CONSTRUCTION PLANS FOR

PURPLE SAGE DRIVE CULVERT REPLACEMENT

CITY OF ROUND ROCK
2008 ENTERPRISE DRIVE
ROUND ROCK, TX 78664

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	GENERAL NOTES
3	TRAFFIC CONTROL PLAN
4	REMOVAL PLAN
5	ROADWAY PLAN AND PROFILE
6	CULVERT PLAN AND PROFILE
7	GRADING PLAN
8	WATER LINE PLAN AND PROFILE
9	CITY OF ROUND ROCK STANDARD DETAILS
10-11	MISCELLANEOUS DETAILS
12	* SCP-6 SINGLE BOX CULVERTS PRECAST 6'-0" SPAN
13	* FW-0 CONCRETE WINGWALLS WITH FLARED WINGS FOR BOX CULVERTS
14	* SW-0 CONCRETE WINGWALLS WITH STRAIGHT WINGS FOR BOX CULVERTS
15	* SCP-MD PRECAST MISCELLANEOUS DETAILS
16	* ECD EXTENDED CURB DETAILS FOR BOX CULVERTS WITH CURBS OVER 1'-0" TO 5'-0" TALL

* THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

Andy Dutton P.E. 6/24/2015 DATE

STATE OF TEXAS
COUNTY OF WILLIAMSON

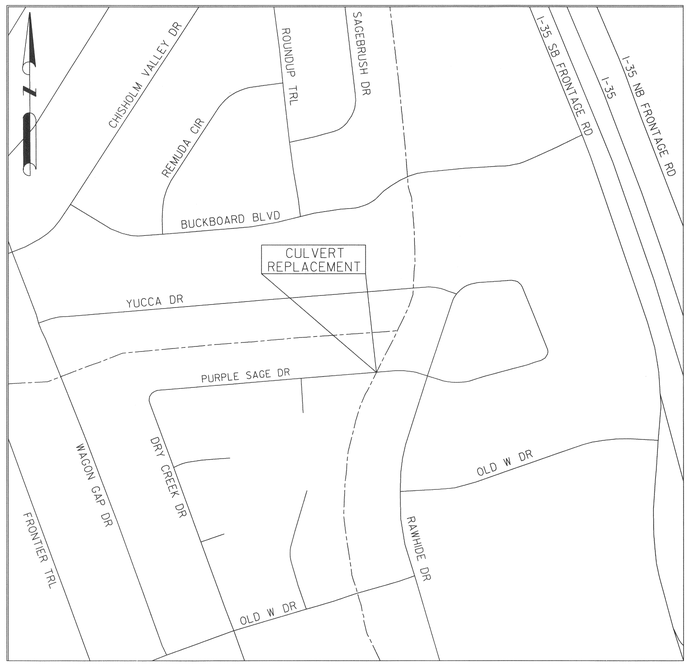
I, ANDREW M. L. DUTTON, P.E., DO HEREBY CERTIFY THAT THE PUBLIC WORKS AND DRAINAGE IMPROVEMENTS DESCRIBED HEREIN HAVE BEEN DESIGNED UNDER MY SUPERVISION.

Andy Dutton 6/24/2015
DATE

"ALL RESPONSIBILITY FOR THE ADEQUACY OF THESE PLANS REMAINS WITH THE ENGINEER WHO PREPARED THEM. IN ACCEPTING THESE PLANS, THE CITY OF ROUND ROCK MUST RELY UPON THE ADEQUACY OF THE WORK OF THE DESIGN ENGINEER."

ACCEPTED FOR CONSTRUCTION:

Daniel Lynn Holdan, P.E. City Engineer 6/24/15
UTILITIES AND ENVIRONMENTAL SERVICES DEPARTMENT DATE
CITY OF ROUND ROCK, TEXAS



LOCATION MAP
N.T.S.

F312 6/24/2015

STATE OF TEXAS
ANDREW M. L. DUTTON
117255
LICENSED
PROFESSIONAL ENGINEER

Andy Dutton

100% Submittal
06/24/2015

HALFF
4030 WEST BRAKER LANE, SUITE 450
AUSTIN, TEXAS 78759-5356
TEL (512) 252-8184
FAX (512) 252-8141

GENERAL NOTES:

1. All construction shall be in accordance with the City of Round Rock Standard Specifications Manual.
2. Any existing utilities, pavement, curbs, sidewalks, structures, trees, etc., not planned for destruction or removal that are damaged or removed shall be repaired or replaced at contractor's expense.
3. The Contractor shall verify all depths and locations of existing utilities prior to any construction. Any discrepancies with the construction plans found in the field shall be brought immediately to the attention of the Engineer who shall be responsible for revising the plans as appropriate.
4. Manhole frames, covers, valves, cleanouts, etc. shall be raised to finished grade prior to final paving construction.
5. The Contractor shall give the City of Round Rock 48 hours notice before beginning each phase of construction.
6. All areas disturbed or exposed during construction shall be revegetated in accordance with the plans and specifications.
7. Prior to any construction, the Contractor shall convene a preconstruction conference between the City of Round Rock, himself, other utility companies, any affected parties and any other entity the City may require.
8. The Contractor shall keep accurate records of all construction that deviates from the plans and furnish the City of Round Rock accurate "As-Built" drawings following completion of all construction. These "As-Built" drawings shall meet with the satisfaction of the City prior to final acceptance.
9. When construction is being carried out within easements, the Contractor shall confine his work to within the permanent and any temporary easements. Prior to final acceptance, the Contractor shall be responsible for removing all trash and debris within the permanent and temporary easements. Clean-up shall be to the satisfaction of the City.
10. Available benchmarks (NAVD 88 Datum) that may be utilized for the construction of this project are described as follows:

POINT NO.	TYPE	NORTHING	EASTING	ELEV.
ROUND ROCK 01-001	CITY OF ROUND ROCK BRASS DISK @ SIDEWALK ON HESTER'S CROSSING, EAST OF LA FRONTERA BLVD	10150117.30	3130726.68	857.56
G100	SET PK NAIL W/ SHINER	10152624.89	3131507.76	755.84
G101	SET PK NAIL W/ SHINER	10152644.94	3131747.95	754.88

US State Plane 1983 Texas Central 4203

TRENCH SAFETY NOTES:

1. In accordance with the Laws of the State of Texas and the U. S. Occupational Safety and Health Administration regulations, all trenches over 5 feet in depth in either hard and compact or soft and unstable soil shall be sloped, shored, sheeted, braced or otherwise supported. Furthermore, all trenches less than 5 feet in depth shall also be effectively protected when hazardous ground movement may be expected. Trench safety systems to be utilized for this project will be provided by the Contractor.
2. In accordance with the U. S. Occupational Safety and Health Administration regulations, when persons are in trenches 4 feet deep or more, adequate means of exit, such as a ladder or steps, must be provided and located so as to require no more than 25 feet of lateral travel.
3. If trench safety system details were not provided in the plans because trenches were anticipated to be less than 5 feet in depth and during construction it is found that trenches are in fact 5 feet or more in depth or trenches less than 5 feet in depth are in an area where hazardous ground movement is expected, all construction shall cease, the trenched area shall be barricaded and the Engineer notified immediately. Construction shall not resume until appropriate trench safety system details, as designed by a professional engineer, are retained and copies submitted to the City of Round Rock.

STREET AND DRAINAGE NOTES:

1. All testing shall be done by an independent laboratory at the Owner's expense. Any retesting shall be paid for by the Contractor. City personnel shall be present during all tests. Testing shall be coordinated with the City and the City shall be given a minimum of 24 hours notice prior to any testing.
2. Backfill behind the curb shall be compacted to obtain a minimum of 95% maximum density to within 3" of top of curb. Material used shall be primarily granular with no rocks larger than 6" in the greatest dimension. The remaining 3" shall be clean topsoil free from all clods and suitable for sustaining plant life.
3. Depth of cover for all crossings under pavement including gas, electric, telephone, cable tv, water services, etc., shall be a minimum of 30" below subgrade.
4. Street rights-of-way shall be graded at a slope of 1/4" per foot toward the curb unless otherwise indicated. However, in no case shall the width of right-of-way at 1/4" per foot slope be less than 10 feet unless a specific request for an alternate grading scheme is made to and accepted by the City of Round Rock Engineering and Development Services Department.
5. Barricades built to City of Round Rock standards shall be constructed on all dead-end streets and as necessary during construction to maintain job and public safety.
6. All R.C.P. shall be minimum class III.

WATER AND WASTEWATER NOTES:

1. Pipe material for water mains shall be PVC (AWWA C-900, min. class 200), or Ductile Iron (AWWA C-100, min. class 200). Water services (2" or less) shall be polyethylene tubing (black, 200 psi, DR 9).
2. Pipe material for pressure wastewater mains shall be PVC (AWWA C-900, min. class 150), or Ductile Iron (AWWA C-100, min. class 200). Pipe material for gravity wastewater mains shall be PVC (ASTM D2241 or D3034, max. DR-26), Ductile Iron (AWWA C-100, min. class 200).
3. Unless otherwise accepted by the City, depth of cover for all lines out of the pavement shall be 30" min., and depth of cover for all lines under pavement shall be a min. of 30" below subgrade.
4. All iron pipe and fittings shall be wrapped with minimum 8-mil polyethylene and sealed with duct tape or equal accepted by the City.
5. The Contractor shall contact the City to coordinate utility tie-ins and notify the City at least 48 hours prior to connecting to existing lines.
6. All manholes shall be concrete with cast iron ring and cover. All manholes located outside of the pavement shall have bolted covers. Tapping of fiberglass manholes shall not be allowed.
7. The Contractor must obtain a bulk water permit or purchase and install a water meter for all water used during construction. A copy of this permit must be carried at all times by all who use water.
8. Line flushing or any activity using a large quantity of water must be scheduled with the City.
9. The Contractor, at his expense, shall perform sterilization of all potable water lines constructed and shall provide all equipment (including test gauges), supplies (including concentrated chlorine disinfecting material), and necessary labor required for the sterilization procedure. The sterilization procedure shall be monitored by City of Round Rock personnel. Water samples will be collected by the City of Round Rock to verify each treated line has attained an initial chlorine concentration of 50 ppm. Where means of flushing is necessary, the Contractor, at his expense, shall provide flushing devices and remove said devices prior to final acceptance by the City of Round Rock.
10. Sampling taps shall be brought up to 3 feet above grade and shall be easily accessible for City personnel. At the Contractor's request, and in his presence, samples for bacteriological testing will be collected by the City of Round Rock not less than 24 hours after the treated line has been flushed of the concentrated chlorine solution and charged with water approved by the City.
11. The Contractor, at his expense, shall perform quality testing for all wastewater pipe installed and pressure pipe hydrostatic testing of all water lines constructed and shall provide all equipment (including pumps and gauges), supplies and labor necessary to perform the tests. Quality and pressure testing shall be monitored by City of Round Rock personnel.
12. The Contractor shall coordinate testing with the City of Round Rock and provide no less than 24 hours notice prior to performing sterilization, quality testing or pressure testing.
13. The Contractor shall not open or close any valves unless authorized by the City of Round Rock.
14. All valve boxes and covers shall be cast iron.
15. All water service, wastewater service and valve locations shall be appropriately marked as follows:

water service	"W" on top of curb
wastewater service	"S" on top of curb
valve	"V" on face of curb

16. Tools for marking the curb shall be provided by the Contractor. Other appropriate means of marking service and valve locations shall be provided in areas without curbs. Such means of marking shall be as accepted by the City of Round Rock.
17. Contact the City of Round Rock for assistance in obtaining existing water and wastewater locations.
18. The City of Round Rock Fire Department shall be notified 48 hours prior to testing of any building sprinkler piping in order that the Fire Department may monitor such testing.
19. Sand, as described in Specification item 510 pipe, shall not be used as bedding for water and wastewater lines. Acceptable bedding materials are pipe bedding stone, pea gravel and in lieu of sand, a naturally occurring or manufactured stone material conforming to ASTM C33 for stone quality and meeting the following gradation specification:

Sieve Size	Percent Retained By Weight
1/2"	0
3/8"	0-2
#4	40-85
#10	95-100

20. The Contractor is hereby notified that connecting to, shutting down, or terminating existing utility lines, may have to occur at off-peak hours. Such hours are usually outside normal working hours and possibly between 12 a.m. and 6 a.m.
21. All wastewater construction shall be in accordance with the Texas Commission on Environmental Quality (TCEQ) Regulations, 30 TAC Chapter 213 and 317, as applicable. Whenever TCEQ and City of Round Rock Specifications conflict, the more stringent shall apply.

TRAFFIC MARKING NOTES:

1. Any methods, street markings and signage necessary for warning motorists, warning pedestrians or diverting traffic during construction shall conform to the Texas Manual of Uniform Traffic Control Devices for Streets and Highways, latest edition.
2. All pavement markings, markers, paint, traffic buttons, traffic controls and signs shall be installed in accordance with the Texas Department of Transportation Standard Specifications for Construction of Highways, Streets and Bridges and, the Texas Manual of Uniform Traffic Control Devices for Streets and Highways, latest editions.

EROSION AND SEDIMENTATION CONTROL NOTES:

1. Erosion control measures, site work and restoration work shall be in accordance with the City of Round Rock Erosion and Sedimentation Control Ordinance.
2. All slopes shall be sodded or seeded with approved grass, grass mixtures or ground cover suitable to the area and season in which they are applied.
3. Silt fences, rock berms, sedimentation basins and similarly recognized techniques and materials shall be employed during construction to prevent point source sedimentation loading of downstream facilities. Such installation shall be regularly inspected by the City of Round Rock for effectiveness. Additional measures may be required if, in the opinion of the City Engineer, they are warranted.
4. All temporary erosion control measures shall not be removed until final inspection and approval of the project by the Engineer. It shall be the responsibility of the Contractor to maintain all temporary erosion control structures and to remove each structure as approved by the Engineer.
5. All mud, dirt, rocks, debris, etc., spilled, tracked or otherwise deposited on existing paved streets, drives and areas used by the public shall be cleaned up immediately.

PURPLE SAGE DRIVE
CULVERT REPLACEMENT
Round Rock, TX

ROUND ROCK, TEXAS
PURPOSE.PASSION.PROSPERITY.

HALFF
4030 WEST BRAKER LANE, SUITE 450
AUSTIN, TEXAS 78759-5356
TEL (512) 252-8184
FAX (512) 252-8141
TBPE FIRM NO. F-312

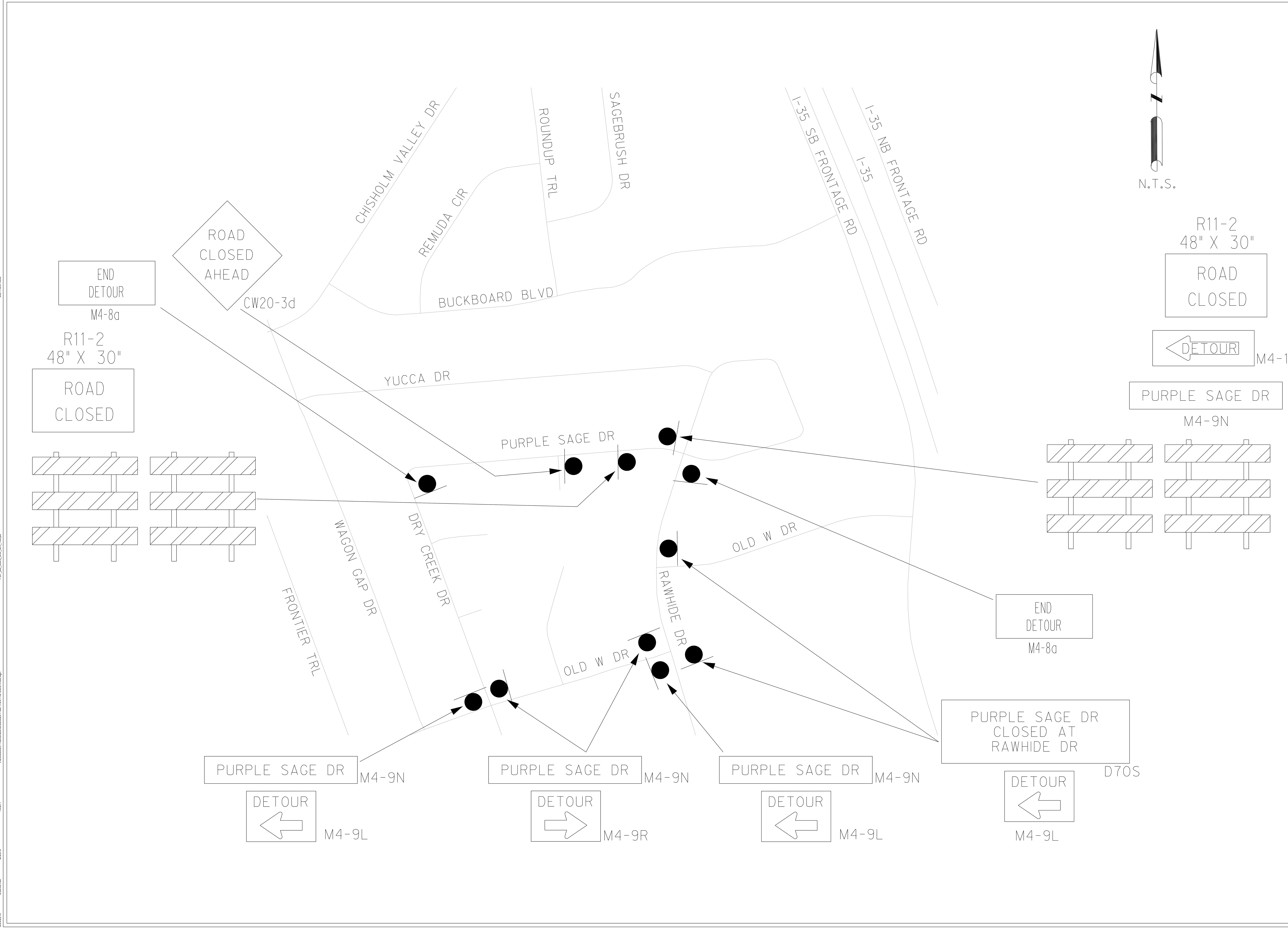
Revision No.	Date	Description

F312 6/24/2015
STATE OF TEXAS
ANDREW M. L. DUTTON
117255
LICENSED
PROFESSIONAL ENGINEER

Project No.:	29113B
Issued:	06/24/2015
Drawn By:	AL
Checked By:	ER
Scale:	

Sheet Title
Purple Sage Dr.
General Notes
Round Rock, TX

2
Sheet Number



PURPLE SAGE DRIVE
CULVERT REPLACEMENT
Round Rock, TX

ROUND ROCK, TEXAS
PURPOSE.PASSION.PROSPERITY.

