	STD.	12-1/4"	BASE = 10"	BASE = 18-1/4"
DFW36C-SBSM-LID*	36C	STD.	1-3/4"	LID = 10"	LID = 15"

* ROTEC BY DFW PLASTICS INCORPORATED OR APPROVED EQUAL.

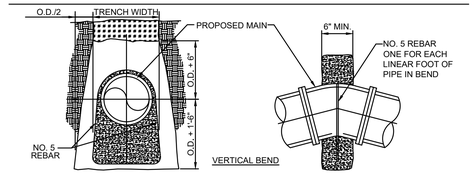
1" & 3/4" WATER METER DETAIL
N.T.S.



HORIZONTAL BEND



TEE/OUTLET

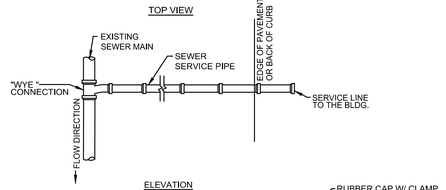


VERTICAL BEND

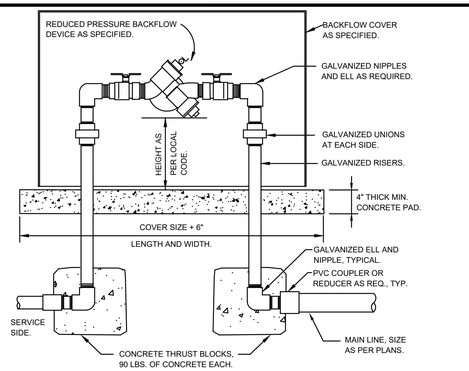
THRUST BLOCK DESIGN AS FOLLOWS:
A. PRESSURE OF 150 P.S.I. (ACTUAL IF HIGHER) + 50% SURGE ALLOWANCE
B. MAXIMUM SOIL BEARING:
C. ALL PIPE & FITTING TO BE WRAPPED WITH 40 PLASTIC MIL.

SOIL TYPE	PRESSURE
LIMESTONE	4,000 LBS./SQ. FT.
UNDISTURBED SOIL, CALICHE	2,000 LBS./SQ. FT.
LOOSE OR SPONGY SOIL	1,500 LBS./SQ. FT.

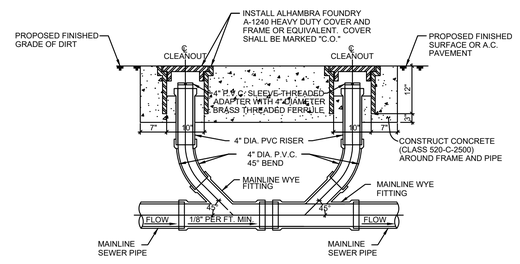
THRUST BLOCK DETAIL
N.T.S.



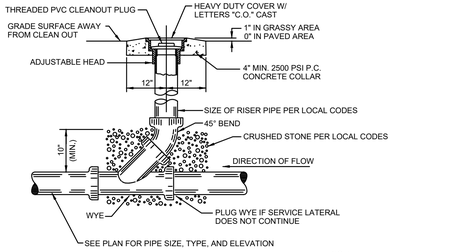
SEWER TAP DETAIL
N.T.S.



RP BACKFLOW WITH ENCLOSURE DETAIL
N.T.S.



SANITARY SEWER DOUBLE CLEAN-OUT
N.T.S.



NOTE:
SEE APPLICABLE DETAIL FOR BACKFILL AND BEDDING INSTRUCTIONS.

SANITARY SEWER CLEAN-OUT
N.T.S.

NO.	DATE	DESCRIPTION	BY
1	06-08-23	1st CITY SUBMITTAL	AP
2	06-21-23	REVISED PER CLIENT COMMENT	AP
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STATE OF TEXAS
KARTAVYA S. PATEL
97534
LICENSED PROFESSIONAL ENGINEER
06/21/2023

UTILITY DETAILS

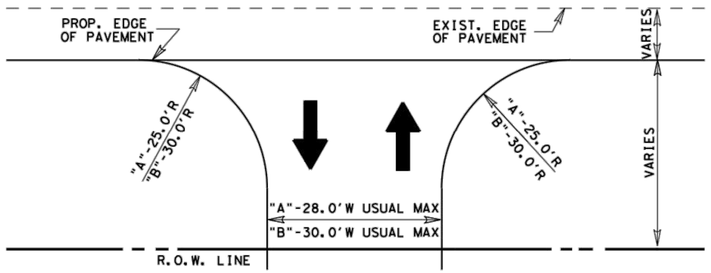
DOLLAR GENERAL
NE QUADRANT OF FM 2450 & CHAPMAN ROAD
CITY OF SANGER ETJ
DENTON COUNTY, TEXAS 76266
JAMES B.P. JANUARY SURVEY ABSTRACT NO #658

TRIANGLE ENGINEERING LLC
T: 469.331.8566 I F: 469.213.7145 I E: info@triangle-engr.com
W: triangle-engr.com I O: 1784 McDermott Drive, Suite 110, Allen, TX 75013
Planning | Civil Engineering | Construction Management

P.E.	DES.	DATE	SCALE	PROJECT NO.	SHEET NO.
KP	AP	06-02-23	SEE SCALE BAR	050-23	C-9.1

TX. P.E. FIRM #11525

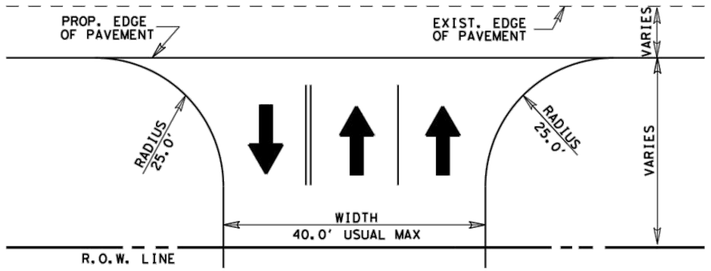
DESIGNS FOR TWO-WAY COMMERCIAL DRIVEWAYS



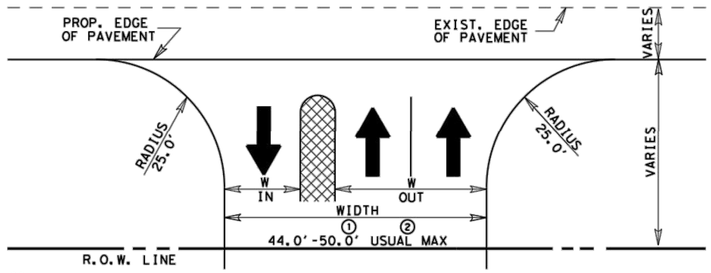
"A"- ONE ENTRY LANE AND ONE EXIT LANE, FEWER THAN 4 LARGE VEHICLES PER HOUR

"B"- ONE ENTRY LANE AND ONE EXIT LANE, 4 OR MORE SINGLE UNIT VEHICLES① PER HOUR

① - *DRIVEWAY DESIGNS FOR LARGER VEHICLES WILL BE CONSIDERED ON A CASE BY CASE BASIS*

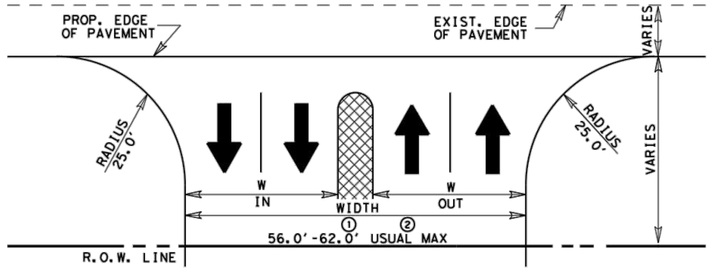


ONE ENTRY LANE AND TWO EXIT LANES (WITHOUT DIVIDERS)



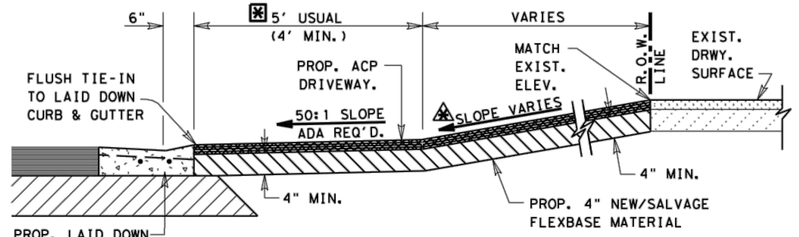
① - *4.0' WIDE DIVIDER, FACE-TO-FACE CURBS*
② - *10.0' WIDE DIVIDER, FACE-TO-FACE-CURBS*

ONE ENTRY LANE AND TWO EXIT LANES (WITH A DIVIDER)



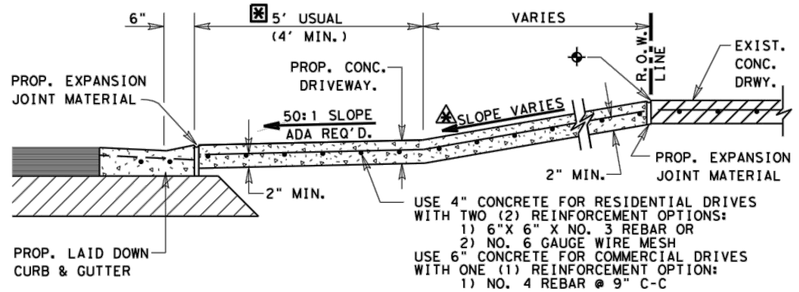
① - *4.0' WIDE DIVIDER, FACE-TO-FACE CURBS*
② - *10.0' WIDE DIVIDER, FACE-TO-FACE-CURBS*

TWO ENTRY LANES AND TWO EXIT LANES (WITH A DIVIDER)



TYPICAL ASPH. CONC. PVM'T. DRIVEWAY SECTION

N.T.S.



TYPICAL CONCRETE DRIVEWAY SECTION

N.T.S.

⊕ CONCRETE SHALL BE SAW CUT TO THE LIMITS OF REMOVAL WHERE APPLICABLE.

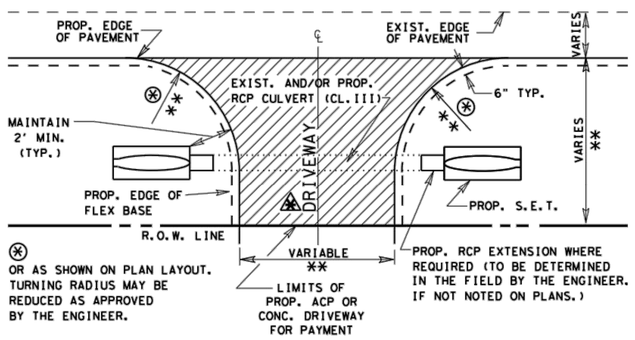
⊠ PROP./FUTURE SIDEWALK CROSSING LOCATION UNLESS SHOWN ELSEWHERE ON P&P SHEETS. SEE P&P SHEETS FOR PROP. SIDEWALK LOCATION IF SIDEWALKS ARE INCLUDED AS PART OF PROJECT. REFER TO STATE STANDARDS - PEDESTRIAN FACILITIES - FOR ADDITIONAL REQUIREMENTS.

⚠ ENTRANCE'S BASE AND SURFACING MAY BE EXTENDED BEYOND R.O.W. LINE AS REQUIRED TO MEET EXISTING GRADE IN A SATISFACTORY MANNER OF WHICH NO STEEPER THAN 12:1 FOR COMMERCIAL DRIVEWAY AND 8:1 FOR RESIDENTIAL DRIVEWAY SLOPE WILL BE CONSTRUCTED.

PROP. DWY ALGEBRAIC DIFFERENCE TABLE
COMMERCIAL DRIVEWAYS @ A = 6% MAX. RESIDENTIAL DRIVEWAYS @ A = 8% MAX.

PROPOSED DRIVEWAY SLOPE TABLE
COMMERCIAL DRIVEWAYS @ 12:1 MAX. RESIDENTIAL DRIVEWAYS @ 8:1 MAX.

PRIVATE AND COMMERCIAL DRIVES WITHOUT CURB & GUTTER



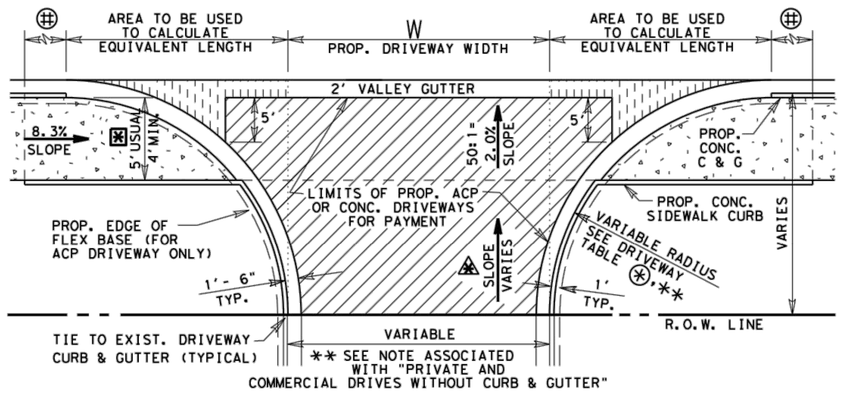
⊛ OR AS SHOWN ON PLAN LAYOUT. TURNING RADIUS MAY BE REDUCED AS APPROVED BY THE ENGINEER.

PLAN OF PRIVATE AND COMMERCIAL DRIVES

** FOR PRIVATE RESIDENTIAL DRIVES, TRY TO MATCH EXISTING WITH A MINIMUM WIDTH OF 12 FT. AND A MAXIMUM WIDTH OF 24 FT. WITH 15 FT. USUAL RADIUS. FOR COMMERCIAL DRIVES, USE ABOVE COMMERCIAL DRIVEWAY DETAILS.

⚠ SEE TYPICAL DRIVEWAY SECTIONS NOTES FOR DRIVEWAY SLOPE CRITERIA.

PRIVATE AND COMMERCIAL DRIVES WITH CURB & GUTTER



PLAN OF PRIVATE AND COMMERCIAL DRIVES

SEE P&P SHEETS FOR LOCATIONS OF DRIVES
N.T.S.

⊠ PROP./FUTURE CONC. SIDEWALK LOCATION UNLESS SHOWN ELSEWHERE ON P&P SHEETS. REFER TO STATE STANDARDS - PEDESTRIAN FACILITIES - FOR ADDITIONAL REQUIREMENTS.

⊕ LIMITS OF SLOPE FOR PROP. CONC. CURB BASED ON 8.3% SLOPE FOR SIDEWALK.

⚠ SEE TYPICAL DRIVEWAY SECTIONS NOTES FOR DRIVEWAY SLOPE CRITERIA.

LF EQUIVALENT TABLE FOR PAYMENT LIMITS OF 2' VALLEY GUTTER

LF OF VALLEY GUTTER= W + X1 + X2

WHERE X1 AND X2 MAY VARY DEPENDING ON RADIUS

Prop. Driveway Radius	X1 or X2 (Sq Ft Area / 2') Equivalent LF Length
5'	1
8'	2
10'	4
12'	6
15'	9
18'	12
20'	15
22'	18
25'	24
28'	30
30'	34

SEE DRIVEWAY TABLE FOR LIMITS OF LAID DOWN CURB TO BE PAID FOR AS CURB AND GUTTER

DRIVEWAY TYPES

TY PB-1
EXIST. PRIVATE OR COMMERCIAL DRIVEWAYS TO BE CONSTRUCTED AS SHOWN WITH 4" NEW AND/OR SALVAGE FLEX. BASE, PRIMED AND SURFACED WITH 114#/SY ACP.

CONCRETE (RESIDENTIAL)
EXIST. PRIVATE DRIVEWAYS TO BE CONSTRUCTED AS SHOWN WITH 4" CONCRETE. TO BE PAID FOR BY THE SQ.YD.

CONCRETE (COMMERCIAL)
EXIST. BUSINESS DRIVEWAYS TO BE CONSTRUCTED AS SHOWN WITH 6" CONCRETE. TO BE PAID FOR BY THE SQ.YD.

PHARR DISTRICT STANDARD

TEXAS DEPARTMENT OF TRANSPORTATION

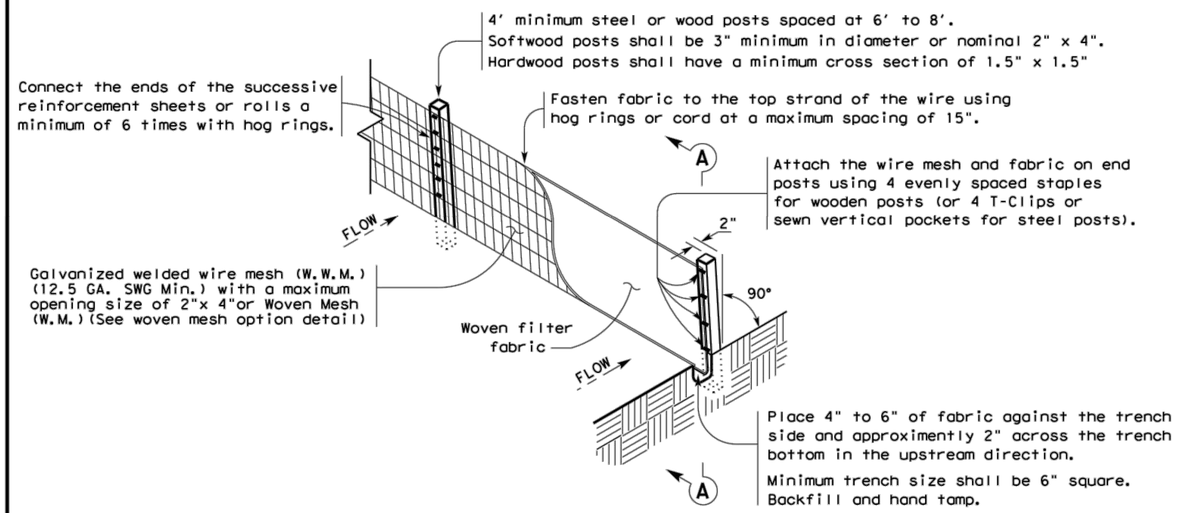
DRIVEWAY DETAILS PRIVATE (RESIDENTIAL-COMMERCIAL)

REV. 01/17

DRIVEWAY2.DGN

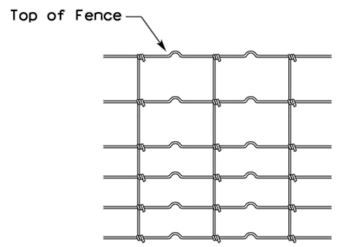
FED. RD. DIV. NO.	PROJECT NO.	FILE NO.	SHEET NO.
6			37 OF 37

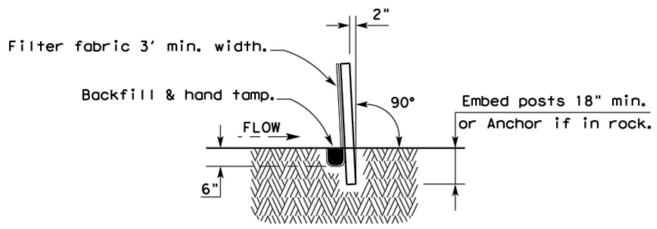
STATE	STATE DIST. NO.	COUNTY	CONT.	SECT.	JOB	HIGHWAY NO.
TEXAS	21					



TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

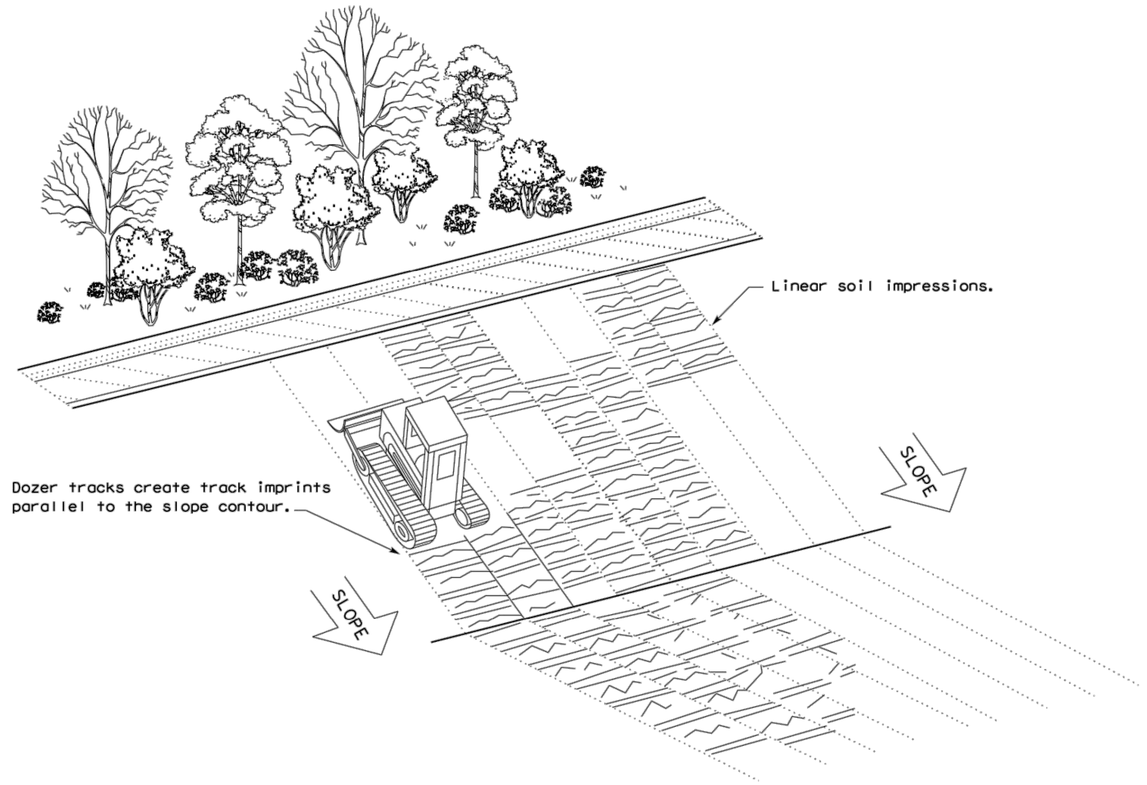
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

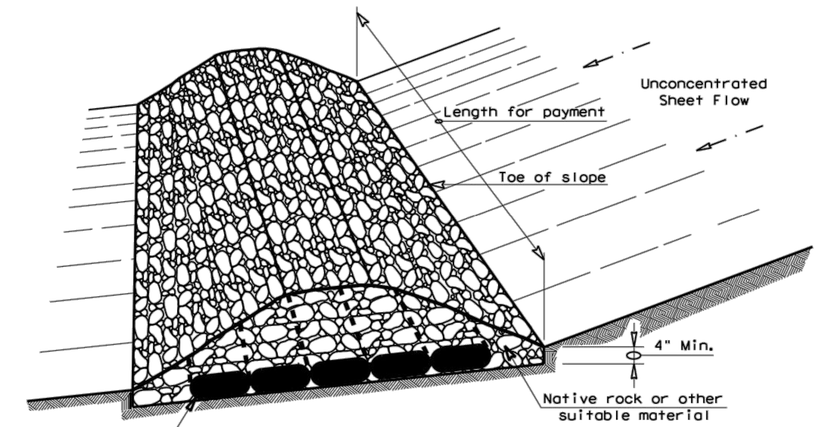
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

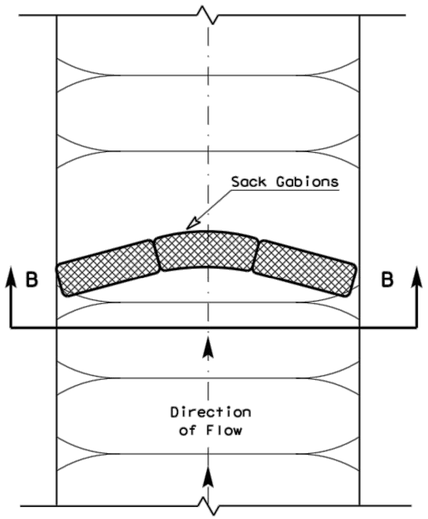
FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS					
	DIST	COUNTY		SHEET NO.	

