# ASH STREET RECONSTRUCTION
# OKLAHOMA ST. TO PRESTON RD.
# (C.I.P. #P-201401-01 )

*MAYOR*
SEAN TERRY

*MAYOR PRO TEM*
CARMEN ROBERTS

*CITY COUNCIL*
GEORGE KENDRICK
CHAD ANDERSON
WAYNE NABORS
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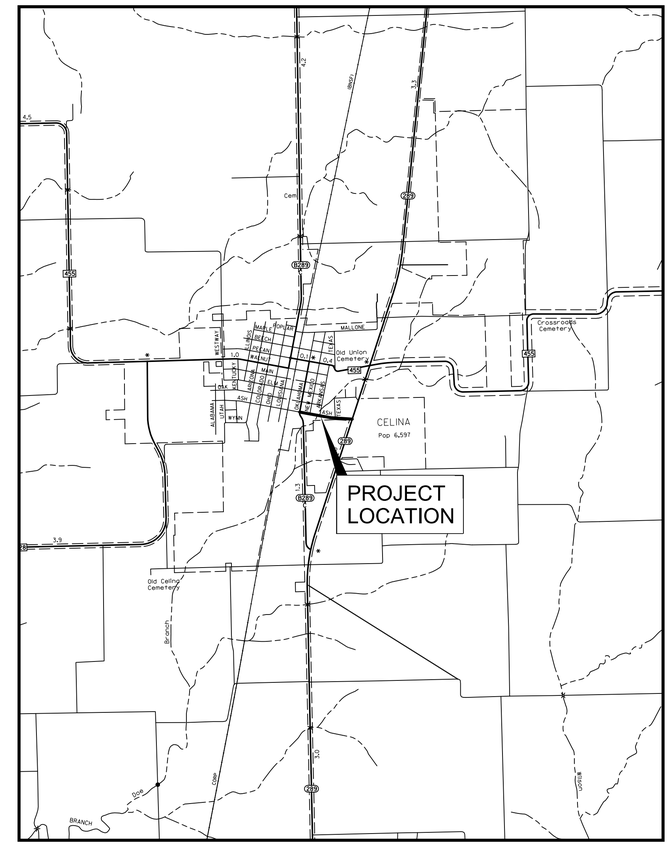
*PUBLIC WORKS DIR.*
JOSEPH JOHNSON

*CITY MANAGER*
MIKE FOREMAN

*CITY ENGINEER*
GABE JOHNSON, P.E., P.H., CFM

## Location Map




LOCATOR MAP
PROJECT LENGTH 0.5 MILES
N.T.S.

REFER TO INDEX OF SHEETS, NEXT PAGE.

RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

HALFF
2080 NORTH S.H. 360, SUITE 350
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ASH STREET RECONSTRUCTION C.I.P. #P-201401-01

City of Celina

CONSTRUCTION GENERAL NOTES - Revised 8/12/2013

GENERAL

1. All construction shall be in accordance with the latest revision of the North Central Texas Council of Governments "Standard Specifications for Public Works Construction" including the Standard Drawings therein and the City of Celina's addendum thereto. Contractor shall have at least one set of approved Engineering Plans and Specifications on-site at all times.

2. Before beginning construction, the contractor shall prepare a construction sequence schedule. The construction schedule shall be such that there is minimum interference with traffic along or adjacent to the project.

3. Construction may not begin earlier than 7:00 A.M. on weekdays nor continue after dark without permission from the City of Celina. Construction on holidays and Saturday must be approved two days in advance. A fee of $300.00 a day for working on holidays and Saturday will be accessed payable to the city before work is performed. Work may not begin before 8:00 A.M. on holidays and Saturday and work on Sunday is prohibited without special permission and payment of fees.

4. Utilities shown on the plans were taken from field surveys and information provided by the utility companies. The completeness and the accuracy of this data is not guaranteed. The contractor is responsible for verifying the location of all underground utilities and structures and protecting them from damage during construction. It will be the responsibility of each contractor to protect all existing public and private utilities throughout the construction of this project. Contractor shall contact the appropriate utility companies for line location prior to commencement of construction and shall assume full liability to those companies for any damages caused to their facilities.

| | |
|---|---|
| DIG TESS | 800-DIG-TESS |
| GCEC-TELECOM | 903-482-7274 |
| GCEC-ELECTRIC | 903-821-3007 |
| AT&T | 972-569-3013 |
| ATMOS ENERGY | 972-881-4161 |
| ATMOS ENERGY | 214-341-9900 |
| CROSSTEX ENERGY | 817-570-6753 |
| ONEOK | 903-257-6594 |
| COSERV-ELEC | 940-321-7800 |
| COSERV-GAS | 940-321-7800 |
| CITY OF CELINA | 972-382-2682 |
| TOWN OF PROSPER | 972-347-9969 |
| MARILEE SUD | 972-382-3222 |
| GRANDE | 972-410-0583 |
| SUDDEN LINK | 469-853-0486 |

5. Work may not be backfilled or covered until the City has inspected it.

6. Material testing shall be performed by an independent testing laboratory and paid for by the Contractor. The following material tests shall be provided by the Contractor:

   a. Embankment - One soil density test shall be performed at each location for each 500 C.Y. of backfill placed.

   b. Pavement Sub grade - One gradation test (where lime stabilized) and one soil density test shall be performed for each 300 linear feet of pavement unless otherwise noted. Gradations must pass 100% through a 1¾" sieve and 60% through a #4 sieve.

   c. Utility Trench Backfill - One soil density test shall be performed at 300 feet intervals or as directed by the Inspector.

   d. Concrete Tests:

      1) Compressive Strength - Four test cylinders shall be taken from a representative portion of the concrete being placed for every 150-cubic yards of concrete pavement placed, but in no case shall less than 2 sets of cylinders be taken from any one day's placement.)

      2) Air, slump, and temperature tests shall be taken for every set of cylinders made. Concrete with a temperature above 95° F will be rejected.

      3) Additional cylinders and/or tests may be required at the Inspector's discretion.

   e. The City shall select the location and depth of each soil density test unless otherwise directed.

7. All excavation on the project is unclassified.

8. Temporary erosion control shall be used to minimize the spread of silt and mud from the project on to existing streets, alleys, drainage ways and public and private property. Temporary erosion controls may include silt fences, rock check dams, stabilized construction entrances, straw bales, berms, dikes, swales, strips of undisturbed vegetation, check dams and other methods as required by the City Manager or his representative and shall conform to the Storm Water Quality Best Management Practices for Construction Activities as published by the North Central Texas Council of Governments and the City of Celina Erosion and Sediment Control Manual.

9. Finished slopes on public rights-of-way and easements shall not be steeper than 4:1. All slopes steeper than 6:1 shall be covered with erosion control matting and are hydro mulched and maintained by the contractor until grass covers all parts of the slope.

10. The contractor shall maintain one-way traffic at all times along the project. An approved suggested Traffic Control and Detour Plan are provided with the plans. Deviations or alterations made to this plan by a Licensed Professional Engineer will require approval from the City.

11. Remove, salvage and replace all street and traffic control signs, which may be damaged by the construction of the project. Signs to be reused can be stored at the City's Public Work Service Center at 107 E. Elm.

12. All trenching and excavation shall be performed in accordance with OSHA standards. Trench safety design will be the responsibility of the Contractor. Contractor shall submit a trench safety design approved by a professional engineer to the City for review prior to the start of any underground utility construction.

PAVING

1. All embankments shall be compacted to 95% Standard Proctor density.

2. All streets and alleys shall be placed on lime stabilized sub grade with a lime content of not less than 7% or as approved by city engineer.

3. The minimum 28 day compressive strength of concrete street paving shall not be less than 3600 psi and shall be air entrained. Water may not be applied to the surface of concrete paving to improve workability.

4. All curb and gutter shall be integral with the pavement.

5. Parabolic crowns are required on all street pavements except on major thoroughfares where straight sections are required.

6. Streets and alleys shall be constructed with provisions for sidewalk ramps at all intersections.

DRAINAGE

1. Storm sewer pipe shall be reinforced concrete, Class III unless otherwise noted.

2. All structural concrete shall be Class "C" (3600 psi compressive strength at 28 days), air entrained.

3. The contractor shall install plugs in storm sewer lines or otherwise prevent mud from entering the storm sewer system during construction.

WATER AND SANITARY SEWER

1. Water mains shall be AWWA C-900 or 905 PVC Class 200 unless otherwise noted. Minimum cover for waterlines is 48" below top of curb, 60" where no curbed street is present or as required to clear existing utilities, whichever is greater. Class B+ embedment unless otherwise noted.

2. All utility trench backfill shall be performed in 12" loose lifts and mechanically compacted with approved vibratory methods.

3. Marking tape shall be installed one foot above and over PVC water lines.

4. Fittings for PVC water lines shall be ductile iron and be encased in a polyethylene sheath.

5. All Mechanical Joints will be restrained. (Mega-Lug etc.)

6. Valves, including tapping valves shall be resilient seat gate valves, unless noted otherwise.

7. All direct burial valves shall be provided with cast iron valve boxes with PVC stacks. Valve stacks shall be vertical and concentric with the valve stem. Stainless steel valve extensions are required on all valves where the operating nut is greater than 4 feet below finished grade.

8. Fire hydrants shall be Waterous or equal as directed or approved by the City of Celina on a case by case basis and field painted silver with bonnet and caps color-coded to pipe size.

   a. Six inch line- silver body with RED bonnet and caps.

   b. Eight inch line- silver body with BLUE bonnet and caps.

   c. Ten inch line- silver body with GREEN bonnet and caps.

   d. Twelve inch and larger- silver body with YELLOW bonnet and caps.

9. All exposed bolting on any buried equipment or material shall be stainless steel. Included are:

   a. Bonnet and stuffing box bolts on valves.

   b. Shoe bolts on fire hydrants.

   c. Flange bolts.

   d. "Cor-ten" mechanical joint "T" bolts are acceptable for direct burial service.

10. Depending on meter size; meter boxes shall be DFW37C-12-1SAF, DFW38C-14-1SAF, DFW65C-14-1SAF, or approved equal, and shall incorporate the Celina logo in the lid.

11. One sample station shall be provided to the city for every 250 connections.

12. Sanitary sewer mains shall be DR 35 PVC. Embedment shall be Class H unless otherwise noted.

13. The contractor shall install and maintain watertight plugs in all connections to the City's sanitary sewer system until the City accepts the project.

14. All sanitary sewer lines and manholes shall be leak tested before the project is accepted.

15. Deflection testing of PVC sewer lines is required. Deflection shall be tested with a mandrel for 5% deflection.

16. All sewer lines shall be video inspected with a copy of the video and station report submitted to the Inspector.

17. Mandrel, Air Test, and Video inspection shall not be performed until all utilities are complete, in place, and backfilled.

18. Specifications are not meant to exclude any other manufacturer. Any specification may be replaced with an approved equal upon approval by the City of Celina.


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| 5 | Traffic Control Plan - Phase II |
| 6 | Pavement Construction Sequence for Streets with Driveways |
| 7 | Ash Street Demolition Plan |
| 8 | Baseline Layout and Survey Control Sta 10+00 to Sta 19+00 |
| 9 | Baseline Layout and Survey Control Sta 19+00 to End |
| 10 | Typical Sections |
| 11 | Ash Street Paving Plan and Profile Sta 10+00 to Sta 14+50 |
| 12 | Ash Street Paving Plan and Profile Sta 14+50 to Sta 19+00 |
| 13 | Ash Street Paving Plan and Profile Sta 19+00 to Sta 23+50 |
| 14 | Ash Street Paving Plan and Profile Sta 23+50 to Sta 28+00 |
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| 26 | Storm Drain Lines 'A' and 'B' Plan and Profile |
| 27 | Storm Drain Line 'C' Plan and Profile Sta 1+00 to Sta 5+50 |
| 28 | Storm Drain Line 'C' Plan and Profile Sta 5+50 to Sta 10+00 |
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RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

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| Revision | | |
|---|---|---|
| No. | Description | Date |
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General Notes and Sheet Index

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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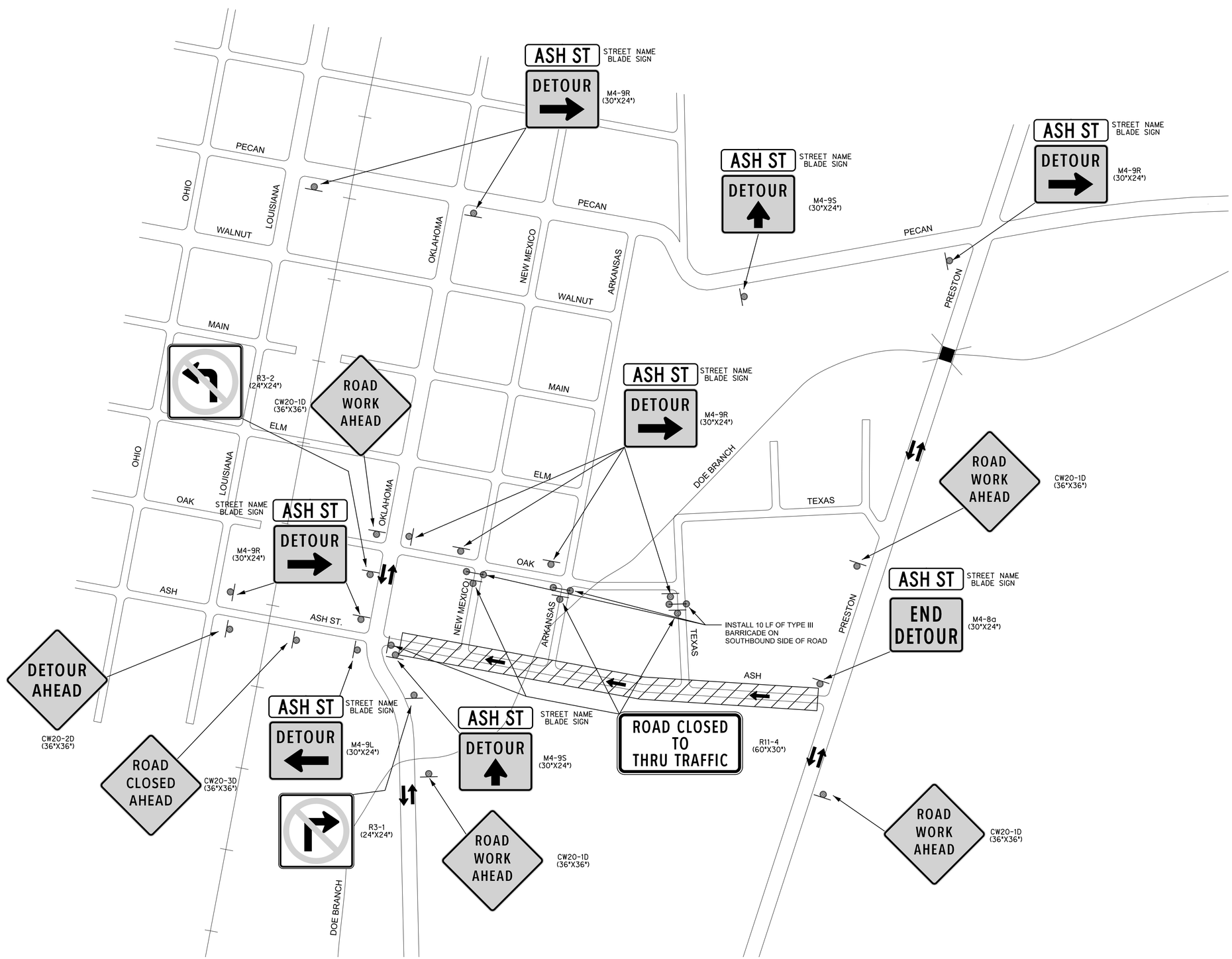


## TRAFFIC CONTROL LEGEND:

- CONCRETE PAVEMENT AND UTILITY CONSTRUCTED IN THIS PHASE
- TRAFFIC FLOW DIRECTION
- CONSTRUCTION SIGN
- TYPE 3 BARRICADE

Detour Notes:

1. All temporary traffic control measures and traffic control devices and placement shall conform to the 'Texas Manual on Uniform Traffic Control Devices', latest edition, Part V in particular.
2. Refer to Suggested Traffic Control Plan Phase I & II for additional information.
3. The roadway shall be constructed one side at a time, contractor shall maintain a minimum of 1 travel lane (westbound direction) at all times, unless otherwise approved by the City Engineer.
4. This Detour Plan is schematic is in intended to provide guidance to the Contractor. The contractor shall provide modified detour/traffic control plans prepared by a Licensed Engineer to the City for review as required for their work.

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Revision

| No. | Description | Date |
|---|---|---|
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Ash Street

Detour Plan

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

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TBPE FIRM #F-312

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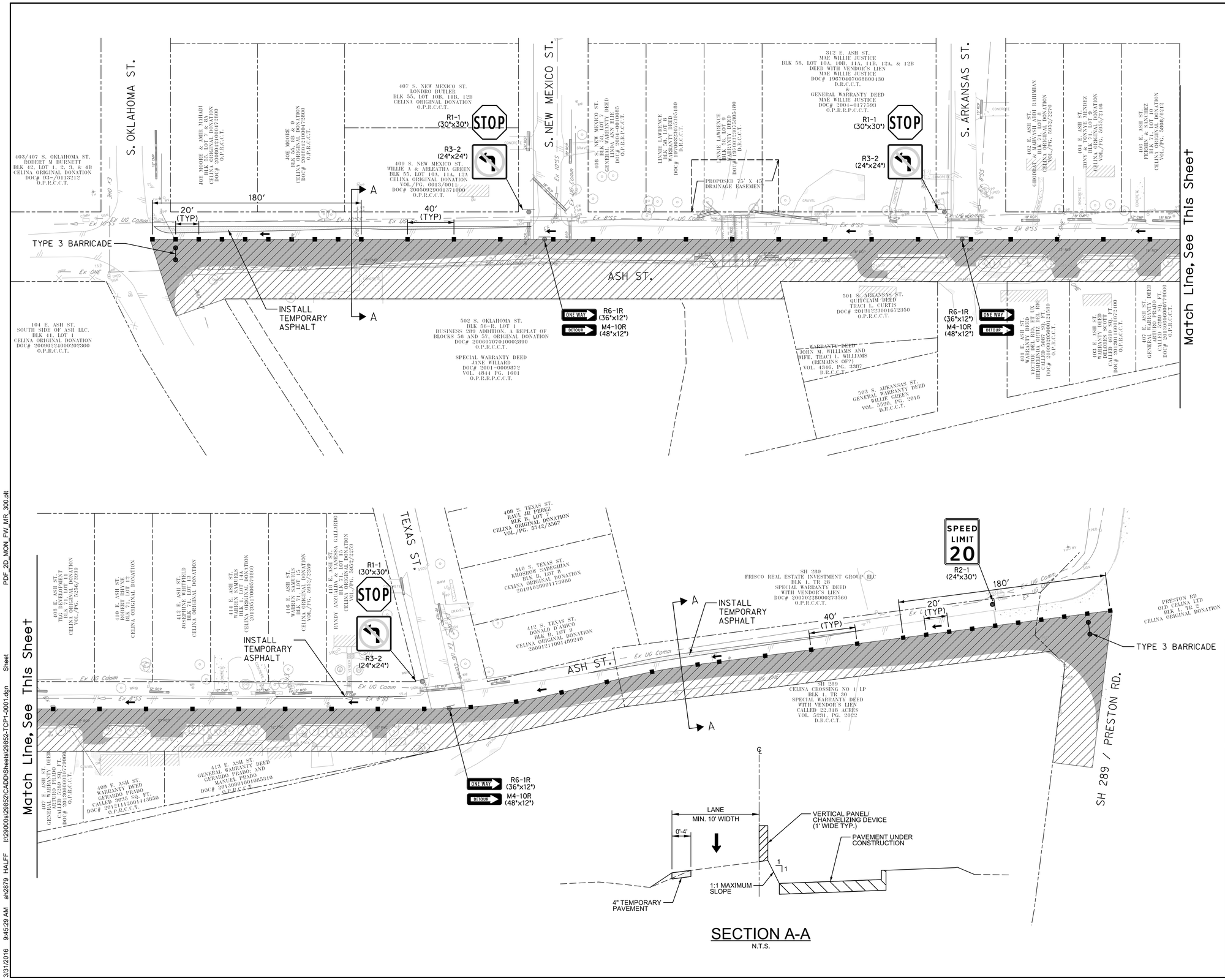


N

SCALE: 1"=40'

## LEGEND

- PERMANT SURFACE THIS PHASE
- WORK AREA THIS PHASE
- 4" TEMPORARY ASPHALT PAVEMENT (TYPE B)
- TYPE 3 BARRICADE
- TRAFFIC SIGN
- VERTICAL PANEL/ CHANNELIZING DEVICE

Traffic Control Notes:

1. All temporary traffic control measures and traffic control devices and placement shall conform to the 'Texas Manual on Uniform Traffic Control Devices', latest edition, Part VI in particular.
2. This plan is not encompassing of all potential phases, construction required, or contractor preferred work sequence. All major deviations from this plan or additional phasing will require a Temporary Traffic Control Plan prepared by a licensed engineer, and be reviewed and approved by the City Engineer.
3. Refer to TXDOT Stds. BC(4)-13 through BC(11)-13 for additional information.
4. Contractor shall maintain a minimum of 1-10' travel lane (plus vertical panels) at all times.
5. Contractor shall ensure that access to all driveways at all times. Contractor may stage driveway construction as shown on the "Pavement Construction Sequence for Streets with Driveways' sheet included with these plans.