HALFF
4030 WEST BRAKER LANE, SUITE 450
AUSTIN, TEXAS 78759-5356
TEL (512) 252-8184
FAX (512) 252-8141
TBPE FIRM NO. F-312

Revision No.	Date	Description

F312 6/24/2015
STATE OF TEXAS
ANDREW M. L. DUTTON
117255
LICENSED
PROFESSIONAL ENGINEER

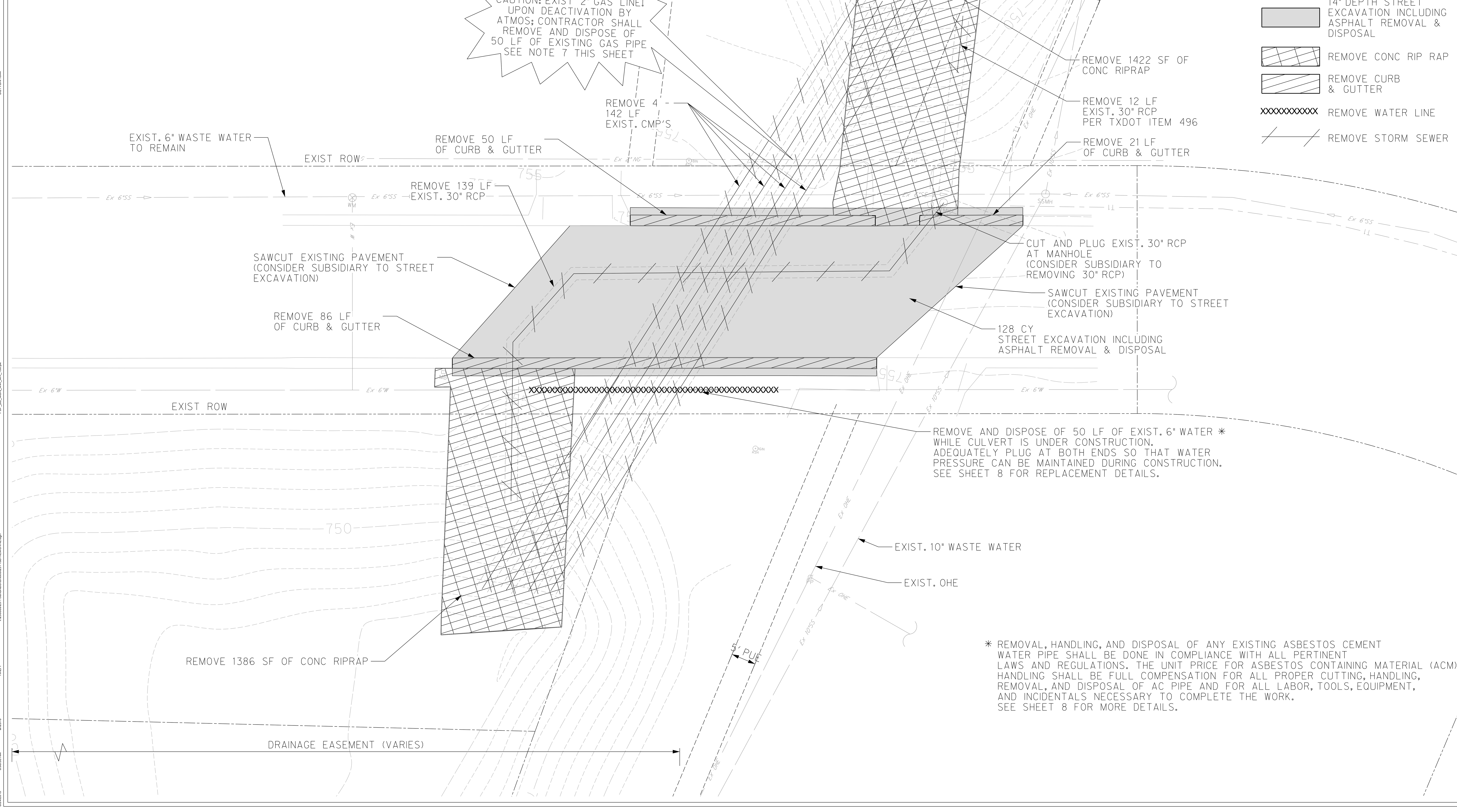
Project No.:	29113B
Issued:	06/24/2015
Drawn By:	AL
Checked By:	ER
Scale:	NTS

Sheet Title
Purple Sage Dr.
Traffic Control Plan
Round Rock, TX

3
Sheet Number

NOTES:

1. REMOVAL OF CONCRETE RIPRAP SHALL BE IN ACCORDANCE WITH SPECIFICATION ITEM 104 AND SHALL BE PAID FOR UNDER BID ITEM "REMOVE PC CONCRETE SLAB".
2. REMOVAL OF CURB AND GUTTER SHALL BE IN ACCORDANCE WITH SPECIFICATION ITEM 104 AND SHALL BE PAID FOR UNDER BID ITEM "REMOVE PC CONCRETE CURB".
3. STREET EXCAVATION SHALL BE IN ACCORDANCE WITH SPECIFICATION ITEM 110 AND SHALL BE APPROXIMATELY 14" DEPTH IN THE AREA SHOWN; THE LIMITS SHALL EXTEND 18" PAST THE BACK OF CURB IN AREAS OF CURB REMOVAL. EXISTING ASPHALT SURFACING REMOVED IN THE AREA OF STREET EXCAVATION SHALL BE CONSIDERED WASTE AND SHALL BE PROPERLY DISPOSED OF BY THE CONTRACTOR.
4. REMOVAL OF EXISTING RCP AND CMPs SHOWN HEREON SHALL BE MEASURED BY THE LINEAR FOOT OF PIPE REMOVED AND PAID FOR UNDER BID ITEM "REMOVE STORM SEWER PIPE"; THIS ITEM SHALL BE IN ACCORDANCE WITH THE DETAILS SHOWN ON SHEET 11 AND APPLICABLE PROVISIONS OF SPECIFICATION ITEM 101, AND INCLUDES PROPER DISPOSAL OF PIPE REMOVED.
5. ALL REMOVAL OF TREES, STUMPS, OR ANYTHING NOT SPECIFICALLY CALLED OUT ON THIS PLAN SHALL BE IN ACCORDANCE WITH SPECIFICATION ITEM 101 AND SHALL BE PAID FOR UNDER BID ITEM "PREPARING RIGHT-OF-WAY".
6. REMOVAL OF ANY TREES AND SHRUBS SHALL BE IN ACCORDANCE WITH SPECIFICATION ITEM 102 AND SHALL BE PAID FOR UNDER THE BID ITEM "CLEARING AND GRUBBING".
7. CONTACT MARTIN PEREZ AT ATMOS ENERGY PRIOR TO DIGGING IN THIS AREA TO CONFIRM DEACTIVATION. (512) 415-8426



✱ REMOVAL, HANDLING, AND DISPOSAL OF ANY EXISTING ASBESTOS CEMENT WATER PIPE SHALL BE DONE IN COMPLIANCE WITH ALL PERTINENT LAWS AND REGULATIONS. THE UNIT PRICE FOR ASBESTOS CONTAINING MATERIAL (ACM) HANDLING SHALL BE FULL COMPENSATION FOR ALL PROPER CUTTING, HANDLING, REMOVAL, AND DISPOSAL OF AC PIPE AND FOR ALL LABOR, TOOLS, EQUIPMENT, AND INCIDENTALS NECESSARY TO COMPLETE THE WORK. SEE SHEET 8 FOR MORE DETAILS.

PURPLE SAGE DRIVE

CULVERT REPLACEMENT
Round Rock, TX

ROUND ROCK, TEXAS
PURPOSE. PASSION. PROSPERITY.

HALFF
4030 WEST BRAKER LANE, SUITE 450
AUSTIN, TEXAS 78759-5356
TEL (512) 252-8184
FAX (512) 252-8141
TBPE FIRM NO. F-312

Revision No.	Date	Description

F312 6/24/2015
STATE OF TEXAS
ANDREW M. L. DUTTON
117255
LICENSED
PROFESSIONAL ENGINEER

Project No.:	29113B
Issued:	06/24/2015
Drawn By:	AL
Checked By:	ER
Scale:	AS NOTED

Sheet Title
Purple Sage Dr.
Removal Plan
Round Rock, TX

Chain PS CL contains:
PS1 PS2

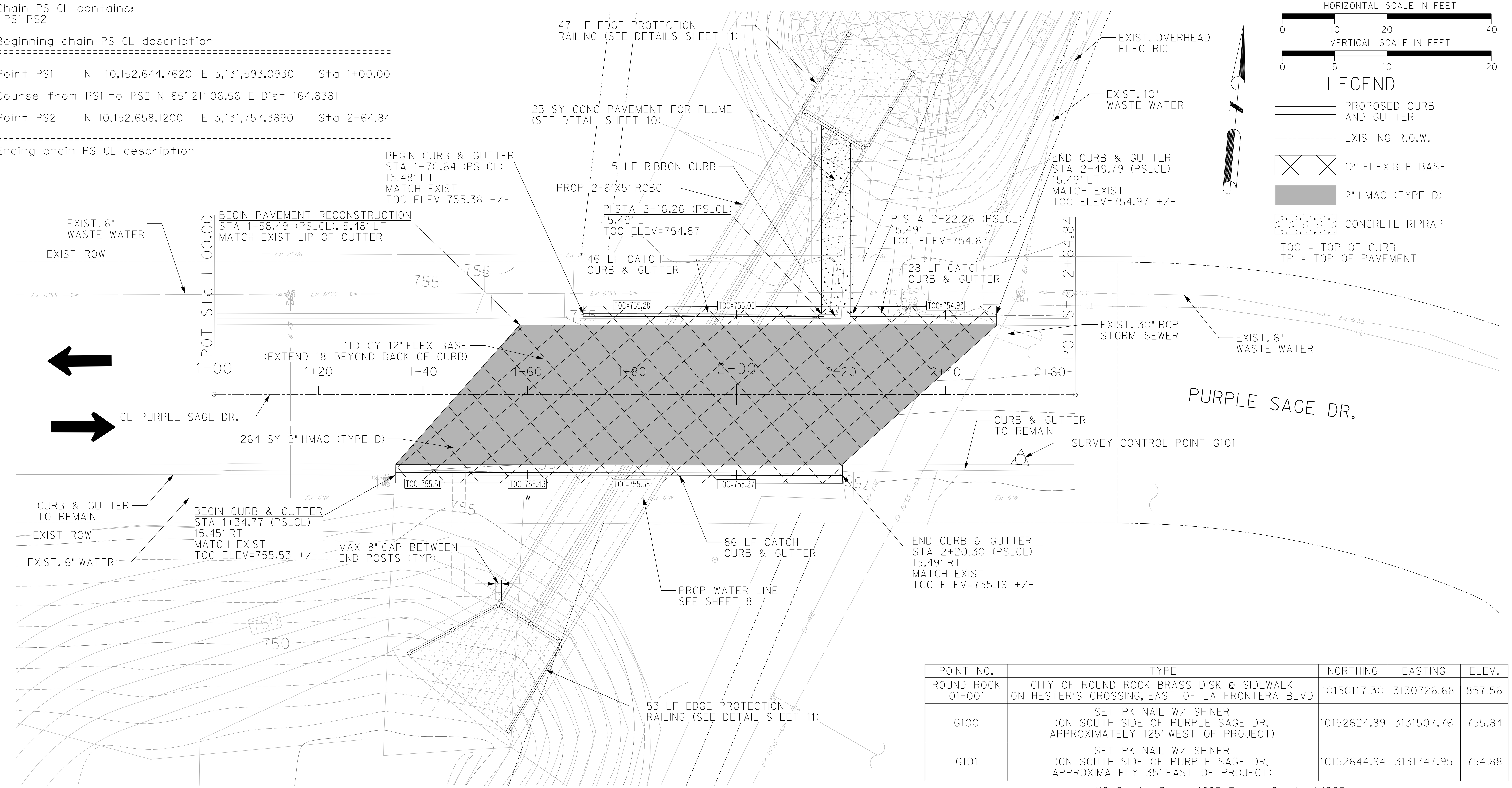
Beginning chain PS CL description

Point PS1 N 10,152,644.7620 E 3,131,593.0930 Sta 1+00.00

Course from PS1 to PS2 N 85° 21' 06.56" E Dist 164.8381

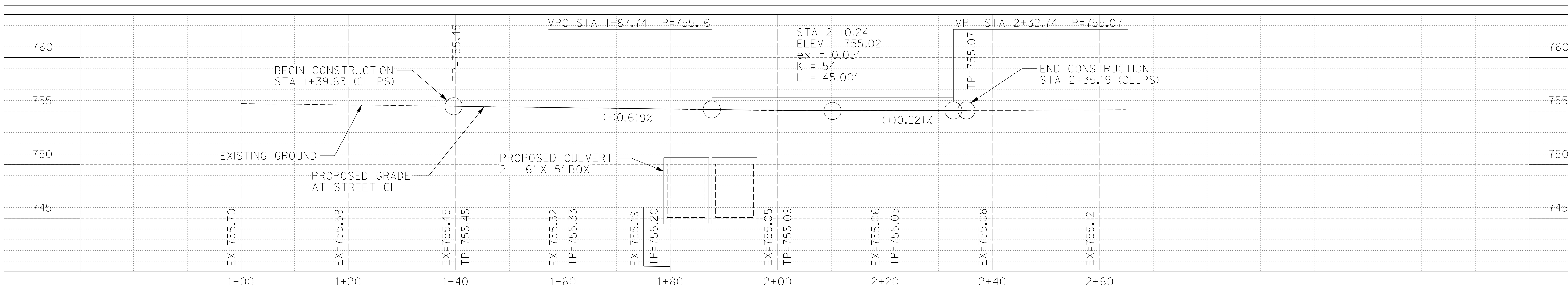
Point PS2 N 10,152,658.1200 E 3,131,757.3890 Sta 2+64.84

Ending chain PS CL description



POINT NO.	TYPE	NORTHING	EASTING	ELEV.
ROUND ROCK 01-001	CITY OF ROUND ROCK BRASS DISK @ SIDEWALK ON HESTER'S CROSSING, EAST OF LA FRONTERA BLVD	10150117.30	3130726.68	857.56
G100	SET PK NAIL W/ SHINER (ON SOUTH SIDE OF PURPLE SAGE DR, APPROXIMATELY 125' WEST OF PROJECT)	10152624.89	3131507.76	755.84
G101	SET PK NAIL W/ SHINER (ON SOUTH SIDE OF PURPLE SAGE DR, APPROXIMATELY 35' EAST OF PROJECT)	10152644.94	3131747.95	754.88

US State Plane 1983 Texas Central 4203



PURPLE SAGE DRIVE
CULVERT REPLACEMENT
Round Rock, TX

ROUND ROCK, TEXAS
PURPOSE. PASSION. PROSPERITY.

HALFF
4030 WEST BRAKER LANE, SUITE 450
AUSTIN, TEXAS 78759-5356
TEL (512) 252-8184
FAX (512) 252-8141
TBPE FIRM NO. F-312

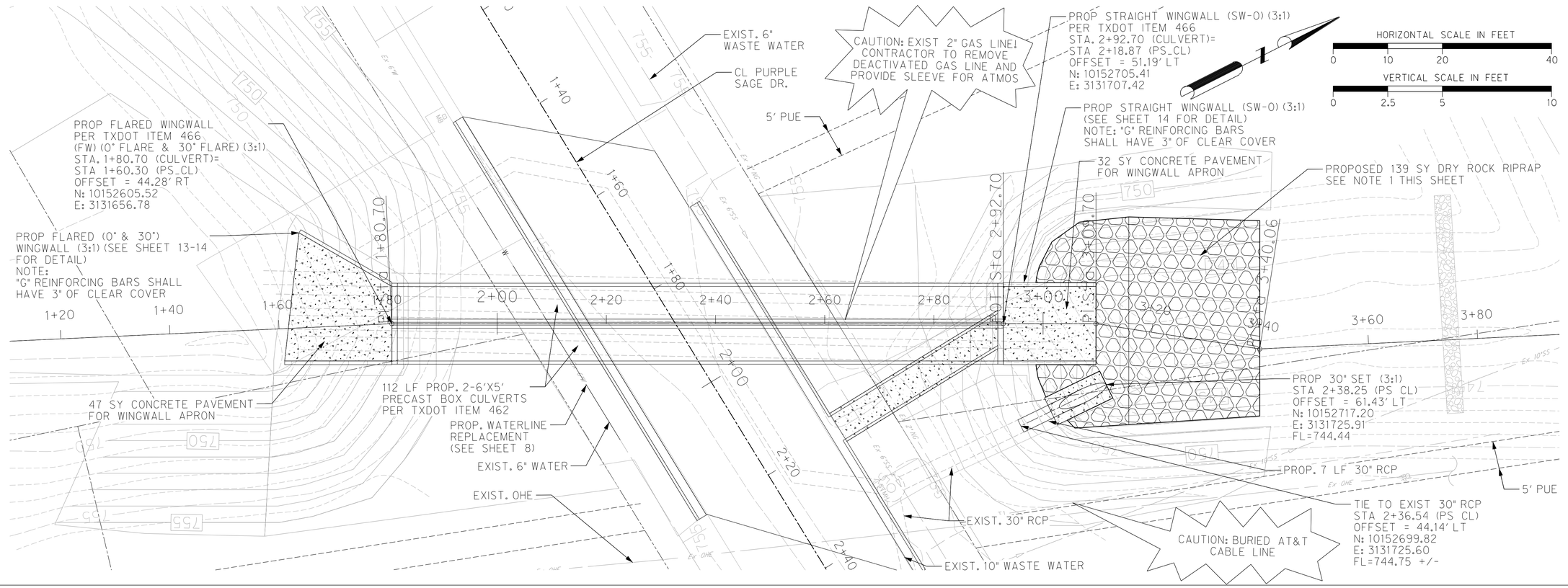
Revision No.	Date	Description

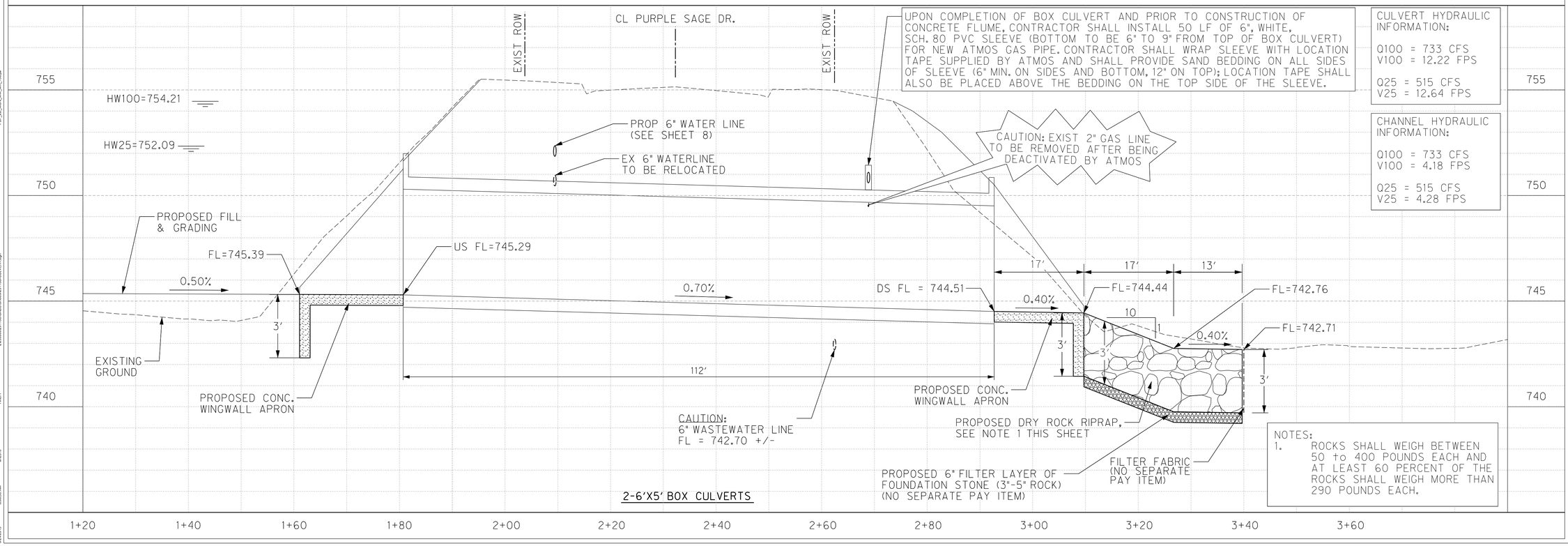
F312 6/24/2015
STATE OF TEXAS
ANDREW M. L. DUTTON
117255
LICENSED
PROFESSIONAL ENGINEER

Project No.:	29113B
Issued:	06/24/2015
Drawn By:	AL
Checked By:	ER
Scale:	AS NOTED

Sheet Title
Purple Sage Dr.
Roadway Plan & Profile
Round Rock, TX

5
Sheet Number





PURPLE SAGE DRIVE
CULVERT REPLACEMENT
Round Rock, TX

ROUND ROCK, TEXAS
PURPOSE.PASSION.PROSPERITY.