DATE
FILE

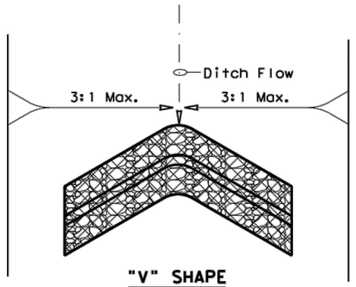


FILTER DAM AT TOE OF SLOPE

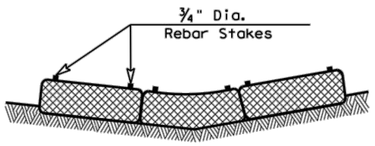
RFD1



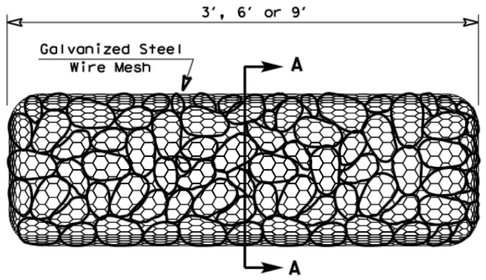
PLAN VIEW



"V" SHAPE PLAN VIEW

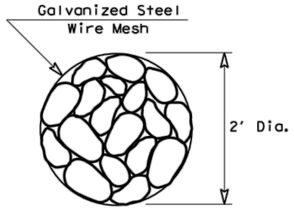


SECTION B-B

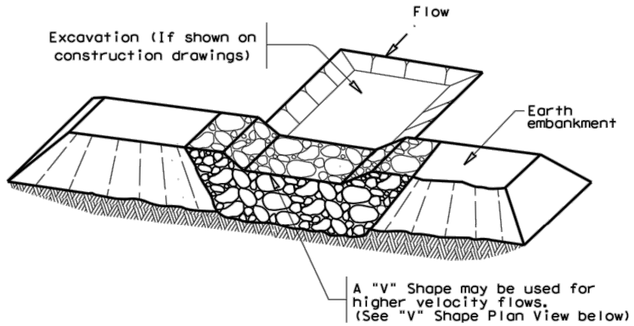


TYPE 4 (SACK GABIONS)

RFD4

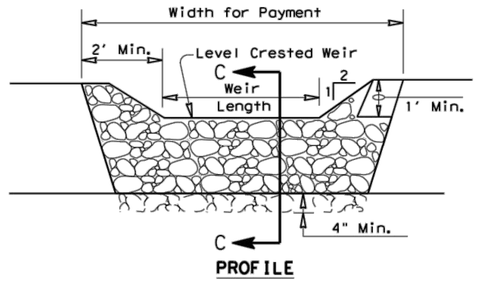


SECTION A-A

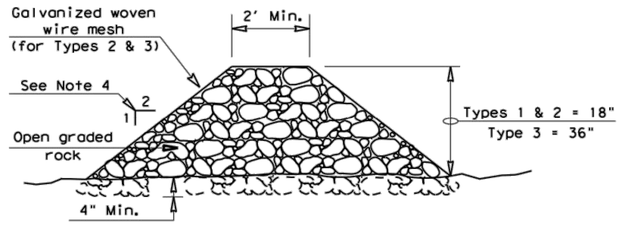


FILTER DAM AT SEDIMENT TRAP

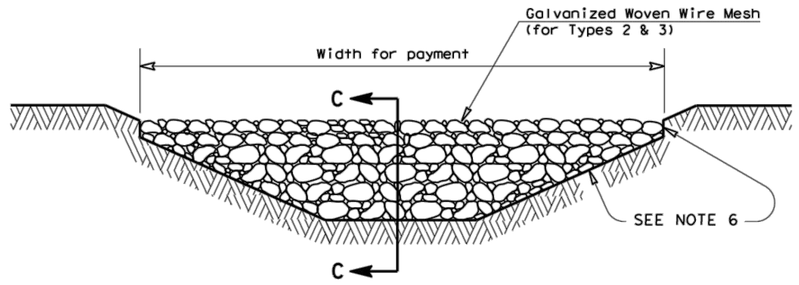
RFD1 — OR — RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 — OR — RFD2 — OR — RFD3

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4

Texas Department of Transportation — Design Division Standard

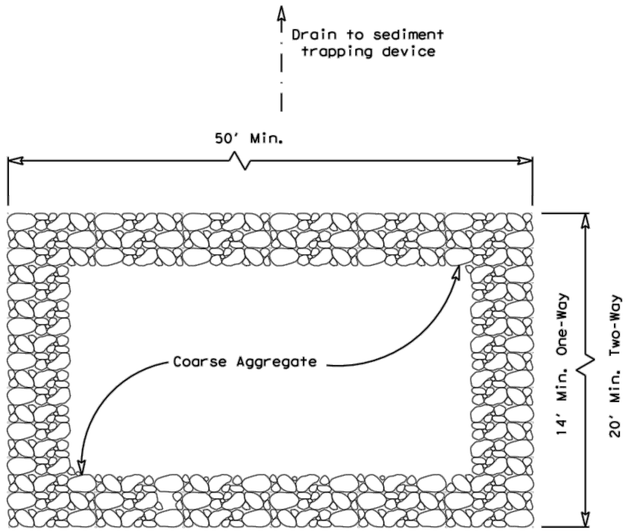
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

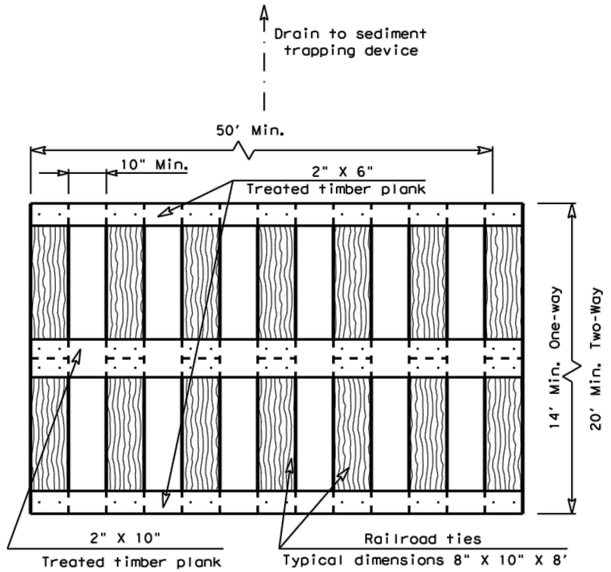
EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS					
	DIST	COUNTY		SHEET NO.	
				D-25	

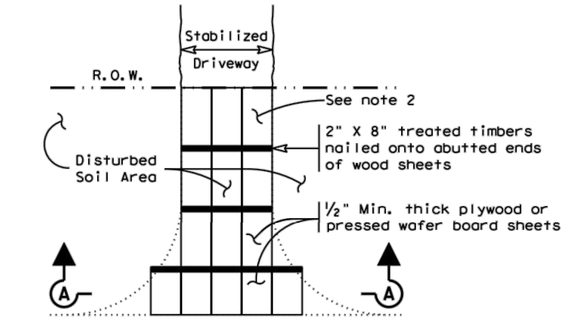
DATE:
FILE:



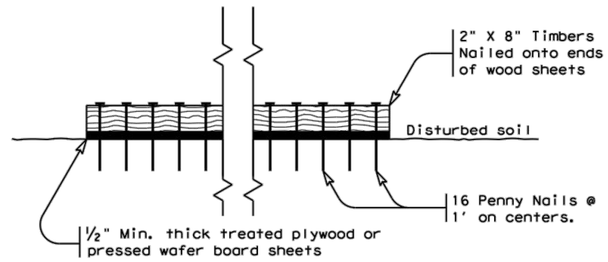
PLAN VIEW



PLAN VIEW



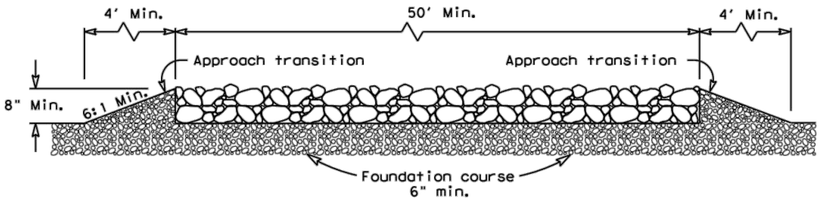
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

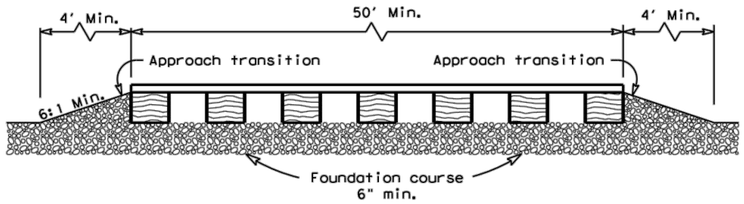
SHORT TERM



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

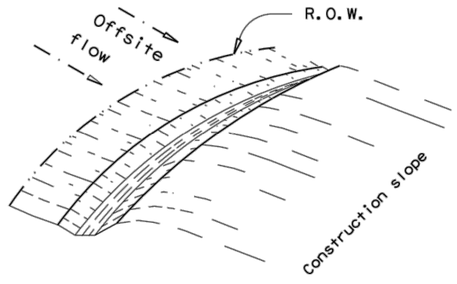
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

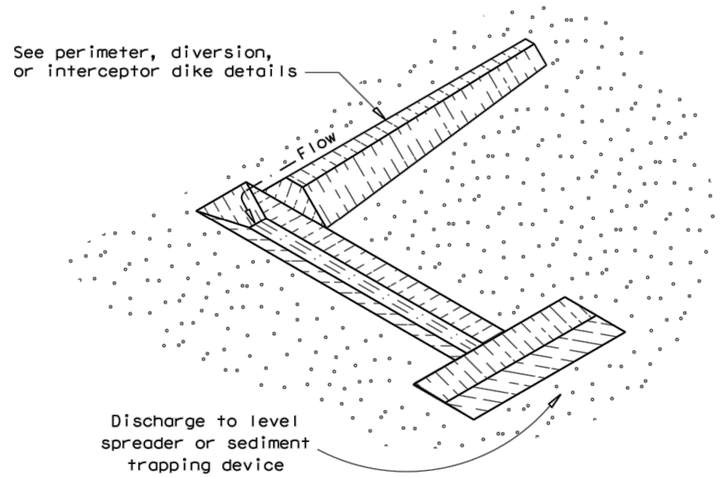
EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	C	S	J	HWY	
	DIST	COUNTY		SHEET NO.	
	DST	CTY	$EC(3)16$		

DATE: $DATE$
FILE: $FILE$



PERIMETER SWALE



DIVERSION SWALE

GENERAL NOTE

1. Dimensions of swale may be modified with prior approval of the Engineer.
2. Side slopes within the safety clear zone of a roadway shall be 6:1 or flatter.
3. Grading shall be shown elsewhere on the plans or as directed by the Engineer.
4. The Engineer reserves the right to modify the dimensions shown for the swale dependent on runoff volume characteristics.
5. Swales that are in place for more than 14 calender days should be stabilized through seeding or other measures to control sediment runoff.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Remove sediment and debris when accumulation affects the performance of the devices, after a rain and when directed by the Engineer.

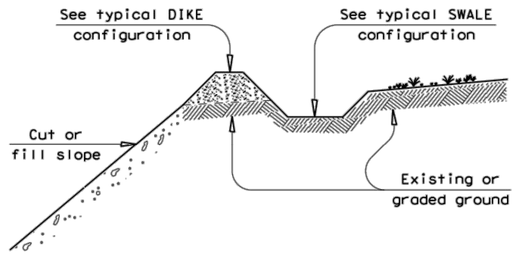
SWALE AND DIKE/SWALE USAGE GUIDELINES

A swale or dike/swale may be used to intercept runoff and divert it around unstabilized areas or to divert sediment laden runoff to an erosion control device (sediment basin or trap, rock filter dam, etc.).

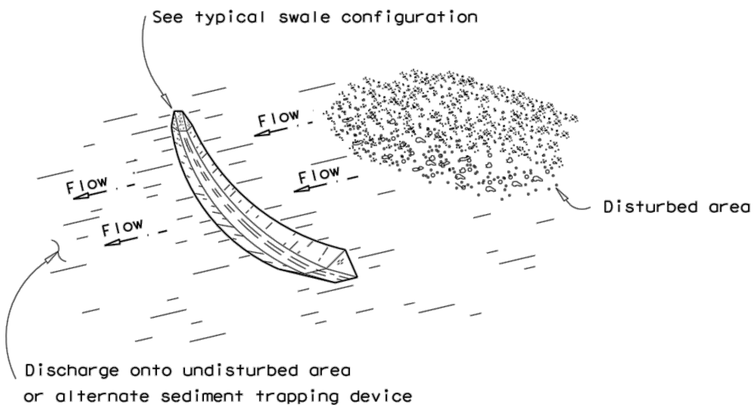
The drainage area contributing runoff to a swale or dike/swale should not exceed 5 acres. The spacing of swales and dike/swales should be as follows:

Slope of disturbed areas above dike	greater than 10%	5 - 10%	less than 5%
Maximum distance between dikes	100′	200′	300′

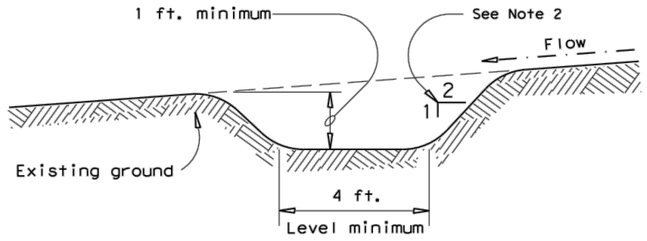
Intercepted runoff flowing in a swale or dike/swale should outlet to a stabilized area (vegetation, rock, etc.).



DIVERSION DIKE WITH SWALE



INTERCEPTOR SWALE



TYPICAL SWALE CONFIGURATION

PLAN SHEET LEGEND

SWALE (S)

DIKE (D)

Texas Department of Transportation | Design Division Standard

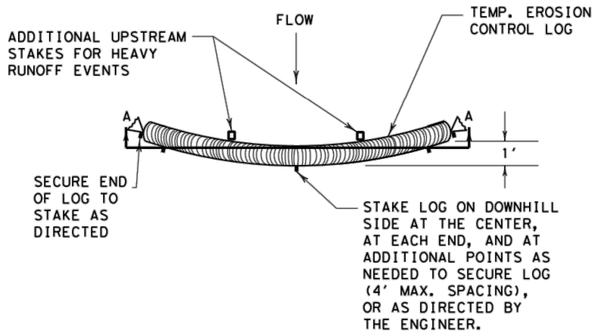
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
SWALES
(EARTHWORK FOR EROSION CONTROL)

EC(5)-16

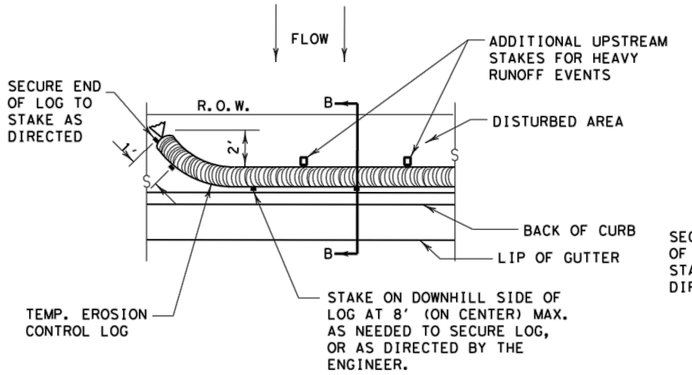
FILE: ec516	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.
				D-27

DATE:
FILE:

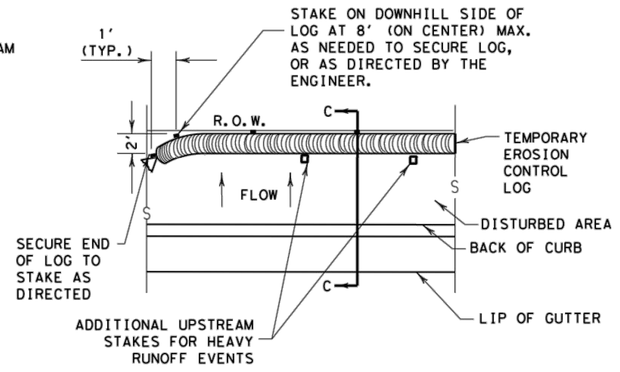
DATE:
FILE:



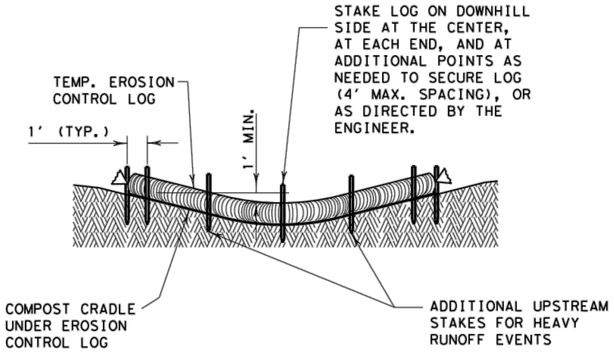
PLAN VIEW



PLAN VIEW



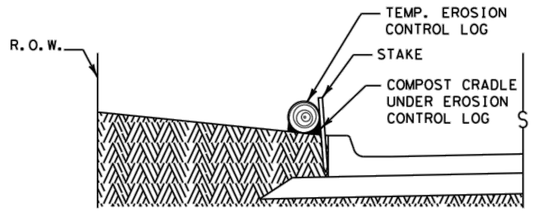
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

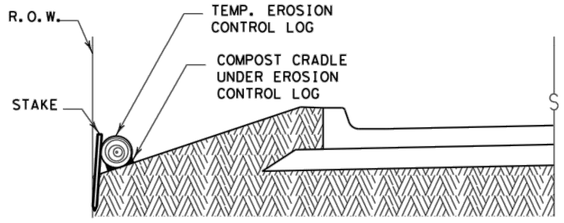
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

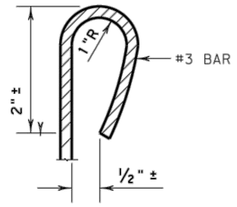
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



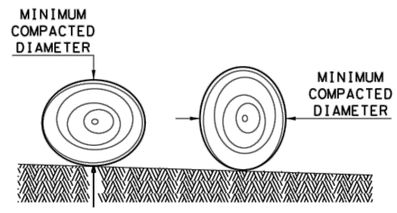
REBAR STAKE DETAIL

LEGEND

CL-D	EROSION CONTROL LOG DAM
CL-BOC	EROSION CONTROL LOG AT BACK OF CURB
CL-ROW	EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
CL-SST	EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
CL-SSL	EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
CL-DI	EROSION CONTROL LOG AT DROP INLET
CL-CI	EROSION CONTROL LOG AT CURB INLET
CL-GI	EROSION CONTROL LOG AT CURB & GRATE INLET

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:
1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916		DN: TxDOT	CK: KM	DW: LS/PT	CK: LS		
© TxDOT: JULY 2016		CONT	SECT	JOB		HIGHWAY	
REVISIONS							
		DIST	COUNTY			SHEET NO.	
						D-28	

DATE:
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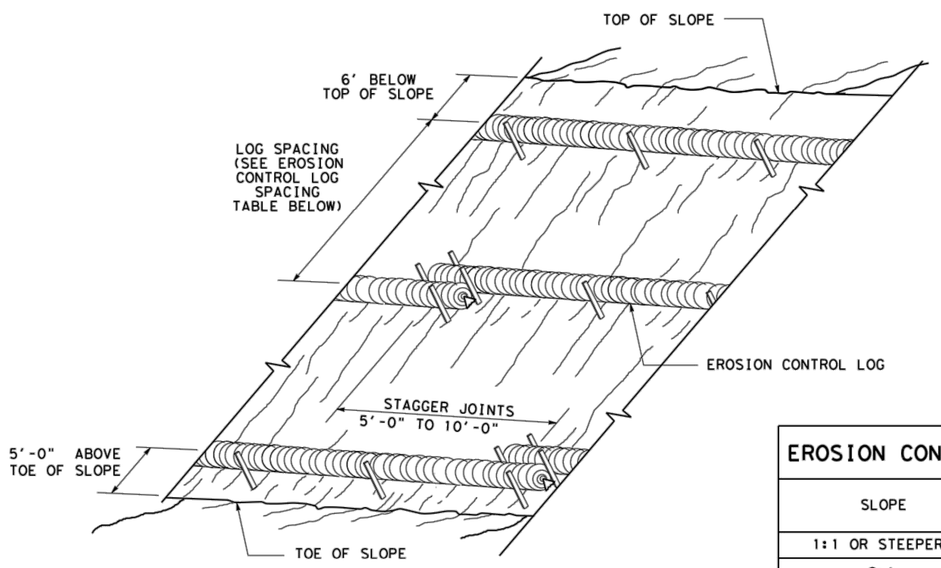
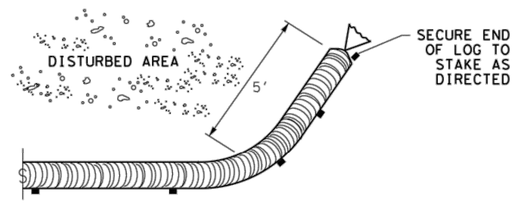


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

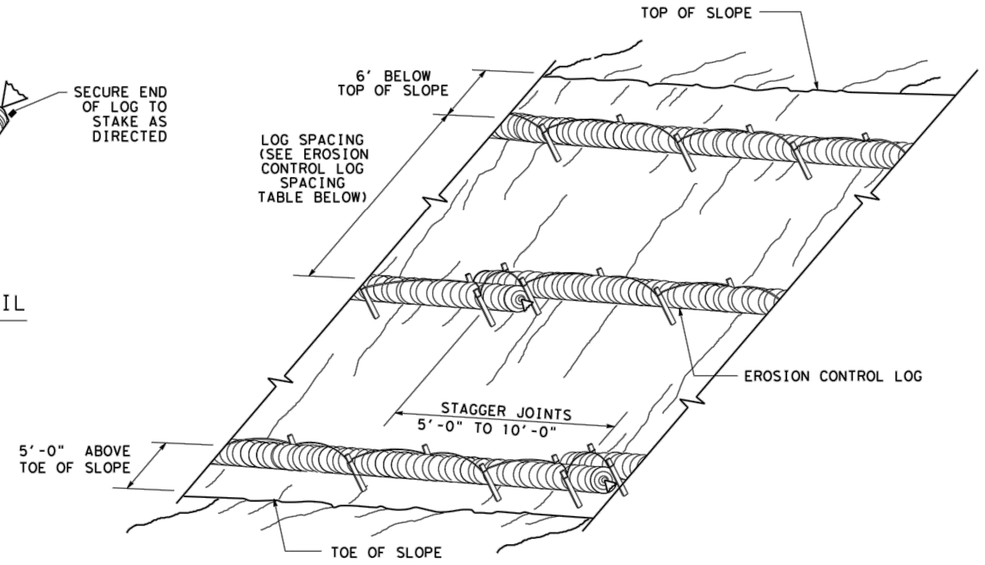
CL-SST



END SECTION RAP DETAIL

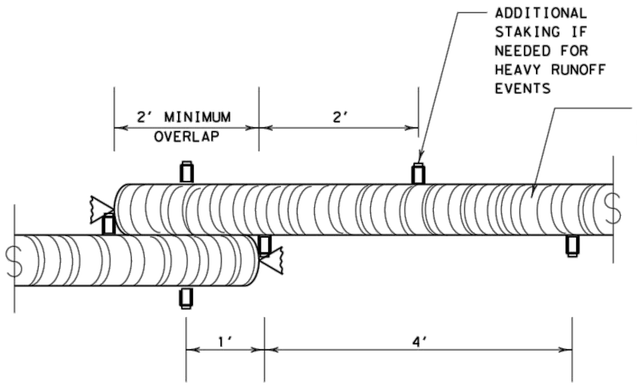
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