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Revision

| No. | Description | Date |
|---|---|---|
| 1 | SCALE CORRECTION | 10/29/2014 |
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| | | |

# Traffic Control Plan

## Phase I

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

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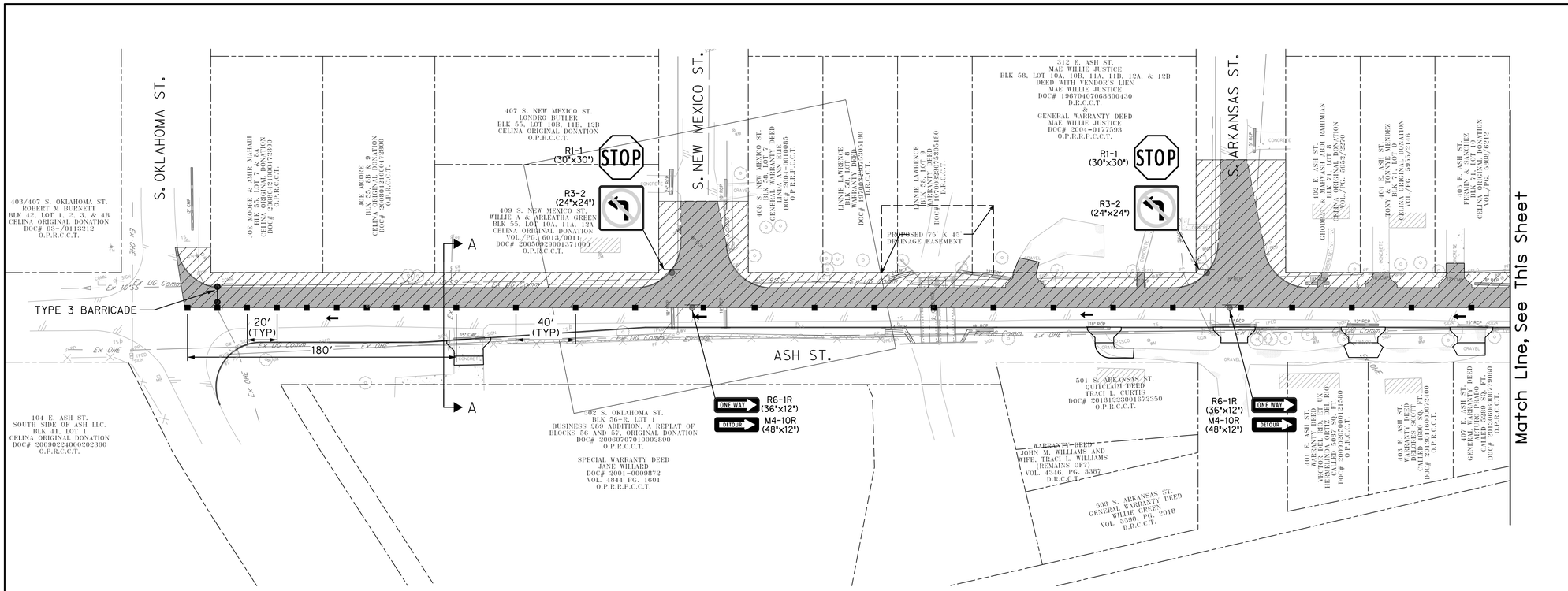
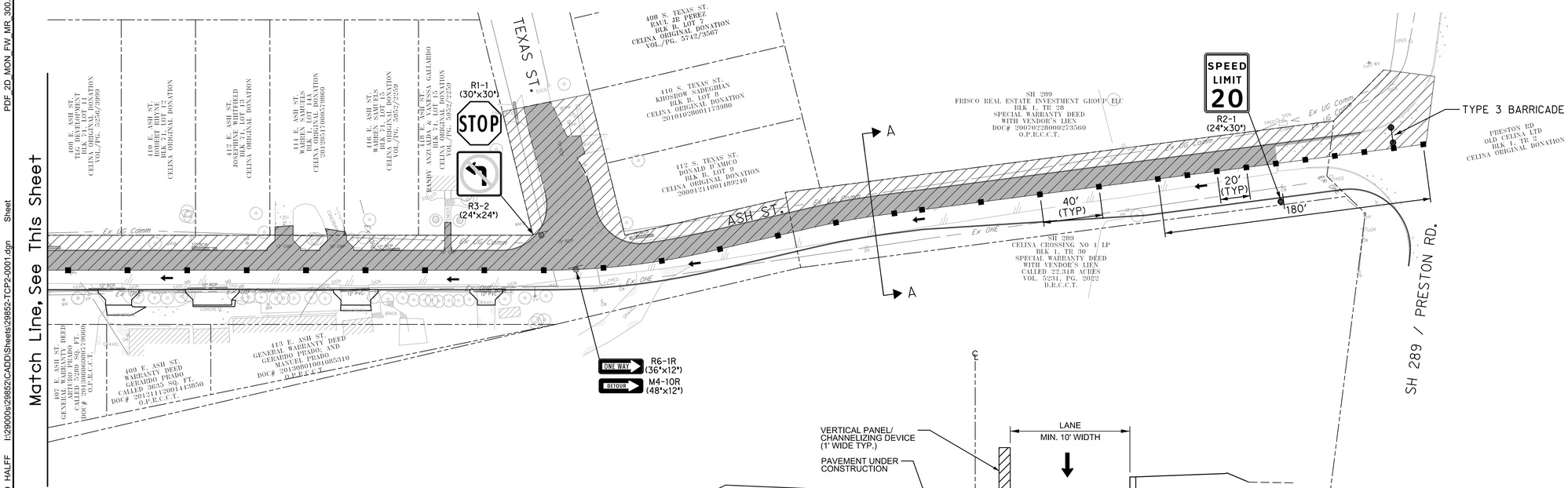
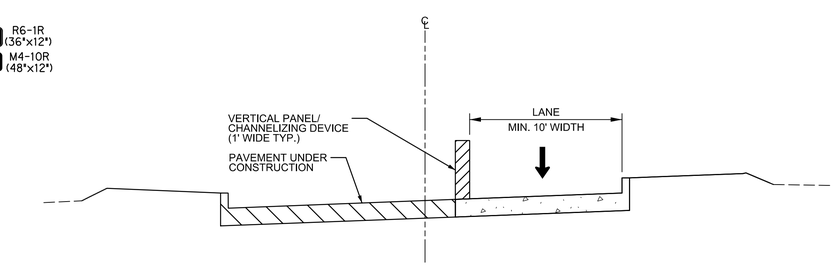
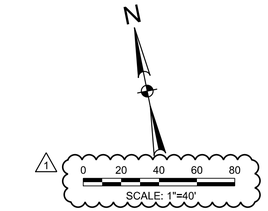



## SECTION A-A

N.T.S.




## LEGEND

- PERMANT SURFACE THIS PHASE
- WORK AREA THIS PHASE
- PERMANENT PAVEMENT PREVIOUS PHASE
- TYPE 3 BARRICADE
- TRAFFIC SIGN
- VERTICAL PANEL/ CHANNELIZING DEVICE

Traffic Control Notes:

1. All temporary traffic control measures and traffic control devices and placement shall conform to the 'Texas Manual on Uniform Traffic Control Devices', latest edition, Part VI in particular.
2. This plan is not encompassing of all potential phases, construction required, or contractor preferred work sequence. All major deviations from this plan or additional phasing will require a Temporary Traffic Control Plan prepared by a licensed engineer, and be reviewed and approved by the City Engineer.
3. Refer to TXDOT Stds. BC(4)-13 through BC(11)-13 for additional information.
4. Contractor shall maintain a minimum of 1-10' travel lane (plus vertical panels) at all times.
5. Contractor shall ensure that access to all driveways at all times. Contractor may stage driveway construction as shown on the "Pavement Construction Sequence for Streets with Driveways' sheet included with these plans.

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Revision

| No. | Description | Date |
|---|---|---|
| 1 | SCALE CORRECTION | 10/29/2014 |
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# Traffic Control Plan

## Phase II

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

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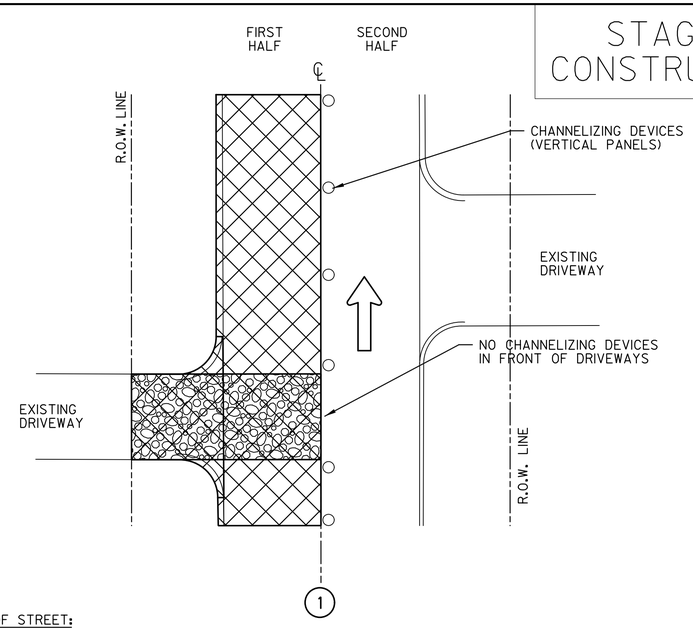
# STAGE 1 CONSTRUCTION



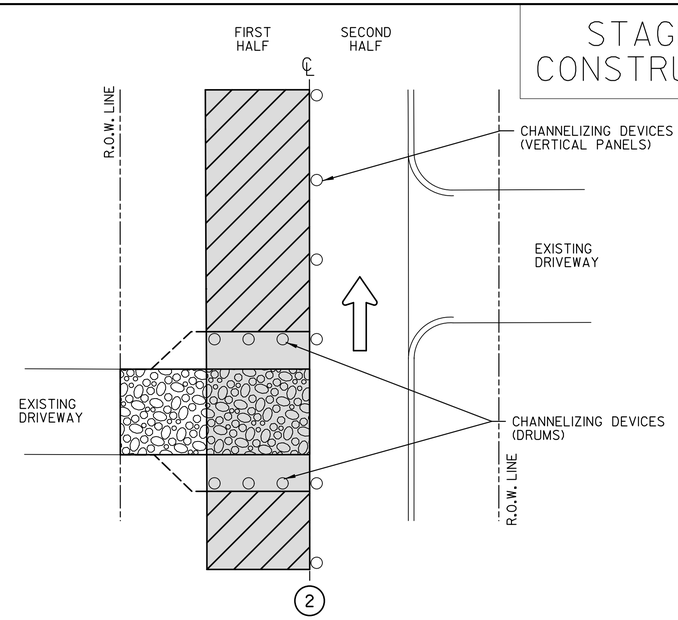

FIRST HALF OF STREET:

1. INSTALL TRAFFIC CONTROL DEVICES
2. PAVEMENT REMOVAL
3. GRAVEL PLACED AT DRIVE
4. INSTALLATION OF STORM DRAINAGE
5. NO THROUGH TRAFFIC
6. NO STREET PARKING
7. ACCESS TO DRIVEWAYS MAINTAINED

SECOND HALF OF STREET:

1. EXIST PAVEMENT REMAINS
2. ONE-WAY TRAFFIC
3. NO STREET PARKING
4. ACCESS TO DRIVEWAYS

# STAGE 2 CONSTRUCTION



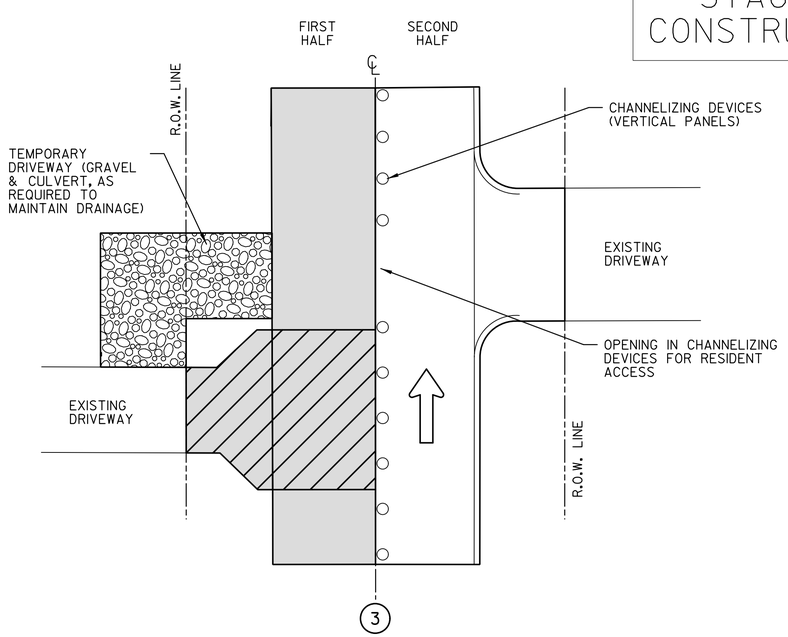

FIRST HALF OF STREET:

1. PAVEMENT CONSTRUCTION. NO VEHICLES ON PAVEMENT FOR A MINIMUM OF 72 HOURS AFTER CONCRETE POURED.
2. ACCESS TO DRIVEWAYS MAINTAINED
3. NO STREET PARKING

SECOND HALF OF STREET:

1. EXIST PAVEMENT REMAINS
2. ONE-WAY TRAFFIC
3. NO STREET PARKIING
4. ACCESS TO DRIVEWAYS

# STAGE 3 CONSTRUCTION



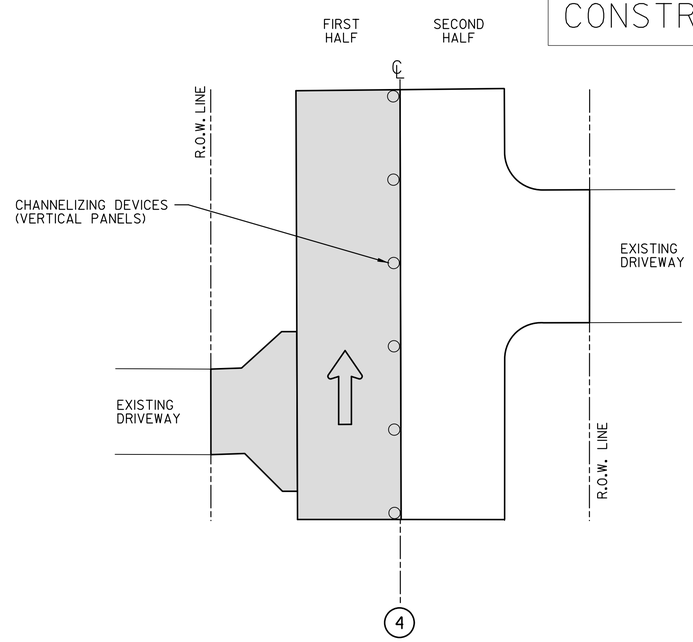

FIRST HALF OF STREET:

1. DRIVEWAY CONSTRUCTION
2. CONSTRUCT TEMPORARY GRAVEL DRIVEWAY TO PROVIDE ACCESS TO RESIDENT.
3. NO VEHICLES ON PAVEMENT FOR A MINIMUM OF 72 HOURS AFTER CONCRETE POURED.

SECOND HALF OF STREET:

1. EXIST PAVEMENT REMAINS
2. ONE-WAY TRAFFIC
3. NO STREET PARKIING
4. ACCESS TO DRIVEWAYS

# STAGE 4 CONSTRUCTION




FIRST HALF OF STREET:

1. REMOVE TEMPORARY GRAVEL DRIVEWAY AFTER PAVEMENT DRIVEWAY COMPLETED

SECOND HALF OF STREET:

1. REPEAT FIRST HALF OF STREET STAGES 1-4 FOR CONSTRUCTION OF SECOND HALF OF STREET.

## LEGEND

- PAVEMENT REMOVAL
- PAVEMENT UNDER CONSTRUCTION
- TEMPORARY GRAVEL DRIVE
- COMPLETED CONSTRUCTION

NOTES:

1. CONTRACTOR SHALL MAINTAIN ACCESS TO EXISTING DRIVEWAYS UNTIL DRIVEWAY IS CONSTRUCTED.

2. CONTRACTOR TO ALLOW PARKING FOR RESIDENTS ON COMPLETED ROADWAY IN FRONT OF RESIDENT PROPERTY UNTIL DRIVEWAY COMPLETED.