HALFF
4030 WEST BRAKER LANE, SUITE 450
AUSTIN, TEXAS 78759-5356
TEL (512) 252-8184
FAX (512) 252-8141
TBPE FIRM NO. F-312

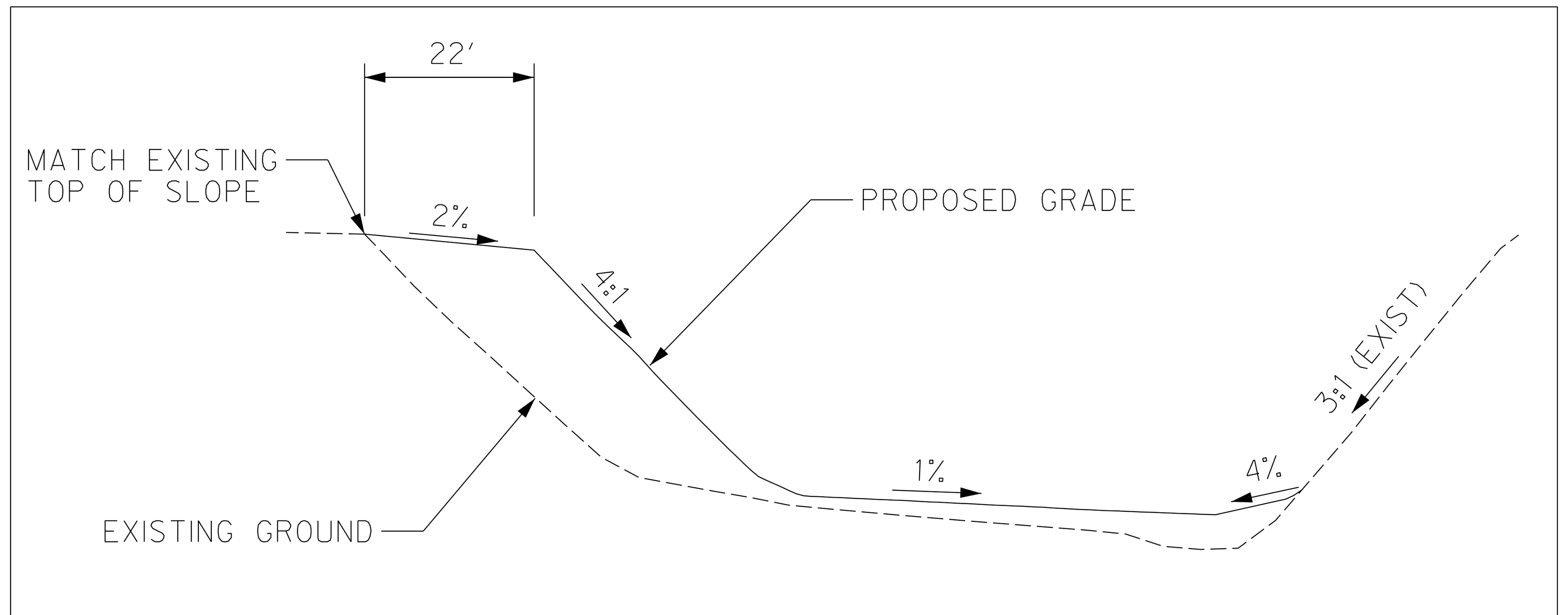
Revision No.	Date	Description

F-312 6/24/2015
STATE OF TEXAS
ANDREW M. L. DUTTON
117255
LICENSED
PROFESSIONAL ENGINEER

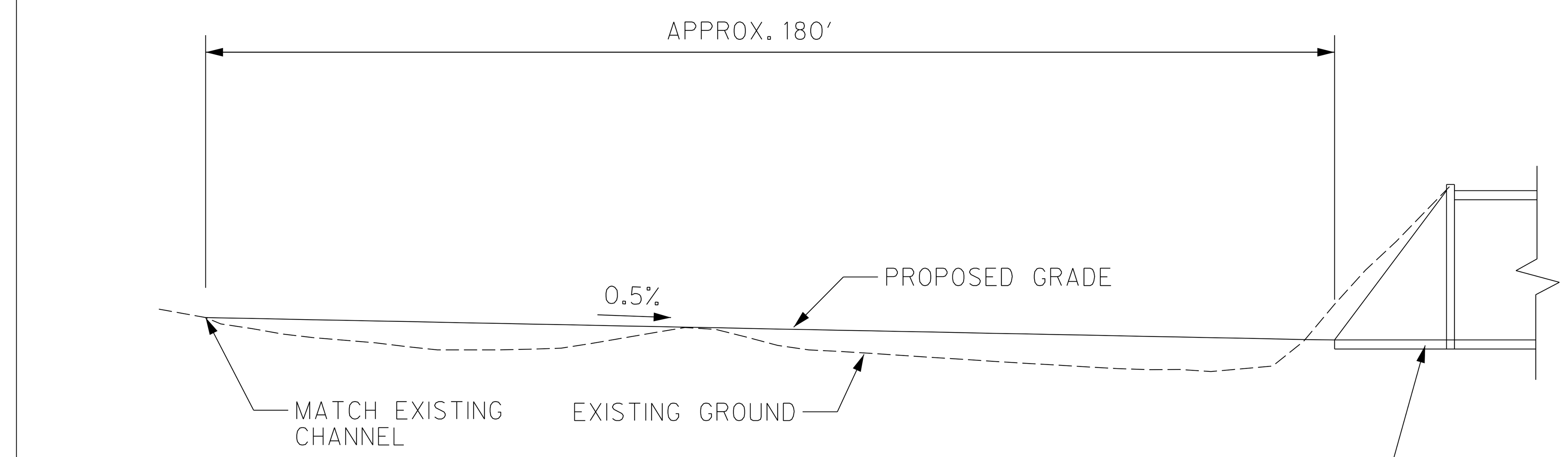
Project No.:	29113B
Issued:	06/24/2015
Drawn By:	AL
Checked By:	ER
Scale:	AS NOTED

Sheet Title
Purple Sage Dr.
Culvert Plan & Profile
Round Rock, TX

6
Sheet Number



SECTION (A) - (A)
N.T.S.



SECTION (B) - (B)
N.T.S.

SCALE IN FEET
0 20 40 80

LEGEND

- STRIP, SALVAGE AND PLACE TOPSOIL WITH NATIVE SEEDING AND SOIL RETENTION BLANKET (CLASS I, TYPE A)
- STRIP, SALVAGE AND PLACE TOPSOIL WITH BERMUDA BLOCK SODDING
- 750 PROPOSED CONTOUR
- 750 EXISTING CONTOUR

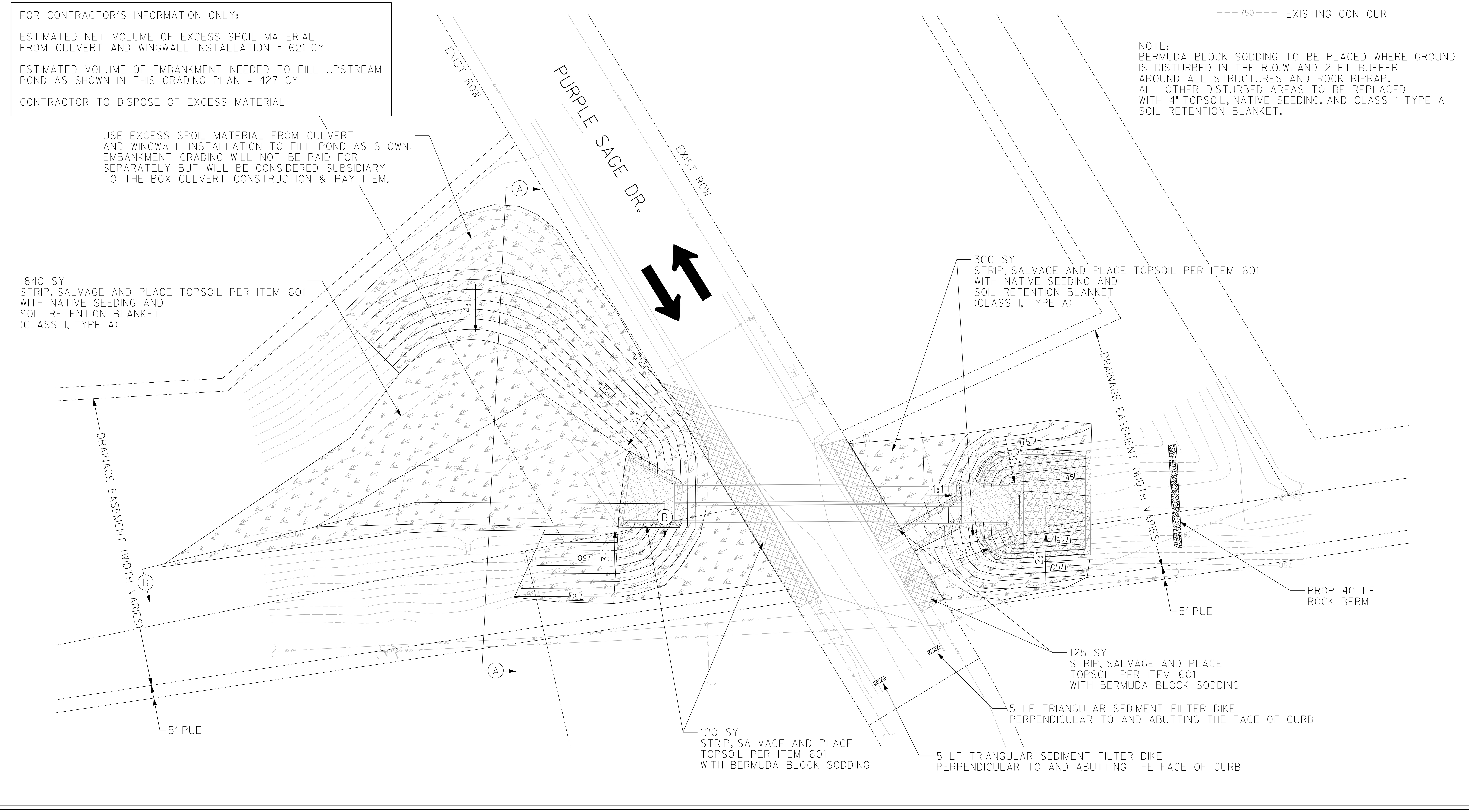
NOTE:
BERMUDA BLOCK SODDING TO BE PLACED WHERE GROUND IS DISTURBED IN THE R.O.W. AND 2 FT BUFFER AROUND ALL STRUCTURES AND ROCK RIPRAP. ALL OTHER DISTURBED AREAS TO BE REPLACED WITH 4" TOPSOIL, NATIVE SEEDING, AND CLASS 1 TYPE A SOIL RETENTION BLANKET.

FOR CONTRACTOR'S INFORMATION ONLY:

ESTIMATED NET VOLUME OF EXCESS SPOIL MATERIAL FROM CULVERT AND WINGWALL INSTALLATION = 621 CY

ESTIMATED VOLUME OF EMBANKMENT NEEDED TO FILL UPSTREAM POND AS SHOWN IN THIS GRADING PLAN = 427 CY

CONTRACTOR TO DISPOSE OF EXCESS MATERIAL



PURPLE SAGE DRIVE
CULVERT REPLACEMENT
Round Rock, TX

ROUND ROCK, TEXAS
PURPOSE. PASSION. PROSPERITY.

HALFF
4030 WEST BRAKER LANE, SUITE 450
AUSTIN, TEXAS 78759-5356
TEL (512) 252-8184
FAX (512) 252-8141
TBPE FIRM NO. F-312

Revision No.	Date	Description

F312 6/24/2015
STATE OF TEXAS
ANDREW M. L. DUTTON
117255
LICENSED
PROFESSIONAL ENGINEER

Project No.:	29113B
Issued:	06/24/2015
Drawn By:	AL
Checked By:	ER
Scale:	AS NOTED

Sheet Title
Purple Sage Dr.
Grading Plan
Round Rock, TX

7
Sheet Number

AC PIPE REMOVAL AND DISPOSAL NOTES:

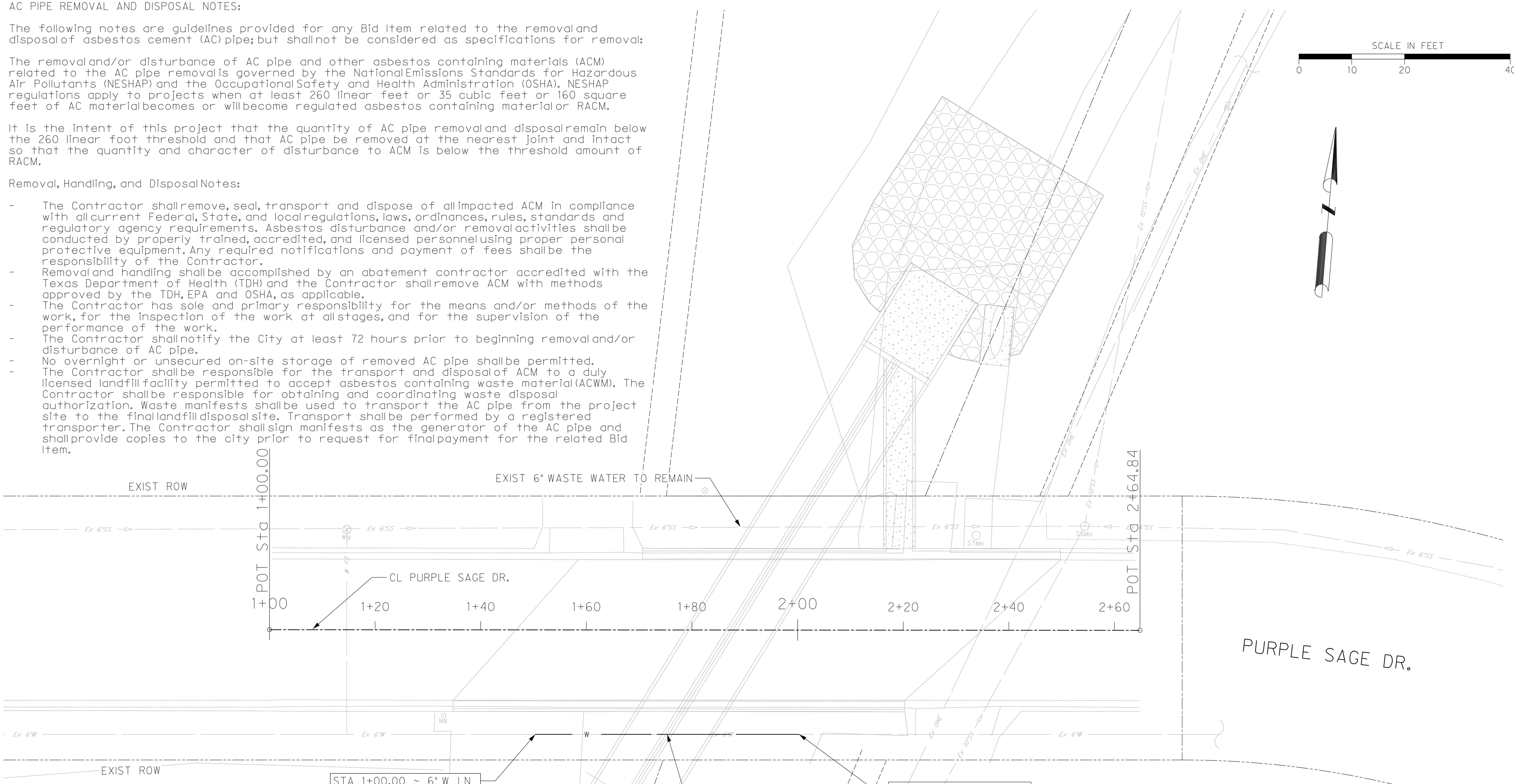
The following notes are guidelines provided for any Bid Item related to the removal and disposal of asbestos cement (AC) pipe; but shall not be considered as specifications for removal:

The removal and/or disturbance of AC pipe and other asbestos containing materials (ACM) related to the AC pipe removal is governed by the National Emissions Standards for Hazardous Air Pollutants (NESHAP) and the Occupational Safety and Health Administration (OSHA). NESHAP regulations apply to projects when at least 260 linear feet or 35 cubic feet or 160 square feet of AC material becomes or will become regulated asbestos containing material or RACM.

It is the intent of this project that the quantity of AC pipe removal and disposal remain below the 260 linear foot threshold and that AC pipe be removed at the nearest joint and intact so that the quantity and character of disturbance to ACM is below the threshold amount of RACM.