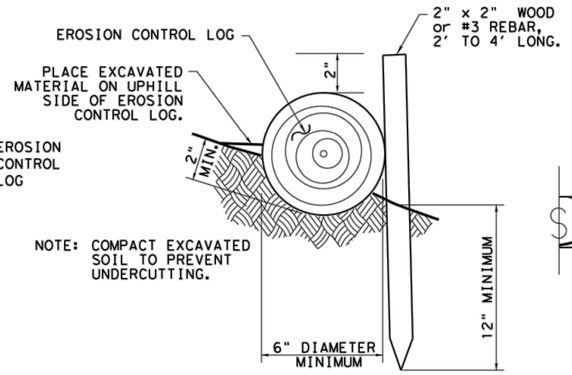
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

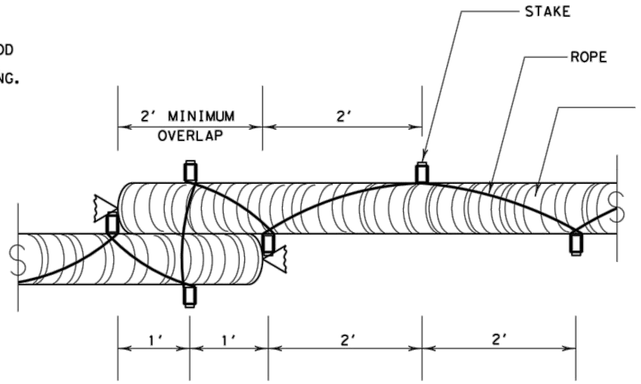


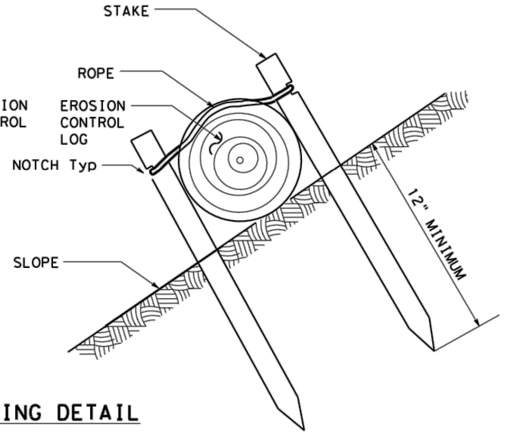


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

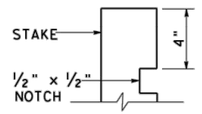
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
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	DIST	COUNTY		SHEET NO.	
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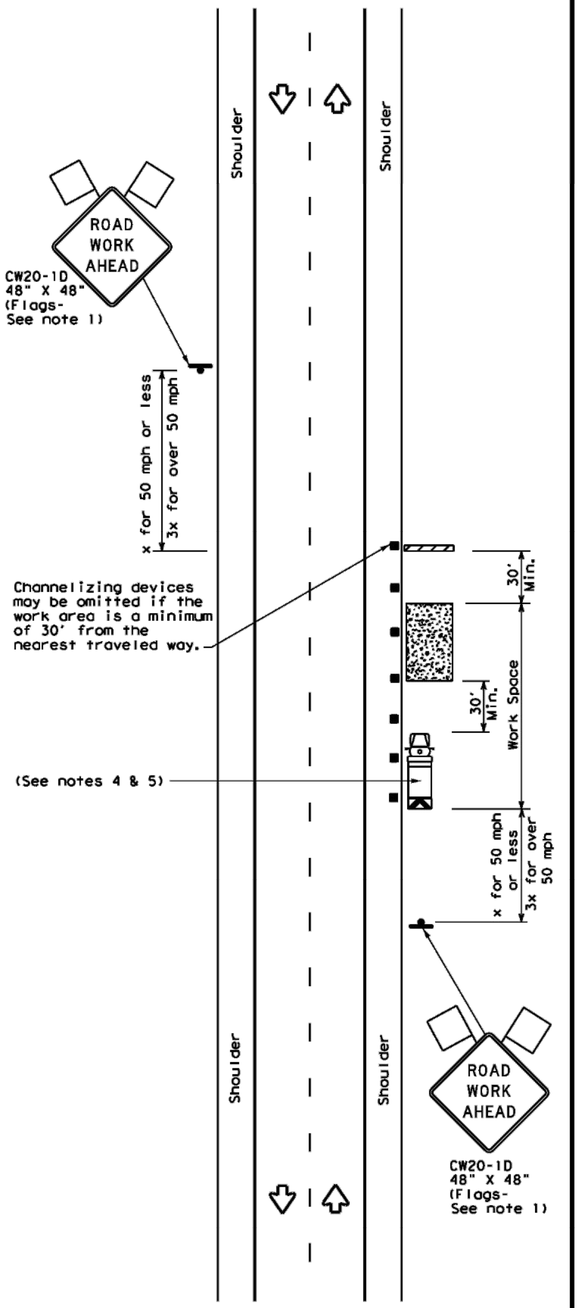
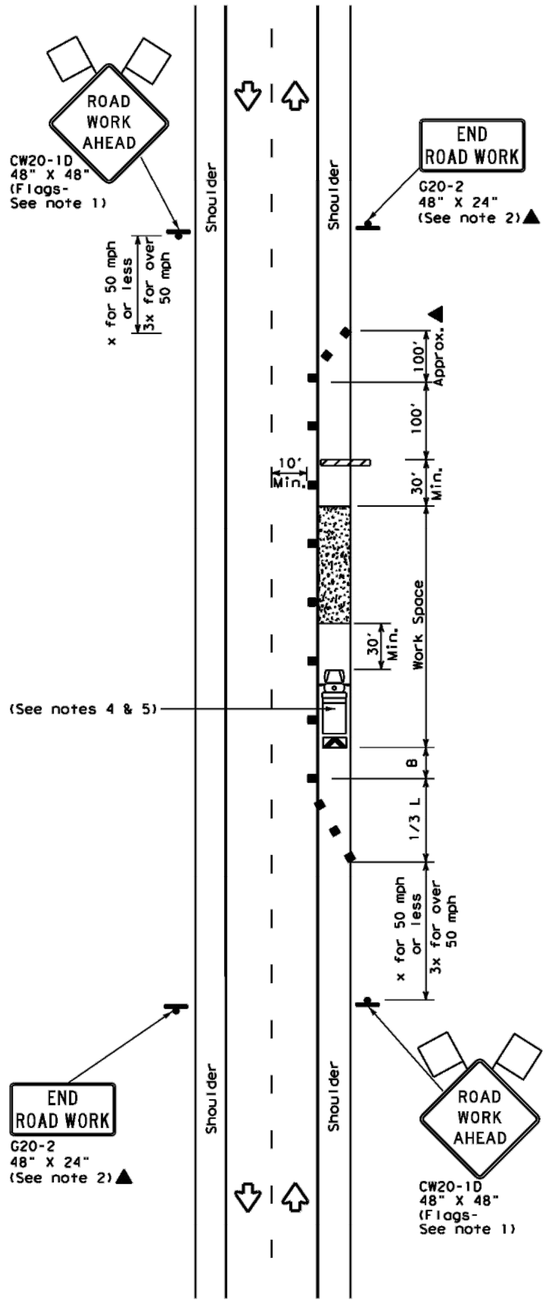


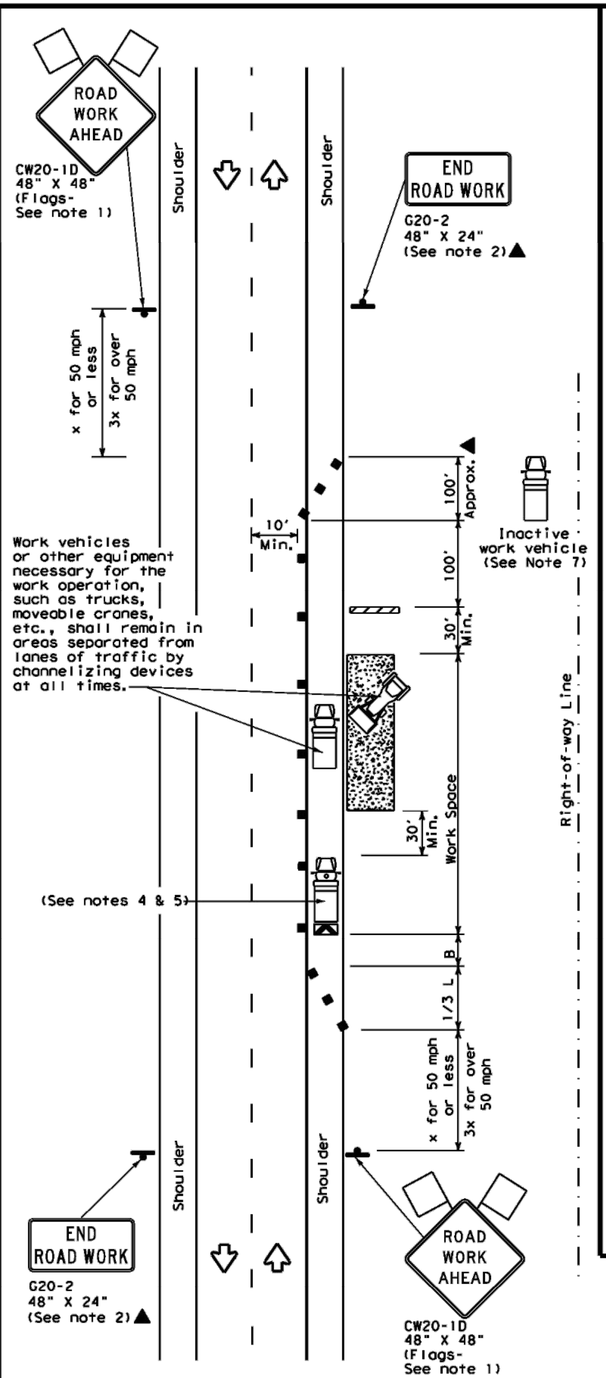
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	✓

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated in the plans, or for routine maintenance work, when approved by the Engineer.
3. Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but rood or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
8. CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation

Traffic Operations Division Standard

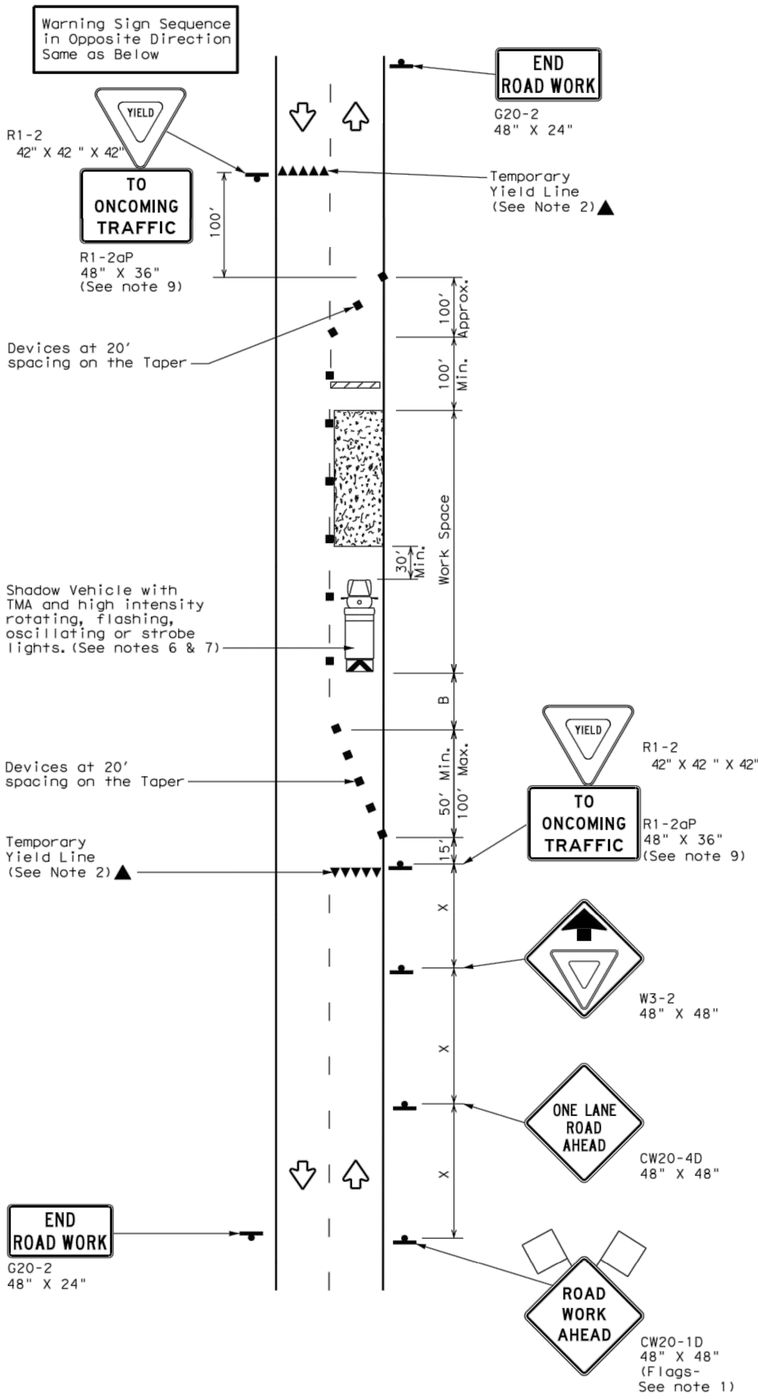
TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

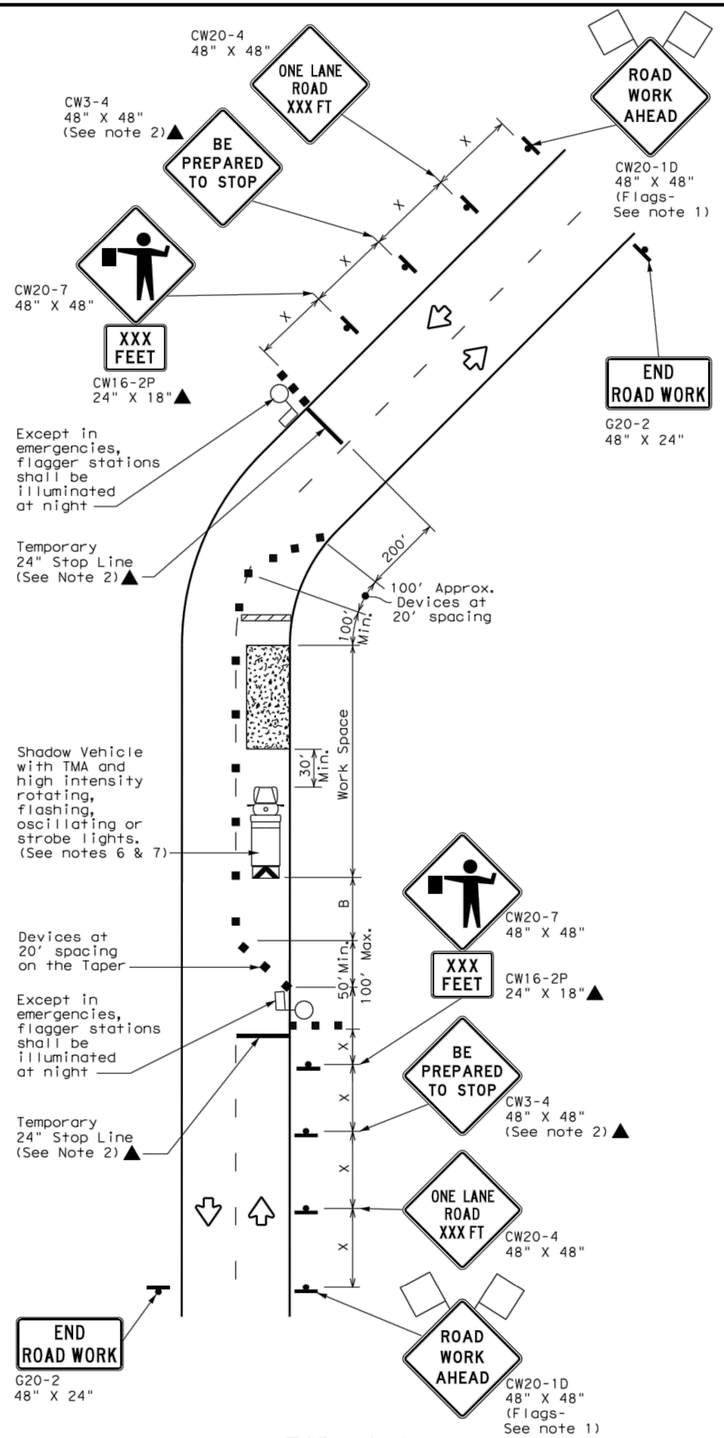
FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	DIST	COUNTY		SHEET NO. D-17

161

DATE:
FILE:



TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



TCP (2-2b)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L=WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

* Conventional Roads Only
** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4 "ONE LANE ROAD XXX FT" sign, but proper sign spacing shall be maintained.
4. Flaggers should use two-way radios or other methods of communication to control traffic.
5. Length of work space should be based on the ability of flaggers to communicate.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-2a)

8. The R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work space should be no longer than one half city block. In rural areas, roadways with less than 2000 ADT, work space should be no longer than 400 feet.
9. The R1-2aP "YIELD TO ONCOMING TRAFFIC" sign shall be placed on a support at a 7 foot minimum mounting height.

TCP (2-2b)

10. Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a queue of stopped vehicles. (See table above).
12. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situtations.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS				
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12				
4-98 2-18				D-18

DATE:
FILE:

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).

2. The development and design of the Traffic Control Plan (TCP)is the responsibility of the Engineer.

3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.

4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.

5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.

6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.

7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.

8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.

10. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.

11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.

12. The Engineer has the final decision on the location of all traffic control devices.

13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY NOTES:

1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.

2. Except in emergency situations, flagger stations shall be illuminated when flagging is used at night.

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.

2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)
TRAFFIC ENGINEERING STANDARD SHEETS

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

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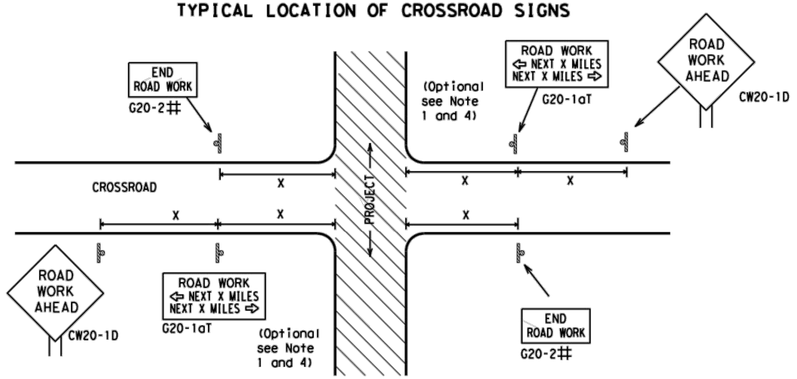
REVISIONS 4-03 7-13 9-07 8-14 5-10 5-21	DIST	COUNTY		SHEET NO. D-5

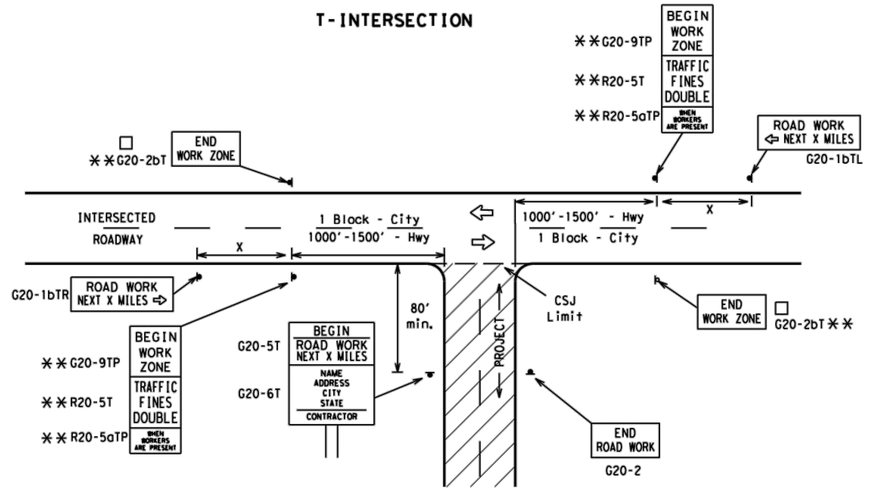
TYPICAL LOCATION OF CROSSROAD SIGNS



May be mounted on back of "ROAD WORK AHEAD"(CW20-1D) sign with approval of Engineer. (See note 2 below)

1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D)sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK"(G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume as per TMUTCD Part 5. This information shall be shown in the plans.
3. Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
4. The "ROAD WORK NEXT X MILES"(G20-1aT)sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
5. Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
6. When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

1. The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
2. If construction closes the road at a T-intersection, the Contractor shall place the "CONTRACTOR NAME"(G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow(G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR)" signs shall be replaced by the detour signing called for in the plans.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING[1,5,6]

SIZE

Sign Number or Series	Conventional Road	Expressway/ Freeway
CW20[4] CW21 CW22 CW23 CW25	48" x 48"	48" x 48"
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"

SPACING

Posted Speed	Sign △ Spacing "X"
MPH	Feet (Apprx.)
30	120
35	160
40	240
45	320
50	400
55	500[2]
60	600[2]
65	700[2]
70	800[2]
75	900[2]
80	1000[2]
*	*[3]

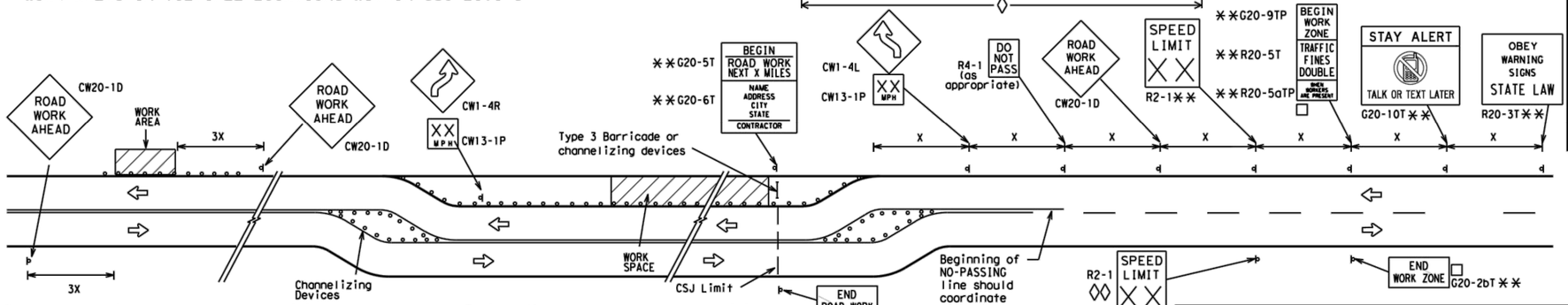
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may be used on low volume crossroads at the discretion of the Engineer as per TMUTCD Part 5. See Note 2 under "Typical Location of Crossroad Signs".
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

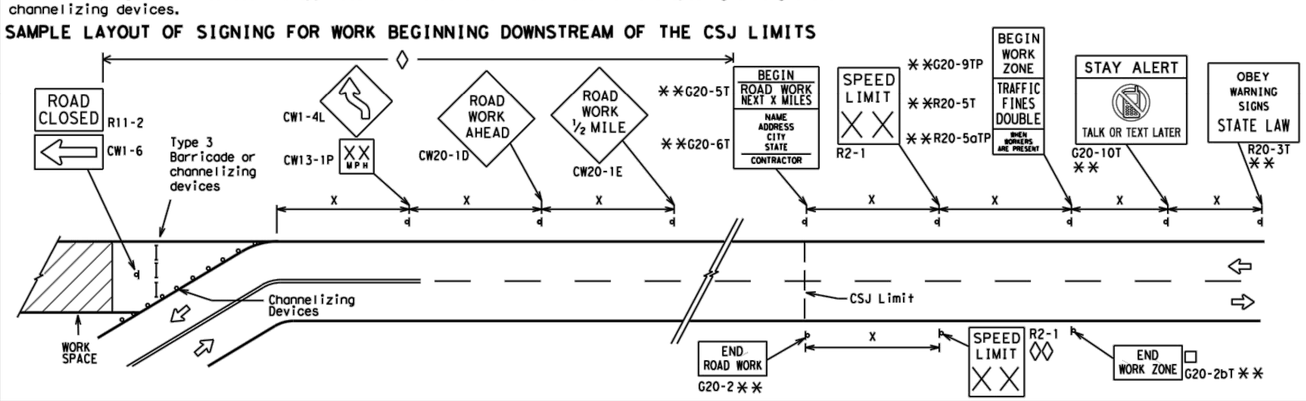
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS



NOTES

The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES"(G20-5T)sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.