3. NO VEHICLES ON PAVEMENT FOR A MINIMUM OF 72 HOURS AFTER CONCRETE POURED.

4. TEMPORARY DRIVEWAY (INCLUDING GRAVEL AND CULVERT) IS SUBSIDARY TO THE CONCRETE PAVING BID ITEM.

RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312



| Revision | | |
|---|---|---|
| No. | Description | Date |
| | | |
| | | |
| | | |

Pavement Construction Sequence

For Streets With Driveways

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 6 |

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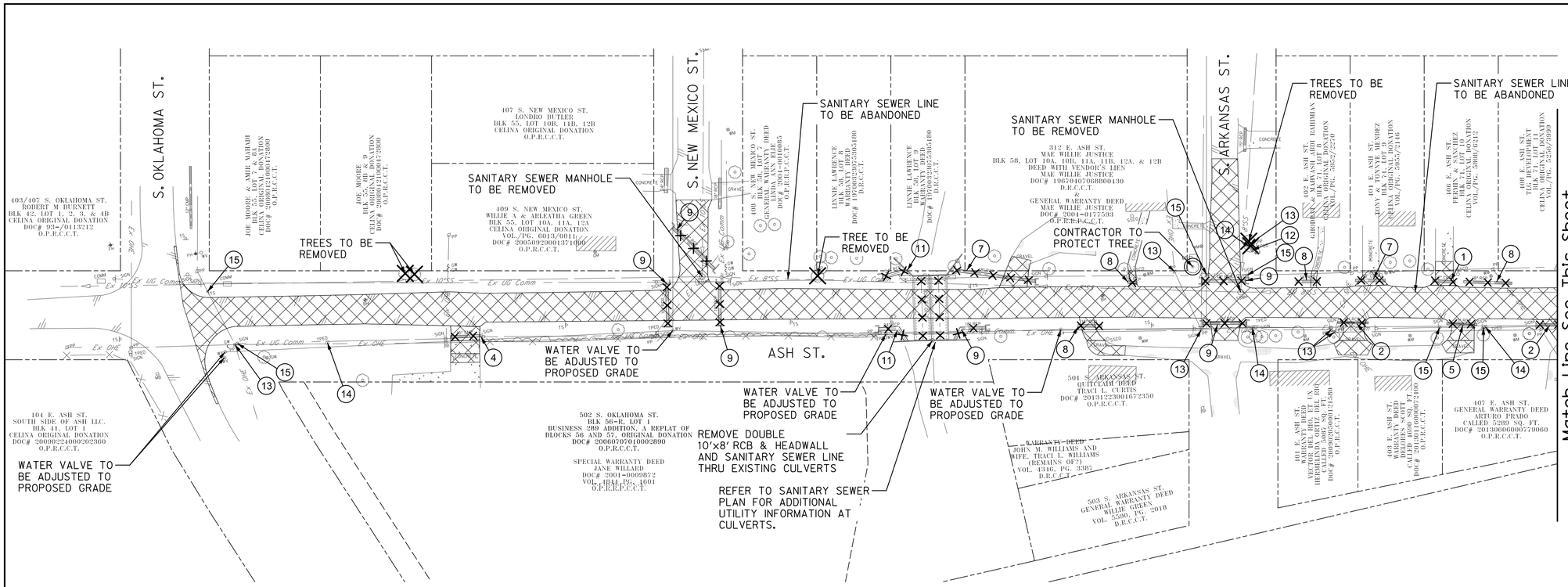
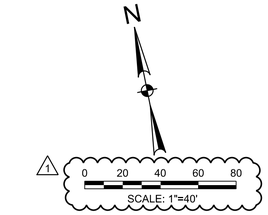
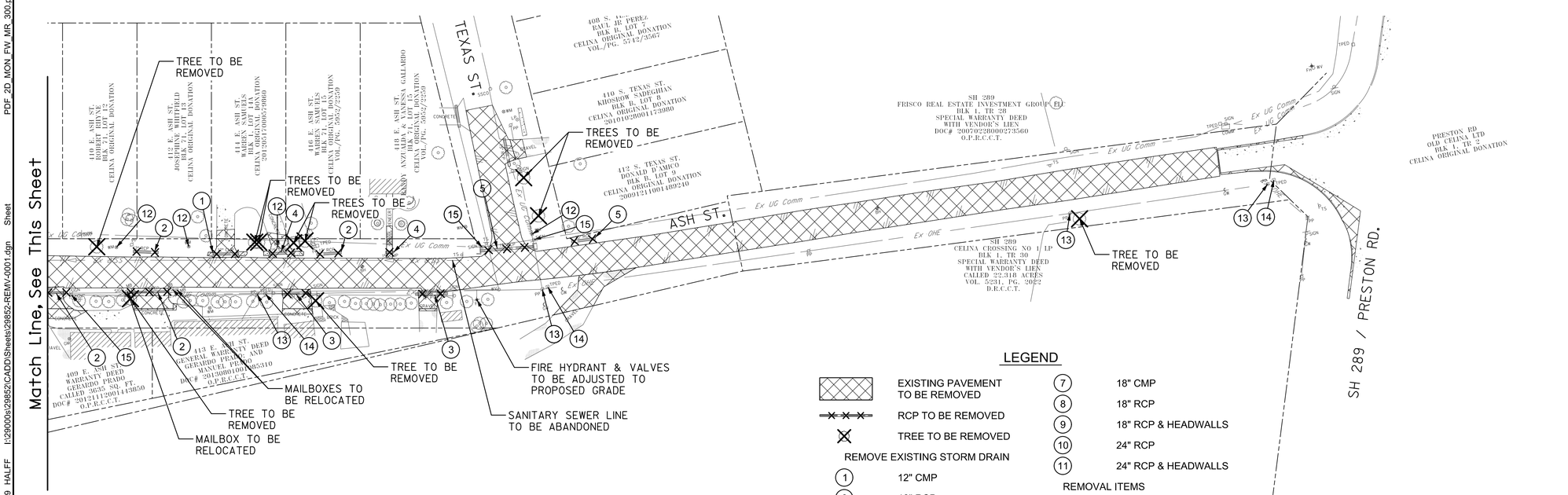



Removal Notes:

1. All items shown to be removed, demolished, salvaged, or relocated by the Contractor unless specifically identified as work by Others.
2. Demolition Plan elements and quantities are approximate and are intended to provide guidance to Contractor. Demolition work shall be paid for under the Roadway or Site Preparation bid item. Any additional demolition required for the construction of this project shall be subsidiary to the roadway or site preparation bid item.
3. Traffic signs to be salvaged , reused and relocated to be stored at Celina's Public Works Service Center at 107 E. Elm. Contact Public Works Director for coordination and access.
4. Refer to Suggested Traffic Control Plans for project phasing.
5. Contractor shall document the project area prior to commencing work and shall provide copies of videos, notes and other material to the City's representative. Damage to private property, or other items not specifically required to be removed for roadway construction shall be repaired or replaced to the Owner's satisfaction at no additional cost.




## LEGEND

| | |
|---|---|
| | EXISTING PAVEMENT TO BE REMOVED |
| | RCP TO BE REMOVED |
| | TREE TO BE REMOVED |

REMOVE EXISTING STORM DRAIN

| | |
|---|---|
| 1 | 12" CMP |
| 2 | 12" RCP |
| 3 | 12" PVC |
| 4 | 15" CMP |
| 5 | 15" RCP |
| 6 | 15" RCP & HEADWALLS |
| 7 | 18" CMP |
| 8 | 18" RCP |
| 9 | 18" RCP & HEADWALLS |
| 10 | 24" RCP |
| 11 | 24" RCP & HEADWALLS |

REMOVAL ITEMS

| | |
|---|---|
| 12 | WATER METER TO BE RELOCATED |
| 13 | POWER POLE TO BE RELOCATED BY OTHERS |
| 14 | TELEPHONE PEDESTAL TO BE RELOCATED BY OTHERS |
| 15 | TRAFFIC SIGN TO BE RELOCATED |

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Design Consultant: Halff Associates Inc. TBPE # F-312

7 / 75

| Revision | | |
|---|---|---|
| No. | Description | Date |
| 1 | SCALE CORRECTION | 10/29/2014 |

Ash Street

Demolition Plan

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 7 |

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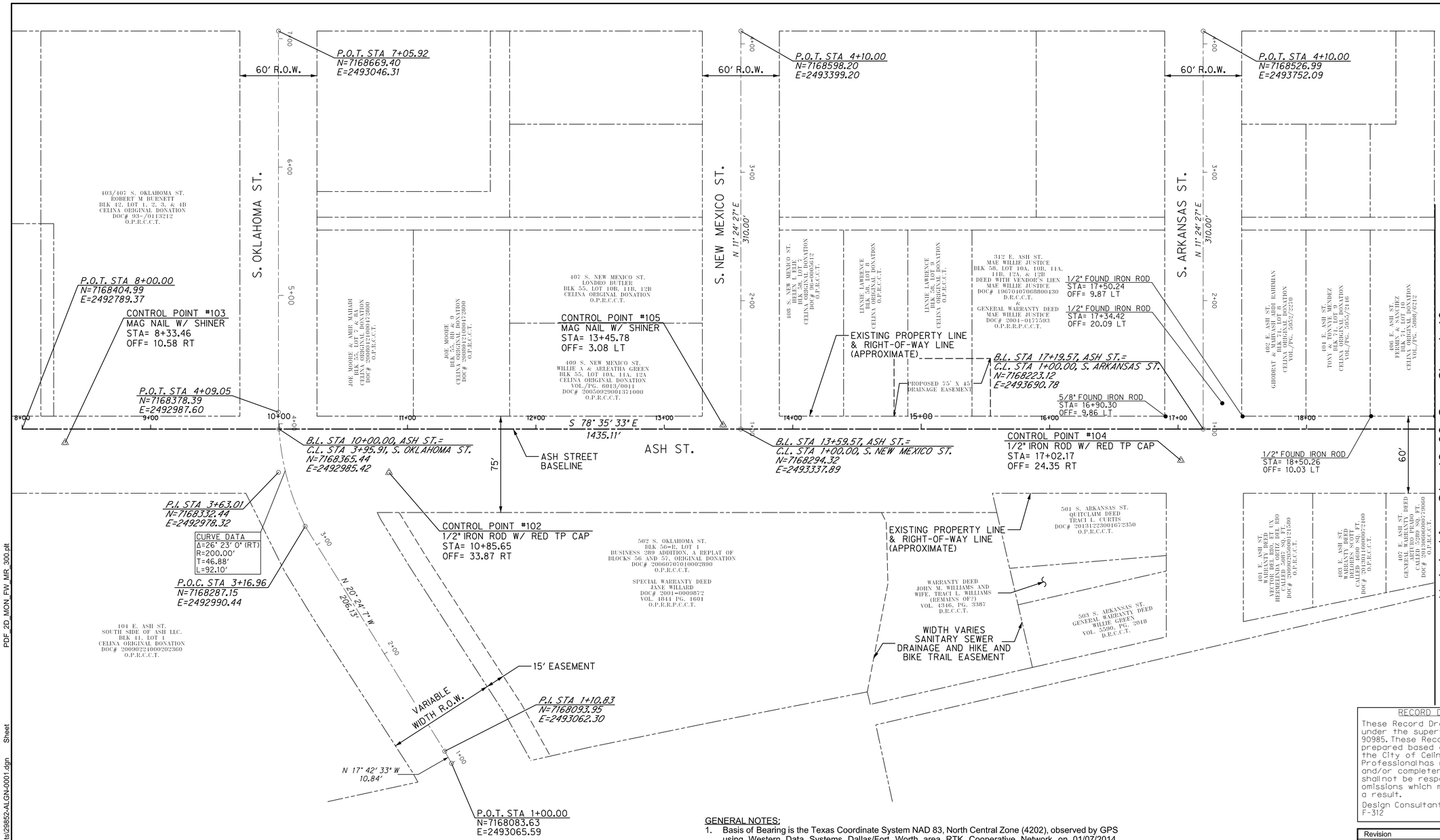


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Design Consultant: Halff Associates Inc. TBPE # F-312

8
75

GENERAL NOTES:

1. Basis of Bearing is the Texas Coordinate System NAD 83, North Central Zone (4202), observed by GPS using Western Data Systems Dallas/Fort Worth area RTK Cooperative Network on 01/07/2014, Convergence Angle for WDS reference monument DMCK0811 is 01 degree 01 minute 26.09037 seconds, according to Corpscon V6.0.1 as provided by the U.S. Army Corps of Engineers. Distances shown are surface distances, scale factor is 1.000152271.
2. All coordinates shown along the project baseline are State Plane Coordinates (surface)
3. All station and offsets shown are based on the Ash Street Base Line.
4. Contractor shall be responsible for survey control points during construction.
5. USGS Monument K263 is set the top of the northwest corner of the northwest concrete footing of the Celina Water Tower. 187 feet east of the east rail of the St. Louis, San Francisco and Texas Railroad, 62 feet south of the center line of West Elm Street.

| Control Point # | Northing (ft) | Easting (ft) | Elevation (ft) | Station | | |
|---|---|---|---|---|---|---|
| 100 | 7168113.75 | 2494736.61 | 724.98 | 27+75.47 | 22.36 | LT |
| 101 | 7168121.52 | 2494225.25 | 700.70 | 22+63.91 | 5.26 | LT |
| 102 | 7168315.30 | 2493062.68 | 688.31 | 10+85.65 | 33.87 | RT |
| 103 | 7168388.01 | 2492820.08 | 691.06 | 8+33.46 | 10.58 | RT |
| 104 | 7168202.68 | 2493668.90 | 691.87 | 17+02.17 | 24.35 | RT |
| 105 | 7168300.07 | 2493324.98 | 688.89 | 13+45.78 | 3.08 | LT |
| USGS K263 | 7169043.85 | 2492865.54 | 694.55 | - | - | |

Revision

| No. | Description | Date |
|---|---|---|
| | | |
| | | |
| | | |

Baseline Layout and Survey Control

Sta 10+00 to Sta 19+00

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
| JFR | GAH | 06/13/2014 | AS NOTED | 29852 | P-201401-01 | 8 |

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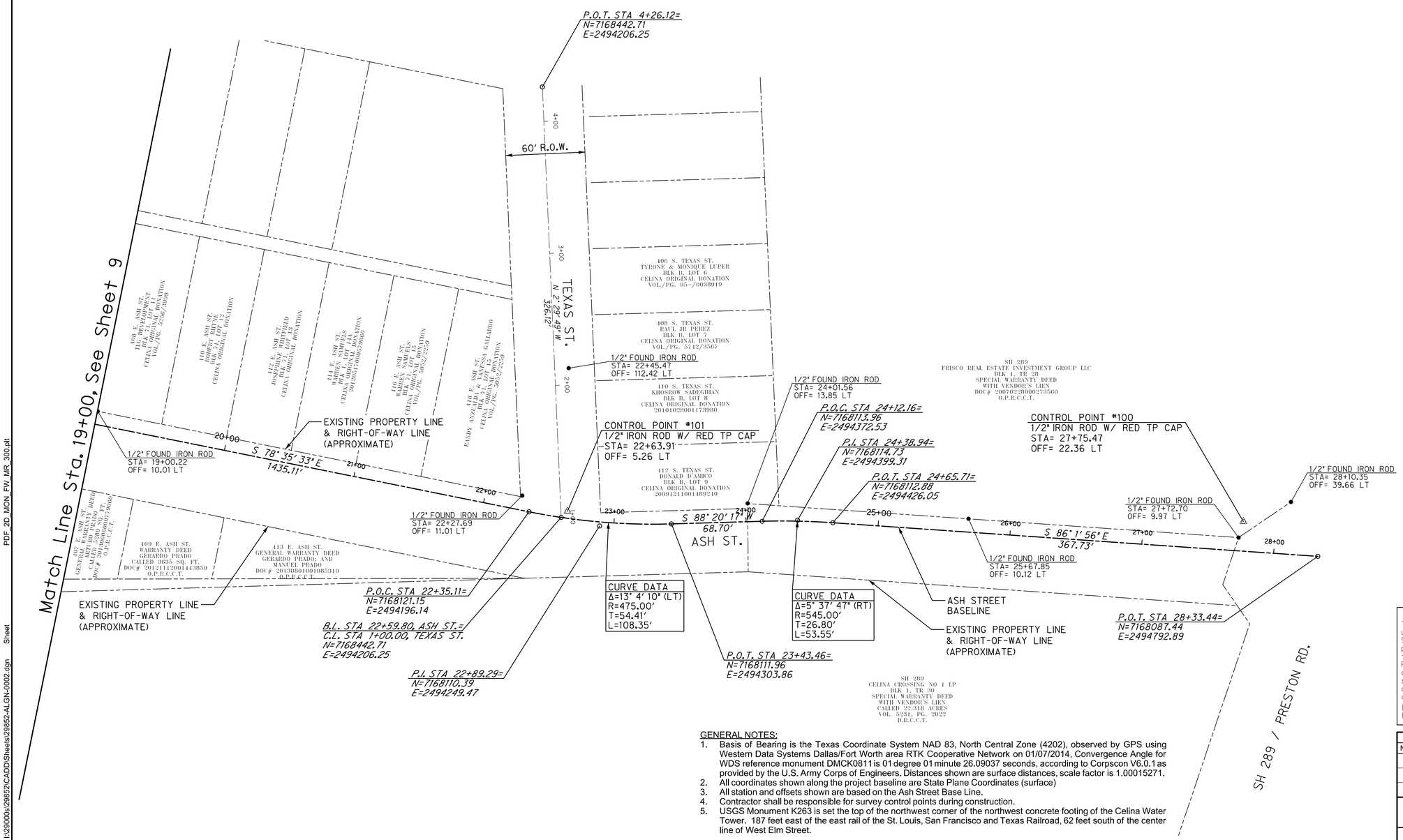


N

0 20 40 60 80

SCALE: 1"=40'

## LEGEND

- PROJECT BASELINE
- CROSS STREET CENTERLINE
- APROXIMATE PROPERTY LINE
- EXISTING EASEMENT
- CONTROL POINT
- FOUND MONUMENT
- BASELINE / CENTERLINE POINT

GENERAL NOTES:

1. Basis of Bearing is the Texas Coordinate System NAD 83, North Central Zone (4202), observed by GPS using Western Data Systems Dallas/Fort Worth area RTK Cooperative Network on 01/07/2014, Convergence Angle for WDS reference monument DMCK0811 is 01 degree 01 minute 26.09037 seconds, according to Corpscon V6.0.1 as provided by the U.S. Army Corps of Engineers. Distances shown are surface distances, scale factor is 1.00015271.
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| 104 | 7168202.68 | 2493668.90 | 691.87 | 17+02.17 | 24.35 | RT |
| 105 | 7168300.07 | 2493324.98 | 688.89 | 13+45.78 | 3.08 | LT |
| USGS K263 | 7169043.85 | 2492865.54 | 694.55 | - | - | |

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Design Consultant: Halff Associates Inc. TBPE # F-312

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Revision

| No. | Description | Date |
|---|---|---|
| | | |
| | | |
| | | |

Baseline Layout & Survey Control

Sta 19+00 to End

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
| JFR | GAH | 06/13/2014 | AS NOTED | 29852 | P-201401-01 | 9 |

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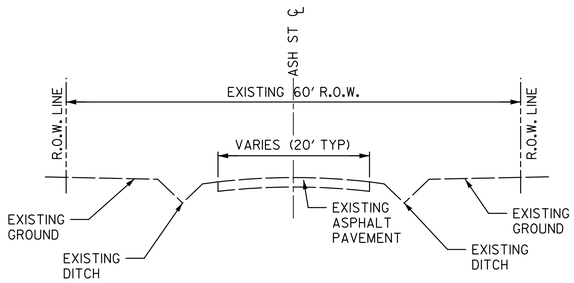
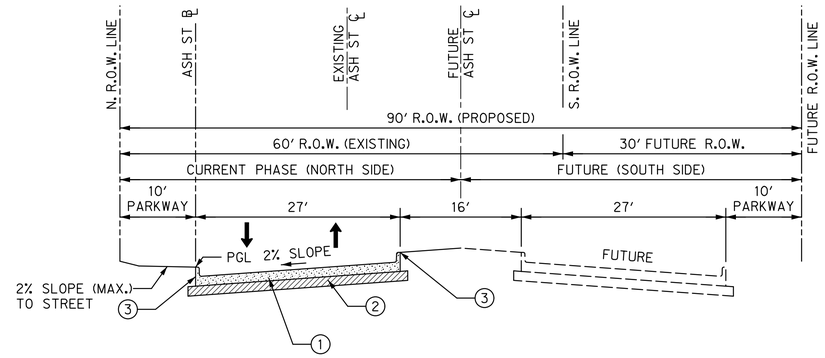



## ASH STREET
## EXISTING TYPICAL SECTION

STA 13+20.60 to STA 24+89.06

SCALE: H: 1"=10'
V: 1"=2'




## ASH STREET
## PROPOSED TYPICAL SECTION

STA 13+20.60 to STA 24+89.06

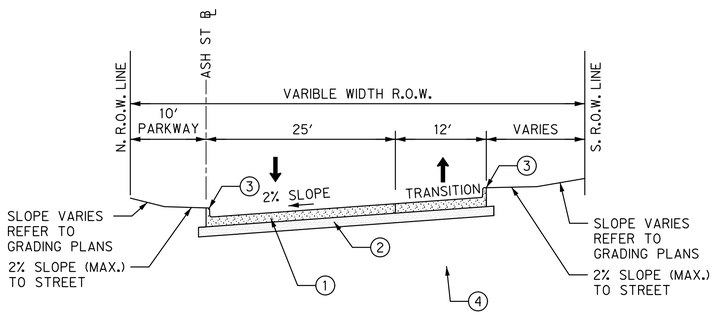
SCALE: H: 1"=10'
V: 1"=2'

### LEGEND

1. 8" REINFORCED CONCRETE PAVEMENT
2. 6" LIME STABILIZED (7%) SUBGRADE
3. 6" MONOLITHIC CURB
4. 6" ASPHALT PAVEMENT (4" TYPE B BASE COURSE, 2" TYPE D SURFACE COURSE)

Typical Section Notes:

1. See Pavement details for more information.
2. The Profile Grade Line (PGL) is along the left (northern) top back of curb. The PGL for the side streets shall be the top of pavement at centerline.
3. All pavement construction and subgrade preparation shall be in accordance with the 'Geotechnical Engineering Study - East Ash Street Reconstruction, South Oklahoma to Preston Road' prepared by CMJ Engineering, Inc. (project No. 117-13-171) dated February 2014.
4. All dimensions are to back of curb or edge of pavement unless noted otherwise.