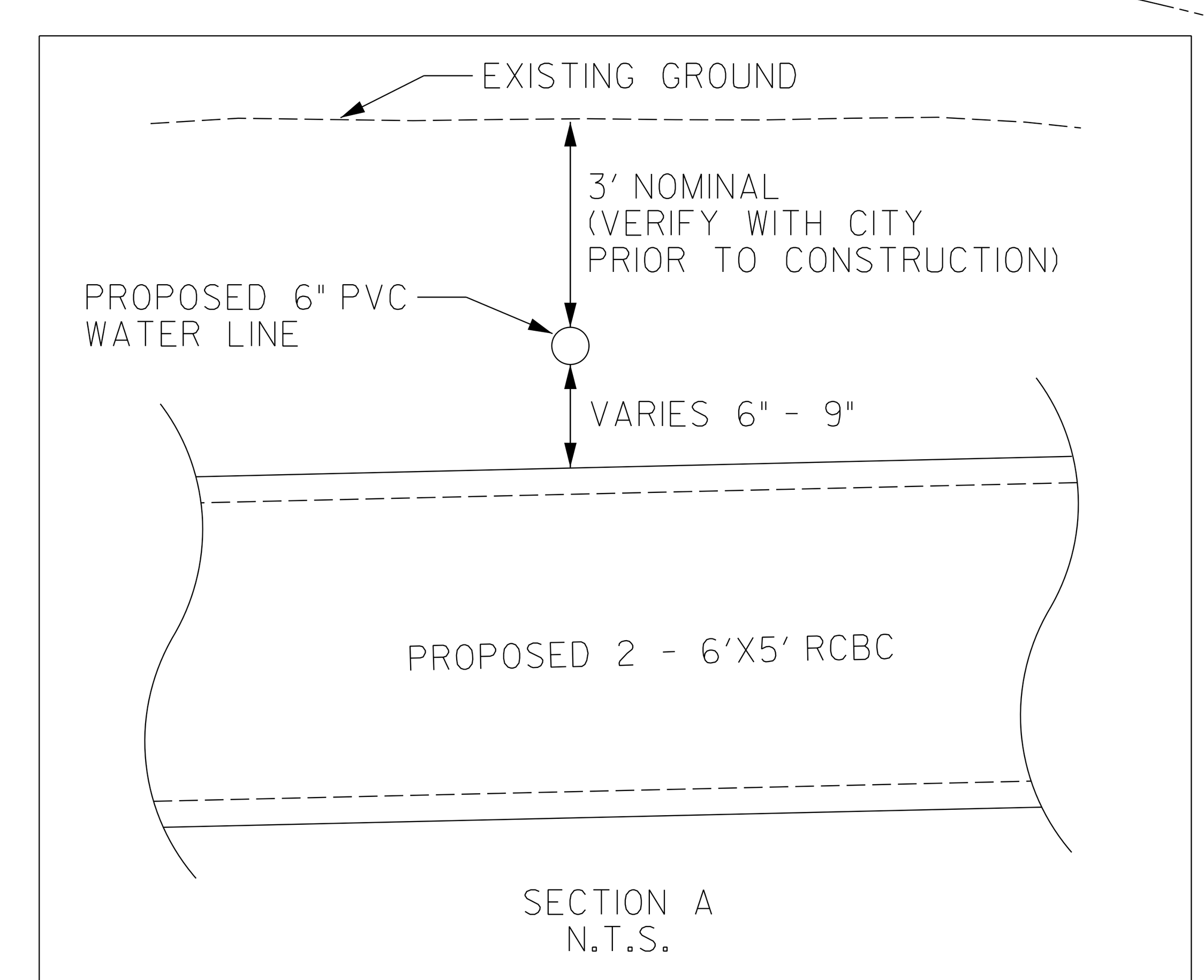
Removal, Handling, and Disposal Notes:

- The Contractor shall remove, seal, transport and dispose of all impacted ACM in compliance with all current Federal, State, and local regulations, laws, ordinances, rules, standards and regulatory agency requirements. Asbestos disturbance and/or removal activities shall be conducted by properly trained, accredited, and licensed personnel using proper personal protective equipment. Any required notifications and payment of fees shall be the responsibility of the Contractor.
- Removal and handling shall be accomplished by an abatement contractor accredited with the Texas Department of Health (TDH) and the Contractor shall remove ACM with methods approved by the TDH, EPA and OSHA, as applicable.
- The Contractor has sole and primary responsibility for the means and/or methods of the work, for the inspection of the work at all stages, and for the supervision of the performance of the work.
- The Contractor shall notify the City at least 72 hours prior to beginning removal and/or disturbance of AC pipe.
- No overnight or unsecured on-site storage of removed AC pipe shall be permitted.
- The Contractor shall be responsible for the transport and disposal of ACM to a duly licensed landfill facility permitted to accept asbestos containing waste material (ACWM). The Contractor shall be responsible for obtaining and coordinating waste disposal authorization. Waste manifests shall be used to transport the AC pipe from the project site to the final landfill disposal site. Transport shall be performed by a registered transporter. The Contractor shall sign manifests as the generator of the AC pipe and shall provide copies to the city prior to request for final payment for the related Bid Item.



NOTES:

1. USE TRANSITION COUPLING TO TIE PROPOSED WATERLINE TO EXISTING WATERLINE. "HYMAX" LONG BODY OR APPROVED EQUAL. CONTRACTOR SHALL VERIFY EXISTING O.D. AND PIPE MATERIAL FOR COUPLING SIZES. CONTRACTOR SHALL BLOCK OR OTHERWISE ANCHOR COUPLING AND PIPING AS NECESSARY TO PREVENT MOVEMENT.
2. IF THE DISTANCE FROM THE EDGE OF THE TRANSITION COUPLING TO THE EDGE OF THE NEXT EXISTING WATERLINE COUPLING OR JOINT WILL BE LESS THAN 3', REMOVE EXISTING WATER MAIN PAST NEXT COUPLING OR JOINT. TRIM PIPE AS REQUIRED AND INSTALL TRANSITION COUPLING.



SECTION A
N.T.S.

PURPLE SAGE DRIVE
CULVERT REPLACEMENT
Round Rock, TX

ROUND ROCK, TEXAS
PURPOSE. PASSION. PROSPERITY.

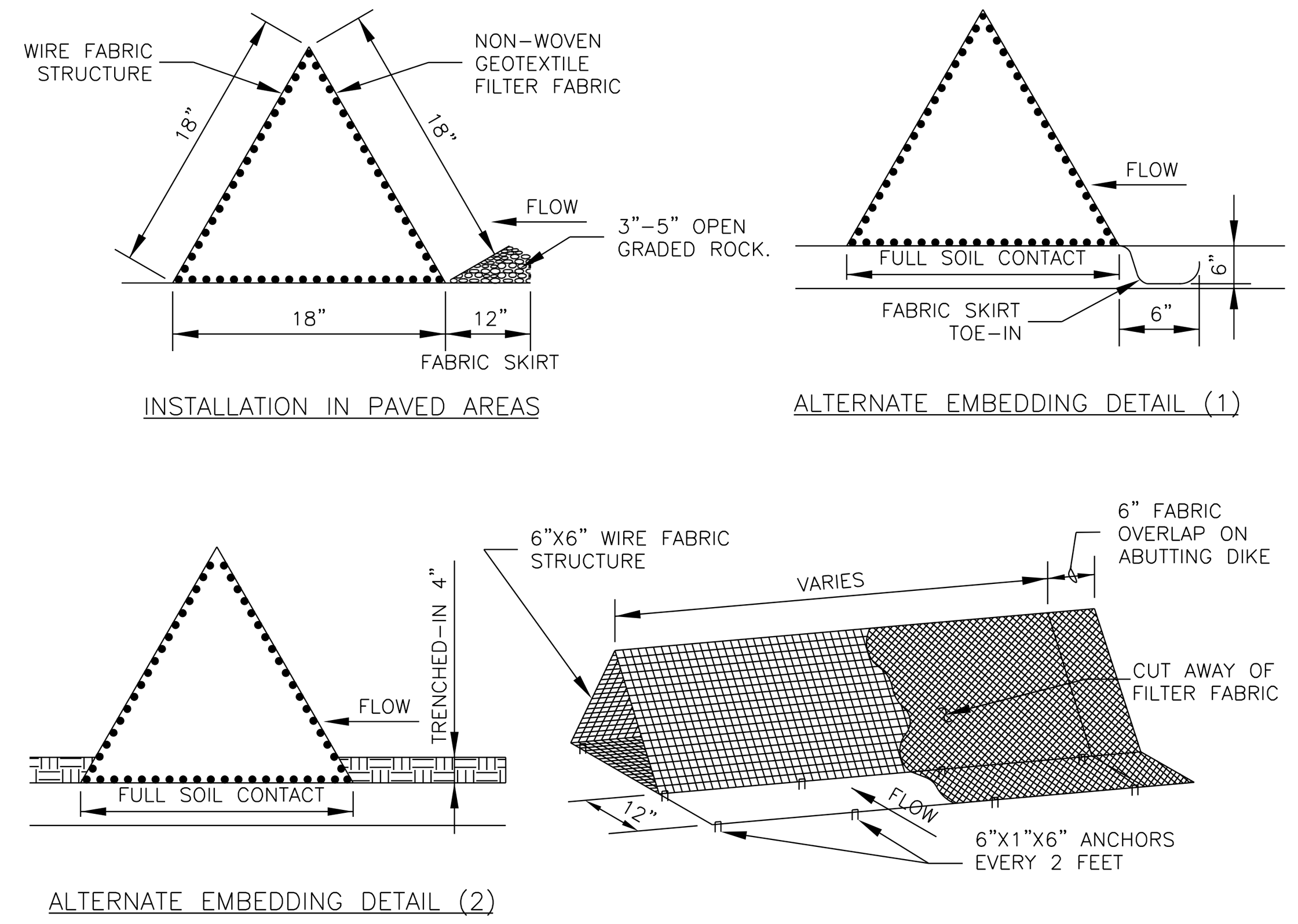
HALFF
4030 WEST BRAKER LANE, SUITE 450
AUSTIN, TEXAS 78759-5356
TEL (512) 252-8184
FAX (512) 252-8141
TBPE FIRM NO. F-312

Revision No.	Date	Description

F312 6/24/2015
STATE OF TEXAS
ANDREW M. L. DUTTON
117255
LICENSED
PROFESSIONAL ENGINEER

Project No.:	29113B
Issued:	06/24/2015
Drawn By:	AL
Checked By:	ER
Scale:	AS NOTED
Sheet Title	Purple Sage Dr. Water Line Plan & Profile Round Rock, TX

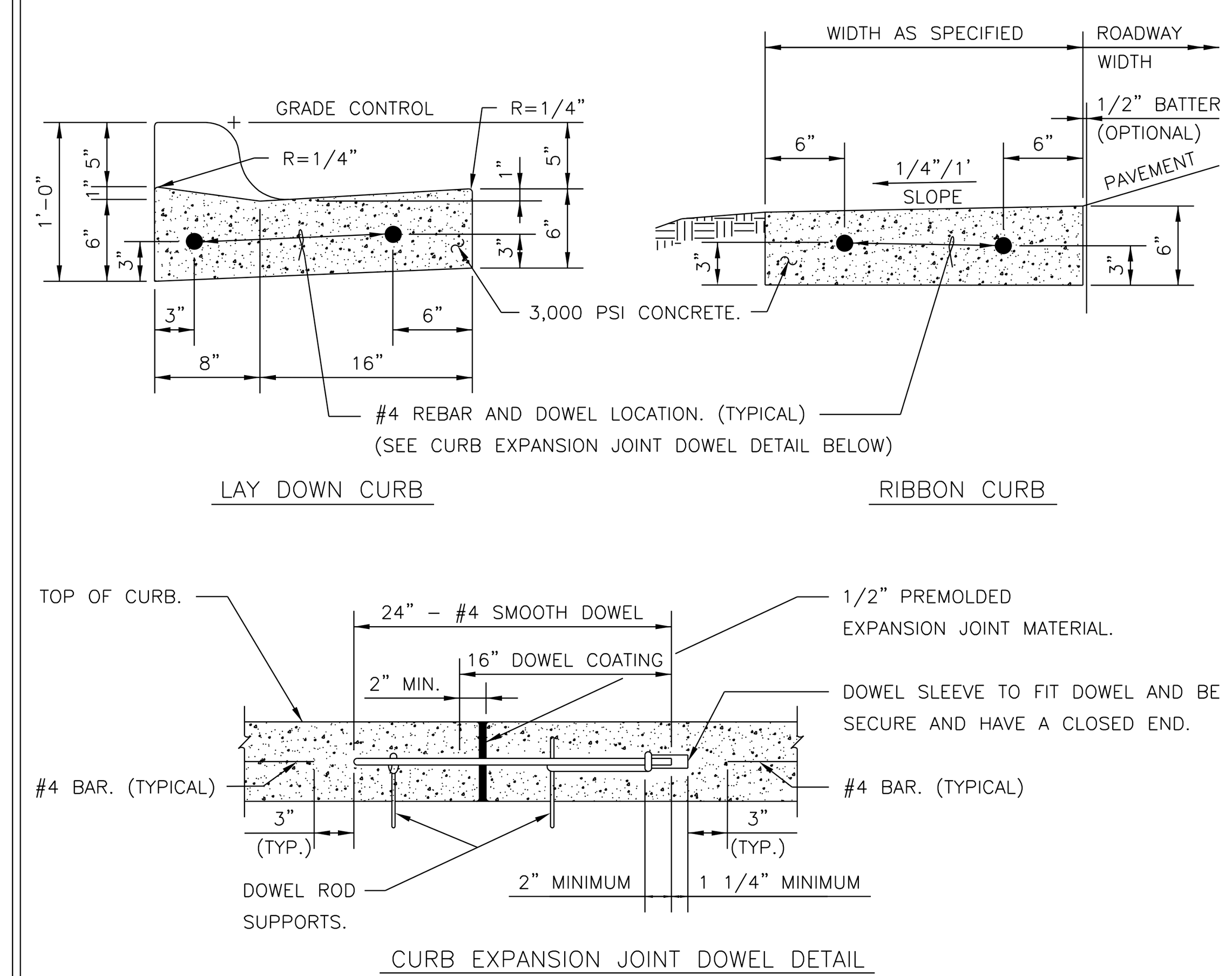
Sheet Number
8



NOTES:

1. DIKES SHALL BE PLACED IN A ROW WITH ENDS TIGHTLY ABUTTING.
2. FABRIC COVER AND SKIRT SHALL BE A CONTINUOUS WRAPPING OF GEOTEXTILE. THE SKIRT SHALL BE A CONTINUOUS EXTENSION OF THE UPSTREAM FACE FABRIC.
3. DIKES AND SKIRT SHALL BE SECURELY ANCHORED IN PLACE WITH WIRE STAPLES AT 2' INTERVALS ON BOTH EDGES AND SKIRT OR WITH 3/8" DIAMETER REBAR WITH TEE ENDS.
4. FILTER MATERIAL SHALL BE LAPPED OVER ENDS 6" TO COVER DIKE-TO-DIKE JOINTS. JOINTS SHALL BE FASTENED WITH GALVANIZED SHOAT RINGS.
5. INSPECTION SHALL BE MADE WEEKLY OR AFTER EACH RAINFALL EVENT AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS REQUIRED.
6. ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF 4" AND DISPOSED OF IN A MANNER WHICH WILL NOT CAUSE ADDITIONAL SILTATION.
7. AFTER THE DEVELOPMENT SITE IS COMPLETELY STABILIZED, THE DIKES AND ANY REMAINING SILT SHALL BE REMOVED. SILT SHALL BE DISPOSED OF AS INDICATED IN NOTE #6 ABOVE.

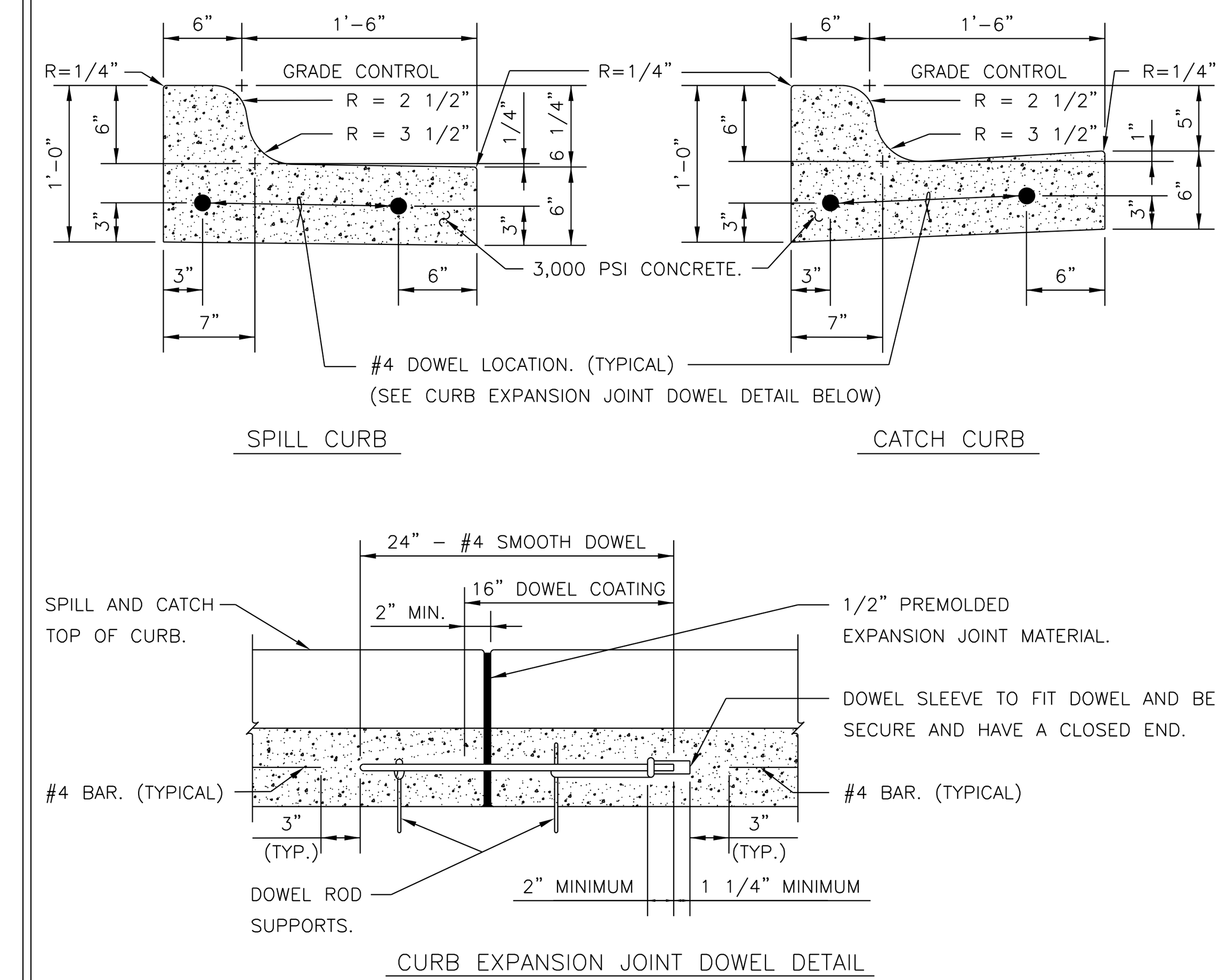
RECORD SIGNED COPY ON FILE AT PUBLIC WORKS APPROVED	CITY OF ROUND ROCK	DRAWING NO: EC-11
03-25-11 DATE	TRIANGULAR SEDIMENT FILTER DIKE DETAIL	
THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR THE APPROPRIATE USE OF THIS DETAIL. (NOT TO SCALE)		



NOTES:

1. ALL WORK AND MATERIAL SHALL CONFORM TO ASTM A615, A615M, C309 AND D1752. BROOM FINISH EXPOSED SURFACE.
2. CONTROL JOINT SPACING SHALL NOT EXCEED 10'-0'.
3. EXPANSION JOINTS AS PER STANDARD ASTM D-1752.
4. EXPANSION JOINT INTERVALS NOT TO EXCEED 40'-0" FOR ALL CURBS AND CONSTRUCTION METHODS.
5. ALL CURBS SHALL HAVE A MINIMUM OF 4" OF COMPACTED FLEXIBLE BASE BETWEEN BOTTOM OF CURB AND TOP SUBGRADE THAT SHALL EXTEND A MINIMUM OF 18" BEHIND BACK OF CURB. TOTAL DEPTH OF FLEXIBLE BASE UNDER AND BEHIND CURB SHALL BE: (TOTAL DEPTH OF FLEXIBLE BASE) LESS (6-INCHES).
6. ALL CURBS SHALL CONFORM TO THESE DETAILS INDEPENDANT OF THE CONSTRUCTION METHODS USED.