□ The "BEGIN WORK ZONE"(G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.

** CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.

◊ Area for placement of "ROAD WORK AHEAD" (CW20-1D)sign and other signs or devices as called for on the Traffic Control Plan.

◊◊ Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND

⊢⊣	Type 3 Barricade
○○○	Channelizing Devices
▬	Sign
X	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

SHEET 2 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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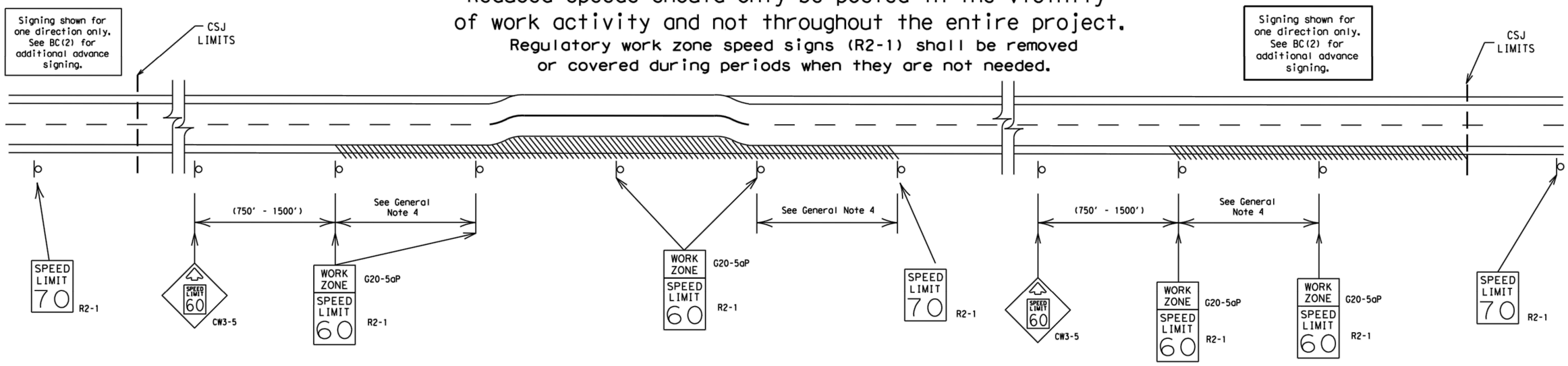
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project.

Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

a) rough road or damaged pavement surface
b) substantial alteration of roadway geometrics (diversions)
c) construction detours
d) grade
e) width
f) other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the traveled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered.
(See Removing or Covering on BC(4)).

GENERAL NOTES

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. Frequency of work zone speed limit signs should be:
   40 mph and greater 0.2 to 2 miles
   35 mph and less 0.2 to 1 mile
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. Fabrication, erection and maintenance of the "ADVANCE SPEED LIMIT" (CW3-5) sign, "WORK ZONE" (G20-5aP) plaque and the "SPEED LIMIT" (R2-1) signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
   A. Law enforcement.
   B. Flagger stationed next to sign.
   C. Portable changeable message sign (PCMS).
   D. Low-power (drone) radar transmitter.
   E. Speed monitor trailers or signs.
9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
10. For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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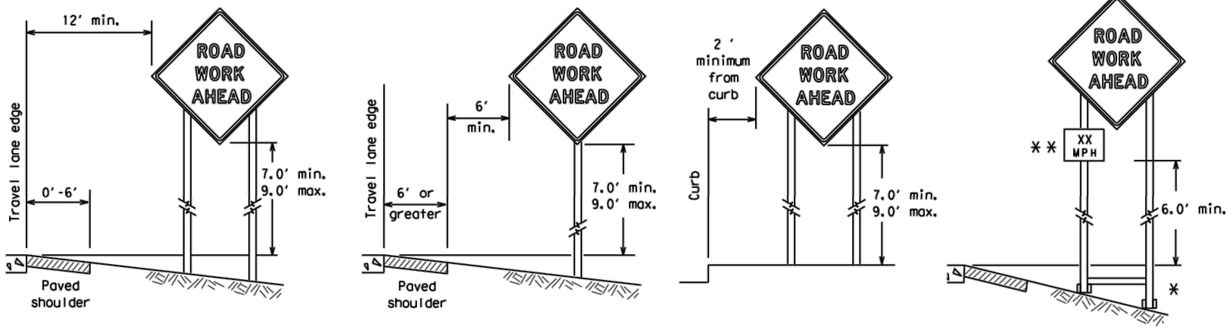
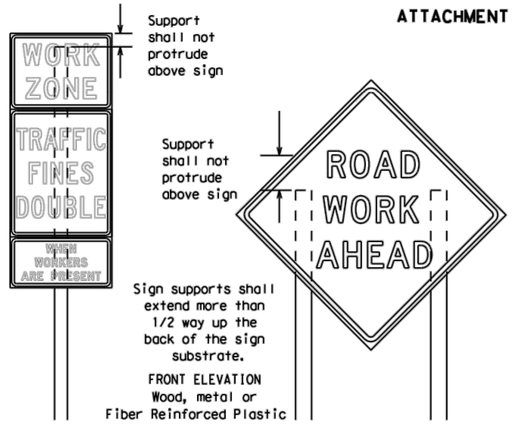
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

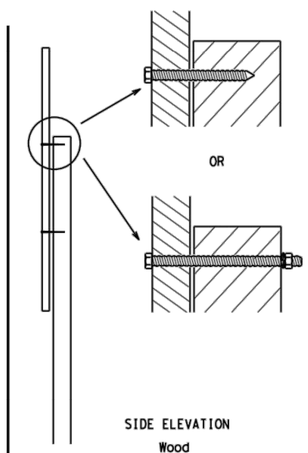


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS





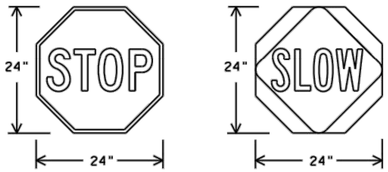
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the spice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

STOP/SLOW PADDLES

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
2. STOP/SLOW paddles shall be retroreflectorized when used at night.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, specific service (LOGO), or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition. For details for covering large guide signs see the TS-CD standard.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
5. If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC standard sheets, TLRS standard sheets or the CWZTCD list. The signs shall meet the required mounting heights shown on the BC, or the SMD standard sheets during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
6. Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
6. The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD) for small roadside signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets. The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)

1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
   a. Long-term stationary - work that occupies a location more than 3 days.
   b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
   c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
   d. Short, duration - work that occupies a location up to 1 hour.
   e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

1. The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
3. Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
4. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

1. Flags may be used to draw attention to warning signs. When used, the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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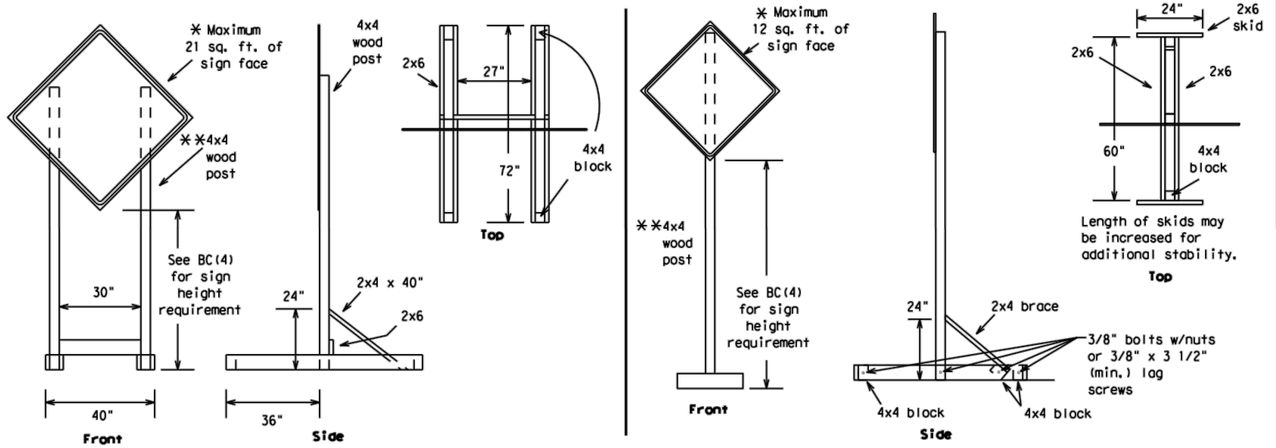
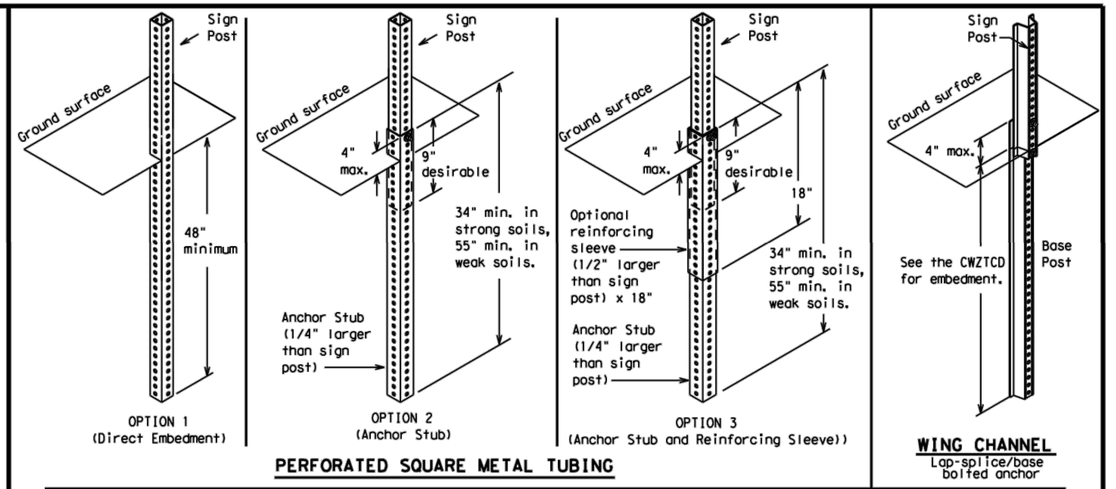


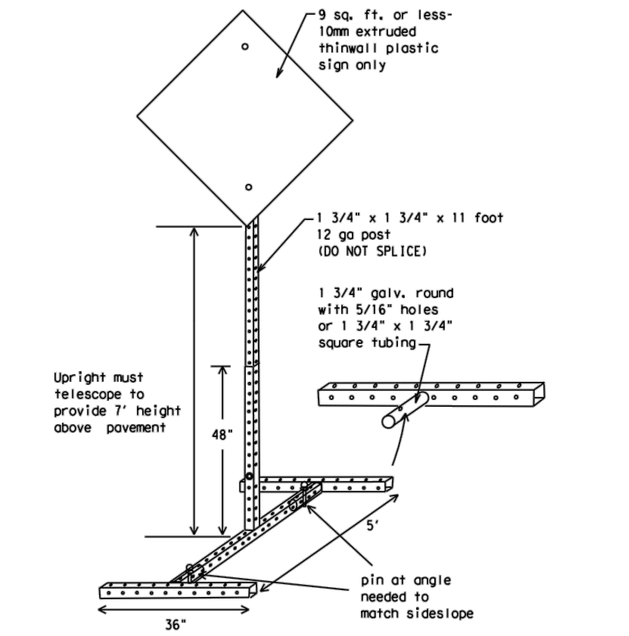
SKID MOUNTED WOOD SIGN SUPPORTS

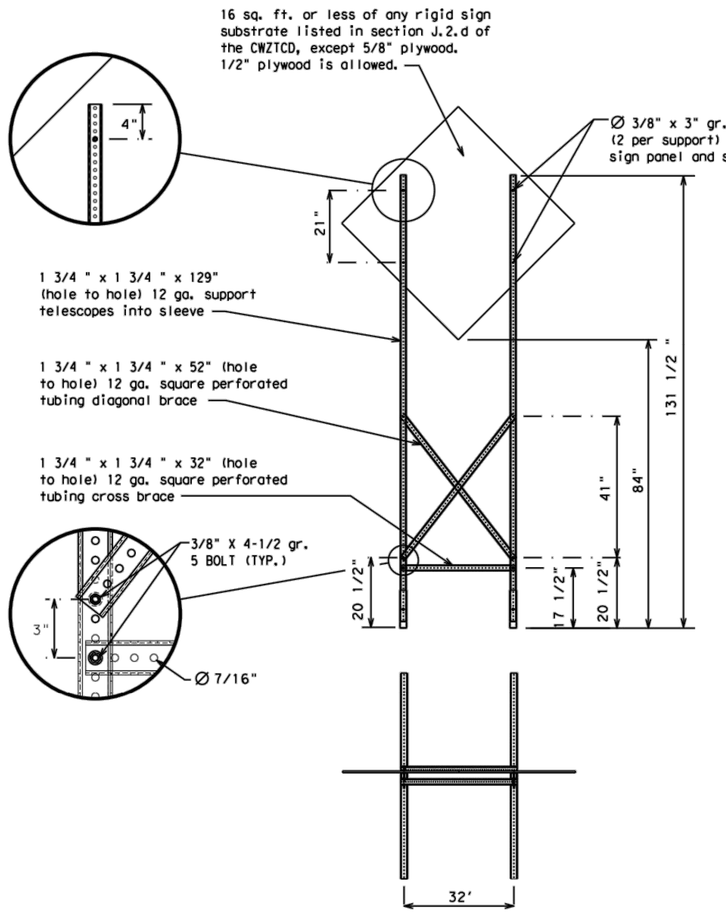
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

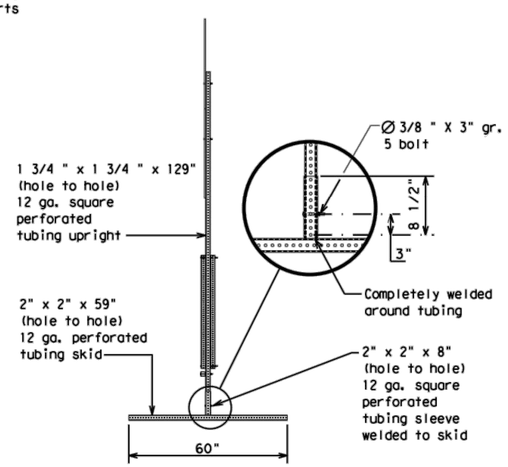


GROUND MOUNTED SIGN SUPPORTS

Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support.
The maximum sign square footage shall adhere to the manufacturer's recommendation.
Two post installations can be used for larger signs.







WEDGE ANCHORS

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

OTHER DESIGNS

MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

GENERAL NOTES

1. Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
3. When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

* See BC(4) for definition of "Work Duration."

** Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.

☐ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

DATE:
FILE:

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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

1. The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
2. Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
3. Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
4. Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
5. Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
6. When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
7. The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
8. The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
9. Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
10. Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
11. Do not use the word "Danger" in message.
12. Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
13. Do not display messages that scroll horizontally or vertically across the face of the sign.
14. The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
15. PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
16. Each line of text should be centered on the message board rather than left or right justified.
17. If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT

WORD OR PHRASE	ABBREVIATION
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

Roadway designation * IH-number, US-number, SH-number, FM-number

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

- FREEWAY CLOSED X MILE
- FRONTAGE ROAD CLOSED
- ROAD CLOSED AT SH XXX
- SHOULDER CLOSED XXX FT
- ROAD CLSD AT FM XXXX
- RIGHT LN CLOSED XXX FT
- RIGHT X LANES CLOSED
- RIGHT X LANES OPEN
- CENTER LANE CLOSED
- DAYTIME LANE CLOSURES
- NIGHT LANE CLOSURES
- I-XX SOUTH EXIT CLOSED
- VARIOUS LANES CLOSED
- EXIT XXX CLOSED X MILE
- EXIT CLOSED
- RIGHT LN TO BE CLOSED
- MALL DRIVEWAY CLOSED
- X LANES CLOSED TUE - FRI
- XXXXXXXX BLVD CLOSED

Other Condition List

- ROADWORK XXX FT
- ROAD REPAIRS XXXX FT
- FLAGGER XXXX FT
- LANE NARROWS XXXX FT
- RIGHT LN NARROWS XXXX FT
- TWO-WAY TRAFFIC XX MILE
- MERGING TRAFFIC XXXX FT
- CONST TRAFFIC XXX FT
- LOOSE GRAVEL XXXX FT
- UNEVEN LANES XXXX FT
- DETOUR X MILE
- ROUGH ROAD XXXX FT
- ROADWORK PAST SH XXXX
- ROADWORK NEXT FRI-SUN
- BUMP XXXX FT
- US XXX EXIT X MILES
- TRAFFIC SIGNAL XXXX FT
- LANES SHIFT *

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

- MERGE RIGHT
- FORM X LINES RIGHT
- DETOUR NEXT X EXITS
- USE XXXXX RD EXIT
- USE EXIT XXX
- USE EXIT I-XX NORTH
- STAY ON US XXX SOUTH
- USE I-XX E TO I-XX N
- TRUCKS USE US XXX N
- WATCH FOR TRUCKS
- WATCH FOR TRUCKS
- EXPECT DELAYS
- EXPECT DELAYS
- PREPARE TO STOP
- REDUCE SPEED XXX FT
- END SHOULDER USE
- USE OTHER ROUTES
- WATCH FOR WORKERS
- STAY IN LANE *

Location List

- AT FM XXXX
- BEFORE RAILROAD CROSSING
- NEXT X MILES
- PAST US XXX EXIT
- XXXXXXX TO XXXXXXX
- US XXX TO FM XXXX

Warning List

- SPEED LIMIT XX MPH
- MAXIMUM SPEED XX MPH
- MINIMUM SPEED XX MPH
- ADVISORY SPEED XX MPH
- RIGHT LANE EXIT
- USE CAUTION
- DRIVE SAFELY
- DRIVE WITH CARE

** Advance Notice List

- TUE-FRI XX AM- X PM
- APR XX-XX X PM-X AM
- BEGINS MONDAY
- BEGINS MAY XX
- MAY X-X XX PM - XX AM
- NEXT FRI-SUN
- XX AM TO XX PM
- NEXT TUE AUG XX
- TONIGHT XX PM- XX AM

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

1. Only 1 or 2 phases are to be used on a PCMS.
2. The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
3. A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
4. A Location Phase is necessary only if a distance or location is not included in the first phase selected.
5. If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
6. For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

1. The words RIGHT, LEFT and ALL can be interchanged as appropriate.
2. Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
3. EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
4. Highway names and numbers replaced as appropriate.
5. ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
6. AHEAD may be used instead of distances if necessary.
7. FT and MI, MILE and MILES interchanged as appropriate.
8. AT, BEFORE and PAST interchanged as needed.
9. Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

FULL MATRIX PCMS SIGNS

1. When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
2. When symbol signs, such as the "Flagger Symbol"(CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
3. When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
4. A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

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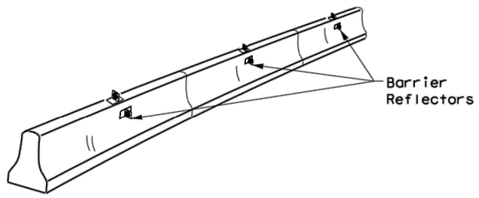
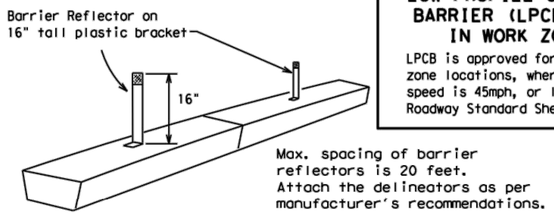
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



CONCRETE TRAFFIC BARRIER (CTB)

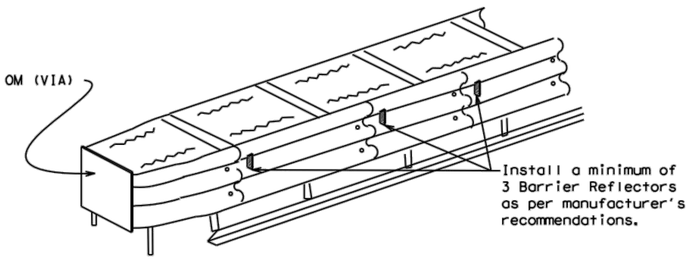
3. Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
4. Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional)while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
5. When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
6. Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
7. Maximum spacing of Barrier Reflectors is forty (40) feet.
8. Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
9. Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
10. Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
11. Single slope barriers shall be delineated as shown on the above detail.



LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

LOW PROFILE CONCRETE BARRIER (LPCB)

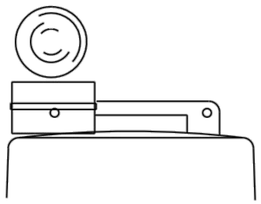


DELINEATION OF END TREATMENTS

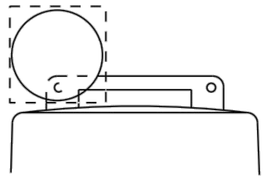
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet the apppropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

WARNING LIGHTS

1. Warning lights shall meet the requirements of the TMUTCD.
2. Warning lights shall NOT be installed on barricades.
3. Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{FL} or C_{FL} Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
4. Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
5. The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
6. When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
7. When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
8. The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

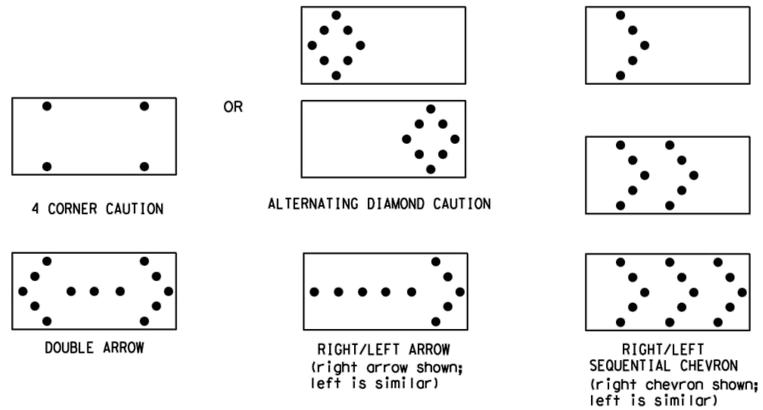
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
4. Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
5. Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
6. Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
7. The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

1. A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
2. The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
3. The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
4. Round reflectors shall be fully reflectorized, including the area where attached to the drum.
5. Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
6. The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
7. When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
8. The warning reflector should be mounted on the side of the handle nearest approaching traffic.
9. The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

1. The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
2. Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
3. The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Board.
4. The Flashing Arrow Board should be able to display the following symbols:



5. The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
6. The straight line caution display is NOT ALLOWED.
7. The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
8. Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
9. The sequential arrow display is NOT ALLOWED.
10. The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.
11. The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
12. A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
13. A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
14. Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW BOARD FROM THE RIGHT-OF-WAY OR PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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GENERAL NOTES

1. For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
2. For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections, one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
3. For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
4. Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
5. Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
6. The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

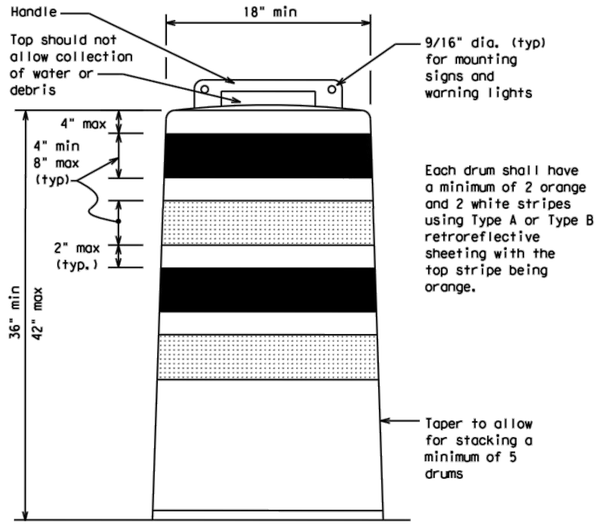
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
3. Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
4. Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
5. The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
6. The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
7. Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
8. Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
9. Drum body shall have a maximum unballasted weight of 11 lbs.
10. Drum and base shall be marked with manufacturer's name and model number.

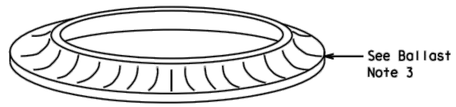
RETROREFLECTIVE SHEETING

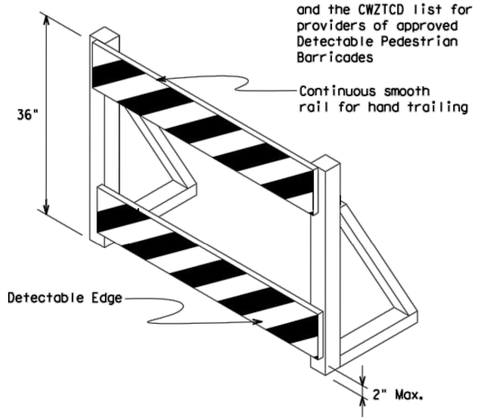
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
2. Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
3. Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
4. The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
5. When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
6. Ballast shall not be placed on top of drums.
7. Adhesives may be used to secure base of drums to pavement.

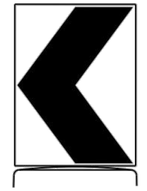




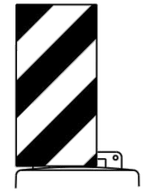


DETECTABLE PEDESTRIAN BARRICADES

1. When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. Refer to WZ(BTS-2) for Pedestrian Control requirements for Sidewalk Diversions, Sidewalk Detours and Crosswalk Closures.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a Detectable Pedestrian Barricade shall be placed across the full width of the closed sidewalk instead of a Type 3 Barricade.
3. Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
4. Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines (ADAAG)" and should not be used as a control for pedestrian movements.
5. Warning lights shall not be attached to detectable pedestrian barricades.
6. Detectable pedestrian barricades should use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign
(Maximum Sign Dimension)
Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer



12" x 24"
Vertical Panel
mount with diagonals sloping down towards travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

1. Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
2. Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{FL} or Type C_{FL} Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
3. Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A or Type B. Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
4. Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
5. Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
6. Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
7. Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations, they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
8. R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

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Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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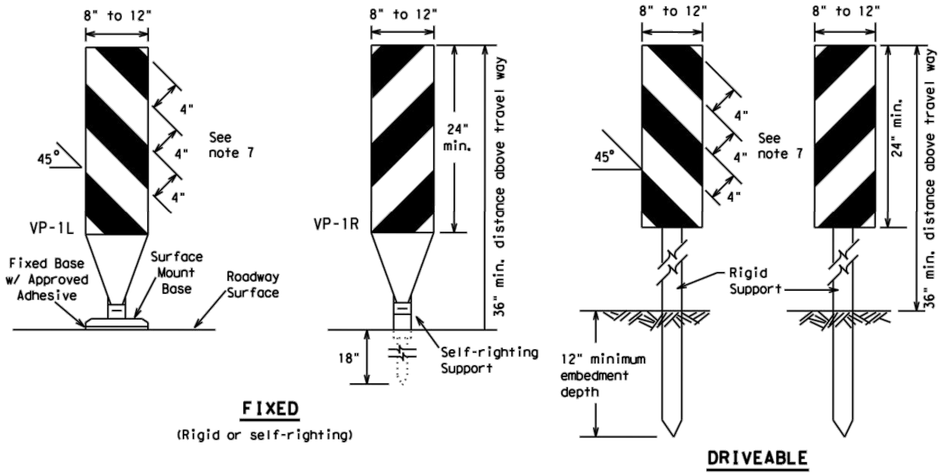
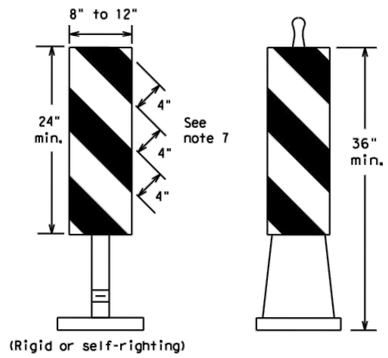


FIXED
(Rigid or self-righting)

DRIVEABLE

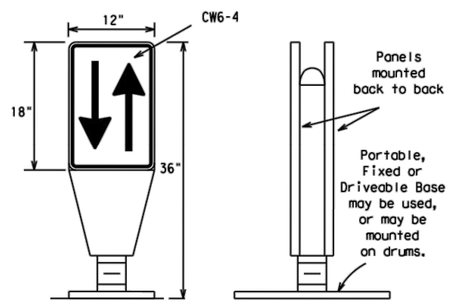


(Rigid or self-righting)

PORTABLE

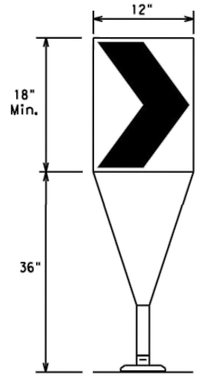
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual for additional requirements on the use VP's for drop-offs.
3. VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.

VERTICAL PANELS (VPs)



1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
2. The OTLD may be used in combination with 42" cones or VPs.
3. Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



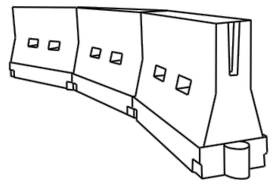
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

1. The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
2. Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
3. Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
4. To be effective, the chevron should be visible for at least 500 feet.
5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
6. For Long Term Stationary use on tapers or transitions on freeways and divided highways, self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS

GENERAL NOTES

1. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.



LONGITUDINAL CHANNELIZING DEVICES (LCD)

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10). Place reflective sheeting near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate Manual for Assessing Safety Hardware (MASH) crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

Posted Speed	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L=WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

** Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

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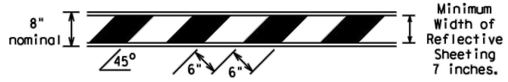
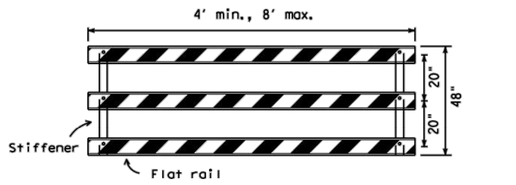
TYPE 3 BARRICADES

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road, striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



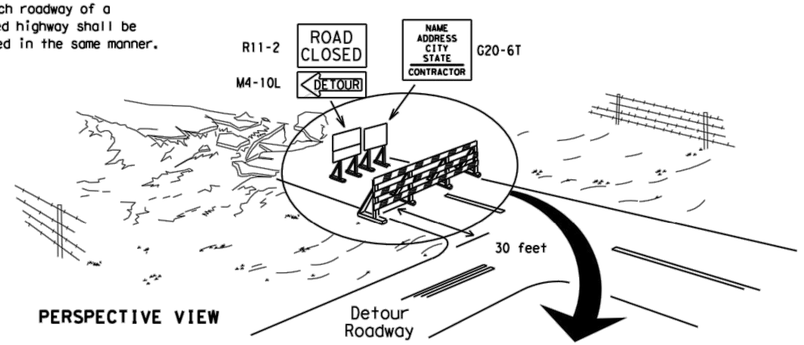
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

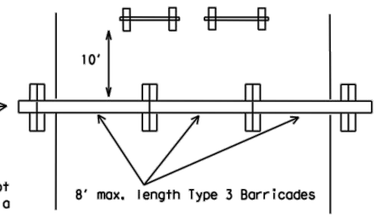
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

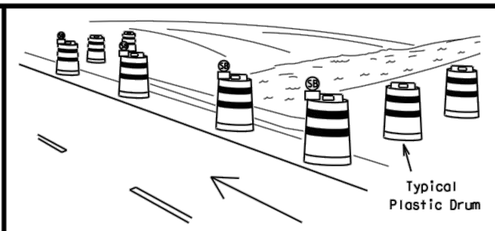
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

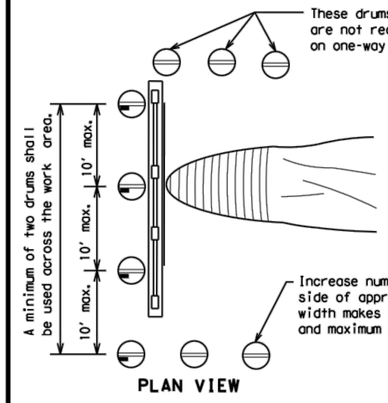
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

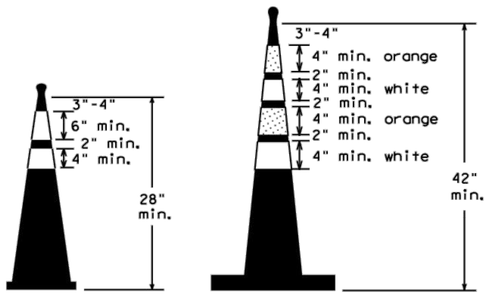
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.



LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

PLAN VIEW

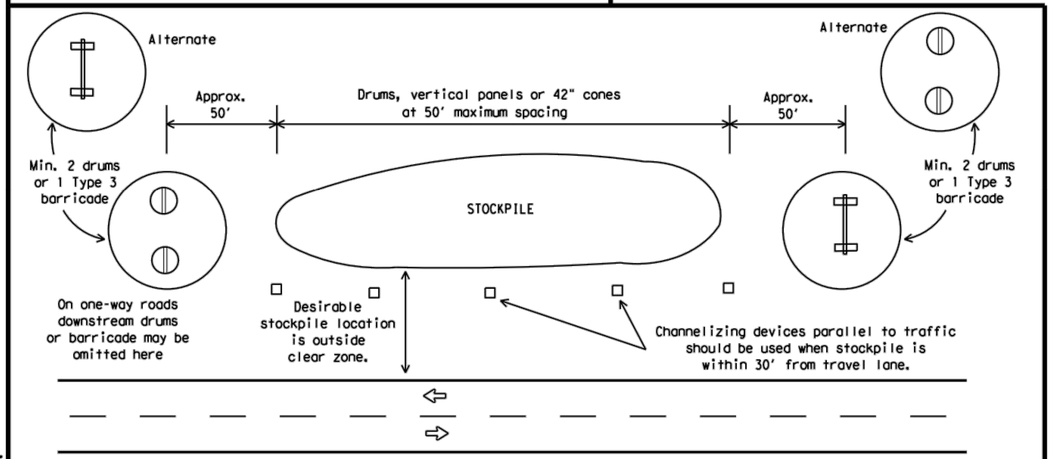
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



28" Cones shall have a minimum weight of 9 1/2 lbs.

42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A or Type B.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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WORK ZONE PAVEMENT MARKINGS

GENERAL

1. The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
2. Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
3. Additional supplemental pavement marking details may be found in the plans or specifications.
4. Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
5. When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
6. When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
7. All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

1. Raised pavement markers are to be placed according to the patterns on BC(12).
2. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

PREFABRICATED PAVEMENT MARKINGS

1. Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
2. Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

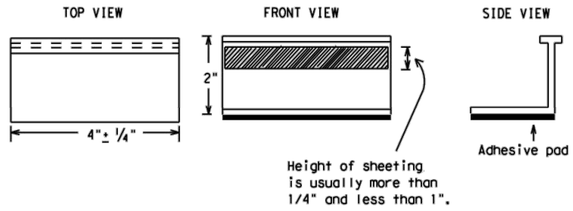
MAINTAINING WORK ZONE PAVEMENT MARKINGS

1. The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
2. Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
3. The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
4. Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

REMOVAL OF PAVEMENT MARKINGS

1. Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
2. The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
3. Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
4. The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
5. Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
6. Blast cleaning may be used but will not be required unless specifically shown in the plans.
7. Over-painting of the markings SHALL NOT BE permitted.
8. Removal of raised pavement markers shall be as directed by the Engineer.
9. Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
10. Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

Temporary Flexible-Reflective Roadway Marker Tabs



STAPLES OR NAILS SHALL NOT BE USED TO SECURE TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS TO THE PAVEMENT SURFACE

1. Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
2. Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
   A. Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
   B. Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
3. Small design variances may be noted between tab manufacturers.
4. See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

1. Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
2. All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
3. Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:
YELLOW - (two amber reflective surfaces with yellow body).
WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

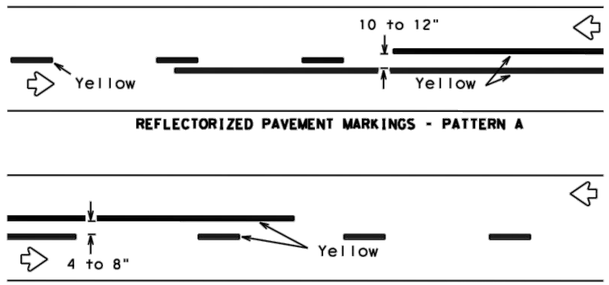
BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-98 9-07 5-21				
1-02 7-13	DIST	COUNTY		SHEET NO.
11-02 8-14				D-15

105

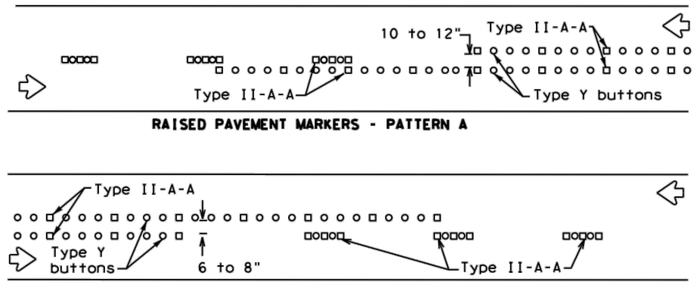
DATE:
FILE:

PAVEMENT MARKING PATTERNS



REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

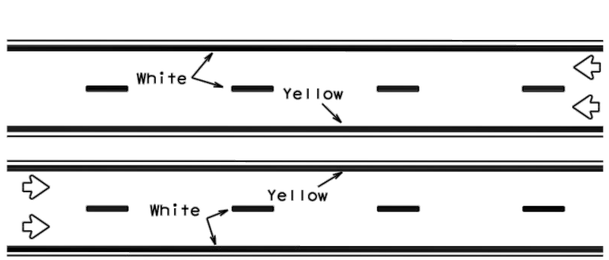


RAISED PAVEMENT MARKERS - PATTERN A

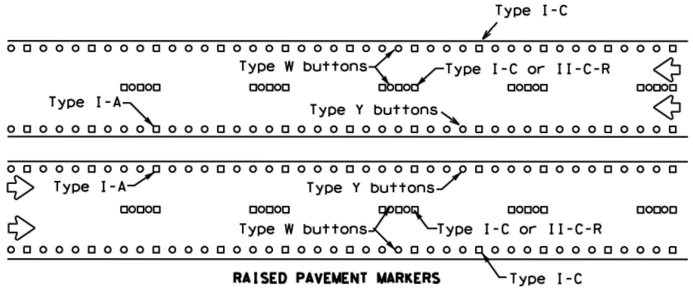
RAISED PAVEMENT MARKERS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer.
Prefabricated markings may be substituted for reflectorized pavement markings.

CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



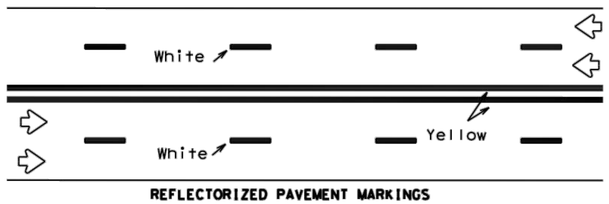
REFLECTORIZED PAVEMENT MARKINGS



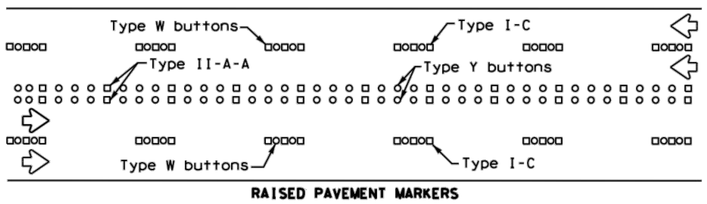
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



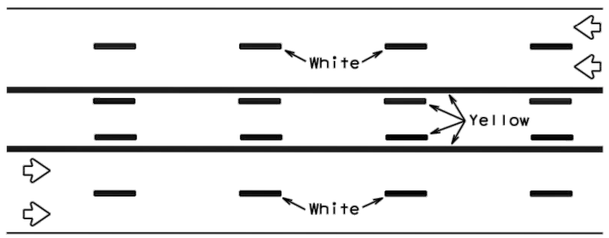
REFLECTORIZED PAVEMENT MARKINGS



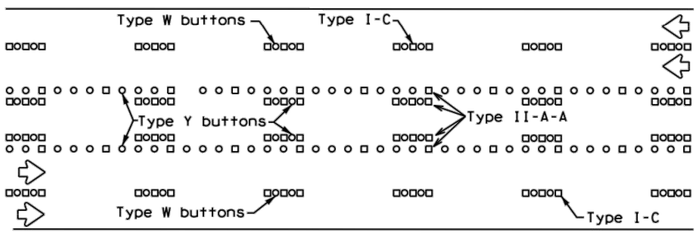
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

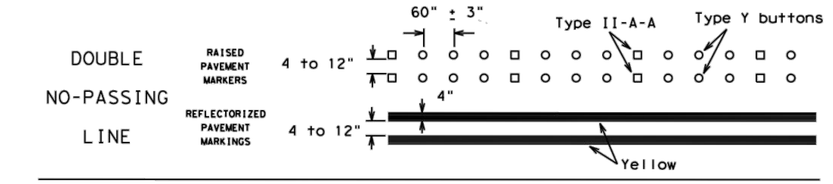
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

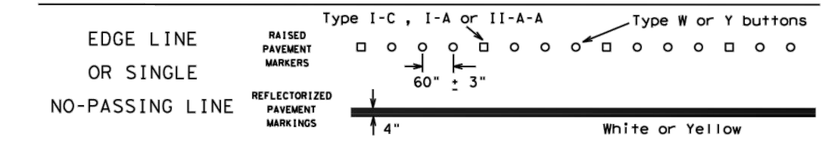
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

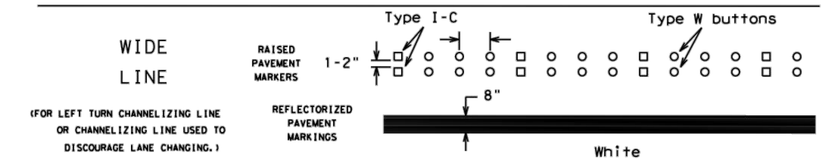


EDGE LINE OR SINGLE NO-PASSING LINE



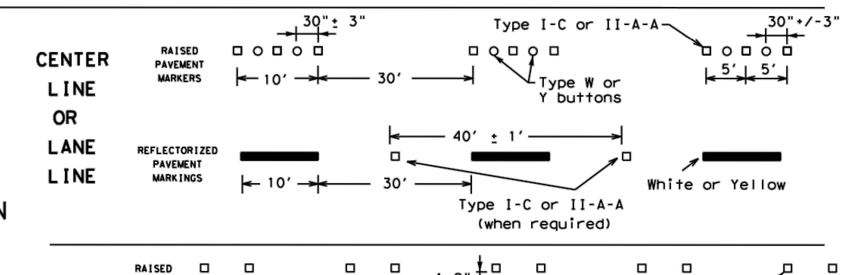
WIDE LINE

(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

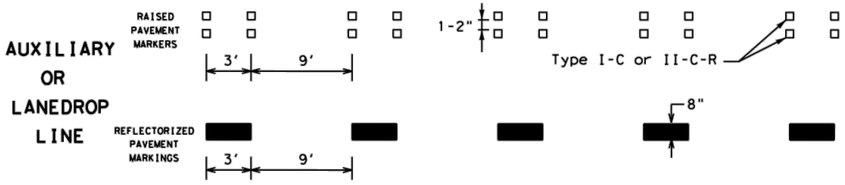


BROKEN LINES

CENTER LINE OR LANE LINE

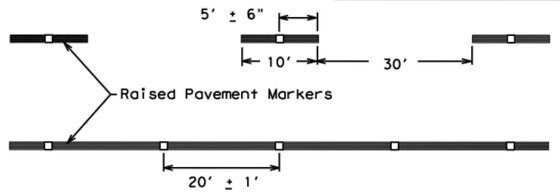


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



Centerline only - not to be used on edge lines

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	DIST	COUNTY		SHEET NO. D-16

USER ID

SURFACE PREPARATION ITEM 160* TOPSOIL SY / ITEM 161* COMPOST MANUF. TOPSOIL (BOS) (4") SY

SURFACE PREPARATION

Prepare planting area surface BEFORE placing Topsoil, Compost, Fertilizer, Seed and/or Sod.
Once project area has been completed to final lines, grade and compaction, remove objectionable materials from planting area surface and cultivate existing surface to a depth of 4 inches, unless otherwise specified or directed.