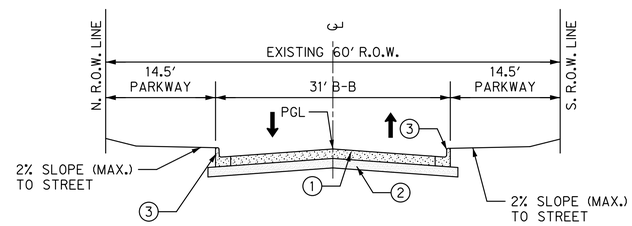



## ASH STREET
## PROPOSED TYPICAL SECTION

STA 10+36.97 to STA 13+20.60
STA 24+89.06 to STA 27+30.00

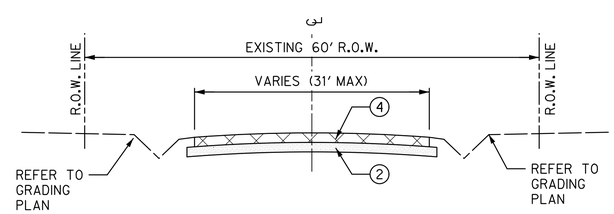
SCALE: H: 1"=10'
V: 1"=2'

* DIMENSION IS 27′ FROM STATION 10+32.97 TO 12+61.53




## OKLAHOMA, ARKANSAS, & TEXAS STREET
## PROPOSED TYPICAL SECTION

SCALE: H: 1"=10'
V: 1"=2'




## OKLAHOMA, ARKANSAS, & TEXAS STREET
## PROPOSED TRANSITION SECTION

SCALE: H: 1"=10'
V: 1"=2'

RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

10
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| Revision | | |
|---|---|---|
| No. | Description | Date |
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| | | |

Typical Sections

ASH STREET RECONSTRUCTION
OKLAHOMA ST. TO PRESTON RD.
CITY OF CELINA, TEXAS

HALFF
TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 10 |

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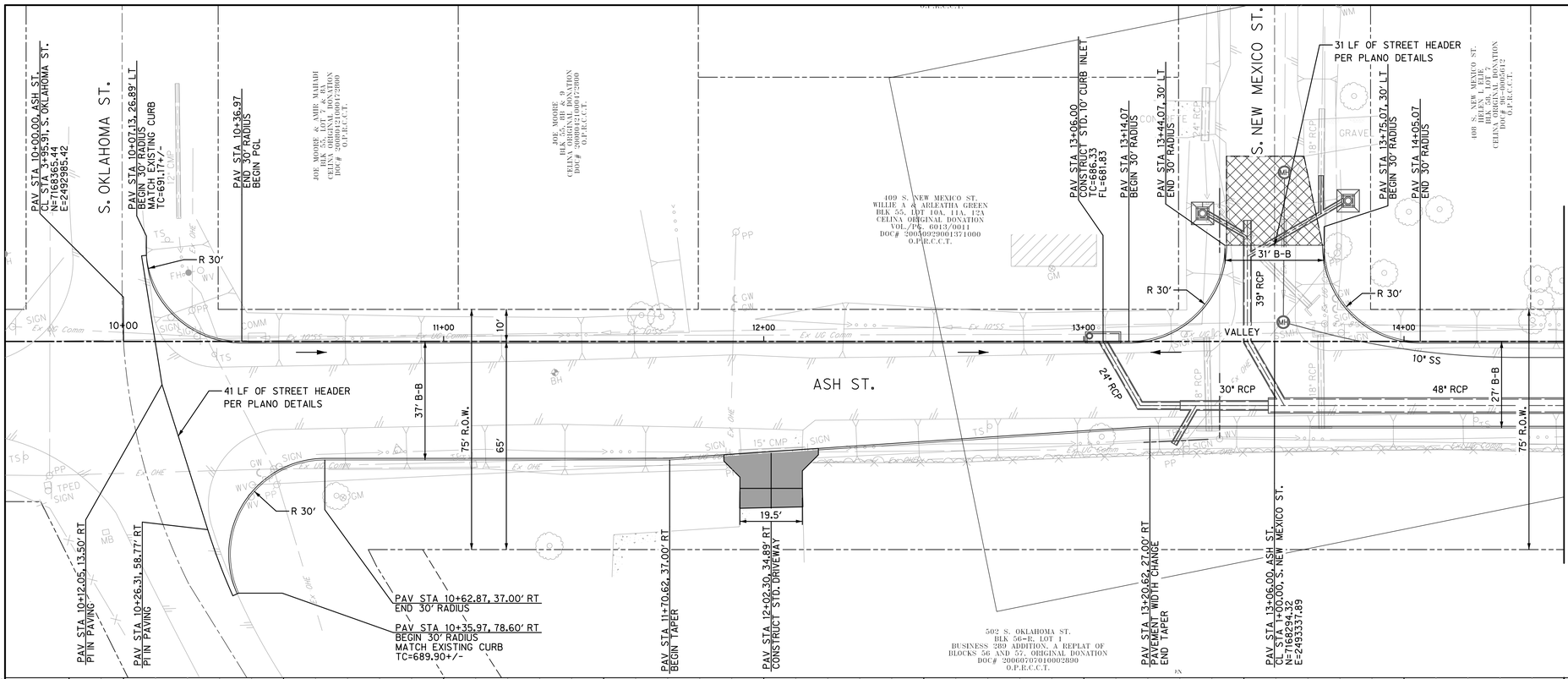


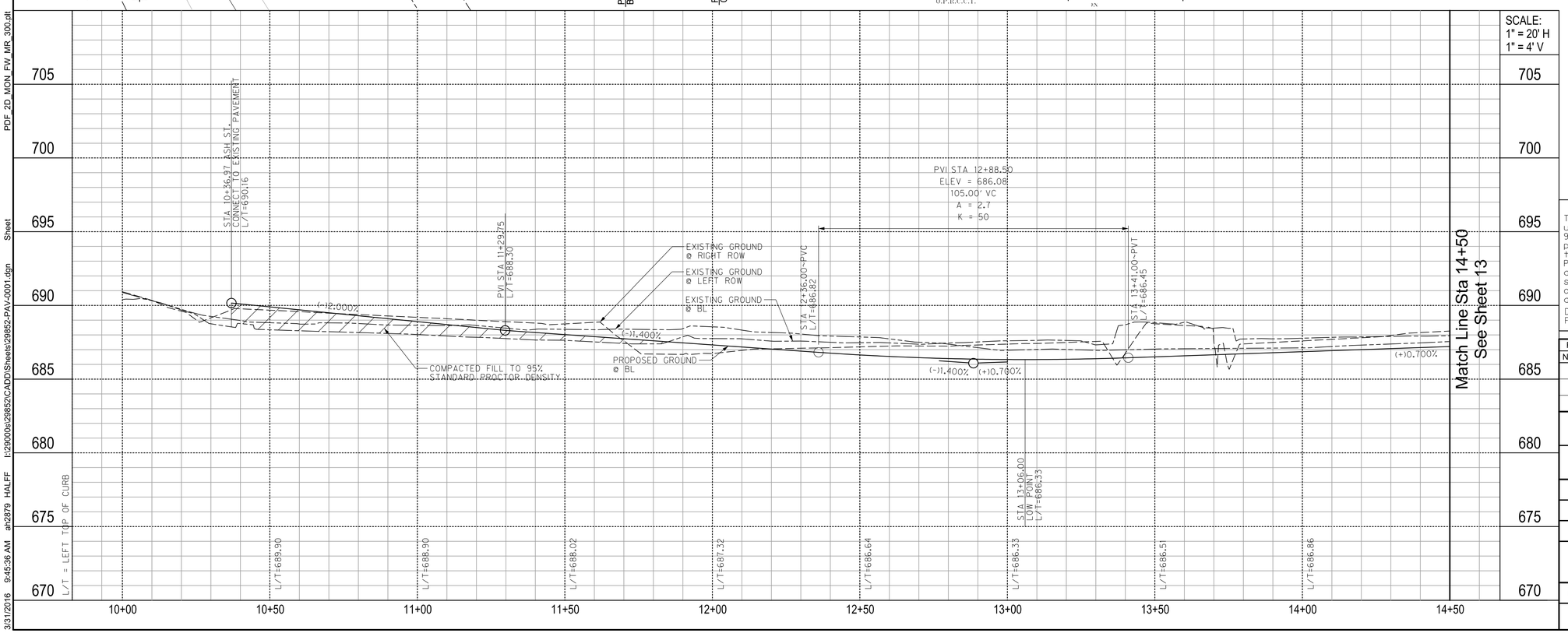


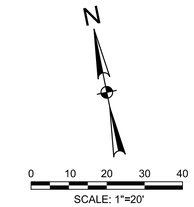


## LEGEND

- 8" CONCRETE PAVEMENT
- 6" CONCRETE PAVEMENT
- 6" ASPHALT PAVEMENT
- GRAVEL - MATCH EXISTING
- 4" SIDEWALK PAVEMENT

## PROFILE LEGEND

- EXISTING GROUND @ LEFT ROW
- EXISTING GROUND @ RIGHT ROW
- EXISTING GROUND @ BASELINE
- PROPOSED GROUND @ BASELINE

Paving Notes:

1. Refer to General Notes for additional information.
2. All pavement construction and subgrade preparation shall be in accordance with the 'Geotechnical Engineering Study - East Ash Street Reconstruction, South Oklahoma to Preston Road' prepared by CMJ Engineering, Inc. (project No. 117-13-171) dated February 2014.
3. Refer to survey control sheets for Ash Street baseline horizontal alignment data.
4. All dimensions and station/offsets are to back of curb unless otherwise noted on plans.
5. Refer to Typical Paving Sections and Cross Sections for additional cross slope and curb elevations.
6. Refer to Grading Plan for additional intersection, driveway, and connections to existing pavement grading information.
7. Refer to City of Plano Pavement Detail Sheets for jointing information and pavement header details.

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Design Consultant: Halff Associates Inc. TBPE # F-312

11
75

Revision

| No. | Description | Date |
|---|---|---|
| | | |

# Ash Street Paving Plan and Profile

## Sta 10+00 to Sta 14+50

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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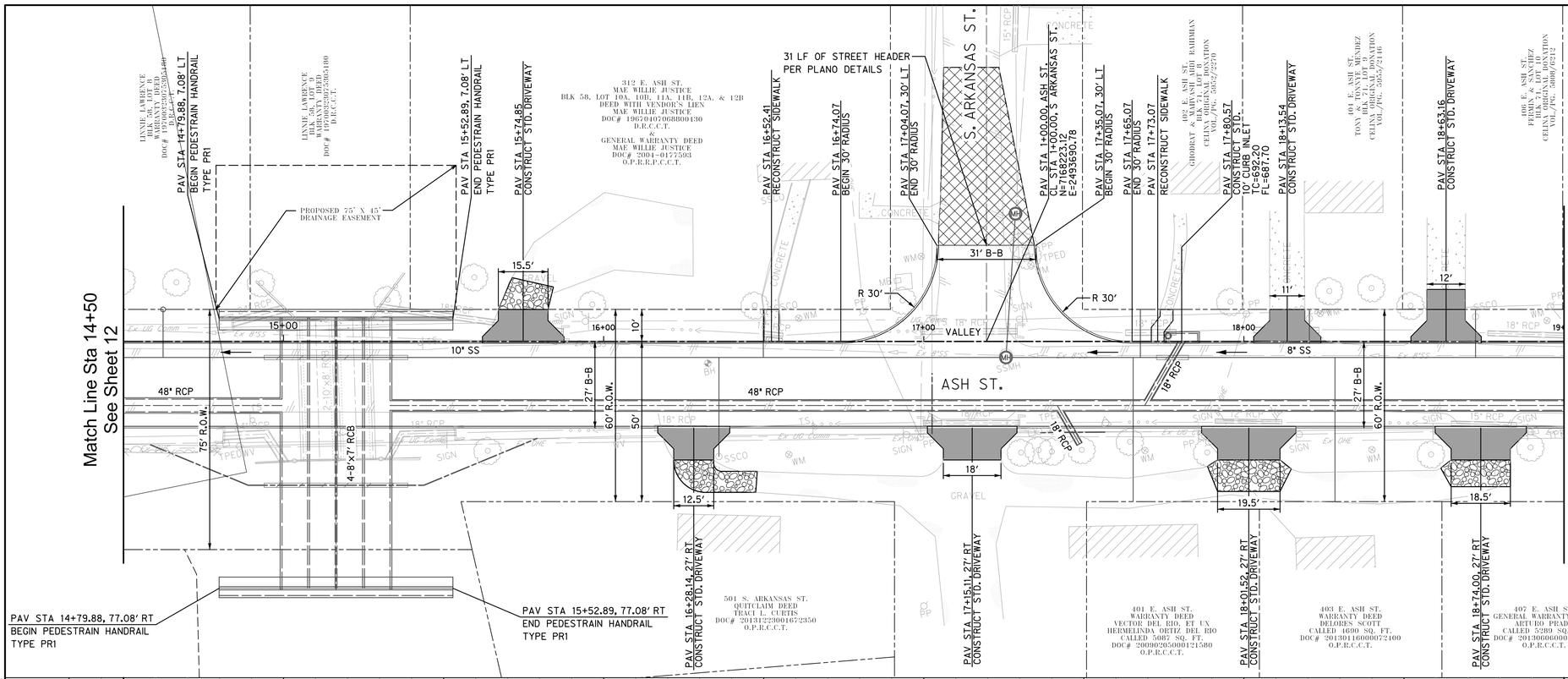


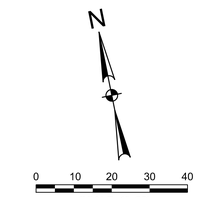


## LEGEND

- 8" CONCRETE PAVEMENT
- 6" CONCRETE PAVEMENT
- 6" ASPHALT PAVEMENT
- GRAVEL - MATCH EXISTING
- 4" SIDEWALK PAVEMENT

## PROFILE LEGEND

- EXISTING GROUND @ LEFT ROW
- EXISTING GROUND @ RIGHT ROW
- EXISTING GROUND @ BASELINE
- PROPOSED GROUND @ BASELINE

Paving Notes:

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Design Consultant: Halff Associates Inc. TBPE # F-312

12
75

| Revision | | |
|---|---|---|
| No. | Description | Date |
| | | |

Ash Street Paving Plan and Profile

Sta 14+50 to Sta 19+00

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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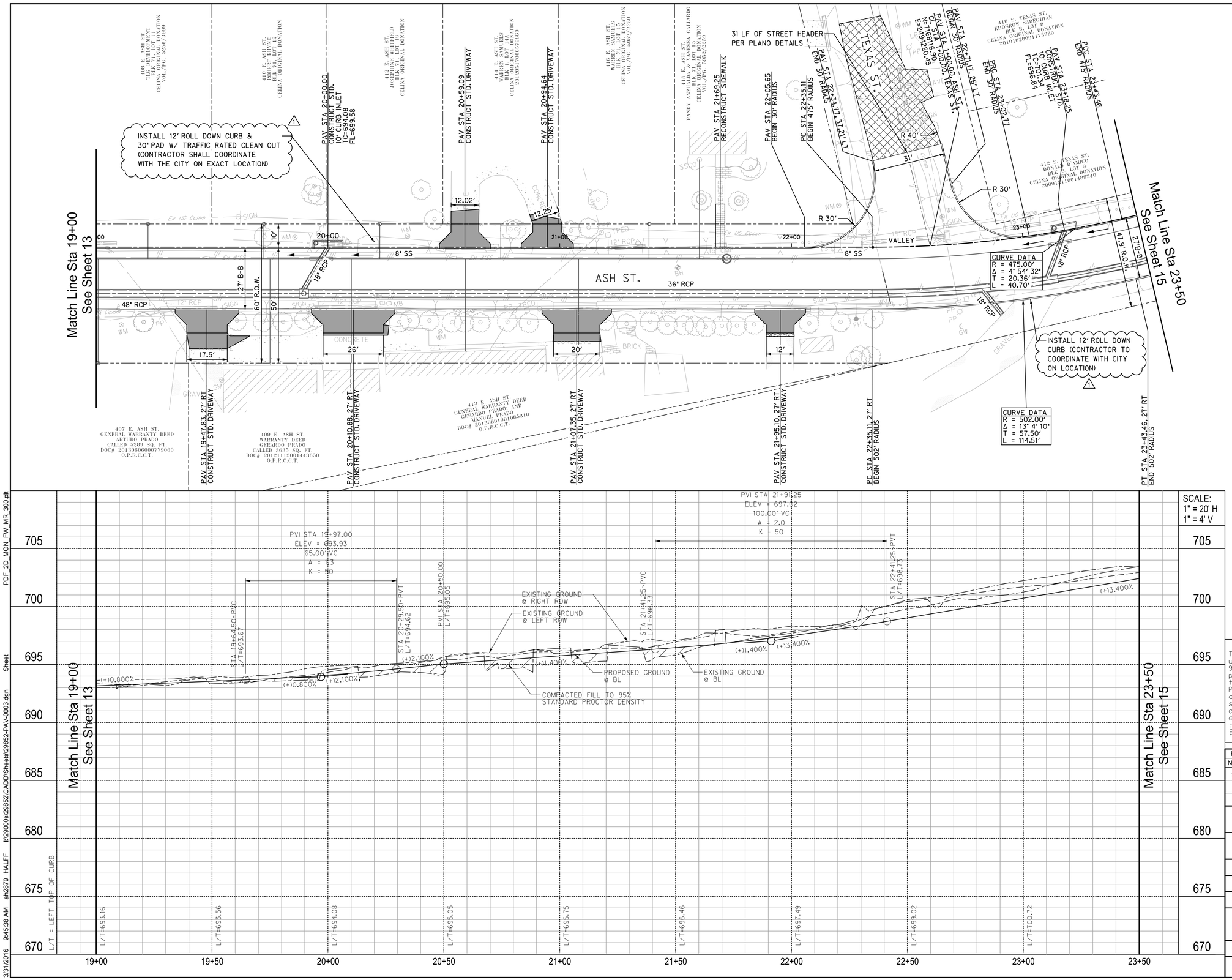


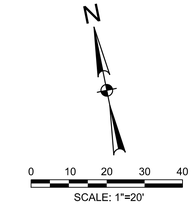


## LEGEND

- 8" CONCRETE PAVEMENT
- 6" CONCRETE PAVEMENT
- 6" ASPHALT PAVEMENT
- GRAVEL - MATCH EXISTING
- 4" SIDEWALK PAVEMENT

## PROFILE LEGEND

- EXISTING GROUND @ LEFT ROW
- EXISTING GROUND @ RIGHT ROW
- EXISTING GROUND @ BASELINE
- PROPOSED GROUND @ BASELINE

Paving Notes:

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Design Consultant: Halff Associates Inc. TBPE # F-312

13 / 75

Revision

| No. | Description | Date |
|---|---|---|
| 1 | ADDITION OF ROLL DOWN CURB & PAD W/ TRAFFIC RATED CLEAN OUT | 01/20/16 |

# Ash Street Paving Plan and Profile

## Sta 19+00 to Sta 23+50

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

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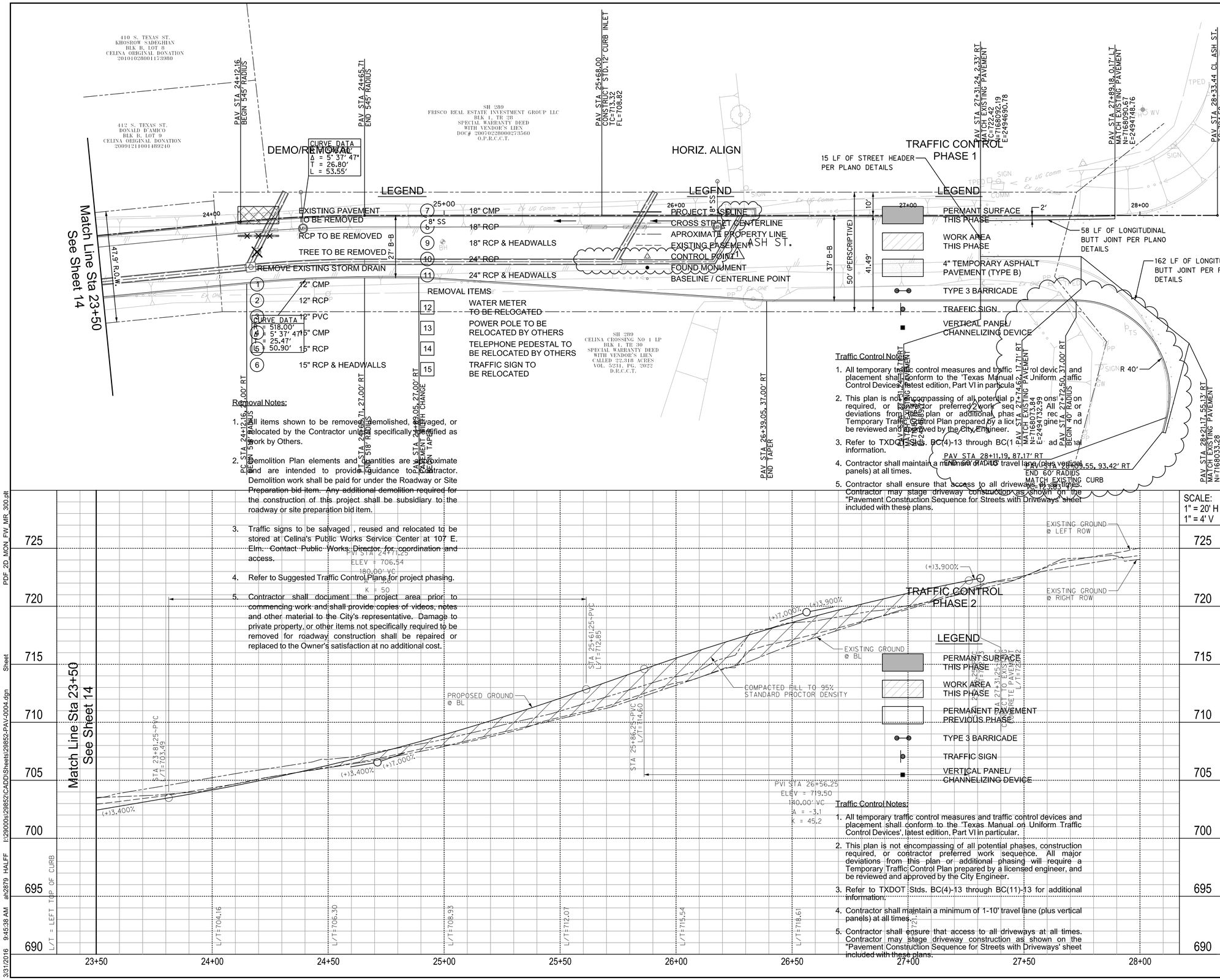


Removal Notes:

1. All items shown to be removed, demolished, salvaged, or relocated by the Contractor unless specifically specified as work by Others.
2. Demolition Plan elements and quantities are approximate and are intended to provide guidance to Contractor. Demolition work shall be paid for under the Roadway or Site Preparation bid item. Any additional demolition required for the construction of this project shall be subsidiary to the roadway or site preparation bid item.
3. Traffic signs to be salvaged , reused and relocated to be stored at Celina's Public Works Service Center at 107 E. Elm. Contact Public Works Director for coordination and access.
4. Refer to Suggested Traffic Control Plans for project phasing.
5. Contractor shall document the project area prior to commencing work and shall provide copies of videos, notes and other material to the City's representative. Damage to private property, or other items not specifically required to be removed for roadway construction shall be repaired or replaced to the Owner's satisfaction at no additional cost.