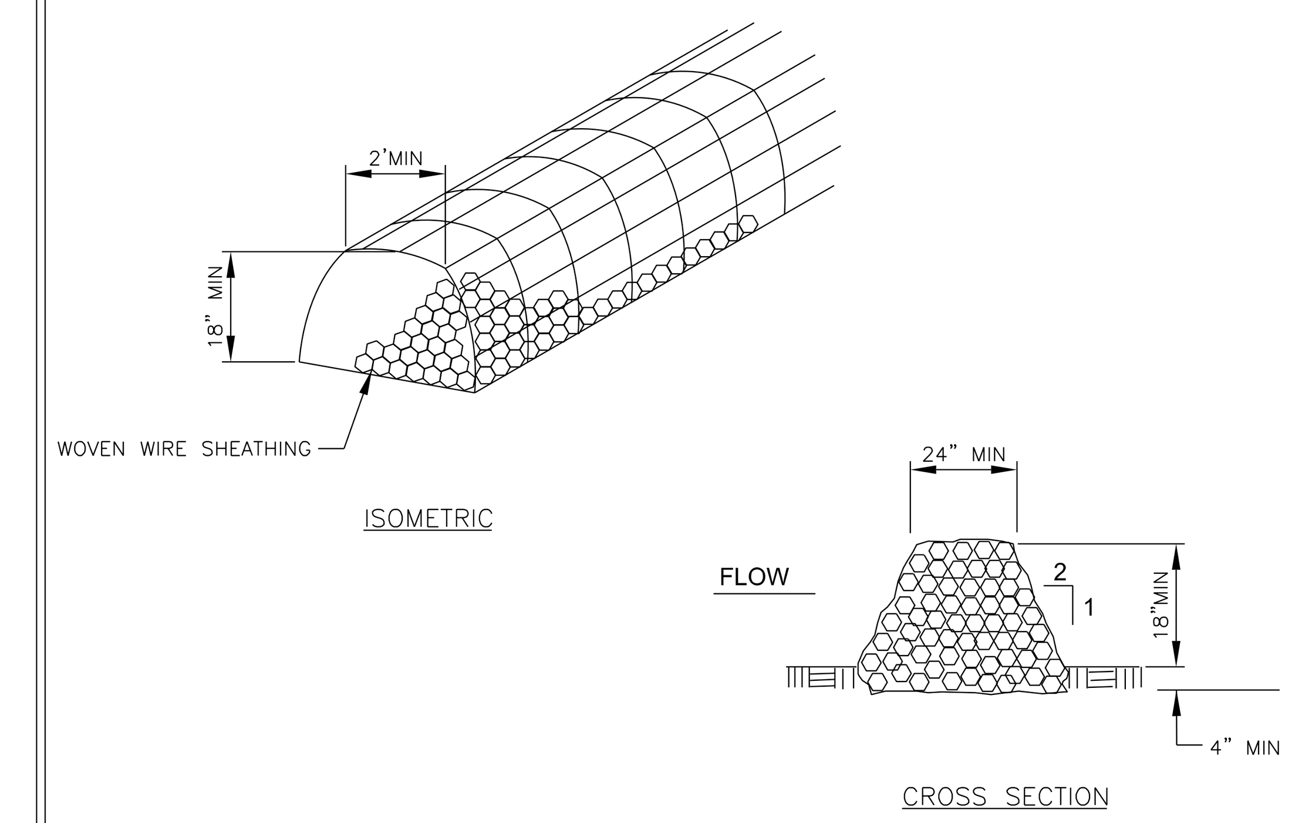
RECORD SIGNED COPY ON FILE AT PUBLIC WORKS APPROVED	CITY OF ROUND ROCK	DRAWING NO: ST-04
08-21-03 DATE	LAYDOWN AND RIBBON CURB DETAIL (WITH CURB EXPANSION JOINT DOWEL DETAIL)	
THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR THE APPROPRIATE USE OF THIS DETAIL.		



NOTES:

1. ALL WORK AND MATERIAL SHALL CONFORM TO ASTM A615, A615M, C309 AND D1752. BROOM FINISH EXPOSED SURFACE.
2. CONTROL JOINT SPACING SHALL NOT EXCEED 10'-0'.
3. EXPANSION JOINTS AS PER STANDARD ASTM D-1752.
4. EXPANSION JOINT INTERVALS NOT TO EXCEED 40'-0" FOR ALL CURBS AND CONSTRUCTION METHODS.
5. ALL CURBS SHALL HAVE A MINIMUM OF 4" OF COMPACTED FLEXIBLE BASE BETWEEN BOTTOM OF CURB AND TOP SUBGRADE THAT SHALL EXTEND A MINIMUM OF 18" BEHIND BACK OF CURB. TOTAL DEPTH OF FLEXIBLE BASE UNDER AND BEHIND CURB SHALL BE: (TOTAL DEPTH OF FLEXIBLE BASE) LESS (6-INCHES).
6. ALL CURBS SHALL CONFORM TO THESE DETAILS INDEPENDANT OF THE CONSTRUCTION METHODS USED.

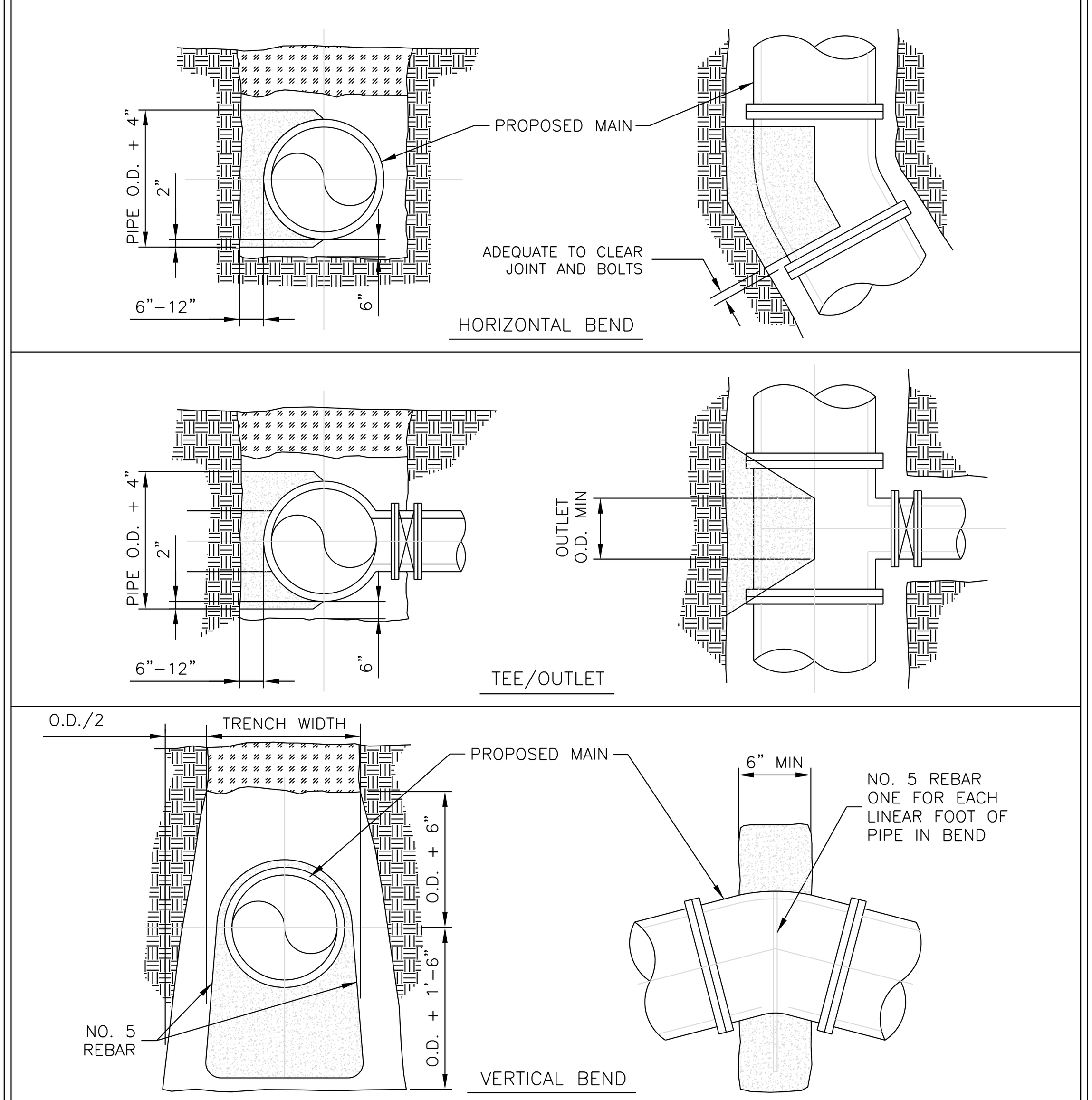
RECORD SIGNED COPY ON FILE AT PUBLIC WORKS APPROVED	CITY OF ROUND ROCK	DRAWING NO: ST-05
08-21-03 DATE	SPILL AND CATCH CURB DETAIL (WITH CURB EXPANSION JOINT DOWEL DETAIL)	
THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR THE APPROPRIATE USE OF THIS DETAIL.		



NOTES:

1. USE ONLY OPEN GRADED ROCK (3 to 5'') DIAMETER FOR ALL CONDITIONS.
2. THE ROCK BERM SHALL BE SECURED WITH A WOVEN WIRE SHEATHING HAVING MAXIMUM 1'' OPENING AND MINIMUM WIRE DIAMETER OF 20 GAUGE.
3. THE ROCK BERM SHALL BE INSPECTED DAILY OR AFTER EACH RAIN, AND THE STONE AND/ OR FABRIC CORE-WOVEN SHEATHING SHALL BE REPLACED WHEN THE STRUCTURE CEASES TO FUNCTION AS INTENDED, DUE TO SEDIMENT ACCUMULATION AMONG THE ROCKS, WASHOUT, CONSTRUCTION TRAFFIC DAMAGE, ETC.
4. IF SEDIMENT REACHES A DEPTH OF 6'', THE SEDIMENT SHALL BE REMOVED AND DISPOSED OF ON AN APPROVED SITE AND IN A MANNER THAT WILL NOT CREATE A SEDIMENTATION PROBLEM.
5. WHEN THE SITE IS COMPLETELY STABILIZED, THE BERM AND ACCUMULATED SEDIMENT SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED MANNER.

RECORD SIGNED COPY ON FILE AT PUBLIC WORKS APPROVED	CITY OF ROUND ROCK	DRAWING NO: EC-12
03-25-11 DATE	ROCK BERM DETAIL	
THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR THE APPROPRIATE USE OF THIS DETAIL. (NOT TO SCALE)		



THRUST BLOCK DESIGN AS FOLLOWS:

A. PRESSURE OF 150 P.S.I. (ACTUAL IF HIGHER) + 50% SURGE ALLOWANCE

B. MAXIMUM SOIL BEARING:

SOIL TYPE	PRESSURE
LIMESTONE	4000 LBS./SQ. FT.
UNDISTURBED SOIL, CALICHE	2000 LBS./SQ. FT.
LOOSE OR SPONGY SOIL	1500 LBS./SQ. FT.

C. ALL PIPE & FITTING TO BE WRAPPED WITH 40 PLASTIC MIL.

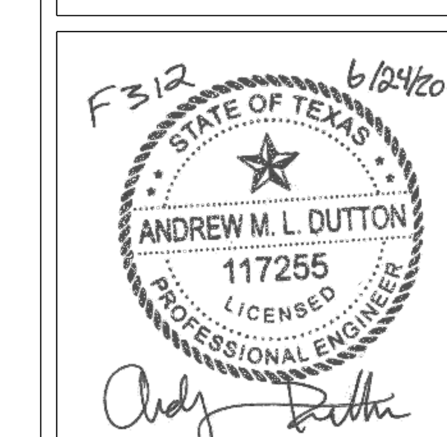
RECORD SIGNED COPY ON FILE AT PUBLIC WORKS APPROVED	CITY OF ROUND ROCK	DRAWING NO: WT-25
04-01-10 DATE	THRUST BLOCK DETAIL	
THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR THE APPROPRIATE USE OF THIS DETAIL. (NOT TO SCALE)		

PURPLE SAGE DRIVE
CULVERT REPLACEMENT
Round Rock, TX

ROUND ROCK, TEXAS
PURPOSE.PASSION.PROSPERITY.

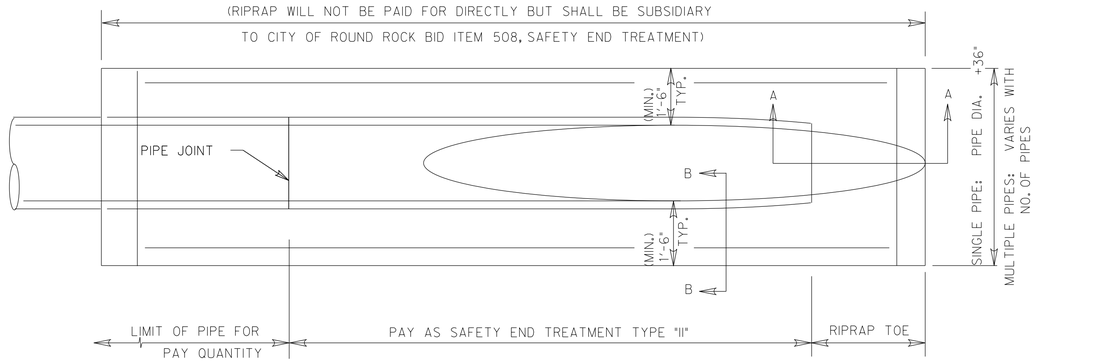
HALFF
4030 WEST BRAKER LANE, SUITE 450
AUSTIN, TEXAS 78759-5356
TEL (512) 252-8184
FAX (512) 252-8141
TBPE FIRM NO. F-312

Revision No.	Date	Description

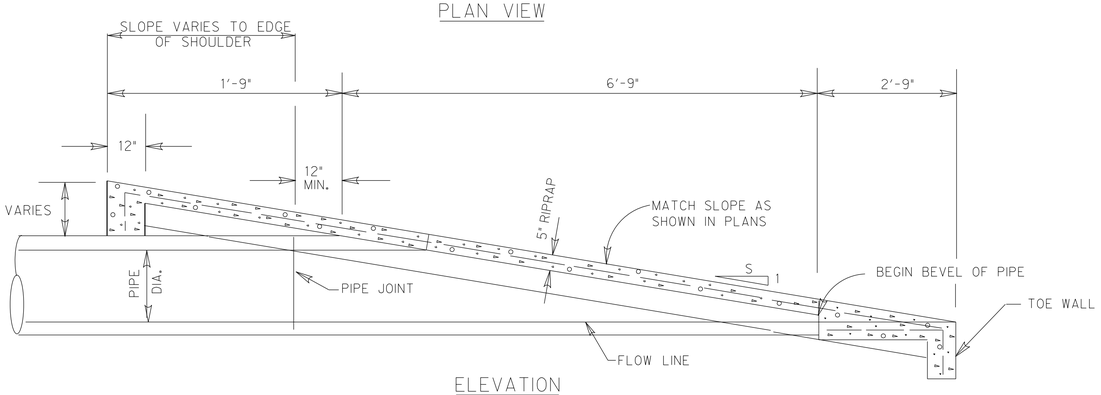


Project No.:	29113B
Issued:	06/24/2015
Drawn By:	AL
Checked By:	ER
Scale:	

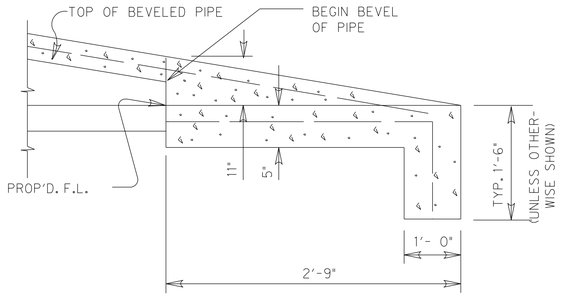
Sheet Title
Purple Sage Dr.
Details
Round Rock, TX



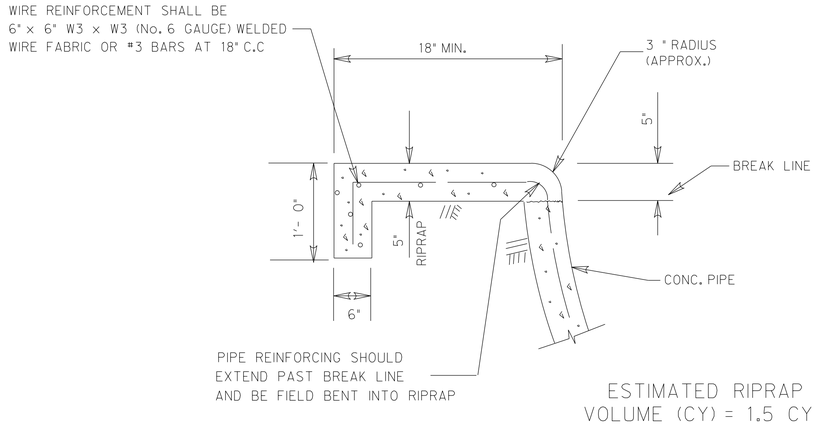
PLAN VIEW



ELEVATION
SAFETY END TREATMENT



SEC. A-A

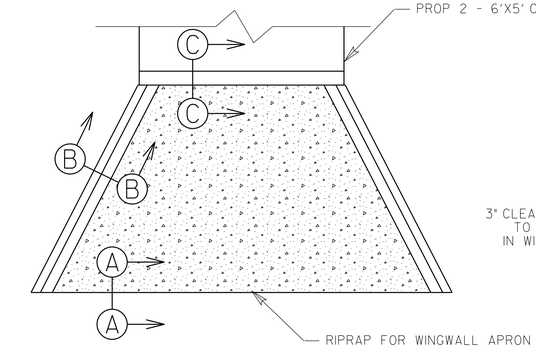


ESTIMATED RIPRAP
VOLUME (CY) = 1.5 CY *

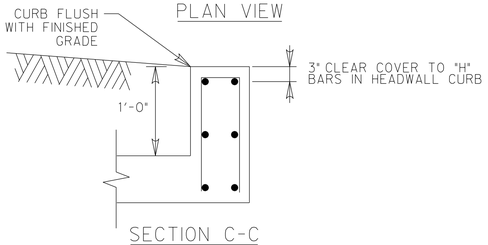
* FOR CONTRACTORS INFORMATION ONLY (S.E.T. TO BE PAID FOR BY EACH AT UNIT BID PRICE)

SAFETY END TREATMENT - DETAIL

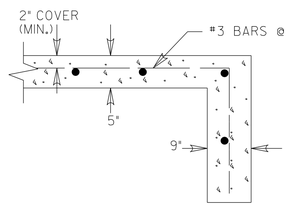
SEC. B-B



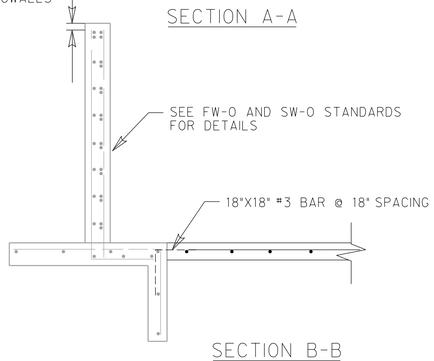
PLAN VIEW



SECTION C-C

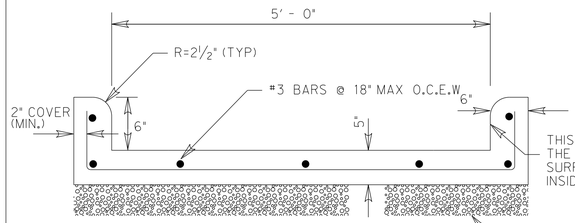


SECTION A-A

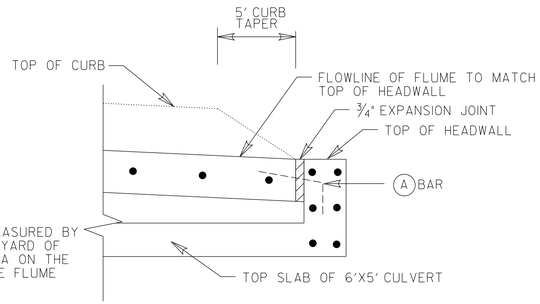


SECTION B-B

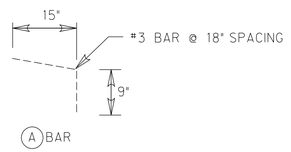
MISCELLANEOUS WINGWALL DETAILS



FLUME CROSS SECTION



SECTION AT FLUME TIE-IN TO HEADWALL



NOTES:
1. ALL CONCRETE SHALL BE CLASS "A".
2. ALL REINFORCING STEEL SHALL BE GRADE 60.
3. BALLAST SHALL BE TEXAS CRUSHED STONE #064 (BALLAST #5) OR APPROVED EQUAL.
4. PROVIDE CONTRACTION JOINTS ACROSS FULL WIDTH OF FLUME AT MAXIMUM 10' SPACING. CONTRACTION JOINT SHALL BE FILLED WITH SELF-LEVELING, LOW MODULUS SILICONE OR POLYURETHANE CONSTRUCTION SEALANT FOR PORTLAND CEMENT CONCRETE.
5. PROVIDE ¾" EXPANSION JOINT BETWEEN FLUME AND HEADWALL, AND BETWEEN FLUME AND RIBBON CURB WITH DOWEL SLEEVES IN FLUME. TOP ONE INCH OF EXPANSION JOINT SHALL BE FILLED WITH SELF-LEVELING, LOW MODULUS SILICONE OR POLYURETHANE CONSTRUCTION SEALANT FOR PORTLAND CEMENT CONCRETE.