Refer to Items 160 and 161 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.

TOPSOIL NOTES:
1. When Topsoil is specified under Item 160, use suitable material salvaged from the project ROW in accordance with Item 160 specifications, and/or secure additional good material from approved sources.
2. Topsoil shall include only the top 6 inches of its native surface, and be easily cultivated, fertile, erosion-resistant and free of objectionable materials.
3. Topsoil obtained from sites outside of the ROW must come from approved sources and have a pH between 5.5 and 8.5 su.
4. Place Topsoil on pre-cultivated surface, spread to a uniform loose cover at thickness specified, and shape per plans. Water and roll the finished surface with a light roller or other suitable equipment per Item 160.3; do not over-compact.

COMPOST NOTES:
1. When Compost Manufactured Topsoil (4") is specified under Item 161, use compost meeting all requirements of Item 161.2 and Table 1. Provide quality control (QC) documentation and obtain Engineer approval prior to compost delivery.
2. Contractor shall provide tickets/invoices that document material type, quantity and placement for all compost delivered.
3. Additional topsoil may be required to be imported to achieve the compost/topsoil mix ratio. Topsoil must meet Item 160 specifications.

APPLICATION OF COMPOST MANUFACTURED TOPSOIL (4")

AFTER Surface Preparation, uniformly spread a 1-inch layer of compost on-grade with 3 inches topsoil over pre-cultivated planting area. (25% compost and 75% topsoil = 1" compost and 3" topsoil.)
Then mix compost and topsoil together by cultivating the compost into the topsoil (by till or disk) to a 4-inch (4") depth.
Roll the finished surface with a light corrugated drum; do not over-compact.

FERTILIZER ITEM 166* FERTILIZER AC

SOIL ANALYSIS FOR FERTILIZER APPLICATION RATE

Unless otherwise stated in the plans, Contractor shall perform at least one soil analysis on each project before fertilization, and submit results to Engineer with recommended fertilizer rates based on soil analysis.
Engineer may direct sample location(s). Soil analysis may be waived if both compost and sod are used on entire project.

FERTILIZER NOTES:
1. Refer to Item 166 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.
2. Apply fertilizer BEFORE seeding, or AFTER placing sod.
3. Use fertilizer containing nitrogen (N), phosphoric acid (P) and potash (K) nutrients, unless otherwise specified. At least 50% of the Nitrogen component shall be a slow-release sulfur-coated urea as described in Item 166.3. Do not apply more than 60 lbs Nitrogen per acre without Engineer concurrence.
4. Deliver fertilizer in bags, clearly labeled to show contents, unless otherwise specified or approved prior to delivery. When non-bagged, loose fertilizer is approved, provide documentation for each load of material delivered, to validate authenticity of the material.
5. Apply fertilizer uniformly, as a dry, granular material, essentially dust-free, and do not mix with water for application as a slurry.
6. When both temporary and permanent seeding are specified for the same area, apply half of the required fertilizer before the temporary seeding operation and the other half before the permanent seeding operation.

SEEDING FOR EROSION CONTROL ITEM 164* DRILL SEEDING AC

RECOMMENDED PLANTING SEASON	PERMANENT RURAL SEED MIX ITEM 164 - DRILL SEEDING (PERM) (RURAL)(CLAY)	Pure Live Seed Rate**	PERMANENT URBAN SEED MIX ITEM 164 - DRILL SEEDING (PERM) (URBAN)(CLAY)	Pure Live Seed Rate**	TEMPORARY DRILL SEED MIX ITEM 164 - DRILL SEEDING (TEMP) (WARM OR COOL)	Pure Live Seed Rate**
WARM SEASON Mar.15th, April, May, June, July, August, Sept. 15th	Green Sprangletop (Van Horn)	- 1.0 lbs/AC	Green Sprangletop (Leptochloa dubia)	- 0.3 lbs/AC	Foxtail Millet (Setaria italica)	- 34 lbs/AC
	Sideoats Grama (Haskell)	- 1.0 lbs/AC	Sideoats Grama (El Reno)(Bouteloua curtipendula)	- 3.6 lbs/AC		
	Texas Grama (Atascosa)	- 1.0 lbs/AC	Buffalograss (Texoka)(Buchloe dactyloides)	- 1.6 lbs/AC		
	Hairy Grama (Chaparral)	- 0.4 lbs/AC	Bermudagrass (Cynodon dactylon)	- 2.4 lbs/AC		
	Shortspike Windmillgrass (Welder)	- 0.2 lbs/AC				
	Little Bluestem (OK Select)	- 0.8 lbs/AC				
	Purple Prairie Clover (Cuero)	- 0.6 lbs/AC				
	Engelmann Daisy (Eldorado)	- 0.75lbs/AC				
	Illinois Bundleflower	- 1.3 lbs/AC				
	Awnless Bushsunflower (Plateau)	- 0.2 lbs/AC				
COOL SEASON Sept 16th, Oct, Nov, Dec, Jan, Feb, Mar 14th					Tall Fescue (Festuca arundinaceae)	- 4.5 lbs/AC
					Western Wheatgrass (Agropyron smithii)	- 5.6 lbs/AC
					Red Winter Wheat (Triticum aestivum)	- 34 lbs/AC
					Cereal Rye	- 34 lbs/AC

SEEDING NOTES:
1. When seeding is specified under Item 164, refer to TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown. Materials and construction shall meet specifications.
2. Conduct seeding upon completion of each applicable construction stage (dependent upon planting season requirements), without compensation for additional move-ins.
3. Place seed AFTER preparing planting area surface. Refer to Surface Preparation detail this sheet, as well as Topsoil Item 160 and Compost Manufactured Topsoil Item 161 when specified. Apply fertilizer per Item 166 BEFORE seeding, per specifications and this sheet, to help drill the fertilizer into the soil.
4. When temporary grasses are well-established and more than 2 inches tall, mow planting area before seeding permanent grasses; mowing for this purpose will be subsidiary. When vegetation is not already well-established, cultivate planting area to a depth as described in Item 164.3, before temporary seeding and before permanent seeding.
5. Seed material must be appropriate to the location, soil type and season. Use the seed mix species and pure live seed rates designated in Tables 1-4 of the TxDOT 2014 Standard Specifications* for Item 164, unless otherwise specified.
6. All seed shall meet labeling, delivery, analysis, and testing requirements described in Item 164.2.1. Deliver seed in labeled, unopened bags or containers to Engineer prior to planting.
7. Uniformly plant seed over the designated planting area, along the contour of slopes, and drill seed to a depth as described in Item 164.3.4.
8. Hydroseeding may be allowed, when specified or Engineer concurs.
9. Implement and continue Vegetative Watering per the schedule, rate and volume specified under Item 168.

****Note:** The amount of Pure Live Seed (PLS) in one pound of bulk seed is based on three factors: % Purity, % Germination, and % Dormant. Use the following formula to calculate PLS in bulk seed: PLS = % Purity X (% Germination + % Dormant) Ensure that the specified amount of pure live seed is placed.

TXDOT REFERENCE MATERIALS:

- "STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES" 2014
- "A GUIDANCE TO ROADSIDE VEGETATION ESTABLISHMENT" 2004
- ONLINE TRAINING COURSE: MNT415 REVEGETATION DURING CONSTRUCTION
- DALLAS DISTRICT "VEGETATION ESTABLISHMENT GUIDELINES"

SODDING FOR EROSION CONTROL ITEM 162* BLOCK SOD (BERMUDA) SY

BLOCK OR ROLL SOD	COMMON NAME	BOTANICAL NAME
	Common Bermuda Grass	Cynodon dactylon

SODDING NOTES:
1. Refer to Item 162 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.
2. Place sod between the average date of the last freeze in the Spring and 6 weeks before the average date of the first freeze in the Fall, per the Texas Almanac for the project area.
3. Place sod only AFTER soil surface preparation is complete as detailed in this sheet. Dry soil may require pre-watering.
4. Place all sod (blocks or rolls) within 24 hours of delivery to the site, and keep moist from the time it is dug up until it is planted. Sod with dried roots will not be accepted.
5. Place sod with joints alternating on each row to prevent all joints from lining up, and place blocks firmly against adjacent blocks. Roll, tamp and trim sod per Item 162.3.
6. Place fertilizer promptly AFTER sodding operation is complete in each area.
7. Water sod immediately following placement, and continue Vegetative Watering per Item 168.

VEGETATIVE WATERING FOR ESTABLISHING SEED AND SOD ITEM 168* VEGETATIVE WATERING MG

WATERING SCHEDULE

SEASON (Usual Months)	RATE	TIME SCHEDULE	TOTAL WATER ESTIMATE
SPRING & FALL (March, April, May, October)	7,000 gallons/acre per working day	Vegetative watering for seed shall begin on the day after rainfall described below and continue for 60 consecutive working days; vegetative watering for sod shall begin on the day the sod is placed and continue for a minimum of 15 consecutive working days.	420,000 gallons/acre (60 working days)
SUMMER (June, July, August, September)	12,000 gallons/acre per working day		720,000 gallons/acre (60 working days)
WINTER (November through February)	1,000 gallons/acre per working day	Vegetative watering for seed and/or sod shall begin on the day after placement for 15 consecutive working days	15,000 gallons/acre (15 working days)

Notes: Rate and frequency may be adjusted, with the approval of the Engineer, to meet site conditions (especially with sod).
For informational purposes only: 1,000 gallons equals 1 MG

VEGETATIVE WATERING NOTES:
1. Refer to Item 168 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.
2. Use clean water free of industrial waste and other substances harmful to vegetation growth, per Item 168.2.
3. Use Vegetative Watering to keep the seed bed moist during germination; not to provide initial watering. After drill seeding, postpone watering operations until site receives at least 1/2-inch of natural rainfall in a single day. Delay watering operations for warm season grasses until soil temperature exceeds 70 degrees F.
4. For sod, water immediately.
5. All water distribution equipment shall be furnished and operated to provide water at a uniform and controllable rate. Use a metering device on all watering equipment.
6. Evenly distribute water over entire area designated for seeding and/or sodding, using even spray patterns that do not disturb seed bed and/or dislodge seed from seed bed.
7. Do not water between the hours of 12:00 p.m. and 6:00 p.m. when daytime temperatures exceed 95 degrees F.
8. After initial establishment period, continue intermittent watering of newly established seed or sod at a rate of approximately 1-inch water/week, during summer months until end of contract.
9. If 1/4-inch or more of rainfall occurs on site on any given working day, no vegetative watering will be needed on that working day. (Note: 1/4-inch rain equals 7,000 gallons of water per acre.)
10. Should the Contractor fail to apply the specified amount of water within the time allowed, any seed or sod in poor condition shall be replaced, fertilized, and watered at Contractor's expense.

ROADSIDE MOWING ITEM 730* PROJECT MAINTENANCE AC

MOWING NOTES:
1. During project construction, once seed is established, use mowing to promote permanent grasses by mowing any remaining temporary grasses.
2. Also mow established turf and ROW grasses in designated areas of project limits as specified or directed by Engineer.
3. Remove litter and debris prior to mowing.
4. Do not mow on wet ground when soil rutting can occur.
5. Hand-trim around obstructions and stormwater control devices as needed.
6. Maintain paved surfaces free of tracked soils and clipped vegetation.

SEQUENCE OF WORK:

- CULTIVATE SURFACE SOIL.
- PREPARE / PLACE TOPSOIL, OR
- PREPARE / PLACE COMPOST MANUFACTURED TOPSOIL.
- APPLY FERTILIZER AND THEN PLACE SEEDING, OR
- PLACE SOD AND THEN APPLY FERTILIZER.
- CONDUCT VEGETATIVE WATERING.
- CONDUCT ROADSIDE MOWING, AS DIRECTED.

Texas Department of Transportation

VEGETATION ESTABLISHMENT SHEET

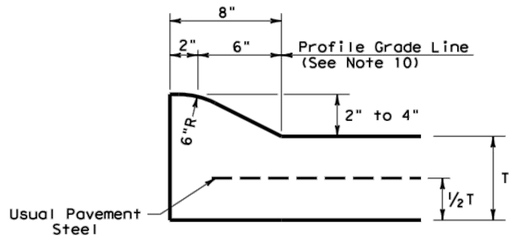
(DALLAS DISTRICT)

TEMPLATE REVISION DATE: 02/21/19

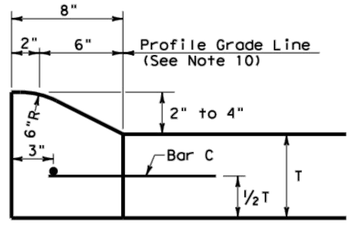
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
CPB	6	(See Title Sheet)		
GRAPHICS: XXX	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK: XXX	TEXAS	DALLAS		
CHECK: XXX	CONTROL	SECTION	JOB	
				D-4

DATE

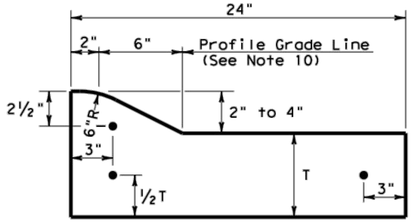
DATE:
FILE:



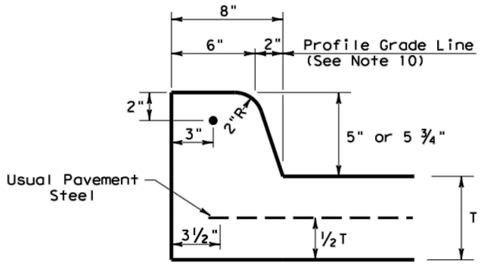
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



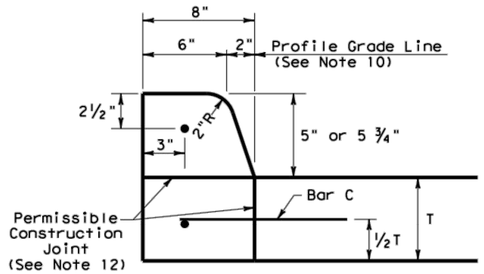
TYPE I CURB
2" - 4" HEIGHT



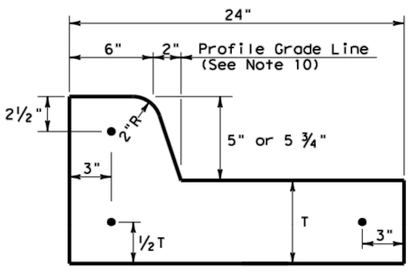
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



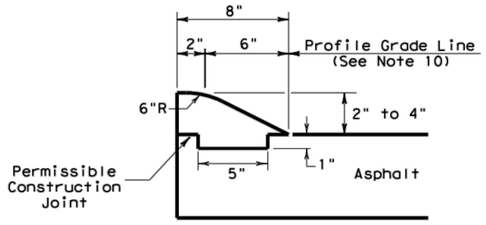
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



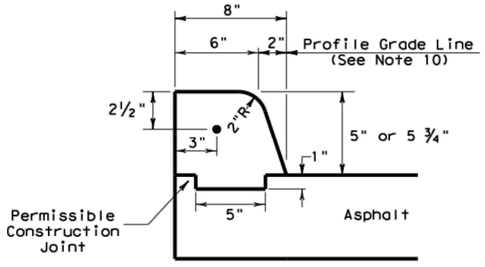
TYPE II CURB
5" - 5 ¾" HEIGHT



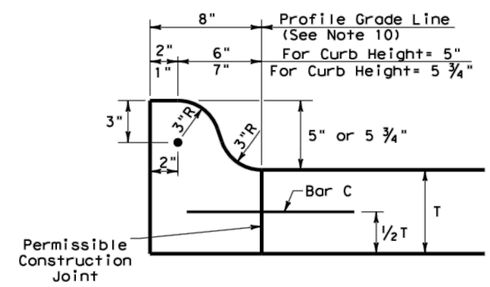
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



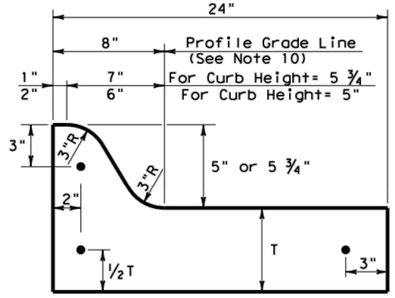
TYPE III CURB (KEYED)
2" - 4" HEIGHT



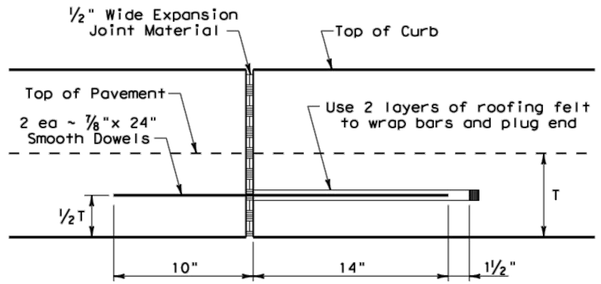
TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



TYPE IIa CURB
5" - 5 ¾" HEIGHT

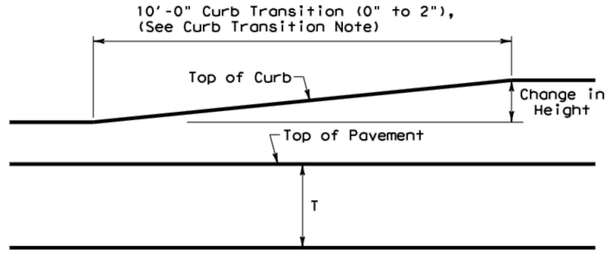


TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

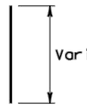
CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



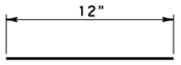
CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and the grouted in place, or may be inserted into fresh concrete.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C~C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
13. Bar B used as needed to support curb reinforcing steel during concrete placement.



BAR B



BAR C

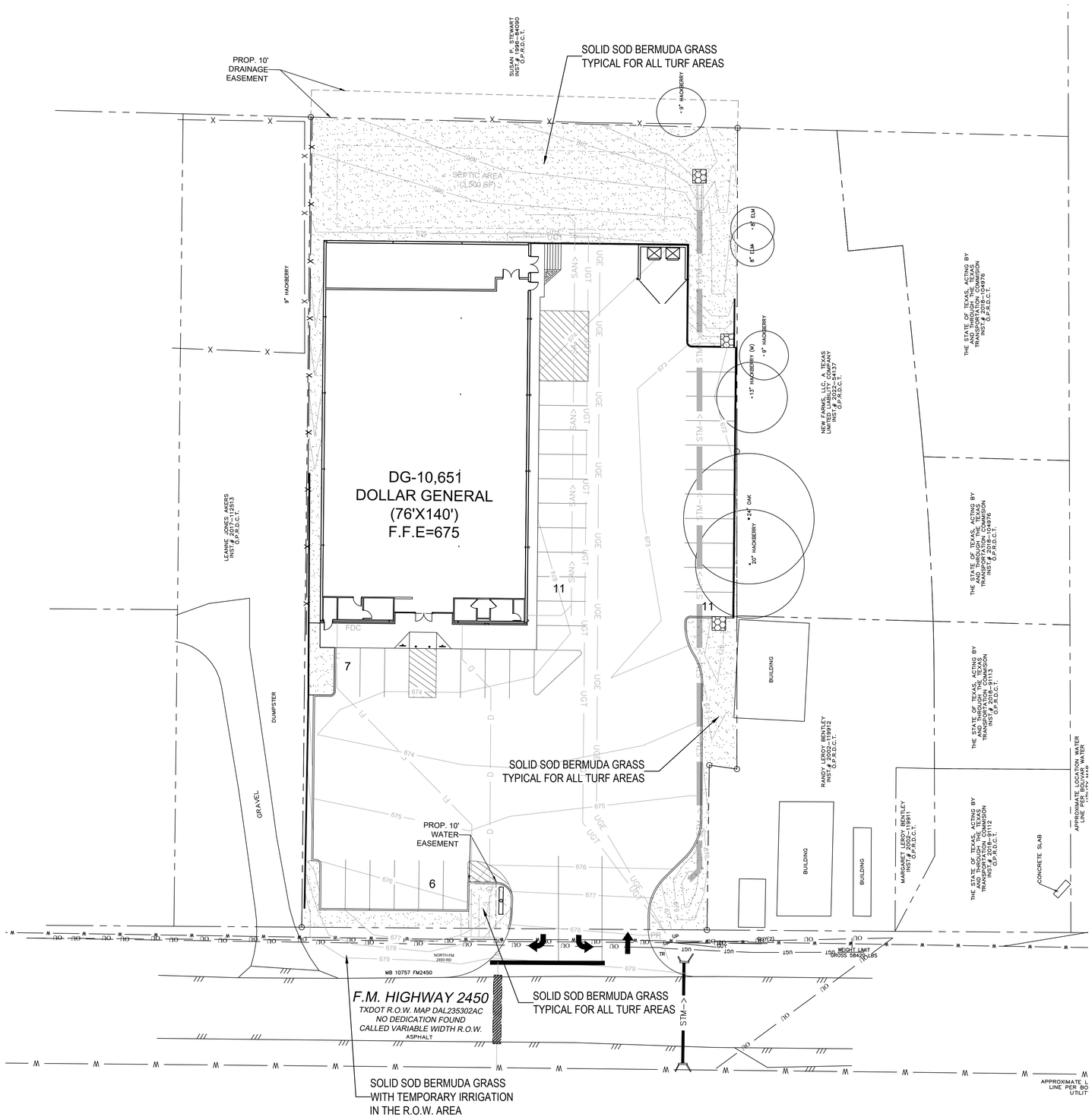
Texas Department of Transportation

Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

CCCG-21

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: SS	CK: KM
© TxDOT: FEBRUARY 2021 REVISIONS	CONT	SECT	JOB	HIGHWAY
	DIST	COUNTY		SHEET NO.
				D-31



LANDSCAPE NOTES

1. *Contractor shall verify all existing and proposed site elements and notify Architect of any discrepancies. Survey data of existing conditions was supplied by others.*
2. *Contractor shall locate all existing underground utilities and notify Architect of any conflicts. Contractor shall exercise caution when working in the vicinity of underground utilities.*
3. *Contractor is responsible for obtaining all required landscape and irrigation permits.*
4. *Contractor to provide a minimum 2% slope away from all structures.*
5. *All planting beds and lawn areas to be separated by steel edging. No steel to be installed adjacent to sidewalks or curbs.*
6. *All landscape areas to be 100% irrigated with an underground automatic irrigation system and shall include rain and freeze sensors.*
7. *All lawn areas to be Solid Sod Bermudagrass, unless otherwise noted on the drawings.*

SOLID SOD NOTES

1. *Fine grade areas to achieve final contours indicated. Leave areas to receive topsoil 3" below final desired grade in planting areas and 1" below final grade in turf areas.*
2. *Adjust contours to achieve positive drainage away from buildings. Provide uniform rounding at top and bottom of slopes and other breaks in grade. Correct irregularities and areas where water may stand.*
3. *All lawn areas to receive solid sod shall be left in a maximum of 1" below final finish grade. Contractor to coordinate operations with on-site Construction Manager.*
4. *Contractor to coordinate with on-site Construction Manager for availability of existing topsoil.*
5. *Plant sod by hand to cover indicated area completely. Insure edges of sod are touching. Top dress joints by hand with topsoil to fill voids.*
6. *Roll grass areas to achieve a smooth, even surface, free from unnatural undulations.*
7. *Water sod thoroughly as sod operation progresses.*
8. *Contractor shall maintain all lawn areas until final acceptance. This shall include, but not limited to: mowing, watering, weeding, cultivating, cleaning and replacing dead or bare areas to keep plants in a vigorous, healthy condition.*
9. *Contractor shall guarantee establishment of an acceptable turf area and shall provide replacement from local supply if necessary.*
10. *If installation occurs between September 1 and March 1, all sod areas to be over-seeded with Winter Ryegrass, at a rate of (4) pounds per one thousand (1000) square feet.*

GENERAL LAWN NOTES

1. Fine grade areas to achieve final contours indicated on civil plans.

2. Adjust contours to achieve positive drainage away from buildings. Provide uniform rounding at top and bottom of slopes and other breaks in grade. Correct irregularities and areas where water may stand.