Traffic Control Notes:

1. All temporary traffic control measures and traffic control devices and placement shall conform to the 'Texas Manual on Uniform Traffic Control Devices', latest edition, Part VI in particular.
2. This plan is not encompassing of all potential phases, construction required, or contractor preferred work sequence. All major deviations from this plan or additional phasing will require a Temporary Traffic Control Plan prepared by a licensed engineer, and be reviewed and approved by the City Engineer.
3. Refer to TXDOT Stds. BC(1) through BC(4)-13 for additional information.
4. Contractor shall maintain a minimum of 1-10' travel lane (plus vertical panels) at all times.
5. Contractor shall ensure that access to all driveways at all times. Contractor may stage driveway construction as shown on the "Pavement Construction Sequence for Streets with Driveways' sheet included with these plans.

Traffic Control Notes:

1. All temporary traffic control measures and traffic control devices and placement shall conform to the 'Texas Manual on Uniform Traffic Control Devices', latest edition, Part VI in particular.
2. This plan is not encompassing of all potential phases, construction required, or contractor preferred work sequence. All major deviations from this plan or additional phasing will require a Temporary Traffic Control Plan prepared by a licensed engineer, and be reviewed and approved by the City Engineer.
3. Refer to TXDOT Stds. BC(4)-13 through BC(11)-13 for additional information.
4. Contractor shall maintain a minimum of 1-10' travel lane (plus vertical panels) at all times.
5. Contractor shall ensure that access to all driveways at all times. Contractor may stage driveway construction as shown on the "Pavement Construction Sequence for Streets with Driveways' sheet included with these plans.

Paving Notes:

1. Refer to General Notes for additional information.
2. All pavement construction and subgrade preparation shall be in accordance with the 'Geotechnical Engineering Study - East Ash Street Reconstruction, South Oklahoma to Preston Road' prepared by CMJ Engineering, Inc. (project No. 117-13-171) dated February 2014.
3. Refer to survey control sheets for Ash Street baseline horizontal alignment data.
4. All dimensions and station/offsets are to back of curb unless otherwise noted on plans.
5. Refer to Typical Paving Sections and Cross Sections for additional cross slope and curb elevations.
6. Refer to Grading Plan for additional intersection, driveway, and connections to existing pavement grading information.
7. Refer to City of Plano Pavement Detail Sheets for jointing information and pavement header details.

RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

14
75

| Revision | | |
|---|---|---|
| No. | Description | Date |
| 1 | Revised Storm Layout | 4/8/15 |
| 2 | Revised Curb Radius | 5/22/15 |

# Ash Street Paving Plan and Profile

## Sta 23+50 to Sta 28+00

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 14 |

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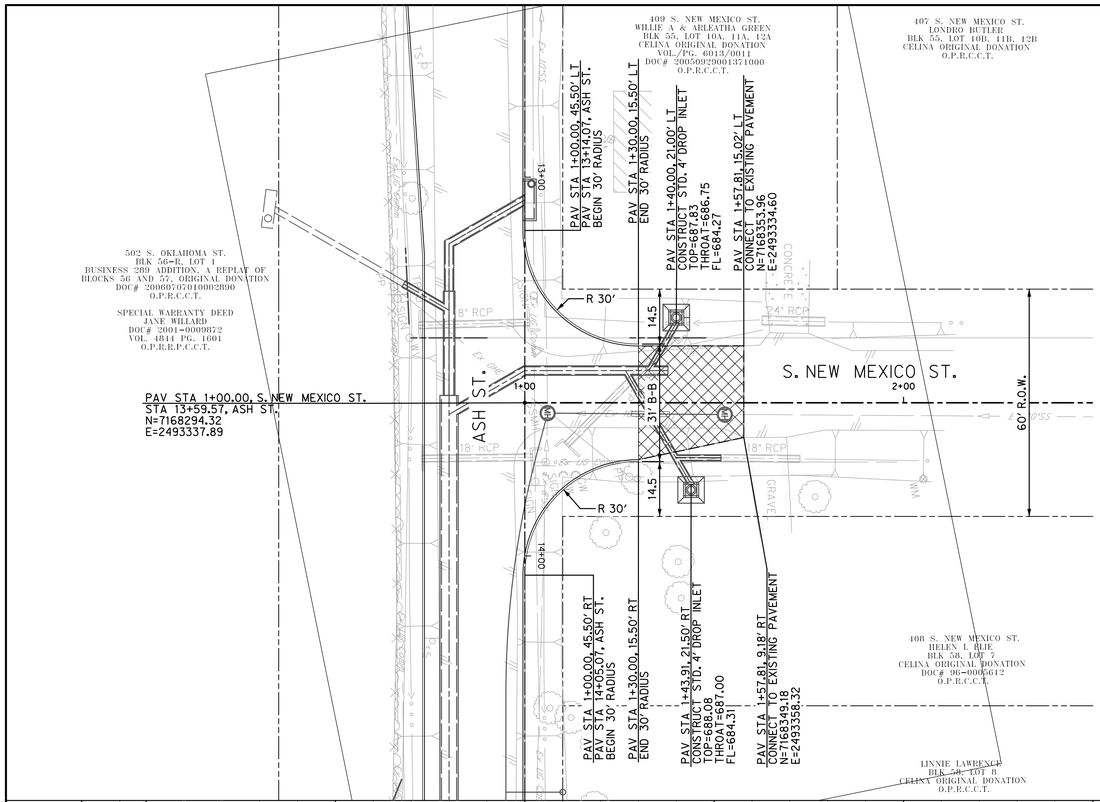


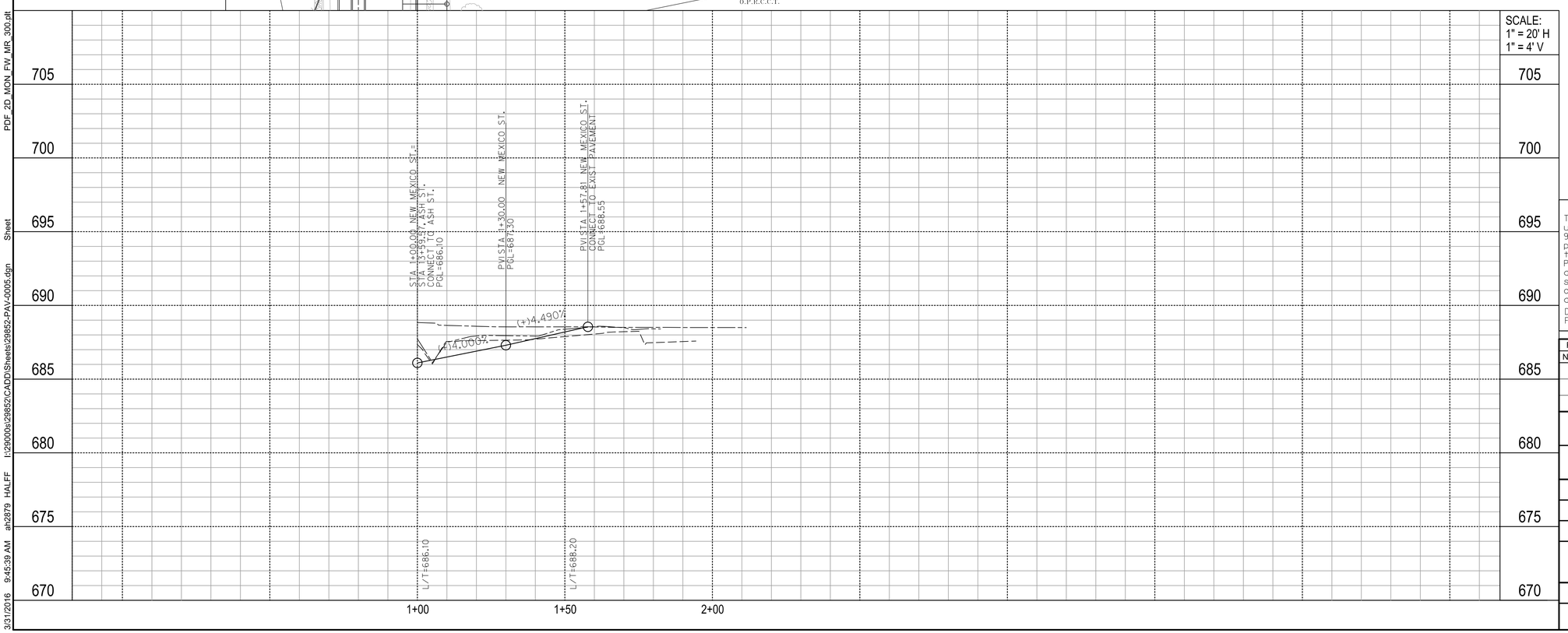


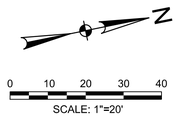


## LEGEND

- 8" CONCRETE PAVEMENT
- 6" CONCRETE PAVEMENT
- 6" ASPHALT PAVEMENT
- GRAVEL - MATCH EXISTING
- 4" SIDEWALK PAVEMENT

## PROFILE LEGEND

- EXISTING GROUND @ LEFT ROW
- EXISTING GROUND @ RIGHT ROW
- EXISTING GROUND @ BASELINE
- PROPOSED GROUND @ BASELINE

Paving Notes:

1. Refer to General Notes for additional information.
2. All pavement construction and subgrade preparation shall be in accordance with the 'Geotechnical Engineering Study - East Ash Street Reconstruction, South Oklahoma to Preston Road' prepared by CMJ Engineering, Inc. (project No. 117-13-171) dated February 2014.
3. Refer to survey control sheets for Ash Street baseline horizontal alignment data.
4. All dimensions and station/offsets are to back of curb unless otherwise noted on plans.
5. Refer to Typical Paving Sections and Cross Sections for additional cross slope and curb elevations.
6. Refer to Grading Plan for additional intersection, driveway, and connections to existing pavement grading information.
7. Refer to City of Plano Pavement Detail Sheets for jointing information and pavement header details.

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Design Consultant: Halff Associates Inc. TBPE # F-312

15
75

Revision

| No. | Description | Date |
|---|---|---|
| | | |

New Mexico Street

Paving Plan and Profile

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
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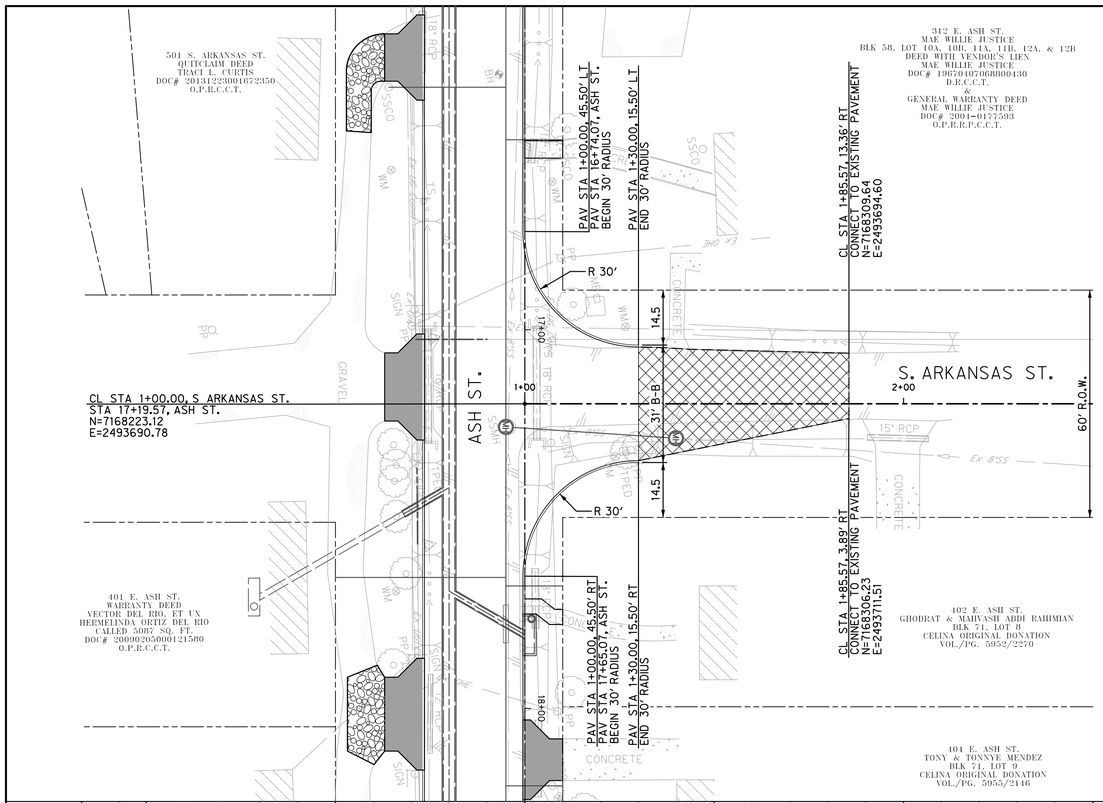


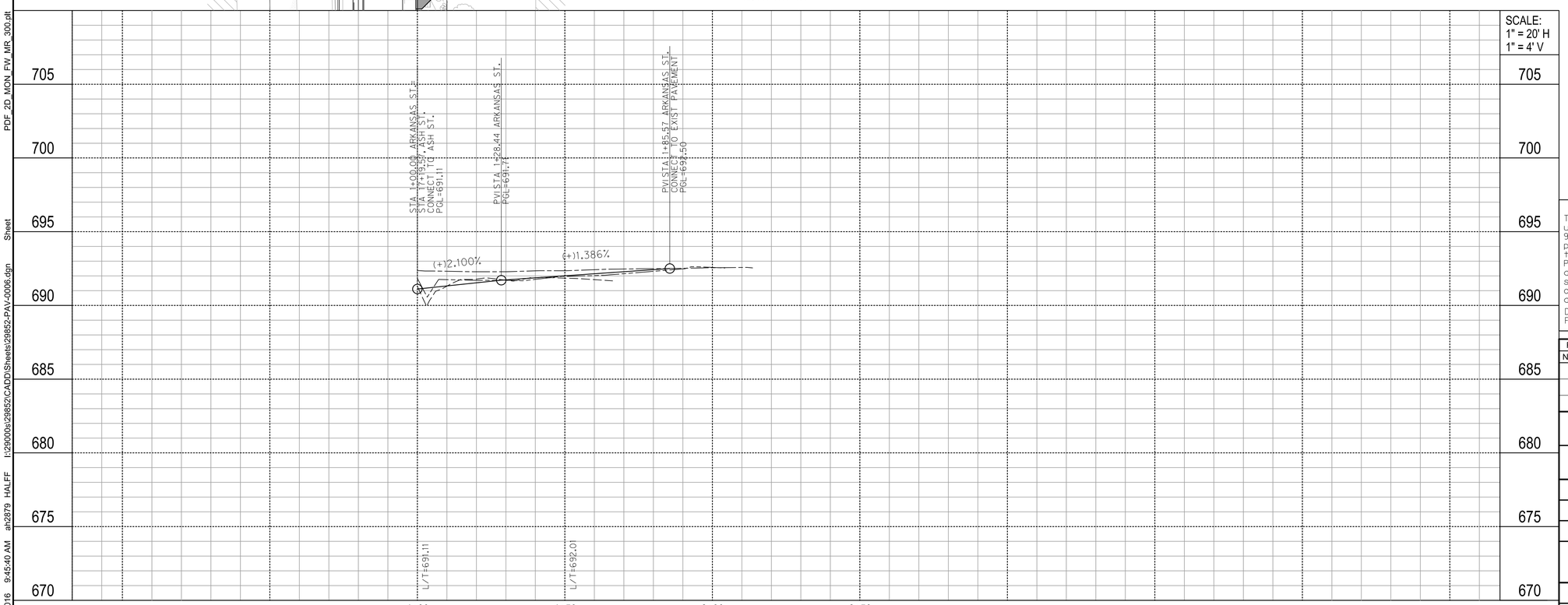


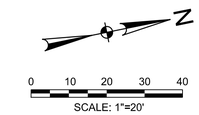


## LEGEND

- 8" CONCRETE PAVEMENT
- 6" CONCRETE PAVEMENT
- 6" ASPHALT PAVEMENT
- GRAVEL - MATCH EXISTING
- 4" SIDEWALK PAVEMENT

## PROFILE LEGEND

- EXISTING GROUND @ LEFT ROW
- EXISTING GROUND @ RIGHT ROW
- EXISTING GROUND @ BASELINE
- PROPOSED GROUND @ BASELINE

Paving Notes:

1. Refer to General Notes for additional information.
2. All pavement construction and subgrade preparation shall be in accordance with the 'Geotechnical Engineering Study - East Ash Street Reconstruction, South Oklahoma to Preston Road' prepared by CMJ Engineering, Inc. (project No. 117-13-171) dated February 2014.
3. Refer to survey control sheets for Ash Street baseline horizontal alignment data.
4. All dimensions and station/offsets are to back of curb unless otherwise noted on plans.
5. Refer to Typical Paving Sections and Cross Sections for additional cross slope and curb elevations.
6. Refer to Grading Plan for additional intersection, driveway, and connections to existing pavement grading information.
7. Refer to City of Plano Pavement Detail Sheets for jointing information and pavement header details.

RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

16 / 75

Revision

| No. | Description | Date |
|---|---|---|
| | | |

Arkansas Street

Paving Plan and Profile

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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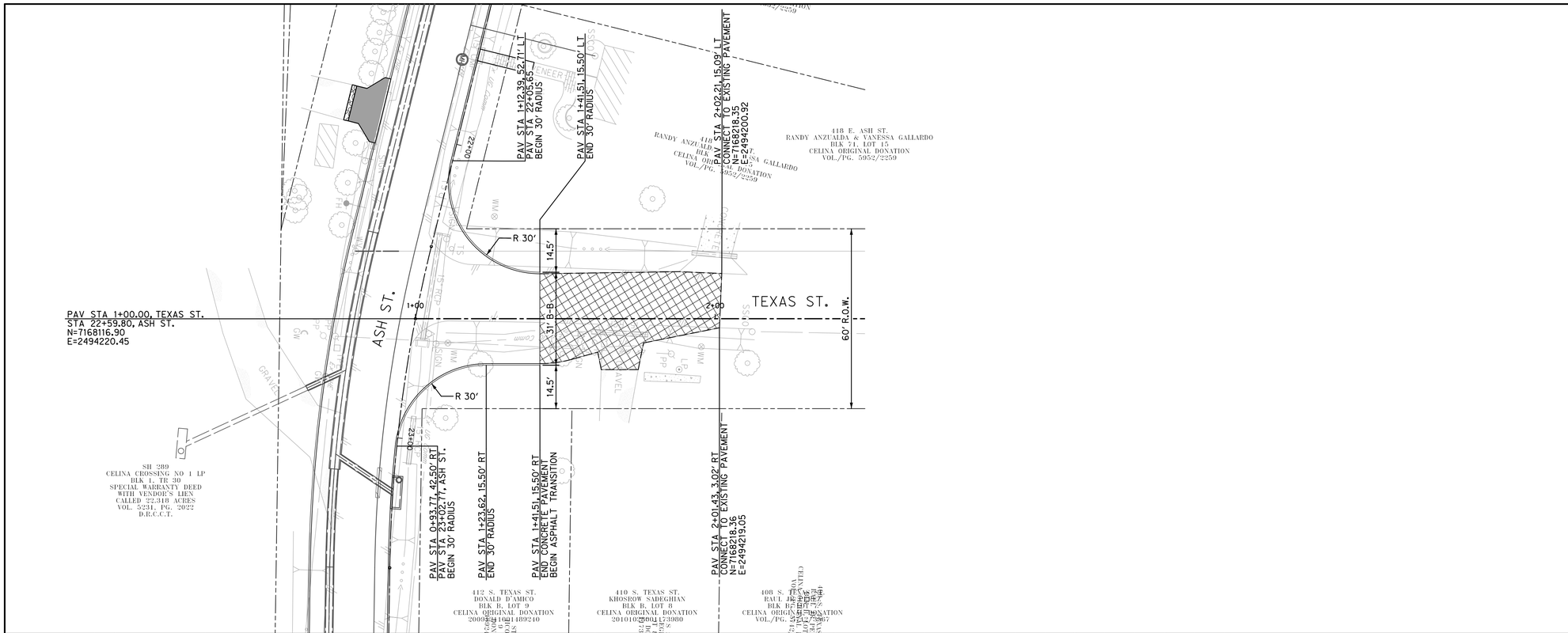


0 10 20 30 40
SCALE: 1"=20'

## LEGEND

- 8" CONCRETE PAVEMENT
- 6" CONCRETE PAVEMENT
- 6" ASPHALT PAVEMENT
- GRAVEL - MATCH EXISTING
- 4" SIDEWALK PAVEMENT

## PROFILE LEGEND

- EXISTING GROUND @ LEFT ROW
- EXISTING GROUND @ RIGHT ROW
- EXISTING GROUND @ BASELINE
- PROPOSED GROUND @ BASELINE

Paving Notes:

1. Refer to General Notes for additional information.
2. All pavement construction and subgrade preparation shall be in accordance with the 'Geotechnical Engineering Study - East Ash Street Reconstruction, South Oklahoma to Preston Road' prepared by CMJ Engineering, Inc. (project No. 117-13-171) dated February 2014.
3. Refer to survey control sheets for Ash Street baseline horizontal alignment data.
4. All dimensions and station/offsets are to back of curb unless otherwise noted on plans.
5. Refer to Typical Paving Sections and Cross Sections for additional cross slope and curb elevations.
6. Refer to Grading Plan for additional intersection, driveway, and connections to existing pavement grading information.
7. Refer to City of Plano Pavement Detail Sheets for jointing information and pavement header details.

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Design Consultant: Halff Associates Inc. TBPE # F-312

17
75

Revision

| No. | Description | Date |
|---|---|---|
| | | |

Texas Street

Paving Plan and Profile

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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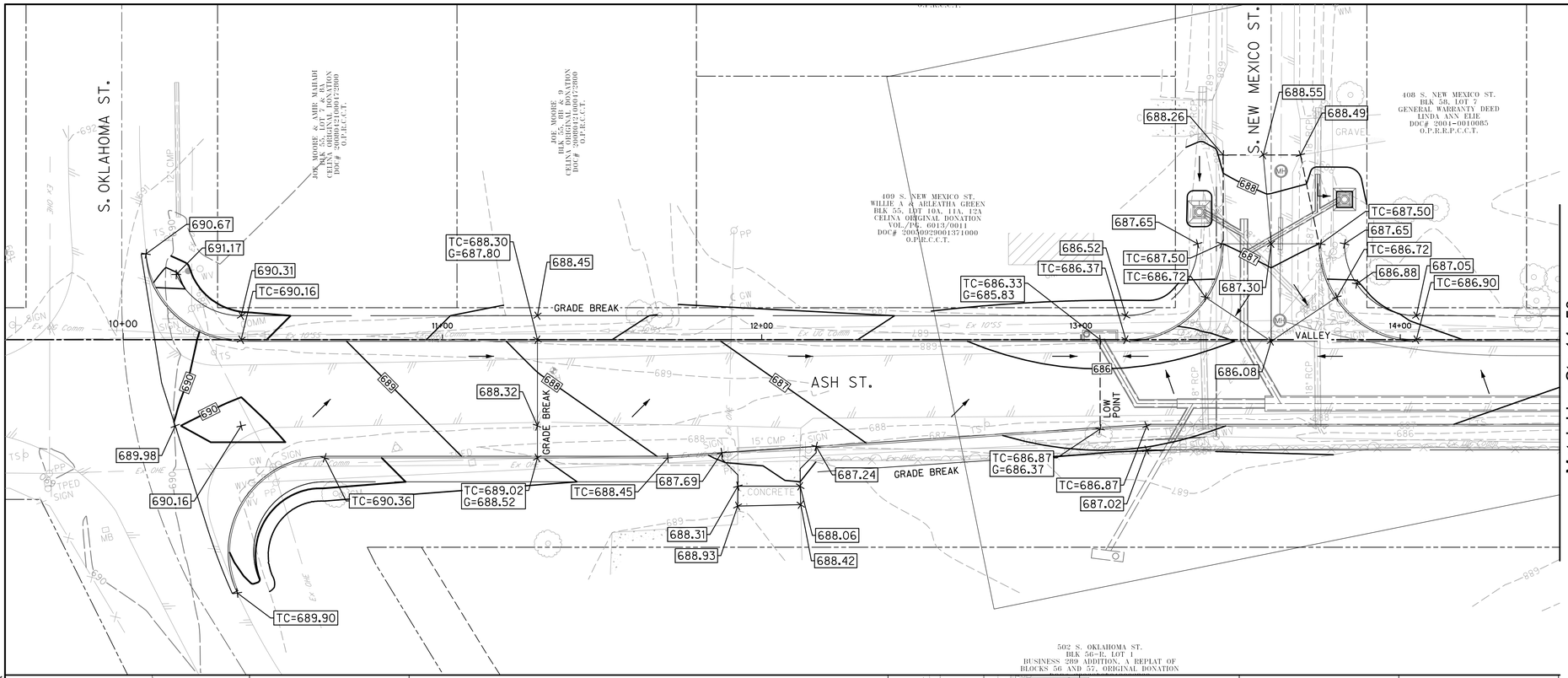


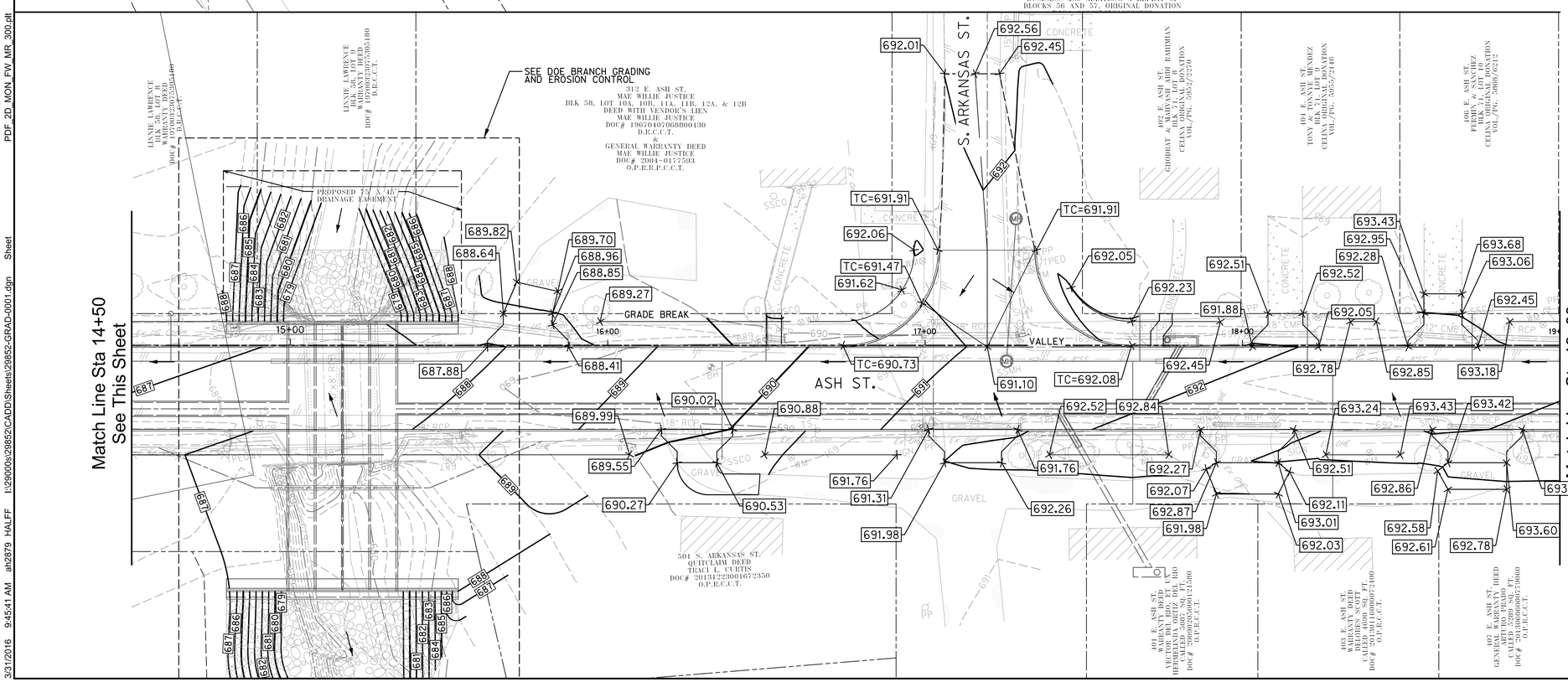


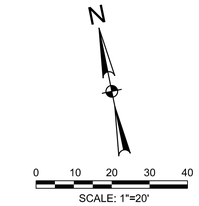


## LEGEND

| | |
|---|---|
| 691 | EX. MINOR CONTOUR |
| 695 | EX. MAJOR CONTOUR |
| 691 | PROP. MINOR CONTOUR |
| 695 | PROP. MAJOR CONTOUR |
| XXX.XX | PROP. SPOT ELEVATION |
| BW | BOTTOM OF WALL |
| TC | TOP OF CURB |
| G | GUTTER |
| | FLOW ARROWS |
| | GRADE BREAK |

RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

18
75

| Revision | | |
|---|---|---|
| No. | Description | Date |
| | | |
| | | |
| | | |

# Grading Plan

## Sta 10+00 to Sta 19+00

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 18 |

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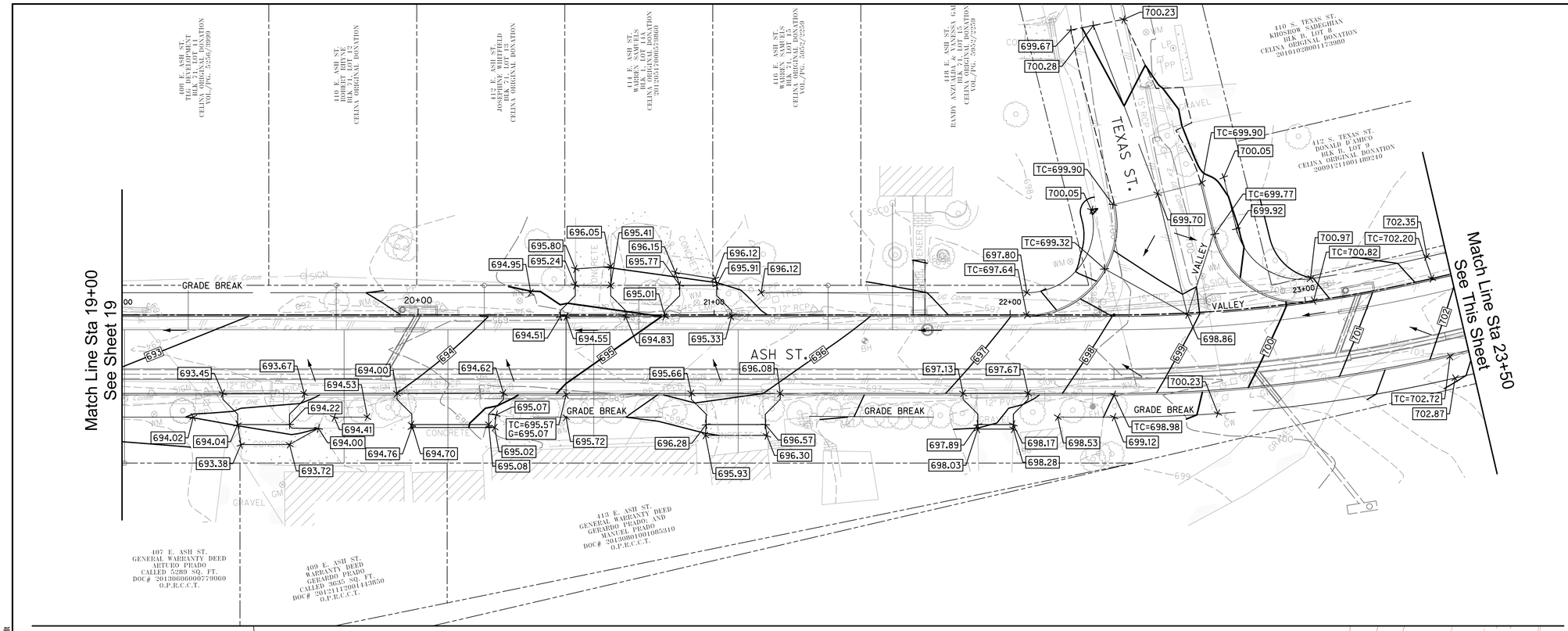


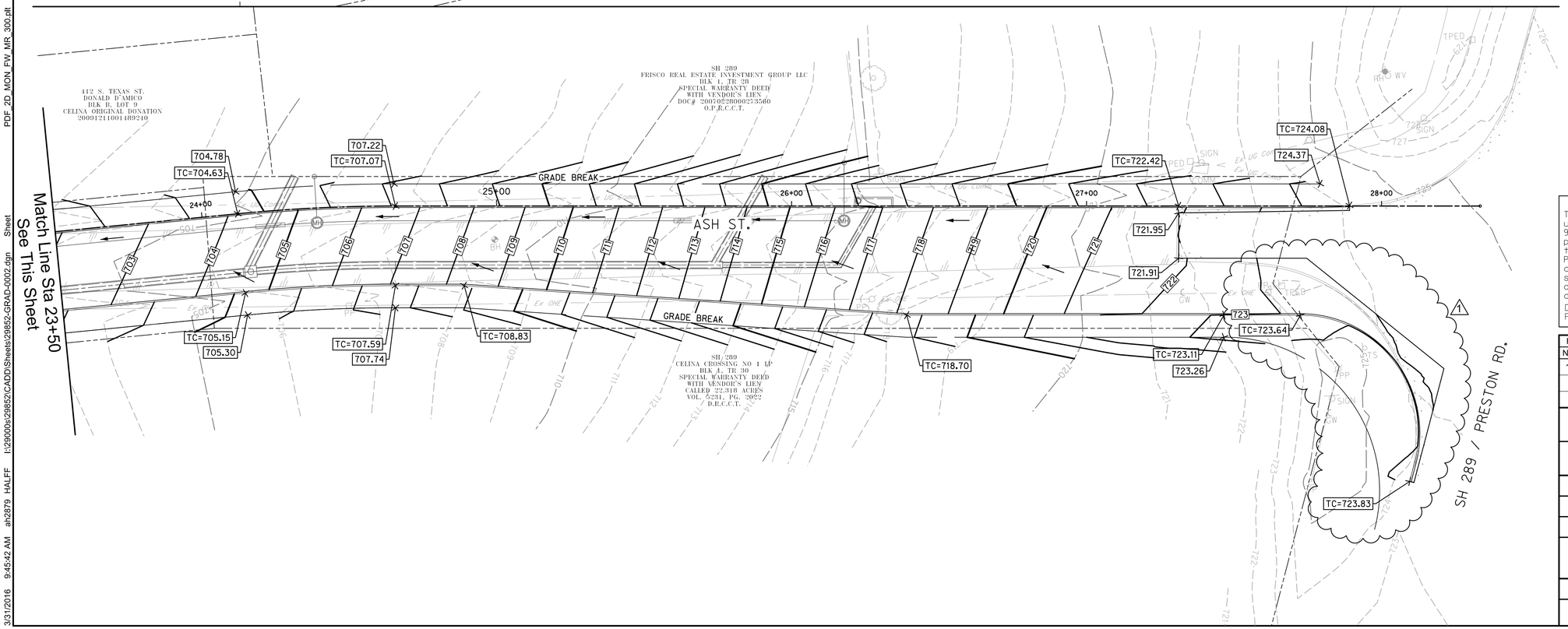


N

0 10 20 30 40

SCALE: 1"=20'

## LEGEND

| | |
|---|---|
| 691 | EX. MINOR CONTOUR |
| 695 | EX. MAJOR CONTOUR |
| 691 | PROP. MINOR CONTOUR |
| 695 | PROP. MAJOR CONTOUR |
| XXX.XX | PROP. SPOT ELEVATION |
| BW | BOTTOM OF WALL |
| TC | TOP OF CURB |
| G | GUTTER |
| | FLOW ARROWS |
| | GRADE BREAK |

RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

19 / 75

Revision

| No. | Description | Date |
|---|---|---|
| 1 | Revised Curb Radius | 5/22/15 |

# Grading Plan

## Sta 19+00 to Sta 28+00

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 19 |

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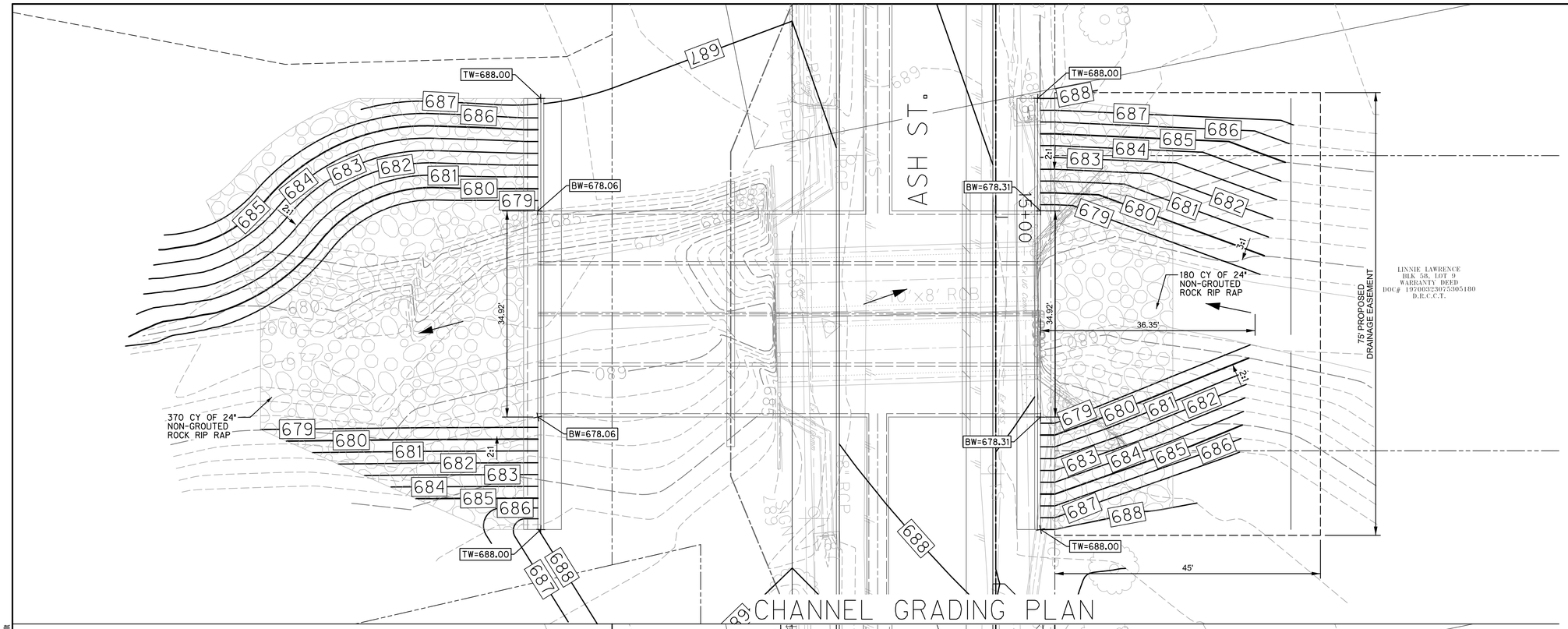