CONCRETE FLUME - DETAIL

PURPLE SAGE DRIVE
CULVERT REPLACEMENT
Round Rock, TX

ROUND ROCK, TEXAS
PURPOSE.PASSION.PROSPERITY.

HALFF
4030 WEST BRAKER LANE, SUITE 450
AUSTIN, TEXAS 78759-5356
TEL (512) 252-8184
FAX (512) 252-8141
TBPE FIRM NO. F-312

Revision No.	Date	Description

F-3112 6/24/2015

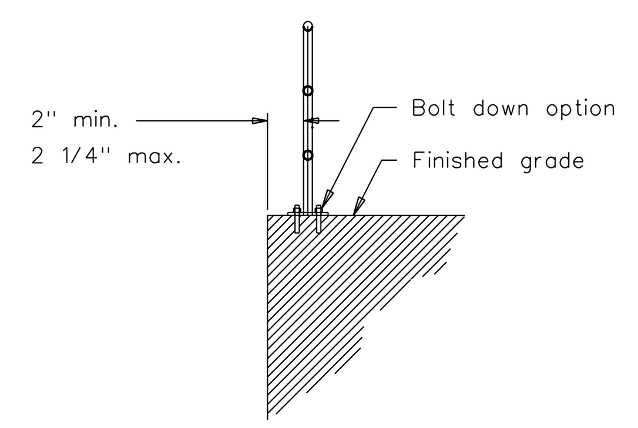
STATE OF TEXAS
ANDREW M. L. DUTTON
117255
LICENSED
PROFESSIONAL ENGINEER

Project No.:	29113B
Issued:	06/24/2015
Drawn By:	AL
Checked By:	ER
Scale:	

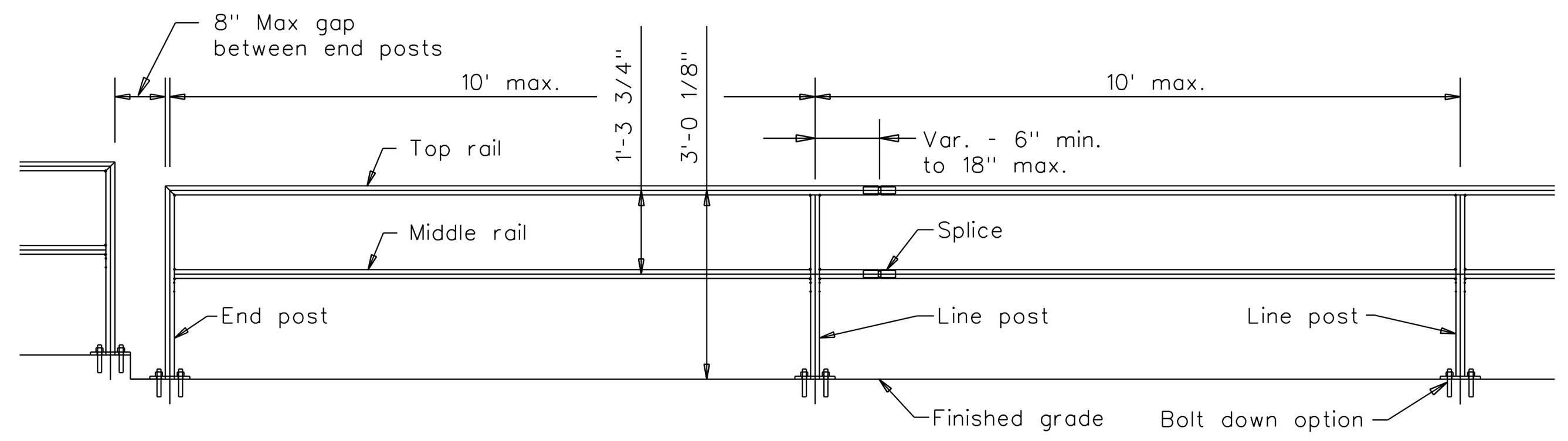
Sheet Title
Purple Sage Dr.
Details
Round Rock, TX

10
Sheet Number

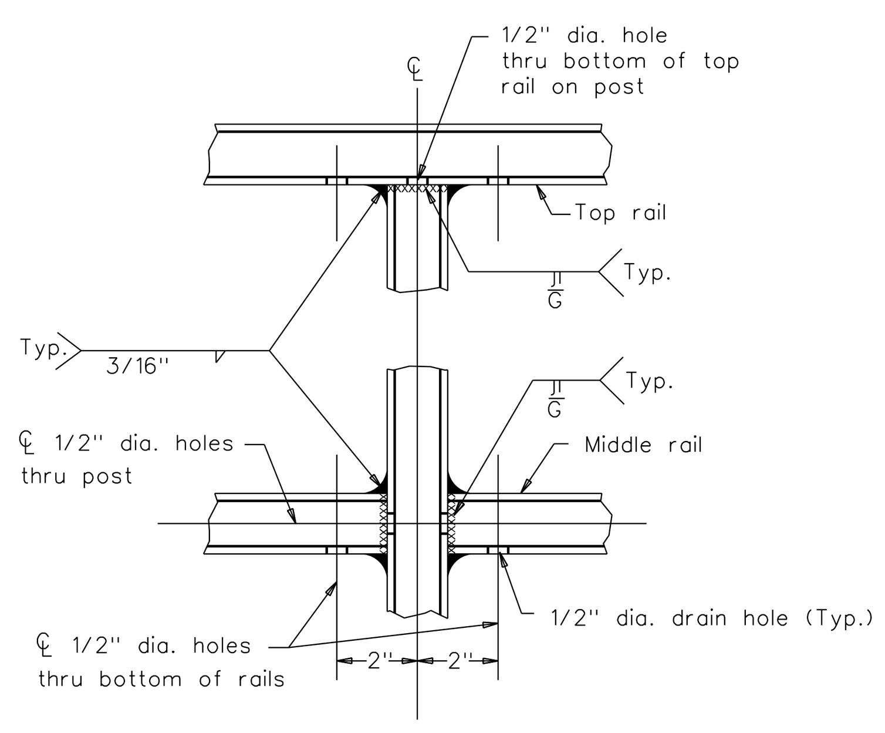
EDGE PROTECTION RAILING



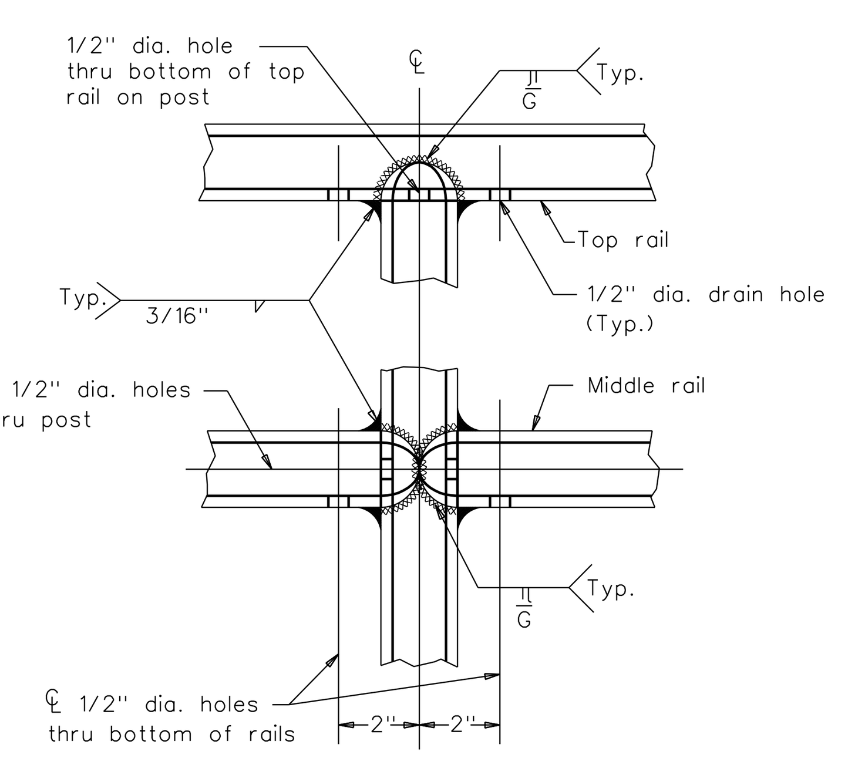
SIDE VIEW
(ON STRUCTURE)



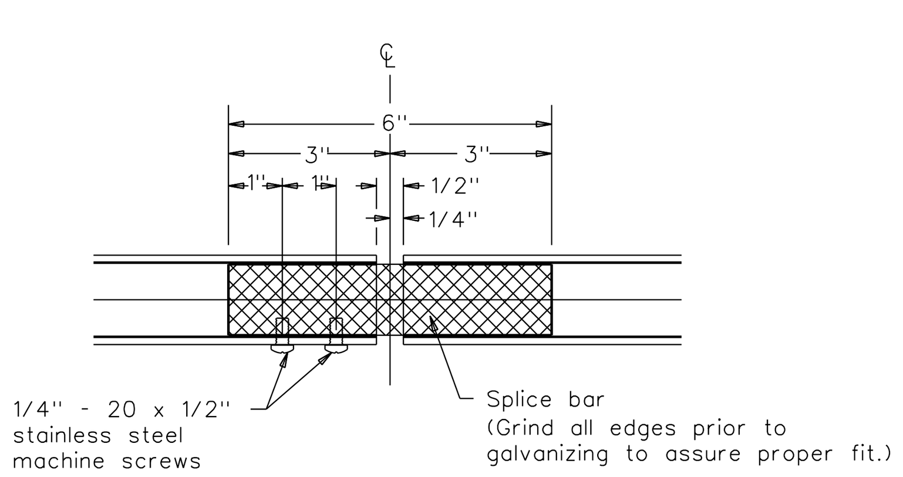
TWO RAIL



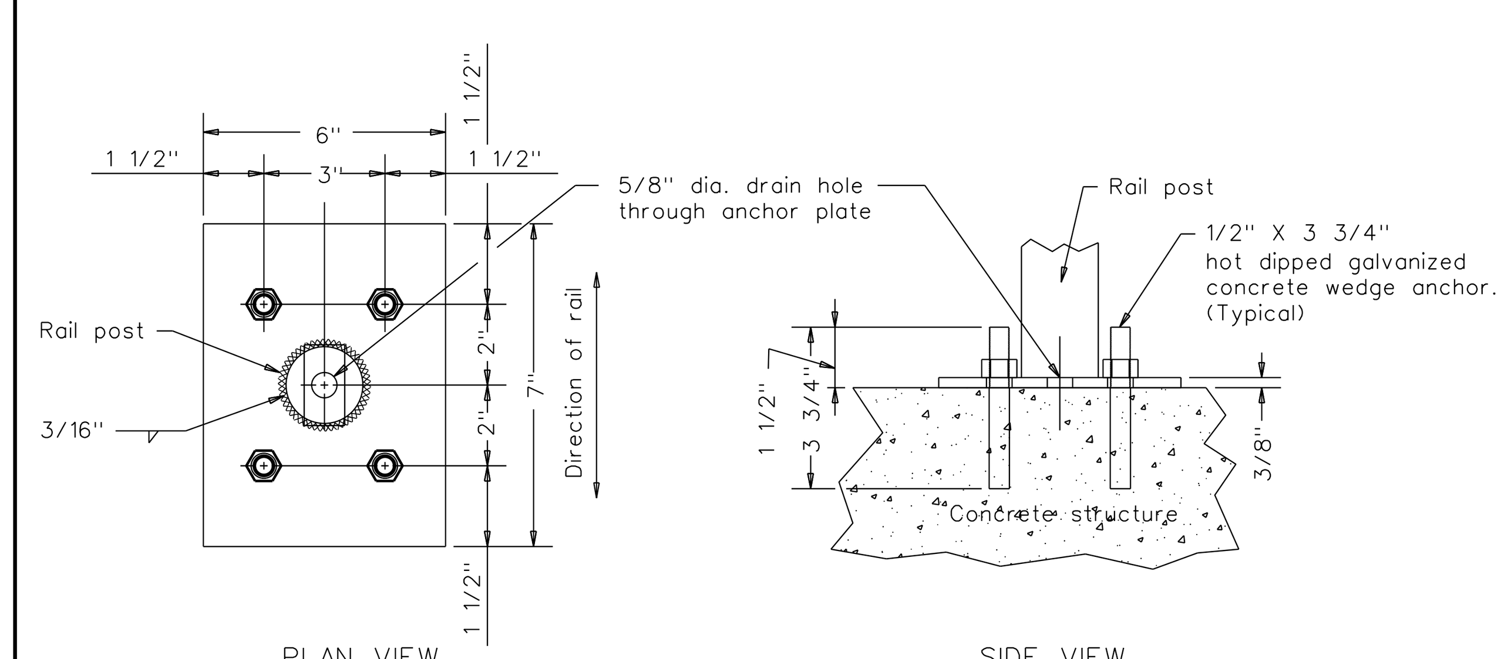
WELD DETAILS FOR STEEL TUBING



WELD DETAILS FOR STEEL PIPE



SPLICE DETAIL



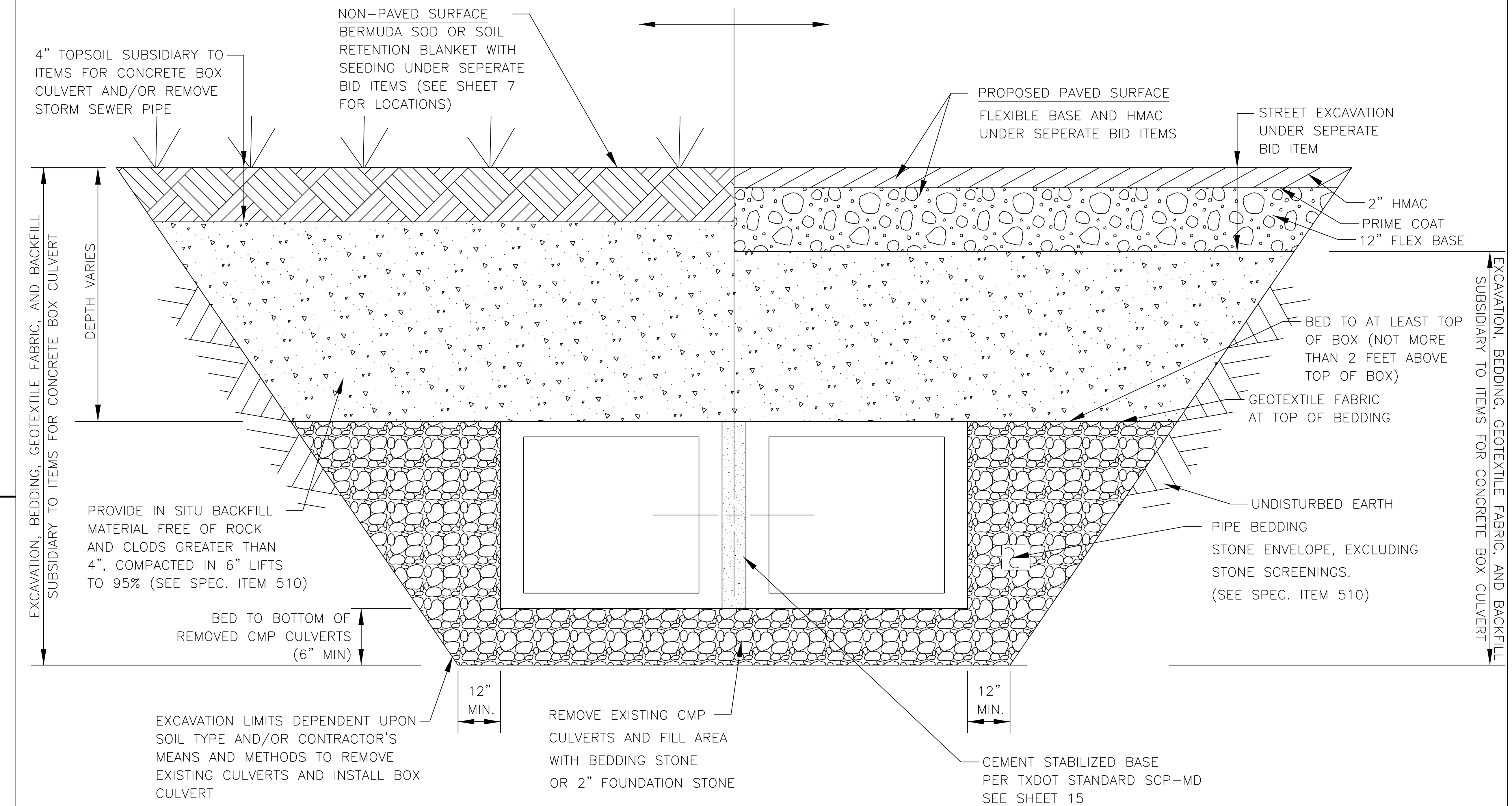
ANCHOR PLATE FOR BOLT DOWN OPTION

MATERIAL TABLE

STEEL PIPE POST AND RAIL MEMBERS				ROUND SPLICE BAR
NOM. DIA.	SCH.	O.D.	I.D.	O.D.
1 1/2"	40	1.990"	1.610"	1 1/2"

GENERAL NOTES FOR ALL DETAILS:

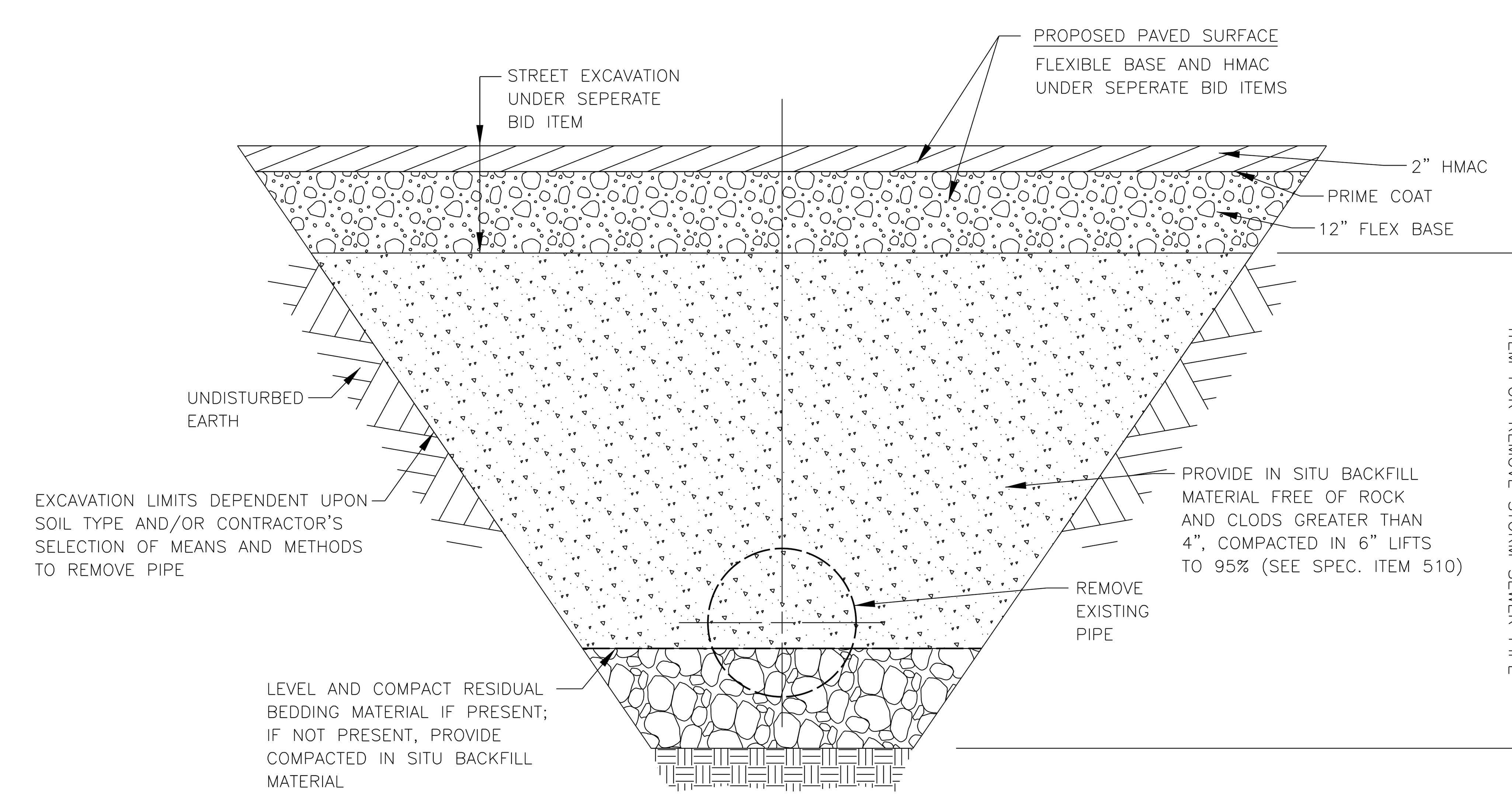
1. Rail height shall be constant above finished grade.
2. Posts and rails shall be identical material in conformance with ASTM specification A53, grade B.
3. Posts shall be vertical. The top rail shall be continuous over a minimum of two posts.
4. On structure, the railing shall conform to the vertical alignment of the structure. Rails shall have a splice in the post space occurring at expansion joints.
5. On grade, rails shall have splices at intervals not to exceed 100'.
6. Hot-dip galvanize all metal parts after fabrication.