3. All lawn areas to receive solid sod shall be left in a maximum of 1" below final finish grade. Contractor to coordinate operations with on-site Construction Manager.

4. Imported topsoil shall be natural, friable soil from the region, known as bottom and soil, free from lumps, clay, toxic substances, roots, debris, vegetation, stones, containing no salt and black to brown in color.

5. All lawn areas to be fine graded, irrigation trenches completely settled, and finish grade approved by the Owner's Construction Manager or Architect prior to installation.

6. All rocks 3/4" diameter and larger, dirt clods, sticks, concrete spoils, etc. shall be removed prior to placing topsoil and any lawn installation

7. Contractor shall provide (1") one inch of imported topsoil on all areas to receive lawn.

HYDROMULCH NOTES

1. *All lawn areas to be Hydromulch Bermudagrass, unless noted otherwise on drawings.*
2. *Contractor shall scarify, rip, loosen all areas to be hydromulched to a minimum depth of 4" prior to topsoil and hydromulch installation.*
3. *Bermudagrass seed shall be extra hulled and treated lawn type and shall be delivered to the site in its original unopened container, and shall meet Texas State Law requirements.*
4. *Fiber: Shall be one hundred (100%) percent Wood Cellulose Fiber, delivered to the site in its original unopened container. 'Conweb' or equal.*
5. *Fiber Tack: Shall be delivered to the site in its original unopened container, and shall be 'Terro-Tack one', as manufactured by Growers, Inc., or equal.*
6. *Hydromulch with Bermudagrass seed at a rate of two (2) pounds per one thousand (1000) square foot.*
7. *Use a 4'x8' batter board against all beds areas.*
8. *If installation occurs between September 1 and April 1, all hydromulch areas to be Winter Ryegrass, at a rate of four (4) pounds per one thousand (1000) square feet. Contractor shall be required to re-hydromulch with Bermudagrass the following growing season.*
9. *In the event rye grass is necessary due to time of year installation, it shall be the responsibility of the contractor to scalp existing grass, bag clippings, and scarify soil to a depth of 1" prior to permanent lawn grass installation.*
10. *All lawn areas to be hydromulched, shall have one hundred (100%) percent coverage prior to final acceptance.*
11. *Contractor shall maintain all lawn areas until final acceptance. This shall include but not be limited to: mowing, watering, weeding, cultivating, cleaning, and replacing dead or bare areas to keep plants in a vigorous, healthy condition.*
12. *Contractor shall guarantee establishment of an acceptable turf area and shall provide replacement from local supply as necessary.*

PLANT MATERIAL SCHEDULE -

GROUNDCOVERS					
TYPE	QTY	COMMON NAME	*BOTANICAL NAME*	SIZE	REMARKS
		'419' Bermudagrass	*Cynodon dactylon '419'*		Solid Sod refer to notes
NOTE: Plant list is an aid to bidders only. Contractor shall verify all quantities on plan. All heights and spreads are minimums. All plant material shall meet or exceed remarks as indicated. All trees to have straight trunks and be matching within varieties.					

01 LANDSCAPE PLAN
SCALE 1"=20'-0"
0 10 20 40

LANDSCAPE ARCHITECT
STUDIO GREEN SPOT, INC.
1782 W. McDERMOTT DR.
ALLEN, TEXAS 75013
(469) 369-4448
CHRIS@STUDIOGREENSPOT.COM

REGISTERED LANDSCAPE ARCHITECT
CHRIS TRONCALIANO
2042
STATE OF TEXAS
06.26.2023

DOLLAR GENERAL

F.M. HWY 2450
SANGER, TEXAS

ISSUE:
FOR APPROVAL 06.08.2023
OWNER COMMENTS 06.26.2023

DATE:
06.26.2023

SHEET NAME:
LANDSCAPE PLAN

SHEET NUMBER:
L.1

SECTION 02900 - LANDSCAPE

PART 1 - GENERAL

1.1 REFERENCED DOCUMENTS

Refer to bidding requirements, special provisions, and schedules for additional requirements.

1.2 DESCRIPTION OF WORK

Work included: Furnish all supervision, labor, materials, services, equipment and appliances required to complete the work covered in conjunction with the landscaping covered in these specifications and landscaping plans, including:

1. Planting (trees, shrubs, and grass)
2. Bed preparation and fertilization
3. Notification of sources
4. Water and Maintenance until final acceptance
5. Guarantee

1.3 REFERENCE STANDARDS

A. American Standard for Nursery Stock published by American Association of Nurserymen: 27 October 1980, Edition; by American National Standards Institute, Inc. (Z60.1) – plant material.

B. American Joint Committee on Horticultural Nomenclature: 1942 Edition of Standardized Plant Names.

C. Texas Association of Nurserymen, Grades and Standards.

D. Hortis Third, 1976 - Cornell University

1.4 NOTIFICATION OF SOURCES AND SUBMITTALS

A. The Contractor shall, within ten (10) days following acceptance of bid, notify the Architect/Owner of the sources of plant materials and bed preparation required for the project.

B. Samples: Provide representative quantities of sandy loam soil, mulch, bed mix material, gravel, and crushed stone. Samples shall be approved by Architect before use on project.

C. Product Data: Submit complete product data and specifications on all other specified materials.

D. Submit three representative samples of each variety of ornamental trees, shrubs, and groundcover plants for Architect's approval. When approved, tag, install, and maintain as representative samples for final installed plant materials.

E. File Certificates of Inspection of plant material by state, county, and federal authorities with Architect, if required.

F. Soil Analysis: Provide sandy loam soil analysis if requested by the Architect.

PART 3 - EXECUTION

3.1 BED PREPARATION & FERTILIZATION

A. Landscape Contractor to inspect all existing conditions and report any deficiencies to the Owner.

B. All planting areas shall be conditioned as follows:

1. Prepare new planting beds by scraping away existing grass and weeds as necessary. Till existing soil to a depth of six (6") inches prior to placing compost and fertilizer. Apply fertilizer as per manufacturers recommendations. Add six (6") inches of compost and till into a depth of six (6") inches of the topsoil. Apply organic fertilizer such as Sustane or Green Sense at the rate of twenty (20) pounds per one thousand (1,000) square feet.
2. All planting areas shall receive a two (2") inch layer of specified mulch.
3. Backfill for tree pits shall be as follows: Use existing top soil on site (use imported topsoil as needed) free from large clumps, rocks, debris, caliche, subsoils, etc., placed in nine (9") inch layers and watered in thoroughly.

C. Grass Areas:

1. Areas to be Solid Sod Bermudagrass: Blocks of sod should be laid joint to joint, (staggered joints) after fertilizing the ground first. Roll grass areas to achieve a smooth, even surface. The joints between the blocks of sod should be filled with topsoil where they are evidently gaped open, then watered thoroughly.
2. Areas to be Hydromulch Common Bermudagrass: Hydromulch with bermudagrass seed at a rate of two (2) pounds per one thousand (1,000) square feet. Use a 4' x 8' batter board against the bed areas.

3.2 INSTALLATION

A. Maintenance of plant materials shall begin immediately after each plant is delivered to the site and shall continue until all construction has been satisfactorily accomplished.

B. Plant materials shall be delivered to the site only after the beds are prepared and area ready for planting. All shipments of nursery materials shall be thoroughly protected from the drying winds during transit. All plants which cannot be planted at once, after delivery to the site, shall be well protected against the possibility of drying by wind and sun. Balls of earth of B & B plants shall be kept covered with soil or other acceptable material. All plants remain the property of the Contractor until final acceptance.

C. Position the trees and shrubs in their intended location as per plan.

D. Notify the Landscape Architect for inspection and approval of all positioning of plant materials.

E. Excavate pits with vertical sides and horizontal bottom. Tree pits shall be large enough to permit handling and planting without injury to balls of earth or roots and shall be of such depth that, when planted and settled, the crown of the plant shall bear the same relationship to the finish grade as it did to soil surface in original place of growth.

JOB CONDITIONS

A. General Contractor to complete the following punch list: Prior to Landscape Contractor initiating any portion of landscape installation, General Contractor shall leave planting bed areas three (3') inches below finish grade of sidewalks, drives and curbs as shown on the drawings. All lawn areas to receive solid sod shall be left one (1") inch below the finish grade of sidewalks, drives, and curbs. All construction debris shall be removed prior to Landscape Contractor beginning any work.

B. General Contractor shall provide topsoil as described in Section 02200 - Earthwork.

C. Storage of materials and equipment at the job site will be at the risk of the Landscape Contractor. The Owner cannot be held responsible for theft or damage.

1.6 MAINTENANCE AND GUARANTEE

A. Maintenance:

1. The Landscape Contractor will be held responsible for the maintenance of all work from the time of planting until final acceptance by the Owner. No trees, shrubs, groundcover or grass will be accepted unless they show a healthy growth and satisfactory foliage conditions.
2. Maintenance shall include watering of trees and plants, cultivation, weeding spraying, edging, pruning of trees, mowing of grass, cleaning up and all other work necessary of maintenance.
3. A written notice requesting final inspection and acceptance should be submitted to the Owner at least seven (7) days prior to completion. An on-site inspection by Owner and Landscape Contractor will be completed prior to written acceptance.
4. After final acceptance of installation, the Landscape Contractor will not be required to do any of the above listed work.

B. Guarantee:

1. Trees shall be guaranteed for a twelve (12) month period after acceptance. Shrubs and groundcover shall be guaranteed for twelve (12) months. The Contractor shall replace all dead materials as soon as weather permits and upon notification of the Owner. Plants, including trees, which have partially died so that shape, size, or symmetry has been damaged, shall be considered subject to replacement. In such cases, the opinion of the Owner shall be final.
   a. Plants used for replacement shall be of the same size and kind as those originally planted and shall be planted as originally specified. All work, including materials, labor and equipment used in replacements, shall carry a twelve (12) month guarantee. Any damage, including ruts in lawn or bed areas, incurred as a result of making replacements shall be immediately repaired.
   b. At the direction of the Owner, plants may be replaced at the start of the next year's planting season. In such cases, dead plants shall be removed from the premises immediately.
   c. When plant replacements are made, plants, soil mix, fertilizer and mulch are to be utilized as originally specified and reinspected for full compliance with Contract requirements. All replacements are to be included under "Work" of this section.
2. The Owner agrees that for the guarantee to be effective, he will water plants at least twice a week during dry periods and cultivate beds once a month after final acceptance.
3. The above guarantee shall not apply where plants die after acceptance because of injury from storms, hail, freeze, insects, diseases, injury by humans, machines or theft.
4. Acceptance for all landscape work shall be given after final inspection by the Owner provided the job is in a completed, undamaged condition, and there is a stand of grass in all lawn areas. At this time, the Owner will assume maintenance on the accepted work.

C. Repairs: Any necessary repairs under the Guarantee must be made within ten (10) days after receiving notice, weather permitting, and in the event the Landscape Contractor does not make repairs accordingly, the Owner, without further notice to Contractor, may provide materials and men to make such repairs at the expense of the Landscape Contractor.

1.7 QUALITY ASSURANCE

A. General: Comply with applicable Federal, State, County and Local regulations governing landscape materials and work

B. Personnel: Employ only experienced personnel who are familiar with the required work. Provide full time supervision by a qualified foreman acceptable to Landscape Architect.

C. Selection of Plant Material:

1. Make contact with suppliers immediately upon obtaining notice of contract acceptance to select and book materials. Develop a program of maintenance (pruning and fertilization) which will insure the purchased materials will meet and/or exceed project specifications.
2. Landscape Architect will provide a key identifying each tree location on site. Written verification will be required to document material selection, source and delivery schedules to site.
3. Owner and/or Architect shall inspect all plant materials when reasonable at place of growth for compliance with requirements for genus, species, cultivar/variety, size and quality.
4. Owner and/or Architect retains the right to further inspect all plant material upon arrival at the site and during installation for size and condition of root balls, limbs, branching habit, insects, injuries, and latent defects.
5. Owner and/or Architect may reject unsatisfactory or defective material at any time during the process of work. Remove rejected materials from the site immediately. Plants damaged in transit or at job site shall be rejected.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Preparation:

1. Balled and Burlapped (B&B) Plants: Dig and prepare shipment in a manner that will not damage roots, branches, shape, and future development.
2. Container Grown Plants: Deliver plants in rigid container to hold ball shape and protect root mass.

A. Delivery:

1. Deliver packaged materials in sealed containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.
2. Deliver only plant materials that can be planted in one day unless adequate storage and watering facilities are available on job site.
3. Protect root balls by heeling in with sawdust or other approved moisture retaining material if not planted within 24 hours of delivery.
4. Protect plants during delivery to prevent damage to root balls or desiccation of leaves. Keep plants moist at all times. Cover all materials during transport.
5. Notify Architect of delivery schedule 72 hours in advance so plant material may be observed upon arrival at job site.
6. Remove rejected plant material immediately from site.
7. To avoid damage or stress, do not lift, move, adjust to plumb, or otherwise manipulate plants by trunk or stems.

PART 2 - PRODUCTS

2.1 PLANTS

A. General: Well-formed No. 1 grade or better nursery grown stock. Listed plant heights are from tops of root balls to nominal tops of plants. Plant spread refers to nominal outer width of the plant, not to the outer leaf tips. Plants will be individually approved by the Architect and his decision as to their acceptability shall be final.

B. Quantities: The drawings and specifications are complimentary. Anything called for on one and not the other is as binding as if shown and called for on both. The plant schedule is an aid to bidders only. Confirm all quantities on plan.

C. Quality and size: Plant materials shall conform to the size given on the plan, and shall be healthy, symmetrical, well-shaped, full branched, and well rooted. The plants shall be free from injurious insects, diseases, injuries to the bark or roots, broken branches, objectionable disfigurements, insect eggs and larvae and are to be of specimen quality.

D. Approval: All plant materials shall be subject to the approval of the Owner. All plants which are found unsuitable in growth, or in any unhealthy, badly shaped, or undersized condition, will be rejected by the Landscape Architect, either before or after planting, and shall be removed at the expense of the Landscape Contractor and replaced with acceptable plants as specified.

E. Trees shall be healthy, full-branched, well-shaped and shall meet the trunk diameter and height requirements of the plant schedule. Balls shall be firm, neat, slightly tapered, and well wrapped in burlap. Any tree loose in the ball or with broken ball at time of planting will be rejected. Balls shall be ten (10") inched in diameter for each one (1") inch of trunk diameter. Measured six (6") inched above ball.
   Nomenclature conforms to the customary nursery usage: for clarification, the term "multi-trunk" defines a plant having three (3) or more trunks of nearly equal diameter.

F. Pruning: All pruning of trees and shrubs, as directed by the Landscape Architect, shall be executed by the Landscape Contractor at no additional cost to the Owner.

2.2 SOIL PREPARATION MATERIALS

A. Sandy Loam:

1. Friable, fertile, dark, loamy soil, free of clay lumps, subsoil, stones and other extraneous material and reasonably free of weeds and foreign grasses. Loam containing Dallasgrass or Nutgrass shall be rejected.
2. Physical properties as follows:
   Clay – between 7-27 percent
   Silt – between 15-25 percent
   Sand – less than 52 percent
3. Organic matter shall be 3%-10% of total dry weight.
4. If requested, provide a certified soil analysis conducted by an approved soil testing laboratory verifying that sandy loam meets the above requirements.

B. Organic Material: Compost with a mixture of 80% vegetative matter and 20% animal waste. Ingredients should be a mix of course and fine textured material.

C. Premixed Bedding Soil as supplied by Vital Earth Resources, Gladewater, Texas; Professional Bedding Soil as supplied by Living Earth Technology, Dallas, Texas or Acid Gro Municipal Mix as supplied by Soil Building Systems, Dallas, Texas or approved equal.

D. Sharp Sand: Sharp sand must be free of seeds, soil particles and weeds.

E. Mulch: Double Shredded Hardwood Mulch, partially decomposed, dark brown. Living Earth Technologies or approved equal.

F. Organic Fertilizer: Fertilaid, Sustane, or Green Sense or equal as recommended for required applications. Fertilizer shall be delivered to the site in original unopened containers, each bearing the manufacturer's guaranteed statement of analysis.

A. Commercial Fertilizer: 10-20-10 or similar analysis. Nitrogen source to be a minimum 50% slow release organic Nitrogen (SCU or UF) with a minimum 8% sulphur and 4% iron, plus micronutrients.

B. Peat: Commercial sphagnum peat moss or partially decomposed shredded pine bark or other approved organic material.

2.3 MISCELLANEOUS MATERIALS

A. Steel Edging: Shall be Ryerson "Estate Curbing", 1/8" x 4" with stakes 4' on center.

B. Staking Material for Shade Trees:

1. Post: Studded T-Post, #1 Armco with anchor plate; 6'-0" length; paint green.
2. Wire: 12 gauge, single strand, galvanized wire.
3. Rubber hose: 2 ply, fiber reinforced hose, minimum ½ inch inside diameter. Color: Black.

C. Gravel: Washed native pea gravel, graded 1 in. to 1-1/2 in.

D. Filter Fabric: Mirafi 140N by Celanese Fibers Marketing Company, available at Loftland Co., (214) 631-5250 or approved equal.

F. Shrub and tree pits shall be no less than two (2) feet, twenty-four (24") inches, wider than the lateral dimension of earth ball and six (6") inches deeper than it's vertical dimension. Remove and haul from site all rocks and stones over one (1") inch in diameter. Plants should be thoroughly moist before removing containers.

G. Dig a wide, rough sided hole exactly the same depth as the height of the ball, especially at the surface of the ground. The sides of the hole should be rough and jagged, never slick or glazed.

H. Percolation Test: Fill the hole with water. If the water level does not percolate within 24 hours, the tree needs to move to another location or have drainage added. Install a PVC stand pipe per tree planting detail as approved by the Landscape Architect.

I. Backfill only with 5 parts existing soil or sandy loam and 1 part bed preparation. When the hole is dug in solid rock, topsoil from the same area should not be used. Carefully settle by watering to prevent air pockets. Remove the burlap from the top 1/3 of the ball, as well as all nylon, plastic string and wire mesh. Container trees will usually be pot bound, if so follow standard nursery practice of 'root scoring'.

J. Do not wrap trees.

K. Do not over prune.

L. Mulch the top of the ball. Do not plant grass all the way to the trunk of the tree. Leave the area above the top of the ball and mulch with at least two (2") inches of specified mulch.

M. All plant beds and trees to be mulched with a minimum settled thickness of two (2") inches over the entire bed or pit.

N. Obstruction below ground: In the event that rock, or underground construction work or obstructions are encountered in any plant pit excavation work to be done under this section, alternate locations may be selected by the Owner. Where locations cannot be changed, the obstructions shall be removed to a depth of not less than three (3') feet below grade and no less than six (6") inches below the bottom of ball when plant is properly set at the required grade. The work of this section shall include the removal from the site of such rock or underground obstructions encountered at the cost of the Landscape Contractor.

O. Trees and large shrubs shall be staked as site conditions require. Position stakes to secure tree against seasonal prevailing winds.

P. Pruning and Mulching: Pruning shall be directed by the Architect and shall be pruned in accordance with standard horticultural practice following Fine Pruning, Class I pruning standards provided by National Arborist Association.

1. Dead wood or suckers and broken badly bruised branches shall be removed. General tipping of the branched is not permitted. Do not cut terminal branches.
2. Pruning shall be done with clean, sharp tools.
3. Immediately after planting operations are completed, all tree pits shall be covered with a layer of organic material two (2") inches in depth. This limit of the organic material for trees shall be the diameter of the plant pit.

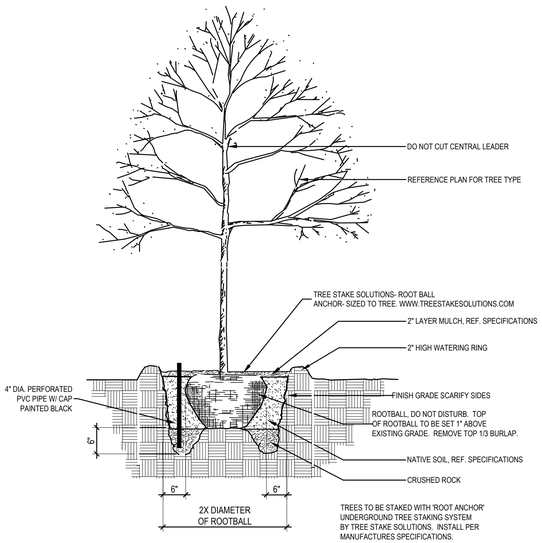
Q. Steel Curbing Installation:

1. Curbing shall be aligned as indicated on plans. Stake out limits of steel curbing and obtain Owners approval prior to installation.
2. All steel curbing shall be free of kinks and abrupt bends.
3. Top of curbing shall be 3/4" maximum height above grade.
1. Stakes are to be installed on the planting bed side of the curbing, as opposed to the grass side.
2. Do not install steel edging along sidewalks.
3. Cut steel edging at 45 degree angle where edging meets sidewalk.

3.3 CLEANUP AND ACCEPTANCE

A. Cleanup: During the work, the premises shall be kept neat and orderly at all times. Storage areas for all materials shall be so organized that they, too, are neat and orderly. All trash and debris shall be removed from the site as work progresses. Keep paved areas clean by sweeping or hosing at end of each days work.