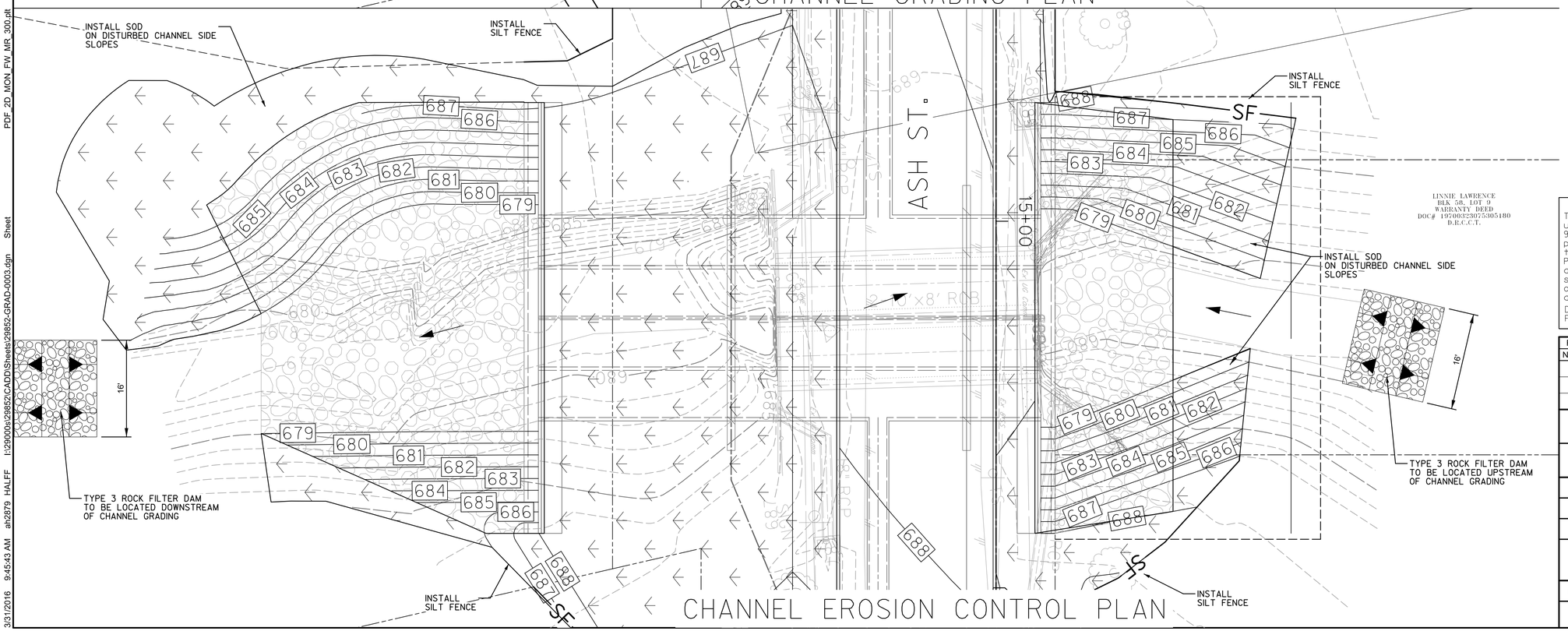


SCALE: 1"=10'

## LEGEND

| | |
|---|---|
| 691 | EX. MINOR CONTOUR |
| 695 | EX. MAJOR CONTOUR |
| 691 | PROP. MINOR CONTOUR |
| 695 | PROP. MAJOR CONTOUR |
| XXX.XX | PROP. SPOT ELEVATION |
| BW | BOTTOM OF WALL |
| TC | TOP OF CURB |
| G | GUTTER |
| | FLOW ARROWS |
| | GRADE BREAK |
| SF | SILT FENCE |
| | SODDING AND 4" TOPSOIL |
| | CONSTRUCTION ENTRANCE / EXIT |
| | ROCK CHECK DAM |
| | CURB INLET PROTECTION |

of Disturbance: 2.6 ACRES
d Area: 1.5 ACRES
aved Area: 1.1 ACRES

Notes:

1. Refer to Grading Plans for additional information and project requirements.
2. Refer to Erosion Control Plans for additional information and project requirements.

RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

20 / 75

Revision

| No. | Description | Date |
|---|---|---|
| | | |
| | | |
| | | |

Grading and Erosion Control Plan

DOE BRANCH

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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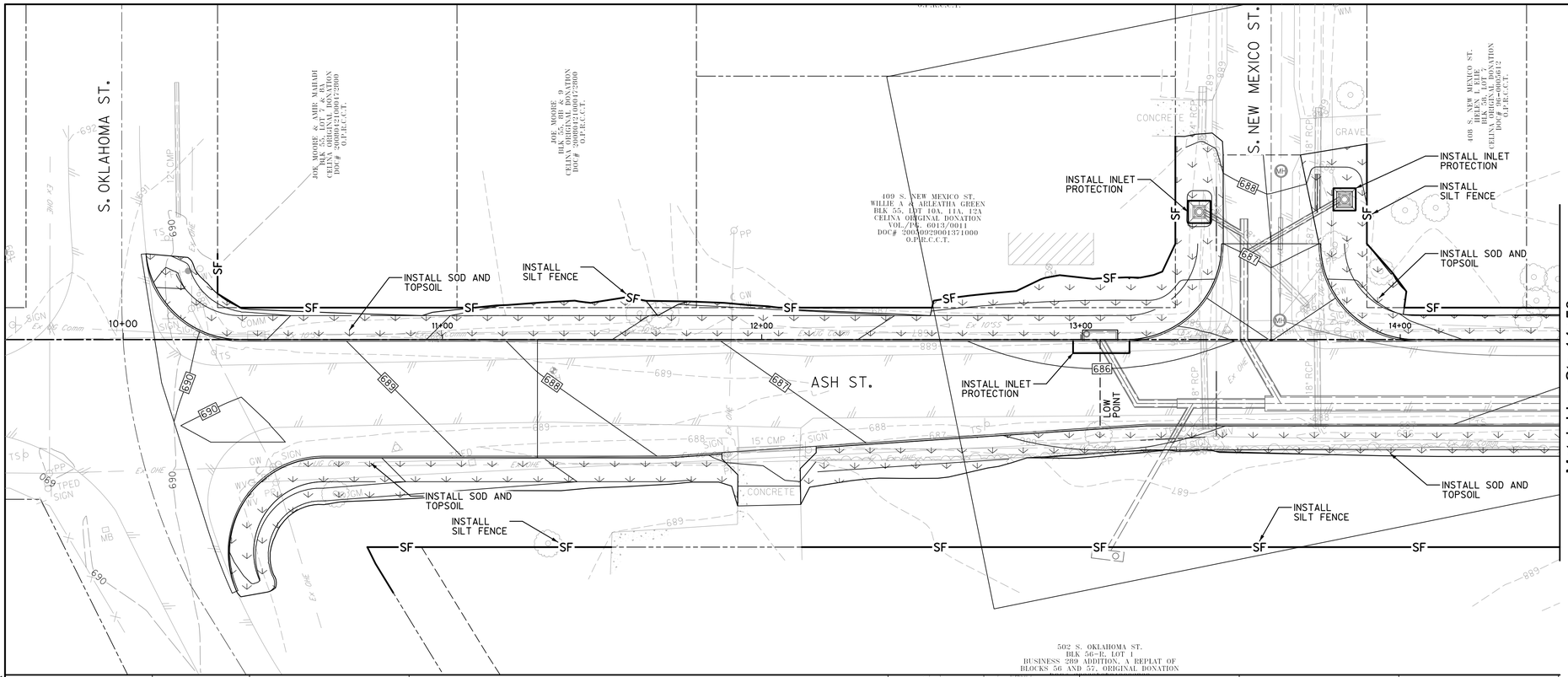


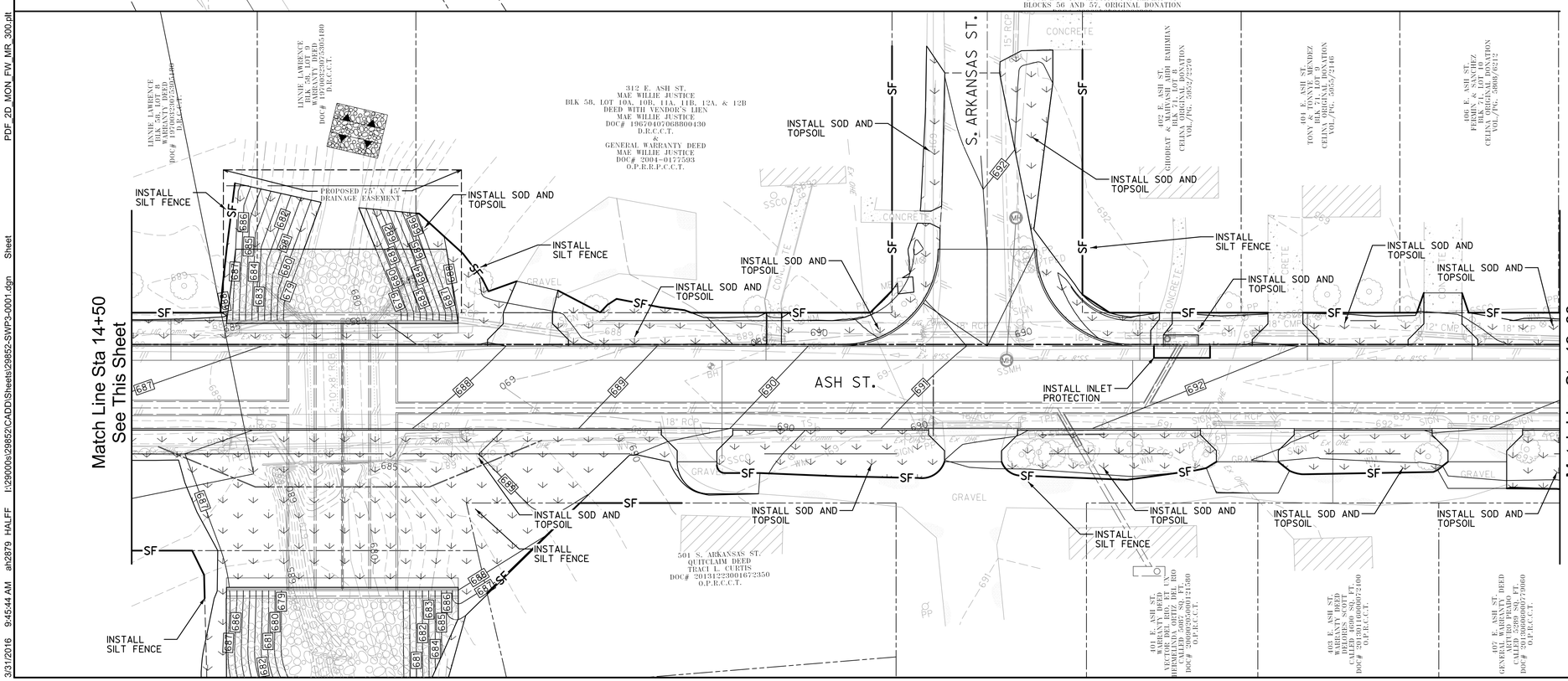


## LEGEND

- SF — SILT FENCE
- SODDING AND 4" TOPSOIL
- CONSTRUCTION ENTRANCE / EXIT
- ROCK CHECK DAM
- CURB INLET PROTECTION

N

0 10 20 30 40
SCALE: 1"=20'

Total Area of Disturbance: 2.6 ACRES
Total Paved Area: 1.5 ACRES
Total non-Paved Area: 1.1 ACRES

Erosion Control Notes:

1. Contractor shall monitor site regularly and keep site free of trash and construction debris.
2. All erosion control devices shall be constructed and maintained in compliance with City Standard Erosion Control Construction Details, sheets 65 and 66 attached.
3. Seeding and/or sodding will be watered until a heavy stand of grass is established with 80% of disturbed areas having no bald spots (see City Standard Detail sheets).
4. Concrete wash-outs shall be sized, maintained and removed per NCTCOG BMP M-3 'Concrete Waste Management'.

PHASES OF EROSION CONTROL

Phase I (As shown on Suggested Traffic Control Plans)
1. Install Silt Fence - entire project
2. Install concrete wash-out area(s)
3. Install Check Dam on Doe Branch

Phase II (As shown on Suggested Traffic Control Plans)
1. Maintain Silt Fence
2. Maintain concrete wash-out area(s)
3. Maintain Check Dam on Doe Branch
4. Install Inlet Protection

Post Roadway Construction
1. Maintain Silt Fence
2. Maintain Inlet Protection
3. Maintain Check Dam on Doe Branch
4. Re-vegetate disturbed areas
5. Remove all temporary erosion control measures once conditions of Notes 3 are met.

RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

21 / 75

Revision

| No. | Description | Date |
|---|---|---|
| | | |
| | | |
| | | |

Erosion Control Plan

Sta 10+00 to Sta 19+00

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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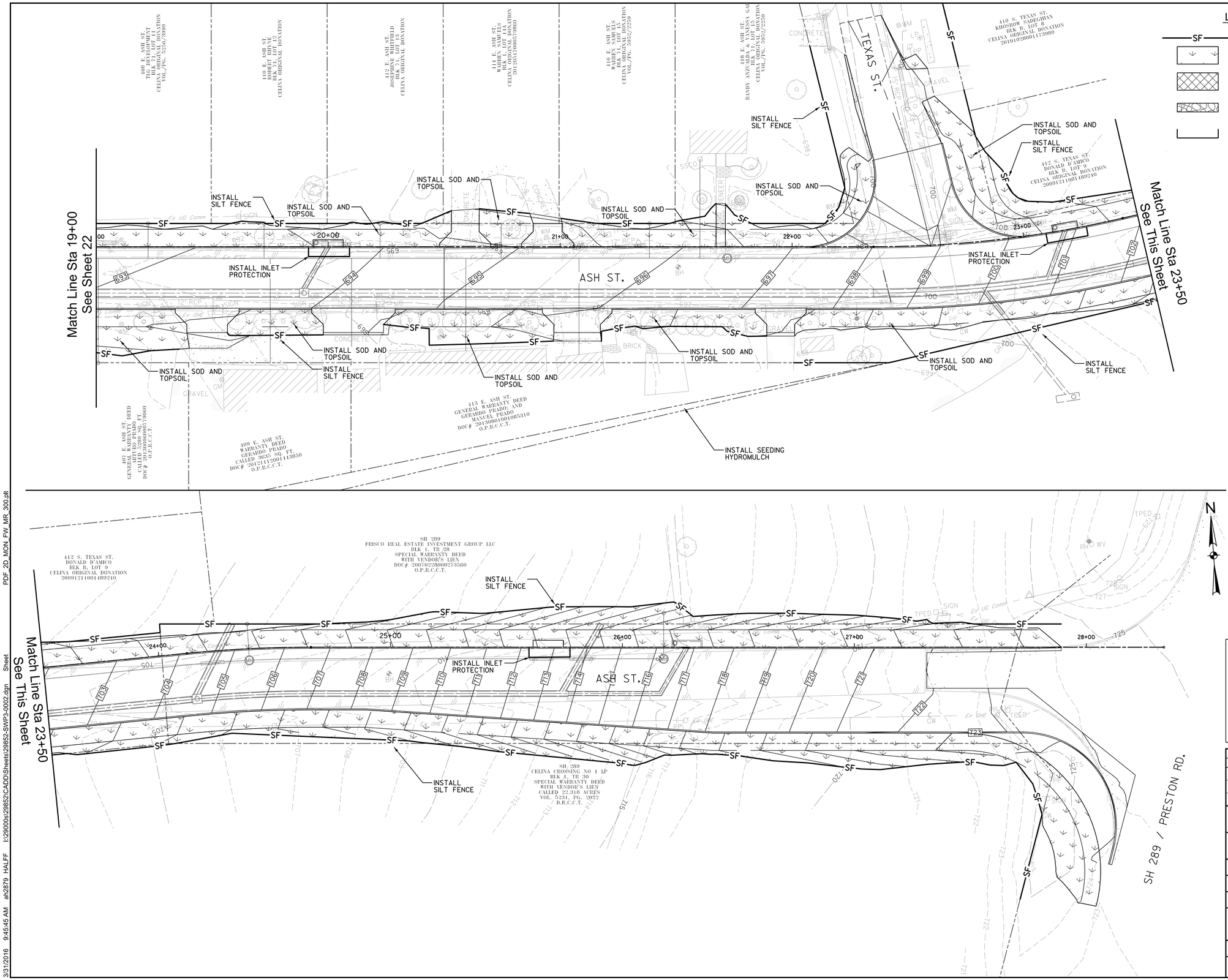



## LEGEND

- SF — SILT FENCE
- SODDING AND 4" TOPSOIL
- CONSTRUCTION ENTRANCE / EXIT
- ROCK CHECK DAM
- CURB INLET PROTECTION

N

0 10 20 30 40
SCALE: 1"=20'

Total Area of Disturbance: 2.6 ACRES
Total Paved Area: 1.5 ACRES
Total non-Paved Area: 1.1 ACRES

Erosion Control Notes:

1. Contractor shall monitor site regularly and keep site free of trash and construction debris.
2. All erosion control devices shall be constructed and maintained in compliance with City Standard Erosion Control Construction Details, sheets 65 and 66 attached.
3. Seeding and/or sodding will be watered until a heavy stand of grass is established with 80% of disturbed areas having no bald spots (see City Standard Detail sheets).
4. Concrete wash-outs shall be sized, maintained and removed per NCTCOG BMP M-3 'Concrete Waste Management'.

PHASES OF EROSION CONTROL

Phase I (As shown on Suggested Traffic Control Plans)
1. Install Silt Fence - entire project
2. Install concrete wash-out area(s)
3. Install Check Dam on Doe Branch

Phase II (As shown on Suggested Traffic Control Plans)
1. Maintain Silt Fence
2. Maintain concrete wash-out area(s)
3. Maintain Check Dam on Doe Branch
4. Install Inlet Protection

Post Roadway Construction
1. Maintain Silt Fence
2. Maintain Inlet Protection
3. Maintain Check Dam on Doe Branch
4. Re-vegetate disturbed areas
5. Remove all temporary erosion control measures once conditions of Notes 3 are met.

RECORD DRAWINGS - APRIL 2016

These Record Drawings were prepared by or under the supervision of Brian C. Haynes, P.E. 90985. These Record Drawings have been prepared based on information provided by the City of Celina, Texas. The Design Professional has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result.