NOTES:

1. ALL EXCAVATION SAFETY SHALL COMPLY WITH APPLICABLE REGULATIONS.

BOX CULVERT INSTALLATION & BACKFILL DETAIL (N.T.S.)



NOTES:

1. ALL TRENCH AND EXCAVATION SAFETY SHALL COMPLY WITH APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS.
2. FOR NON-PAVED SURFACE, EXCAVATION, BACKFILL, AND SURFACING SHALL BE SIMILAR TO THAT SHOWN FOR BOX CULVERT INSTALLATION ABOVE.

PIPE REMOVAL & BACKFILL DETAIL (N.T.S.)

PURPLE SAGE DRIVE
CULVERT REPLACEMENT
Round Rock, TX

ROUND ROCK, TEXAS
PURPOSE. PASSION. PROSPERITY.

HALFF
4030 WEST BRAKER LANE, SUITE 450
AUSTIN, TEXAS 78759-5356
TEL (512) 252-8184
FAX (512) 252-8141
TBPE FIRM NO. F-312

Revision No.	Date	Description

F312 6/24/2015
STATE OF TEXAS
ANDREW M. L. DUTTON
117255
LICENSED
PROFESSIONAL ENGINEER

Project No.:	29113B
Issued:	06/24/2015
Drawn By:	AL
Checked By:	ER
Scale:	

Sheet Title
Purple Sage Dr.
Details
Round Rock, TX

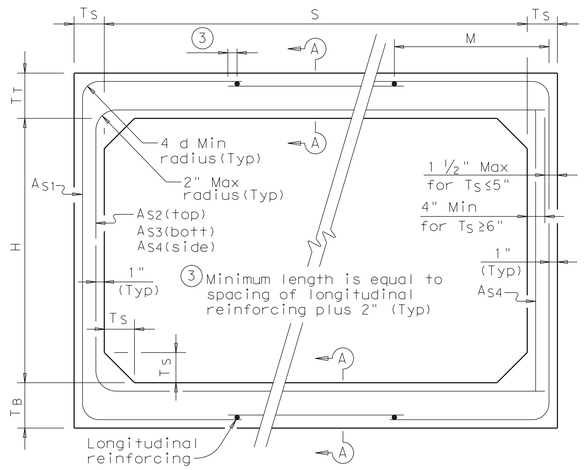
DATE:
FILE:

BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (in²/ft) ②								① Lift Weight (Tons)
S (ft)	H (ft)	T_T (in)	T_B (in)	T_S (in)	(ft)	(in)	A_{S1}	A_{S2}	A_{S3}	A_{S4}	A_{S5}	A_{S6}	A_{S7}	A_{S8}	
6	3	8	7	7	<2	-	0.20	0.31	0.22	0.17	0.19	0.19	0.19	0.17	7.9
6	3	7	7	7	2<3	43	0.21	0.24	0.19	0.17	-	-	-	-	7.5
6	3	7	7	7	3-5	39	0.17	0.18	0.17	0.17	-	-	-	-	7.5
6	3	7	7	7	10	39	0.17	0.18	0.19	0.17	-	-	-	-	7.5
6	3	7	7	7	15	38	0.22	0.24	0.24	0.17	-	-	-	-	7.5
6	3	7	7	7	20	38	0.28	0.31	0.31	0.17	-	-	-	-	7.5
6	3	7	7	7	25	38	0.35	0.38	0.39	0.17	-	-	-	-	7.5
6	3	7	7	7	30	38	0.42	0.46	0.46	0.17	-	-	-	-	7.5
6	4	8	7	7	<2	-	0.19	0.34	0.25	0.17	0.19	0.19	0.19	0.17	8.6
6	4	7	7	7	2<3	43	0.19	0.27	0.21	0.17	-	-	-	-	8.2
6	4	7	7	7	3-5	39	0.17	0.21	0.19	0.17	-	-	-	-	8.2
6	4	7	7	7	10	39	0.17	0.20	0.21	0.17	-	-	-	-	8.2
6	4	7	7	7	15	38	0.18	0.27	0.27	0.17	-	-	-	-	8.2
6	4	7	7	7	20	38	0.24	0.34	0.35	0.17	-	-	-	-	8.2
6	4	7	7	7	25	38	0.29	0.43	0.42	0.17	-	-	-	-	8.2
6	4	7	7	7	30	38	0.35	0.51	0.52	0.17	-	-	-	-	8.2
6	5	8	7	7	<2	-	0.19	0.37	0.28	0.17	0.19	0.19	0.19	0.17	9.3
6	5	7	7	7	2<3	43	0.17	0.30	0.24	0.17	-	-	-	-	8.9
6	5	7	7	7	3-5	43	0.17	0.23	0.21	0.17	-	-	-	-	8.9
6	5	7	7	7	10	39	0.17	0.22	0.23	0.17	-	-	-	-	8.9
6	5	7	7	7	15	38	0.17	0.28	0.29	0.17	-	-	-	-	8.9
6	5	7	7	7	20	38	0.20	0.37	0.38	0.17	-	-	-	-	8.9
6	5	7	7	7	25	38	0.25	0.45	0.46	0.17	-	-	-	-	8.9
6	5	7	7	7	30	38	0.30	0.54	0.55	0.17	-	-	-	-	8.9
6	6	8	7	7	<2	-	0.19	0.38	0.30	0.17	0.19	0.19	0.19	0.17	10.0
6	6	7	7	7	2<3	52	0.17	0.32	0.26	0.17	-	-	-	-	9.6
6	6	7	7	7	3-5	52	0.17	0.24	0.22	0.17	-	-	-	-	9.6
6	6	7	7	7	10	43	0.17	0.23	0.24	0.17	-	-	-	-	9.6
6	6	7	7	7	15	39	0.17	0.29	0.31	0.17	-	-	-	-	9.6
6	6	7	7	7	20	39	0.18	0.38	0.39	0.17	-	-	-	-	9.6
6	6	7	7	7	25	38	0.23	0.46	0.48	0.17	-	-	-	-	9.6
6	6	7	7	7	30	38	0.27	0.55	0.57	0.17	-	-	-	-	9.6

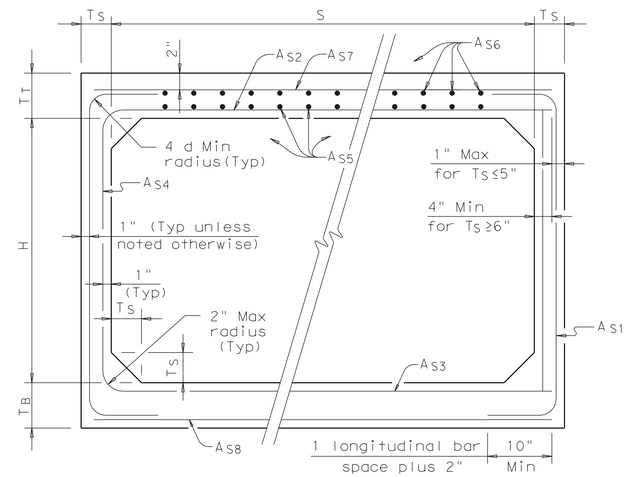
① For Box Length = 8'-0"

② A_{S1} thru A_{S4}, A_{S7} and A_{S8} are minimum required areas of reinforcement per linear foot of box length. A_{S6} and A_{S5} are minimum required areas of reinforcement per linear foot of box width.



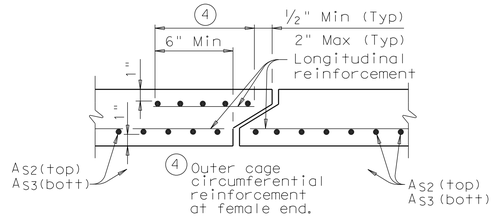
CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT



SECTION A-A

(TOP AND BOTTOM SLAB JOINT REINFORCEMENT)

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

All concrete shall be Class "H" Concrete with a minimum compressive strength of 5,000 psi.

See SCP-MD standard sheet for miscellaneous details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Shop plans for alternate designs shall be submitted in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

6'-0" SPAN

SCP-6

FILE: scp06sts.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.
				12

DATE:
FILE:

TABLE OF DIMENSIONS & REINFORCING STEEL
(Wings for One Structure End)

Dimensions					Variable Reinforcing				Estimated (3) Quantities per ft of wing length (2~Wings)	
					Bars J1		Bars J2			
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'- 8"	1'- 9"	1'- 3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'- 2"	2'- 0"	1'- 6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'- 8"	2'- 3"	1'- 9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'- 2"	2'- 6"	2'- 0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'- 8"	2'- 9"	2'- 3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'- 2"	3'- 0"	2'- 6"	9"	#7	6"	#5	6"	162.29	0.721
13'-0"	6'- 8"	3'- 3"	2'- 9"	11"	#7	6"	#5	6"	178.80	0.856
14'-0"	7'- 2"	3'- 6"	3'- 0"	1'- 0"	#8	6"	#5	6"	216.78	0.959
15'-0"	7'- 8"	4'- 0"	3'- 0"	1'- 1"	#9	6"	#6	6"	283.06	1.068
16'-0"	8'- 2"	4'- 6"	3'- 0"	1'- 3"	#9	6"	#6	6"	297.02	1.234

TABLE OF WINGWALL REINFORCING (2~Wings)

Bar	Size	No.	Spa
D	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
R	#5	6	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

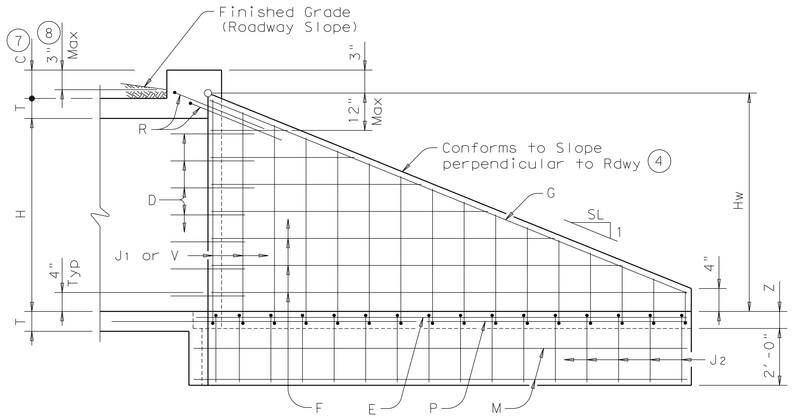
WING DIMENSION CALCULATIONS:

Formulas: (All values are in Feet)

Hw = H + T + C - 0.250'
A = (Hw - 0.333') (SL)
B = (A) Tangent (30°)
Lw = (A) ÷ Cosine (30°)
For Cast-in-place culverts:
Ltw = (N) (S) + (N + 1) (U)
For Precast culverts:
Ltw = (N) (2U + S) + (N - 1) (0.500')
Total Wingwall Area (Two Wings ~ S.F.) = (Hw + 0.333') (Lw)

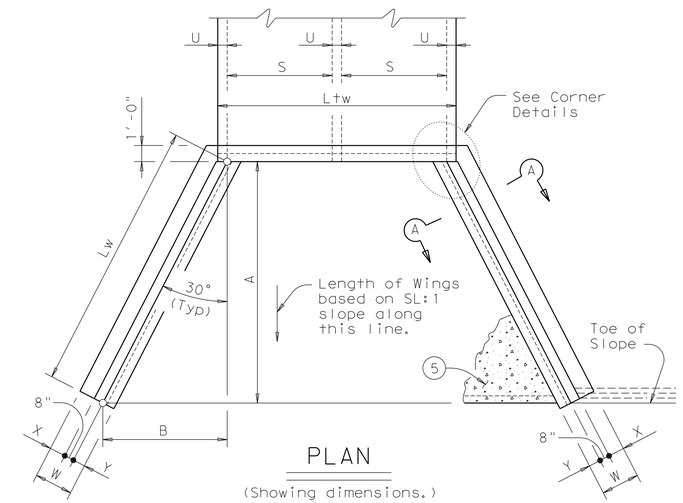
Hw = Height of Wingwall
SL:1 = Side Slope Ratio (Horizontal:1 Vertical)
Lw = Length of Wingwall
Ltw = Culvert Toewall Length
N = Number of Culvert Spans

See applicable box culvert standard for H, S, T, and U values.



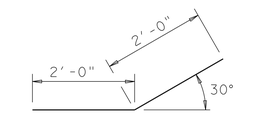
INSIDE ELEVATION

(Showing reinforcing. Culvert and Culvert Toewall reinforcing not shown for clarity.)

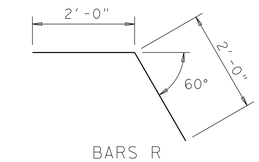


PLAN

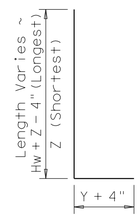
(Showing dimensions.)



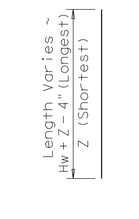
BARS D



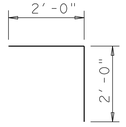
BARS R



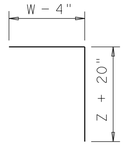
BARS J1



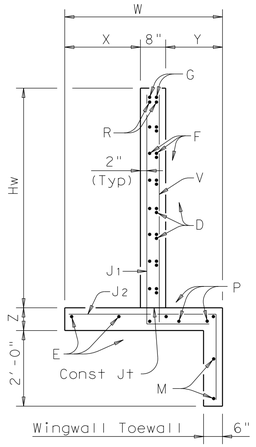
BARS V



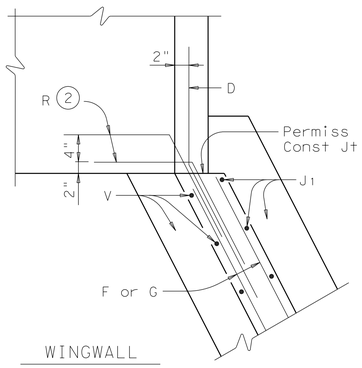
BARS L



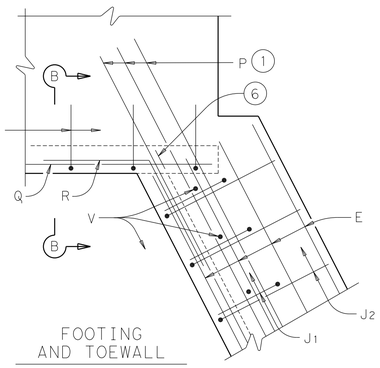
BARS J2



SECTION A-A



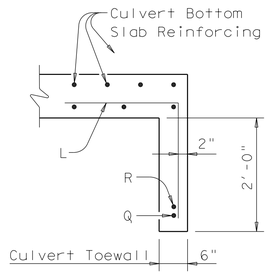
WINGWALL



FOOTING AND TOEWALL

CORNER DETAILS

(Culvert and Culvert Toewall reinforcing not shown for clarity.)



SECTION B-B 5

1. Extend Bars P 3'-0" minimum into bottom slab of Box Culvert.
2. Adjust to fit as necessary to maintain 1 ¼" clear cover and 4" minimum between bars.
3. Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by Lw.
4. Recommended values of Slope are: 2:1, 3:1, 4:1, & 6:1.
5. When shown elsewhere on the plans, a 5" deep concrete riprap shall be constructed. Payment for riprap shall be as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, the riprap shall have a 6" wide by 1'-6" deep reinforced concrete toewall along all edges adjacent to natural ground; the toewall shall be reinforced by extending typical riprap reinforcing into the toewall; construction joints or grooved joints, oriented in the direction of flow, shall extend across the full distance of the riprap, at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.
6. At Contractor's option, Culvert Toewall may be ended flush with Wingwall Toewall. Adjust reinforcing from that shown as necessary.
7. 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1'-0", refer to ECD standard. For structures with T6 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.
8. For vehicle safety, curb heights and wall heights shall be reduced, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.
All reinforcing steel shall be Grade 60.
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.
All reinforcing bars shall be adjusted to provide a minimum of 1 ¼" clear cover.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
See BCS sheet for additional dimensions and information.
The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.