END OF SECTION



01 TREE PLANTING DETAIL
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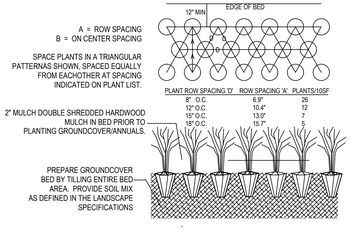

02 GROUNDCOVER PLANTING DETAIL
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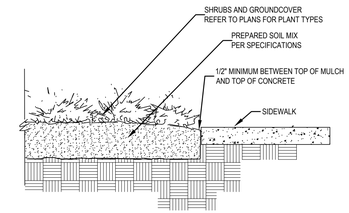
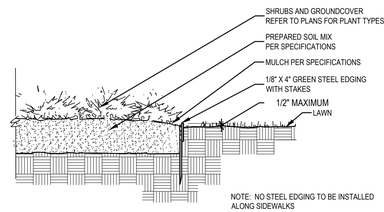


03 SIDEWALK / MULCH DETAIL
no steel along sidewalks NOT TO SCALE



04 STEEL EDGING DETAIL
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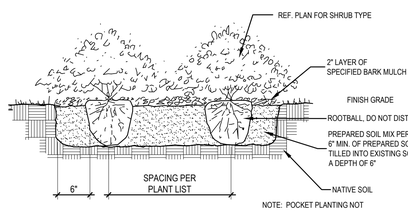

05 SHRUB PLANTING DETAIL
NOT TO SCALE

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06.08.2023

DOLLAR GENERAL

F.M. HWY 2450
SANGER, TEXAS

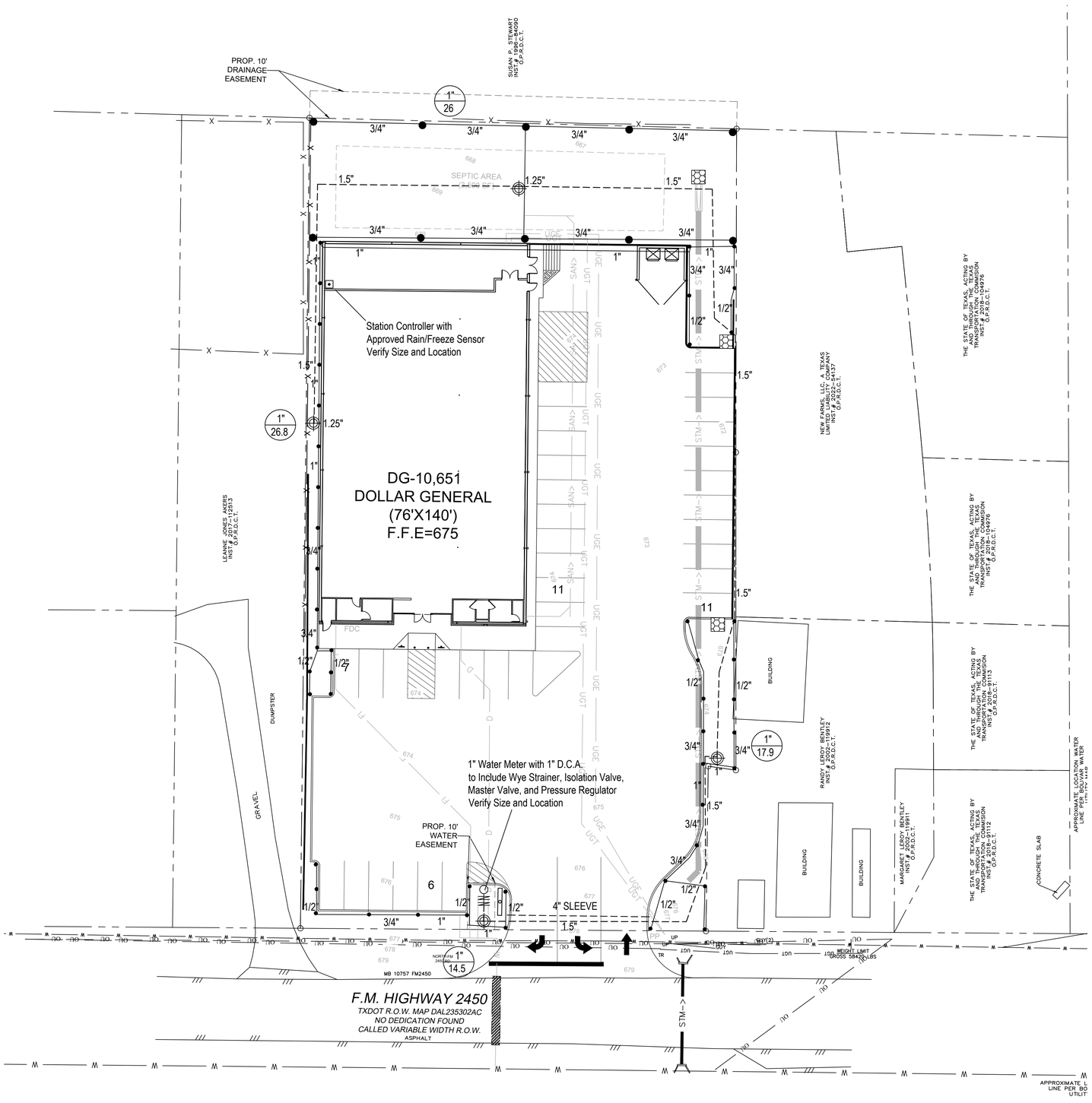
ISSUE:
FOR APPROVAL 06.08.2023

DATE:
06.08.2023

SHEET NAME:
LANDSCAPE DETAILS

SHEET NUMBER:

L.2



TCEQ NOTES

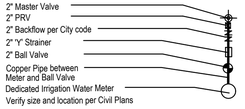
- *All irrigation equipment to be located no closer than 4" to any pavement and / or structure*
- *Electrical splices at each valve and controller only.*
- *Irrigation in Texas is regulated by the Texas Commission on Environmental Quality (TECQ) MC-178 / P.O. BOX 13087 Austin, Texas 78711-3087 www.tceq.state.tx.us*

BUBBLER PIPING CHART

1-5 BUBBLERS - 1/2" PIPE
6-10 BUBBLERS - 3/4" PIPE
11-20 BUBBLERS - 1" PIPE
21-30 BUBBLERS - 1 1/4" PIPE
31-40 BUBBLERS - 1 1/2" PIPE

IRRIGATION LEGEND

- Hunter PRS30-04 4" Pop-up Spray Head with Plastic Hunter Pro Adjustable Nozzle
- Hunter PRS30-12 12" Pop-up Spray Head with Plastic Hunter Pro Adjustable Nozzle
- Hunter PGP Ultra-04 Rotors
- Hunter Multi-Stream Bubbler Nozzle on Hunter PRS30-06 Pop-up Spray Head
- Spray, Rotor & Bubbler Zones-Hunter PGV Control Valves (See Plan for Size)
  Drip Zones-Hunter ICZ Drip Zone Control Kits (See Plan for Size)
- Hunter I-Core series Controller with Hunter Solar Sync Sensor
- WATER METER, SIZE AS INDICATED
  D.C.A., SIZE AS INDICATED
  to Include Wye Strainer, Isolation Valve, Master Valve, and Pressure Regulator
- PVC CLASS 200 LATERAL LINE
- PVC CLASS 200 MAINLINE
- PVC SCHEDULE 40 SLEEVING
- VALVE SIZE / GPM
- HUNTER HDL-09-12-100-PC Drip Line and Fittings (12" LATERAL SPACING, 12" EMITTER SPACING) PVC LATERAL PIPING SIZED AS REQUIRED INSTALL ALL EQUIPMENT ACCORDING TO MANUFACTURERS SPECIFICATIONS



SLEEVING NOTES

1. *Contractor shall lay sleeves and conduits at twenty-four (24") inches below finish grade of the top of pavement.*
2. *Contractor shall extend sleeves one (1') foot beyond edge of all pavement.*
3. *Contractor shall cap pipe ends using PVC caps.*
4. *All sleeves shall be Schedule 40 PVC pipe.*
5. *Contractor shall furnish Owner and Irrigation Contractor with an 'as-built' drawing showing all sleeve locations.*

Water Pressure Calculations

Static Pressure (at the water meter)- 65 psi
Design Pressure for Remote Zone- 55.4 psi
Pressure Losses for Remote Zone and Meter Components- 20.4 psi

Water Meter Components- Pressure Losses

Master Valve Pressure- 2 psi
Pressure Requlator- 1.2 psi
Back Flow- 5 psi
Wye Strainer- 75 psi
Ball Valve- .8 psi

Irrigation Zones Pressure Losses- (most remote zone)

Main Line- 6.8 psi
Valve- 2 psi
Later Line- 1.8 psi
Sprinkler requirements-35 psi

IRRIGATION NOTES

1. *All sprinkler equipment numbers reference the HUNTER equipment catalog unless otherwise indicated.*
2. *LAWN SPRAY HEADS are SRS-04 installed as per detail shown.*
3. *SHRUB SPRAY HEADS are SRS-12 installed as per detail shown.*
4. *ELECTRIC CONTROL VALVES shall be HUNTER PGV-S SERIES installed per detail shown. Size valves as sown on plan. Valves shall be installed in value boxes large enough to permit manual operation, removal of solenoid and/or valve cover without any earth excavation.*
5. *QUICK COUPLING VALVES shall be HQ-44-LRC-AW installed per detail shown. Swing joints shall be constructed using 1" Schedule 80 elbows. Contractor shall supply owner with three (3) HK couplers and three (3) #10 swivel hose ells as part of this contract.*
6. *AUTOMATIC CONTROLLER shall be installed at location shown. Power (120V) shall be located in a junction box within five (5) feet of controller location by other trades.*
7. *All 24 volt valve wiring is to be UF 14 single conductor. All wire splices are to be permanent and waterproof.*
8. *SLEEVES shall be installed by General Contractor. Sleeve material shall be Schedule 40. Size as indicated on plan.*
9. *Ten days prior to start of construction, Landscape or Irrigation Contractor shall verify static water pressure. If static pressure is less than 65 P.S.I., do not work until notified to do so by Owner.*
10. *All main line and lateral piping to a minimum of 12 inches of cover. All piping under paving shall have a minimum of 18" of cover.*
11. *The Irrigation Contractor shall coordinate installation of the system with the Landscape Contractor so that all plant material will be watered in accordance with the intent of the plans and specifications.*
12. *The Irrigation Contractor shall select the proper arc and radius for each nozzle to insure 100% and proper coverage of all lawn areas and plant material. All nozzles in parking lot islands and planting beds shall be low angle to minimize over spray on pavement surfaces. No water will be allowed to spray on building.*

DRIP IRRIGATION NOTES

1. *Drip Irrigation Equipment numbers reference Rainbird Equipment Catalog unless otherwise noted.*
2. *Landscape Contractor shall be required to supply Owner's Construction Manager with all equipment specifications and maintenance guidelines.*
3. *Landscape Contractor shall be required to follow Manufacturer's Specifications and Installation guidelines for drip system.*
4. *PRESSURE COMPENSATING EMITTERS shall be: Multioutlet Rain Bug EM6-M101, Multi outlet Shrub Bug EMT6-M101 or approved equal. (1 PER EVERY 6 - 4" POTS)*
5. *SINGLE OUTLET PRESSURE COMPENSATING EMITTERS shall be: Rain Bug Emitters EM-Mo5, -M10, -M20 and Shrub Bug Emitters EMT-M10, -M20 or approved equal. (1 PER EACH 1 OR 5 GAL PLANT)*
6. *DRIP PRESSURE REGULATORS shall be: PSI-HLA-15, PSI-HLA-20, PSI-HMB-20, PSI-HMB-25 or approved equal.*
7. *Y-FILTERS shall be: RBY-075-200, RBY-100-200 or approved equal.*
8. *MAIN IRRIGATION TUBING shall be:RBT-150P,RBT-160V or approved equal.*
9. *EMITTER DISTRIBUTION TUBING shall be: RBT-150P, RBT-160V or approved equal.*
10. *SUBTERRANEAN EMITTER BOX shall be: SEB-6 or approved equal.*
11. *Drip system piping only occurs within shrub / groundcover beds and rock mulch areas. Piping shall be a maximum 4" depth and a minimum 2" depth.*
12. *Contractor shall verify that all drip system valves and spray system valves are sectioned separately on controller.*

01 IRRIGATION PLAN
SCALE 1"=20'-0"
0 10 20 40

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STATE OF TEXAS
JON TUCK
19638
LICENSED IRRIGATOR
06.26.2023

DOLLAR GENERAL

F.M. HWY 2450
SANGER, TEXAS

ISSUE:
FOR APPROVAL 06.08.2023
OWNER COMMENTS 06.26.2023

DATE:
06.26.2023

SHEET NAME:
IRRIGATION PLAN

SHEET NUMBER:
L.3

SECTION 02810 - IRRIGATION

PART 1 - GENERAL

1.1 SCOPE

A. Provide complete sprinkler installation as detailed and specified herein, includes furnishing all labor, materials, and equipment for the proper installation. Work includes but is not limited to:

1. Trenching and backfill
2. Automatic controlled system.
3. Upon completion of installation, supply drawings showing details of construction including location of mainline piping, manual and automatic valves, electrical supply to valves, and specifically exact location of automatic valves.

B. All sleeves as shown on plans will be furnished by General Contractor. Meter and power source to be provided by General Contractor.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. See Irrigation Plans. See plans for controller, heads, and valves.

B. Section 02900-Landscape

C. Section 02811-Underground Irrigation Sleeve and Utility Conduits

1.3 APPLICABLE STANDARDS

A. America Standard for Testing and Materials (ASTM) – Latest edition.

1. D2241 Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
2. D2464 Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Thread, Schedule 80
3. D2455 Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
4. D2467 Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Socket Type, Schedule 80
5. D2564 Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
6. D2287 Flexible Poly Vinyl Chloride (PVC) Plastic Pipe
7. F656 Poly Vinyl Chloride (PVC) Solvent Weld Primer
8. D2855 Making Solvent – Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings

1.4 MAINTENANCE AND GUARANTEE

A. Materials and workmanship shall be fully guaranteed for one (1) year after final acceptance.

B. Provide maintenance of system, including raising and lowering of heads to compensate for lawn growth, cleaning and adjustment of heads, raising and lowering of shrub heads to compensate for shrub growth, for one (1) year after completion of installation.

C. Guarantee is limited to repair and replacement of defective materials or workmanship, including repair of backfill settlement.

1.5 SUBMITTALS

A. Procedure: Comply with Division I requirements.

B. Product Data: Submit (5) copies of equipment manufacturer's specifications and literature for approval by Landscape Architect prior to installation.

C. Project Record Documents

1. Comply with Division I requirements.
2. Locate by written dimension, routing of mainline piping, remote control valves and quick coupling valves. Locate mainlines by single dimensions from permanent site features provided they run parallel to these elements. Locate valves, intermediate electrical connections, and quick couplers by two dimensions from a permanent site feature at approximately 70 degrees to each other.
3. When dimensioning is complete, transpose work to mylar reproducible tracings.
4. Submit completed tracings prior to final acceptance. Mark tracings "Record Prints Showing Significant Changes". Date and sign drawings.
5. Provide three complete operation manuals and equipment brochures neatly bound in a hard back three-ring binder. Include product data on all installed materials. Include warranties and guarantees extended to the Owner by the manufacturer of all equipment.

D. Quick Coupler Keys: Provide 3 coupler keys with boiler drains attached using brass reducer.

E. Controller Keys: Provide three sets of keys to controller enclosure(s).

F. Use of materials differing in quality, size, or performance from those specified will only be allowed upon written approval of the Landscape Architect. The decision will be based on comparative ability of material or article to perform fully all purposes of mechanics and general design considered to be possessed by item specified.

G. Bidders desiring to make a substitution for specified sprinklers shall submit manufacturer's catalog sheet showing full specification of each type sprinkler proposed as a substitute, including discharge in GPM maximum allowable operating pressure at sprinkler.

H. Approval of substitute sprinkler shall not relieve Irrigation Contractor of his responsibility to demonstrate that final installed sprinkler system will operate according to intent of originally designed and specified system.

I. It is the responsibility of the Irrigation Contractor to demonstrate that final installed sprinkler system will operate according to intent of originally designed and specified system. If Irrigation Contractor notes any problems in head spacing or potential coverage, it is his responsibility to notify the Landscape Architect in writing, before proceeding with work. Irrigation Contractor guarantees 100% coverage of all areas to be irrigated.

1.6 TESTING

A. Perform testing required with other trades, including earthwork, paving, plumbing, electrical, etc. to avoid unnecessary cutting, patching and boring.

B. Wire Connectors: Waterproof splice kit connectors. Type DBY by 3M.

2.6 SCHEDULE 80 PVC NIPPLES

A. Composed of Standard Schedule 40 PVC Fittings and PVC meeting noted standards. No clamps or wires may be used. Nipples for heads and shrub risers to be nominal one-half inch diameter by eight inches long, where applicable.

B. Polyethylene nipples six (6") inches long to be used on all pop-up spray heads.

2.7 MATERIALS - See Irrigation Plan

A. Sprinkler heads in lawn area as specified on plan.

B. PVC Pipe: Class 200, SPR 21
Copper Tubing (City Connection): Type "M"
24V Wire: Size 14, Type U.F.

C. Electric valves to be all plastic construction as indicated on plans.

D. Refer to drawing for backflow prevention requirements and flow valve.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Staking: Before installation is started, place a stake where each sprinkler is to be located, in accordance with drawing. Staking shall be approved by Landscape Architect before proceeding.

B. Excavations: Excavations are unclassified and include earth, loose rock, rock or any combination thereof, in wet or dry state. Backfill trenches with material that is suitable for compaction and contains no lumps, clods rock, debris, etc. Special backfill specifications, if furnished take preference over this general specification.

C. Backfill: Flood or hand-tamp to prevent after settling. Hand rake trenches and adjoining area to leave grade in as good or better condition than before installation.

D. Piping Layout: Piping layout is diagrammatic. Route piping around trees and shrubs in such a manner as to avoid damage to plantings. Do not dig within ball of newly planted trees or shrubs.

3.2 PIPE INSTALLATION

A. Sprinkler Mains: Install a four (4") inch minimum trench with a minimum of eighteen (18") inches of cover.

B. Lateral Piping: Install a four (4") inch wide minimum trench deep enough to allow for installation of sprinkler heads and valves, but in no case, with less than twelve (12") of cover.

C. Trenching: Remove lumber, rubbish, and large rocks from trenches. Provide firm, uniform bearing for entire length of each pipe line to prevent uneven settlement. Wedging or blocking of pipe will not be permitted. Remove foreign matter or dirt from inside of pipe before welding, and keep piping clean by approved means during and after laying of pipe.

3.3 PVC PIPE AND FITTING ASSEMBLY

A. Solvent: Use only solvent recommended by manufacturer to make solvent-welded joints. Thoroughly clean pipe and fittings of dirt, dust and moisture before applying solvent.

B. PVC to metal connection: Work metal connections first. Use a non-hardening pipe dope such as Permatex No. 2 on threaded PVC adapters into which pipe may be welded.

3.4 COPPER TUBING AND FITTING ASSEMBLY

Clean pipe and fitting thoroughly and lightly sand pipe connections to remove residue from pipe. Attach fittings to tubing in an approved manner using 50-50 soft solid core solder.

3.5 POP-UP SPRAY HEADS

Supply pop-up spray heads in accordance with materials list and plan. Attach sprinkler to lateral piping with a semi-flexible polyethylene nipple not less than three (3") inches or more than six (6") inches long.

3.6 VALVES

Supply valves in accordance with materials list and sized according to drawings. Install valves in a level position in accordance with Manufacturer's Specifications. See plan for typical installation of electric valve, valve box.

3.7 WIRING

A. Supply wire from the automatic sprinkler controls to the valves. No conduit will be required for U.F. wire unless otherwise noted on the plan. Wire shall be tucked under the piping.

B. A separate wire is required from the control to each electric valve. A common neutral wire is also required from each control to each of the valves served by each particular control.

C. Bundle multiple wires and tape them together at ten (10') foot intervals. Install ten (10") inch expansion coil at not more than one hundred (100') foot intervals. Make splices waterproof.

3.8 AUTOMATIC SPRINKLER CONTROLS

Supply in accordance with Irrigation Plan. Install according to manufacturer's recommendations.

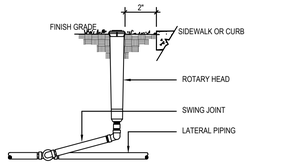
3.9 TESTING

A. Sprinkler Mains: Test sprinkler main only for a period of twelve (12) to fourteen (14) hours under normal pressure. If leaks occur, replace joint or joints and repeat test.
B. Complete tests prior to backfilling. Sufficient backfill material may be placed in trenches between fittings to insure stability of line under pressure. In each case, leave fittings and couplings open to visual inspection for full period of test.

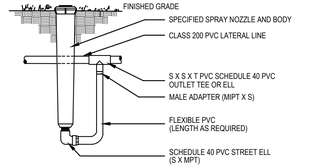
3.10 FINAL ADJUSTMENT

After installation has been completed, make final adjustment of sprinkler system in preparation for Landscape Architect's final inspection. Completely flush system to remove debris from lines and turning on system. Check sprinklers for proper operation and proper alignment for direction of flow. Check each section of spray heads for operating pressure and balance to other sections by use of flow adjustment and top of each valve. Check nozzling for proper coverage. Prevailing wind conditions may indicate that arch of angle of spray should be other than shown on drawings. In this case, change nozzles to provide correct coverage.

END OF SECTION



01 ROTARY HEAD
NOT TO SCALE



02 HIGH POP-UP SPRAY ASSEMBLY
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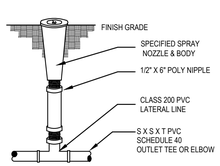

03 POP-UP LAWN SPRAY ASSEMBLY
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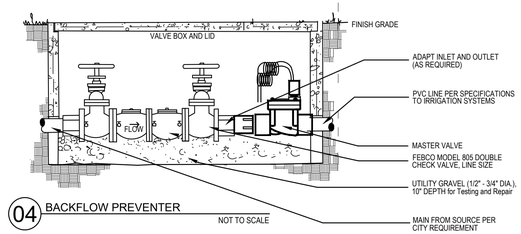

04 BACKFLOW PREVENTER
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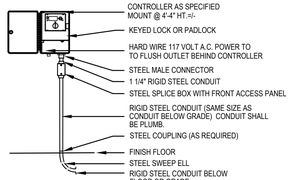

05 WALL MOUNTED CONTROLLER
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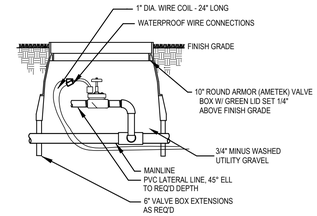

06 REMOTE CONTROL VALVE
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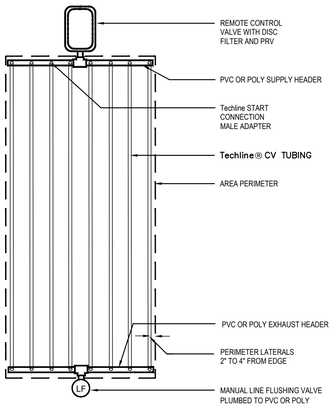

07 TechLine CV END FEED LAYOUT
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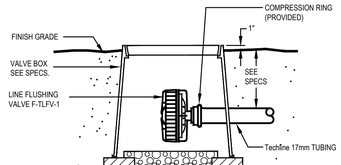

08 TechLine LINE FLUSHING VALVE
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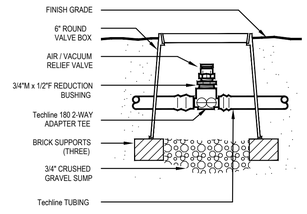

09 TechLine AIR/VACUUM RELIEF
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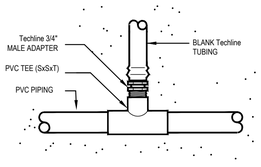

11 TechLine START CONNECTION
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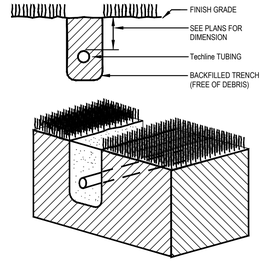

12 TechLine TRENCHING
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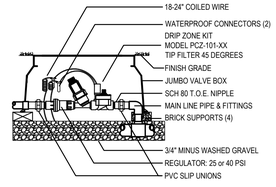

13 DRIP CONTROL VALVE
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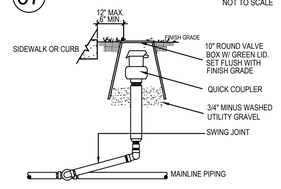

14 QUICK COUPLER
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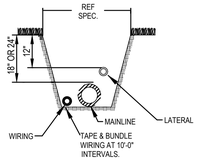
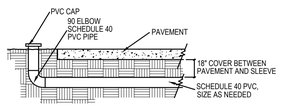


15 TRENCH DETAIL
NOT TO SCALE



16 SLEEVE DETAIL
NOT TO SCALE

LANDSCAPE ARCHITECT
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STATE OF TEXAS
JON TUCK
5638
LICENSED IRRIGATOR
06.08.2023

DOLLAR GENERAL

F.M. HWY 2450
SANGER, TEXAS

ISSUE:
FOR APPROVAL 06.08.2023

DATE:
06.08.2023

SHEET NAME:
IRRIGATION DETAILS

SHEET NUMBER:

L.4