Texas Department of Transportation

Bridge Division Standard

CONCRETE WINGWALLS
WITH FLARED WINGS FOR 0° SKEW BOX CULVERTS

FW-0

FILE: fw-0std.de.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
				13

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

TABLE OF DIMENSIONS & REINFORCING STEEL
(Wings for One Structure End)

Dimensions					Variable Reinforcing				Estimated (3) Quantities per ft of wing length (2~Wings)	
					Bars J1		Bars J2			
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)
2′-6"	2′- 5"	1′- 0"	9"	7"	#4	1′-0"	#4	1′-0"	33.73	0.248
3′-0"	2′- 5"	1′- 0"	9"	7"	#4	1′-0"	#4	1′-0"	37.07	0.261
3′-6"	2′- 5"	1′- 0"	9"	7"	#4	1′-0"	#4	1′-0"	37.74	0.273
4′-0"	2′- 5"	1′- 0"	9"	7"	#4	1′-0"	#4	1′-0"	38.41	0.285
4′-6"	3′- 2"	1′- 6"	1′- 0"	7"	#4	1′-0"	#4	1′-0"	41.75	0.330
5′-0"	3′- 2"	1′- 6"	1′- 0"	7"	#4	1′-0"	#4	1′-0"	45.09	0.343
5′-6"	3′- 2"	1′- 6"	1′- 0"	7"	#4	1′-0"	#4	1′-0"	45.75	0.355
6′-0"	3′- 2"	1′- 6"	1′- 0"	7"	#4	1′-0"	#4	1′-0"	46.42	0.367
7′-0"	3′- 8"	1′- 9"	1′- 3"	7"	#4	1′-0"	#4	1′-0"	52.77	0.414
8′-0"	4′- 2"	2′- 0"	1′- 6"	8"	#5	1′-0"	#4	1′-0"	60.19	0.486
9′-0"	4′- 8"	2′- 3"	1′- 9"	8"	#4	6"	#4	6"	81.49	0.535
10′-0"	5′- 2"	2′- 6"	2′- 0"	8"	#5	6"	#4	6"	97.25	0.584
11′-0"	5′- 8"	2′- 9"	2′- 3"	8"	#6	6"	#5	6"	133.65	0.634
12′-0"	6′- 2"	3′- 0"	2′- 6"	9"	#7	6"	#5	6"	162.29	0.721
13′-0"	6′- 8"	3′- 3"	2′- 9"	11"	#7	6"	#5	6"	178.80	0.856
14′-0"	7′- 2"	3′- 6"	3′- 0"	1′- 0"	#8	6"	#5	6"	216.78	0.959
15′-0"	7′- 8"	4′- 0"	3′- 0"	1′- 1"	#9	6"	#6	6"	283.06	1.068
16′-0"	8′- 2"	4′- 6"	3′- 0"	1′- 3"	#9	6"	#6	6"	297.02	1.234

TABLE OF WINGWALL REINFORCING (2~Wings)

Bar	Size	No.	Spa
D	#5	~	1′-0"
E	#4	~	1′-0"
F	#4	~	1′-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1′-0"
R	#5	6	~
V	#4	~	1′-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1′-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

WING DIMENSION CALCULATIONS:

Formulas: (All values are in Feet)

Hw = H + T + C − 0.250′

Lw = (Hw − 0.333′) (SL)

For Cast-in-place culverts:

Ltw = (N) (S) + (N + 1) (U)

For Precast culverts:

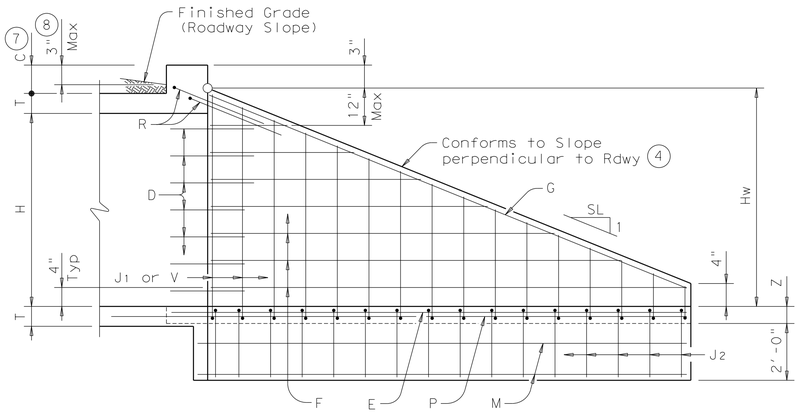
Ltw = (N) (2U + S) + (N − 1) (0.5′)

Total Wingwall Area (Two Wings ~ S.F.) = (Hw + 0.333′) (Lw)

Hw = Height of Wingwall
SL:1 = Side Slope Ratio (Horizontal:1 Vertical)
Lw = Length of Wingwall
Ltw = Culvert Toewall Length
N = Number of Culvert Spans

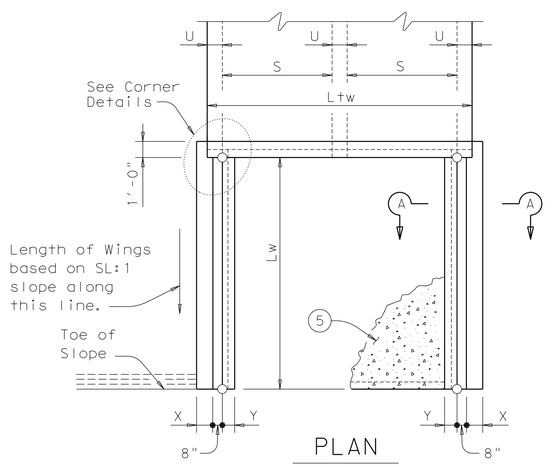
See applicable box culvert standard for H, S, T, and U values.

1. Extend Bars P 3′-0" minimum into bottom slab of Box Culvert.
2. Adjust to fit as necessary to maintain 1 ¼" clear cover and 4" minimum between bars.
3. Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by Lw.
4. Recommended values of Slope are: 2:1, 3:1, 4:1, & 6:1.
5. When shown elsewhere on the plans, a 5" deep concrete riprap shall be constructed. Payment for riprap shall be as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, the riprap shall have a 6" wide by 1′-6" deep reinforced concrete toewall along all edges adjacent to natural ground; the toewall shall be reinforced by extending typical riprap reinforcing into the toewall; construction joints or grooved joints, oriented in the direction of flow, shall extend across the full distance of the riprap, at intervals of approximately 20′. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.
6. At Contractor's option, Culvert Toewall may be ended flush with Wingwall Toewall. Adjust reinforcing from that shown as necessary.
7. 0" min to 5′-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1′-0", refer to ECD standard. For structures with T6 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.
8. For vehicle safety, curb heights and wall heights shall be reduced, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.



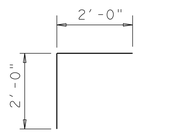
INSIDE ELEVATION

(Showing reinforcing. Culvert and Culvert Toewall reinforcing not shown for clarity.)

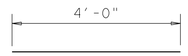


PLAN

(Showing Dimensions)



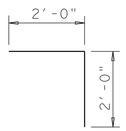
BARS R



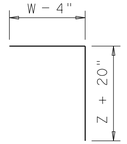
BARS D

BARS J1

BARS V



BARS L



BARS J2

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

All reinforcing steel shall be Grade 60.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

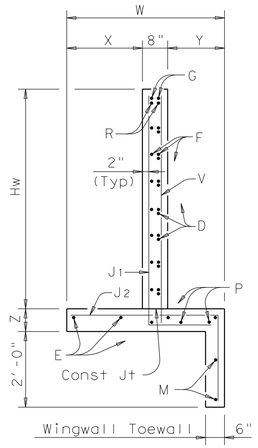
All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.

All reinforcing bars shall be adjusted to provide a minimum of 1 ¼" clear cover.

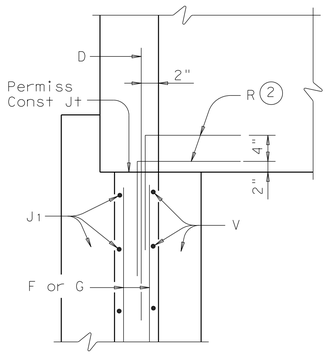
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.

See BCS sheet for additional dimensions and information.

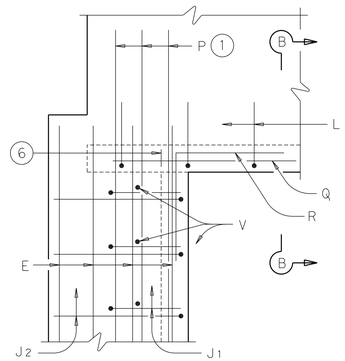
The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.



SECTION A-A

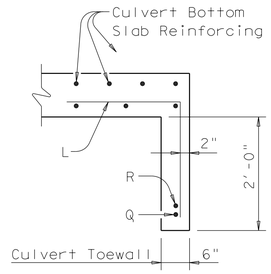


WINGWALL



FOOTING AND TOEWALL

CORNER DETAILS



SECTION B-B (5)

Texas Department of Transportation

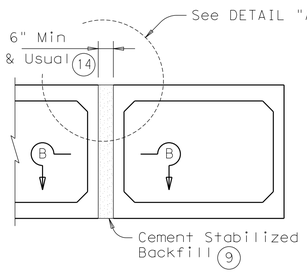
Bridge Division Standard

CONCRETE WINGWALLS
WITH STRAIGHT WINGS FOR 0° SKEW BOX CULVERTS

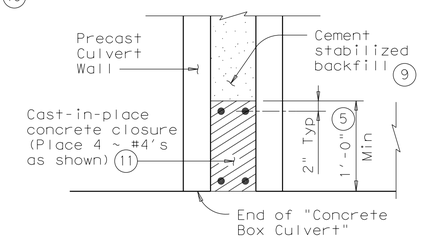
SW-O

FILE: sw-0std e.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
				14

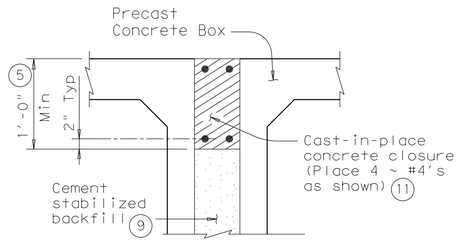
DATE:
FILE:



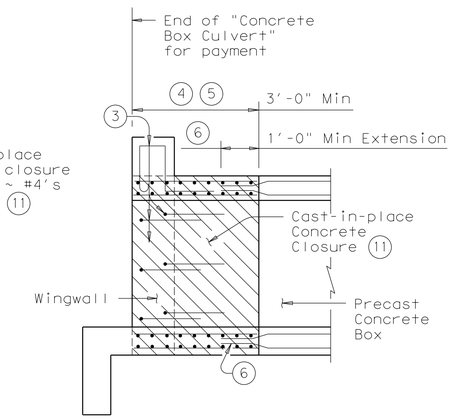
MULTIPLE UNIT PLACEMENT



SECTION B-B

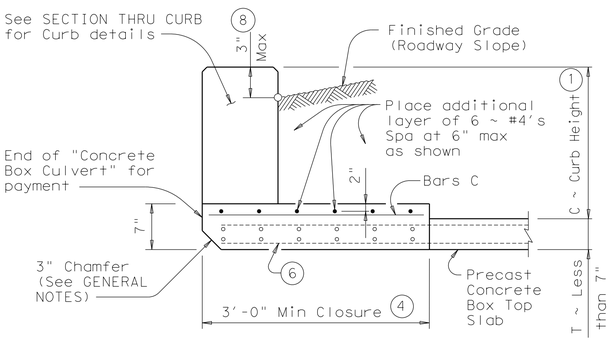


DETAIL "A" (13)

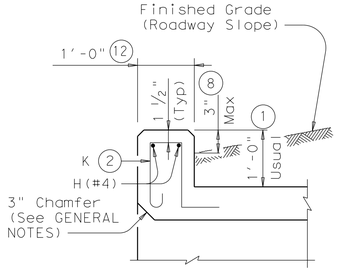


WINGWALL CONNECTION

(Also applies to Safety End Treatment)

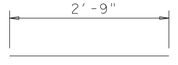


SECTION THRU TOP SLABS LESS THAN 7"

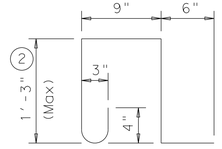


SECTION THRU CURB

(10) QUANTITIES PER FOOT OF CURB	
Reinforcing Steel	4.18 Lb
Concrete	0.037 CY



BARS C ~ #4
(Spa = 1'-0" Max)



BARS K ~ #4
(Spa = 1'-0" Max)
(Length = 4'-3")

1. 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1'-0", refer to ECD standard. For structures with T6 traffic rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.
2. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
3. Curb, Wingwall or Safety End Treatment reinforcing shall extend into concrete closure. Any reinforcing that does not fit into the closure shall be bent or trimmed as necessary.
4. Cast-in-place concrete closure shall be 3'-0" min. Boxes shall be cast short or broken back in the field. All reinforcing in the closure shall be the same size and spacing as in the precast box section. Except where shown otherwise, the cast-in-place closure shall be flush with the inside and outside faces of the precast box section.
5. For multiple unit placements the length of the closure for the interior walls may be adjusted as necessary. The length of the top slab, bottom slab, and exterior wall closure shall not be less than 3'-0". See Section B-B detail when interior walls are cast full length.
6. Precast box reinforcing shall extend a minimum of 1'-0" into concrete closure (Typ).
7. Bands of reinforcing matching the inside and outside face reinforcing shall be placed in the gaps of the top and bottom slabs. A band matching the outside face reinforcing of the wall shall be placed in the gaps of the walls (placed in the outside face only). The bands shall be tack welded to the exposed reinforcing at each point of contact.
8. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, curbs shall project no more than 3" above finished grade.
   - For structures with bridge rail, curbs shall be flush with finished grade.

   Curb heights shall be reduced, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
9. Cement Stabilized Backfill between boxes is considered part of the Box Culvert for payment.
10. All curb concrete and reinforcing is considered part of the Box Culvert for payment.
11. Any additional concrete and reinforcing required for the closures shall be considered as subsidiary to the Concrete Box Culvert.
12. 1'-0" typical. 2'-0" when RAC standard is referred to elsewhere in the plans.
13. For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in DETAIL "A".
14. This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes.

GENERAL NOTES:

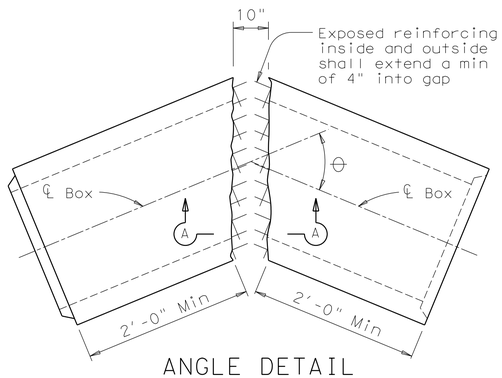
Designed according to AASHTO LRFD Specifications.

All closure concrete shall be Class "C" with a minimum compressive strength of 3600 psi and shall be placed according to the Item, "Concrete Substructures".

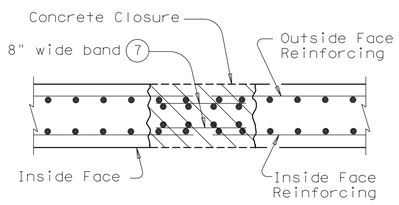
Any additional concrete required for the closures shall be considered as subsidiary to the Concrete Box Culvert.

Refer to the Single Box Culverts Precast standard for details not shown.

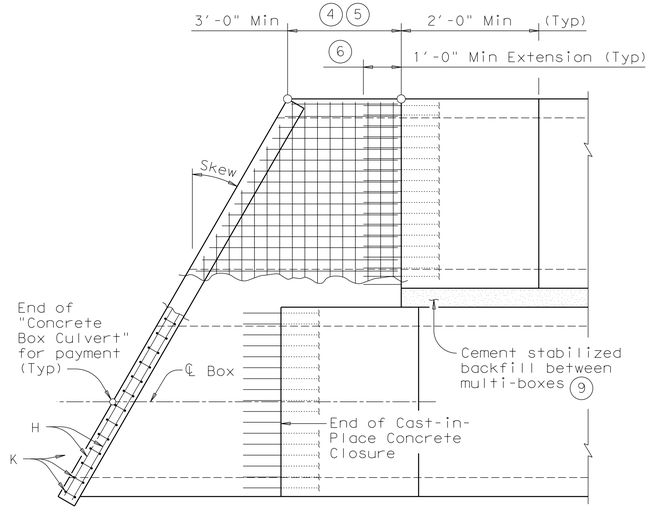
The bottom edge of the top slab closure shall be chamfered 3 inches at the entrance.



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement)

HL93 LOADING

Texas Department of Transportation

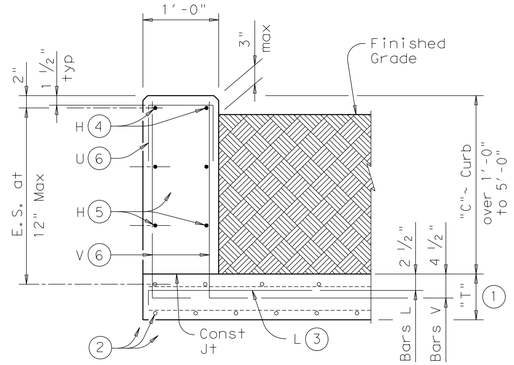
Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

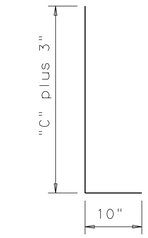
FILE: scpmdsts.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2010 REVISIONS	CONT	SECT	JOB	HIGHWAY
	DIST	COUNTY		SHEET NO.
				15

DATE:
FILE:



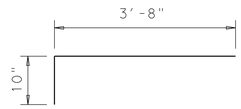
TYPICAL SECTION

Used for Curbs over 1'-0" to 5'-0"



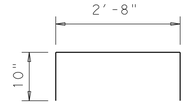
BARS V (#5) (6)

Spaced at 12" max



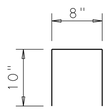
BARS L (#5) (3)

Spaced at 12" max



OPTIONAL BARS L (#5) (3) (7)

Spaced at 12" max



BARS U (#4) (6)

Spaced at 12" max

(1) "T" is equal to the culvert top slab thickness. For Precast Boxes with slabs less than 7", see SCP-MD Standard for additional details.

(2) Normal culvert slab bars adjusted as necessary to clear obstructions.

(3) Place bars L as shown. Tilt hook as necessary to maintain cover.

(4) Place normal culvert curb bars H (#4) as shown. Adjust as necessary to clear obstructions.

(5) Additional bars H (#4) as required to maintain 12" max spa.

(6) Replace normal culvert curb bars K with one bar U and two bars V as shown spaced at 12" max. Adjust length of bars V as necessary to maintain clear cover.

(7) Optional bars L are to be used only for precast box culverts with 3'-0" closure pour.

(8) Quantities shown are for contractor's information only. Quantities are per linear foot of curb length. The values for each section type in table can be interpolated for intermediate values of curb height, "C". Quantity includes bars K (when applicable).

TABLE OF ESTIMATED CURB QUANTITIES (8)

Curb Height "C"	Conc (CY/LF)	Reinf Steel (Lb/LF)
1'-0"	0.037	8.9
1'-6"	0.056	14.3
2'-0"	0.074	15.4
2'-6"	0.093	17.7
3'-0"	0.111	18.8
3'-6"	0.130	21.2
4'-0"	0.148	22.2
4'-6"	0.167	24.6
5'-0"	0.185	25.6

GENERAL NOTES:

Designed according to current AASHTO LRFD Specifications.

These extended curb details have sufficient strength to allow for future retrofit of Type T6 railing. These details are suitable for use with PR1, PR2 and PR3 type rails. These details are not suitable for the mounting of other rail types. For new construction using T6 railing, use the T6-CM standards.

All reinforcing shall be Grade 60. Adjust reinforcing as necessary to provide 1 ¼" cover.

All concrete for curbs shall be Class "C" with a minimum compressive strength of 3600 psi.

This Curb shall be considered as part of the Box Culvert for payment.

For vehicle safety, the top of the curb shall project no more than 3" above the finished grade.

Texas Department of Transportation

Bridge Division Standard

EXTENDED CURB DETAILS

FOR BOX CULVERTS WITH CURBS OVER 1'-0" TO 5'-0" TALL

ECD

FILE: ecdstde1.dgn	DN: GAF	CK:	DW: TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.
				16