Design Consultant: Halff Associates Inc. TBPE # F-312

22
75

Revision

| No. | Description | Date |
|---|---|---|
| | | |
| | | |
| | | |

Erosion Control Plan

Sta 19+00 to Sta 28+00

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

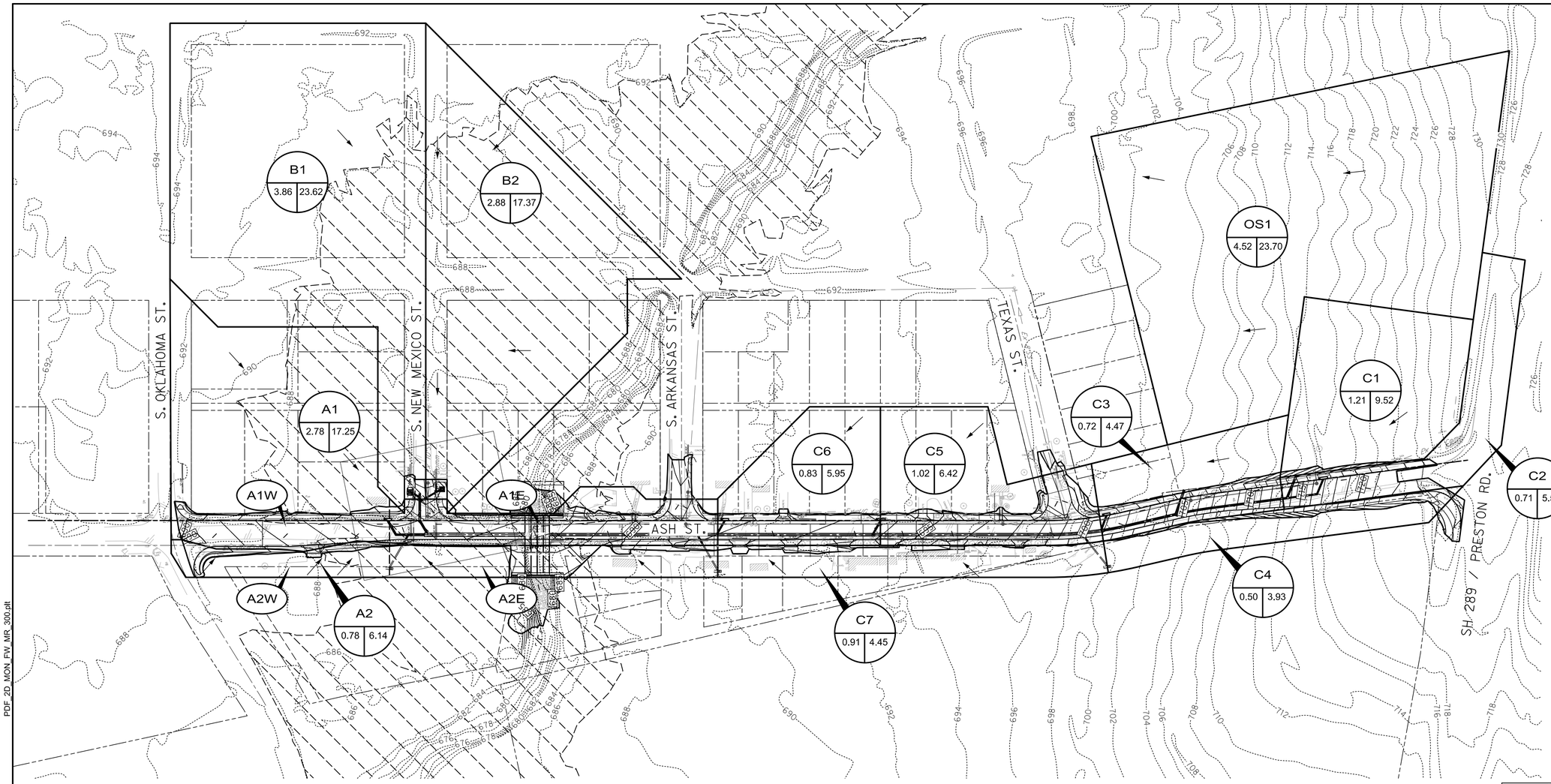
CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 22 |

3/31/2016 9:45:45 AM ah2879 HALFF I:\29000s\29852\CADD\Sheets\29852-SWP3-0002.dgn Sheet PDF_2D_MON_FW_MR_300.plt




N

0 40 80 120 160

SCALE: 1"=80'

## DRAINAGE AREA DESIGN CRITERIA

DRAINAGE AREA DESIGNATION — A1 — 0.56 | 4.08 — 100 YEAR RUNOFF; AREA IN ACRES

$Q_{100}$=C I A

C = Runoff coefficient = REFER TO MODIFIED FORM "A"

$I_{100}$ = Rainfall intensity = 8.74 in/hr

A = Area in acres

## LEGEND

- DRAINAGE DIVIDE
- MINOR DRAINAGE DIVIDE
- 2-FOOT CONTOUR
- FLOW ARROWS

### COMPOSITE "C" CALCULATIONS

| DRAINAGE AREA | ROW 0.9 (ACRES) | Single-family Residential 0.6 (ACRES) | Multi-family Residential 0.8 (ACRES) | School 0.7 (ACRES) | Commercial 0.9 (ACRES) | Industrial 0.9 (ACRES) | AREA (ACRES) | Composite C |
|---|---|---|---|---|---|---|---|---|
| A1W | 0.54 | 1.61 | | | | | 2.15 | 0.67 |
| A1E | 0.53 | 0.10 | | | | | 0.63 | 0.85 |
| *A1* | *1.07* | *1.71* | | | | | *2.78* | *0.71* |
| A2W | 0.30 | | | | | | 0.30 | 0.90 |
| A2E | 0.48 | | | | | | 0.48 | 0.90 |
| *A2* | *0.78* | | | | | | *0.78* | *0.90* |
| B1 | 1.34 | 2.52 | | | | | 3.86 | 0.70 |
| B2 | 0.84 | 2.04 | | | | | 2.88 | 0.69 |
| C1 | | | | | 1.21 | | 1.21 | 0.90 |
| C2 | 0.71 | | | | | | 0.71 | 0.90 |
| C3 | 0.27 | 0.45 | | | | | 0.72 | 0.71 |
| C4 | 0.50 | | | | | | 0.50 | 0.90 |
| C5 | 0.40 | 0.62 | | | | | 1.02 | 0.72 |
| C6 | 0.60 | 0.24 | | | | | 0.83 | 0.82 |
| C7 | 0.56 | | | | | | 0.56 | 0.91 |
| OS1 | | 4.52 | | | | | 4.52 | 0.60 |

### MODIFIED FORM "A" - STORM WATER RUNOFF CALCULATIONS

| DESIGN POINT ID | RUNOFF COEF. "C" | AREA "A" (ACRES) | TOTAL "CA" | TIME OF CONCENTRATION (MIN) | INTENSITY I 2yr (IN/HR) | DISCHARGE Q 2yr (CFS) | INTENSITY I 10yr (IN/HR) | DISCHARGE Q 10yr (CFS) | INTENSITY I 100yr (IN/HR) | DISCHARGE Q 100yr (CFS) | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| A1W | 0.67 | 2.15 | 1.44 | 10 | 4.91 | 7.07 | 6.36 | 9.16 | 8.74 | 12.59 | |
| A1E | 0.85 | 0.63 | 0.54 | 10 | 4.91 | 2.63 | 6.36 | 3.41 | 8.74 | 4.68 | |
| A1 | 0.71 | 2.78 | 1.97 | 10 | 4.91 | 9.69 | 6.36 | 12.55 | 8.74 | 17.25 | |
| A2W | 0.90 | 0.30 | 0.27 | 10 | 4.91 | 1.33 | 6.36 | 1.72 | 8.74 | 2.36 | |
| A2E | 0.90 | 0.48 | 0.43 | 10 | 4.91 | 2.12 | 6.36 | 2.75 | 8.74 | 3.78 | |
| A2 | 0.90 | 0.78 | 0.70 | 10 | 4.91 | 3.45 | 6.36 | 4.46 | 8.74 | 6.14 | |
| B1 | 0.70 | 3.86 | 2.70 | 10 | 4.91 | 13.27 | 6.36 | 17.18 | 8.74 | 23.62 | |
| B2 | 0.69 | 2.88 | 1.99 | 10 | 4.91 | 9.76 | 6.36 | 12.64 | 8.74 | 17.37 | |
| C1 | 0.90 | 1.21 | 1.09 | 10 | 4.91 | 5.35 | 6.36 | 6.93 | 8.74 | 9.52 | |
| C2 | 0.90 | 0.71 | 0.64 | 10 | 4.91 | 3.14 | 6.36 | 4.06 | 8.74 | 5.58 | |
| C3 | 0.71 | 0.72 | 0.51 | 10 | 4.91 | 2.51 | 6.36 | 3.25 | 8.74 | 4.47 | |
| C4 | 0.90 | 0.50 | 0.45 | 10 | 4.91 | 2.21 | 6.36 | 2.86 | 8.74 | 3.93 | |
| C5 | 0.72 | 1.02 | 0.73 | 10 | 4.91 | 3.61 | 6.36 | 4.67 | 8.74 | 6.42 | |
| C6 | 0.82 | 0.83 | 0.68 | 10 | 4.91 | 3.34 | 6.36 | 4.33 | 8.74 | 5.95 | |
| C7 | 0.91 | 0.56 | 0.51 | 10 | 4.91 | 2.50 | 6.36 | 3.24 | 8.74 | 4.45 | |
| OS1 | 0.60 | 4.52 | 2.71 | 10 | 4.91 | 13.32 | 6.36 | 17.25 | 8.74 | 23.70 | Offsite drainage area, assumed to drain to Ash St |
| | | | | | | | | | | | |

RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

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Revision

| No. | Description | Date |
|---|---|---|
| | | |
| | | |
| | | |

# Drainage Area Map

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 23 |

3/31/2016 9:45:46 AM ah2879 HALFF I:\29000s\29852\CADD\Sheets\29852-DAMS-0001.dgn Sheet PDF_2D_MON_FW_MR_300.plt

## FORM "B" - INLET DESIGN CALCULATIONS

| Inlet No. | Inlet Location | Design Storm Frequency (yr) | Area/Runoff: Time of Conc. (min) | Intensity I (in/hr) | Runoff Coeff "C" | Area (ac) | "Q" (cfs) | Carry-Over from Upstream Inlet (cfs) | Total Gutter Flow (cfs) | Gutter Capacity (cfs) | Gutter Slope (ft/100 ft) | Crown Type | Selected Inlet: Length "Li" (Feet) | Selected Inlet: Type | Carry-Over to Downstream Inlet (cfs) | Downstream Inlet No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| Ultimate Condition | | | | | | | | | | | | | | | | |
| A1W | | 100 | 10 | 8.74 | 0.67 | 2.15 | 12.59 | | 12.59 | 4.20 | 0.3 | 2% Cross Slope | | | - | - |
| A1E | | 100 | 10 | 8.74 | 0.85 | 0.63 | 4.68 | | 4.68 | 4.20 | 0.3 | 2% Cross Slope | | | - | - |
| A1 | Ash St. BL 13+08.57 | 100 | 10 | 8.74 | 0.71 | 2.78 | 17.25 | | 17.25 | - | - | - | 9.56 | 10' IIA | - | - |
| A2W | | 100 | 10 | 8.74 | 0.9 | 0.3 | 2.36 | | 2.36 | 4.20 | 0.3 | 2% Cross Slope | | | - | - |
| A2E | | 100 | 10 | 8.74 | 0.9 | 0.48 | 3.78 | | 3.78 | 4.20 | 0.3 | 2% Cross Slope | | | - | - |
| A2 | Ash St. BL 13+08.57, 70' Rt | 100 | 10 | 8.74 | 0.9 | 0.78 | 6.14 | | 6.14 | - | - | - | 3.40 | 6' IIA (future) | - | - |
| B1 | New Mexico CL 1+35, 25' Lt. | 100 | 10 | 8.74 | 0.7 | 3.86 | 23.62 | | - | - | - | - | | V (temp) | | A1E |
| B2 | New Mexico CL 1+35, 25' Rt. | 100 | 10 | 8.74 | 0.69 | 2.88 | 17.37 | | - | - | - | - | | V (temp) | | A1E |
| C1 | Ash St. BL 25+91, 10' Rt | 100 | 10 | 8.74 | 0.9 | 1.21 | 9.52 | | - | - | - | - | | V (temp) | | - |
| C2 | Ash St. BL 25+67.82 | 100 | 10 | 8.74 | 0.9 | 0.71 | 5.58 | | 5.58 | 20.28 | 7.0 | 2% Cross Slope | 11.17 | 12' II | | C4 |
| C3 | Ash St. BL 23+08.26 | 100 | 10 | 8.74 | 0.71 | 0.72 | 4.47 | | 4.47 | 14.13 | 3.4 | 2% Cross Slope | 8.77 | 10' II | | C4 |
| C4 | Ash St. BL 23+08.26, 70' Rt. | 100 | 10 | 8.74 | 0.9 | 0.5 | 3.93 | | 3.93 | 14.13 | 3.4 | 2% Cross Slope | 7.85 | 8' II (future) | | C5 |
| C5 | Ash St. BL 19+99.57 | 100 | 10 | 8.74 | 0.72 | 1.02 | 6.42 | | 6.42 | 11.11 | 2.1 | 2% Cross Slope | 11.51 | 12' II | | A1E |
| C6 | Ash St. BL 17+70.57 | 100 | 10 | 8.74 | 0.82 | 0.83 | 5.95 | | 5.95 | 6.86 | 0.8 | 2% Cross Slope | 9.94 | 10' II | | A1E |
| C7 | Ash St. BL 17+70.57, 70' Rt. | 100 | 10 | 8.74 | 0.91 | 0.56 | 4.45 | | 4.45 | 6.86 | 0.8 | 2% Cross Slope | 7.83 | 8' II (future) | | A2E |
| OS1 | | 100 | 10 | 8.74 | 0.6 | 4.52 | 23.70 | | - | - | - | - | | - | | C2 |
| | | | | | | | | | | | | | | | | |
| Temporary Inlets | | | | | | | | | | | | | | | | |
| A2 | Ash St. BL 13+18.95, 48' Rt | 100 | 10 | 8.74 | 0.9 | 0.78 | 6.14 | | - | - | - | - | | V (temp) | - | - |
| C4 | | 100 | 10 | 8.74 | 0.9 | 0.5 | 3.93 | | - | - | | - | | V (temp) | | - |
| C7 | | 100 | 10 | 8.74 | 0.91 | 0.56 | 4.45 | | - | - | - | - | | V (temp) | | - |
| | | | | | | | | | | | | | | | | |

## MODIFIED FORM "C" - STORM SEWER CALCULATIONS

| RUNOFF COLLECTION POINT (Inlet or Manhole): I.D. | Upstream Station | Downstream Station | Distance Between Collection Points (ft.) | INCREMENTAL DRAINAGE AREA: Area No. | Drainage Area "A" (Acres) | Runoff Coeff. "C" | Incremental "CA" | Accumulated "CA" | Time at Upstream Station (minutes) | Design Storm Frequency (yrs) | Intensity "I" (Inches/hr) | Storm Water Runoff "Q" (cfs) | Slope of Hydraulic Gradient "S" (ft./ft.) | Selected Storm Sewer Size (in.) | Velocity in Sewer Between Collection Point "V" (f.p.s.) | Friction Loss (ft.) | Head Loss Coeff. K | Velocity Head Loss of Upstream Station (ft.) | Flow Time in Sewer Distance V x 60 (min.) | Time of Downstream Station (min.) | Downstream HGL (ft.) | Upstream HGL (ft.) | Design Point HGL (ft.) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| Line A | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 3+05.06 | 2+81.96 | 23.10 | A1 | 2.78 | 0.71 | 1.97 | 1.97 | 10.00 | 100 | 8.74 | 17.25 | 0.0058 | 24 | 5.49 | 0.13 | 1.50 | 0.70 | 0.07 | 10.07 | 684.48 | 684.61 | 685.32 | Curb Inlet |
| 2 | 2+81.96 | 2+69.40 | 12.56 | - | - | - | - | 1.97 | 10.07 | 100 | 8.72 | 17.25 | 0.0058 | 24 | 5.49 | 0.07 | 0.40 | 0.28 | 0.04 | 10.11 | 684.13 | 684.20 | 684.48 | 60° Bend |
| 4 | 2+69.40 | 2+64.40 | 5.00 | - | - | - | - | 1.97 | 10.11 | 100 | 8.71 | 17.25 | 0.0018 | 30 | 3.51 | 0.01 | 1.00 | 0.00 | 0.02 | 10.13 | 684.12 | 684.13 | 684.13 | Pipe Size Change |
| 5 | 2+64.40 | 2+33.39 | 31.01 | A2 | 0.78 | 0.90 | 0.70 | 2.68 | 10.13 | 100 | 8.71 | 23.30 | 0.0032 | 30 | 4.75 | 0.10 | 0.50 | 0.25 | 0.11 | 10.24 | 683.76 | 683.86 | 684.12 | 60° WYE |
| 6 | 2+33.39 | 2+28.39 | 5.00 | - | - | - | - | 2.68 | 10.24 | 100 | 8.68 | 23.30 | 0.0003 | 48 | 1.85 | 0.00 | 1.00 | 0.00 | 0.04 | 10.29 | 683.76 | 683.76 | 683.76 | Pipe Size Change |
| 7 | 2+28.39 | 1+00.00 | 128.39 | LINE B | 6.74 | 0.70 | 4.72 | 7.39 | 10.29 | 100 | 8.67 | 64.11 | 0.0020 | 48 | 5.10 | 0.26 | 0.60 | 0.37 | 0.42 | 10.71 | 683.13 | 683.39 | 683.76 | 60° WYE |
| 8 | 1+00.00 | 1+00.00 | 0.00 | - | - | - | - | 7.39 | 10.71 | 100 | 8.57 | 64.11 | 0.0020 | 48 | 5.10 | 0.00 | 0.00 | 0.40 | 0.00 | 10.71 | 682.73 | 682.73 | 683.13 | Connect to Culvert A |
| Lateral A-1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 1+53.10 | 1+00.00 | 53.10 | A2 | 0.78 | 0.90 | 0.70 | 0.70 | 10.00 | 100 | 8.74 | 6.14 | 0.0007 | 24 | 1.95 | 0.04 | 1.50 | 0.09 | 0.45 | 10.45 | 684.20 | 684.24 | 684.33 | Future Curb Inlet |
| 5 | 1+00.00 | 1+00.00 | 0.00 | - | - | - | - | 0.70 | 10.45 | 100 | 8.63 | 6.14 | 0.0007 | 24 | 1.95 | 0.00 | 0.25 | 0.34 | 0.00 | 10.45 | 683.86 | 683.86 | 684.20 | Connect to Line A |
| Line B | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | 1+54.59 | 1+50.97 | 3.62 | B2 | 2.88 | 0.69 | 1.99 | 1.99 | 10.00 | 100 | 8.74 | 17.37 | 0.0004 | 39 | 2.09 | 0.00 | 0.60 | 0.04 | 0.03 | 10.03 | 685.31 | 685.31 | 685.35 | 60° WYE |
| 21 | 1+50.97 | 1+23.09 | 27.88 | B1 | 3.86 | 0.70 | 2.70 | 4.69 | 10.03 | 100 | 8.73 | 40.95 | 0.0025 | 39 | 4.94 | 0.07 | 0.60 | 0.34 | 0.09 | 10.12 | 684.90 | 684.97 | 685.31 | 60° WYE |
| 22 | 1+23.09 | 1+00.00 | 23.09 | - | - | - | - | 4.69 | 10.12 | 100 | 8.71 | 40.95 | 0.0025 | 39 | 4.94 | 0.06 | 0.55 | 0.17 | 0.08 | 10.20 | 683.70 | 683.76 | 684.90 | 30° Bend |
| 7 | 1+00.00 | 1+00.00 | 0.00 | - | - | - | - | 4.69 | 10.20 | 100 | 8.69 | 40.95 | 0.0025 | 39 | 4.94 | 0.00 | 0.25 | 0.31 | 0.00 | 10.20 | 683.39 | 683.39 | 683.70 | Connect to Line A |
| Lateral B-1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 | 1+24.25 | 1+00.00 | 24.25 | B1 | 3.86 | 0.70 | 2.70 | 2.70 | 10.00 | 100 | 8.74 | 23.62 | 0.0505 | 18 | 13.36 | 1.23 | 1.50 | 4.16 | 0.03 | 10.03 | 684.97 | 686.19 | 690.35 | Area Inlet |
| 21 | 1+00.00 | 1+00.00 | 0.00 | - | - | - | - | 2.70 | 10.03 | 100 | 8.73 | 23.62 | 0.0505 | 18 | 13.36 | 0.00 | 0.25 | 0.00 | 0.00 | 10.03 | 684.97 | 684.97 | 684.97 | Connect to Line B |
| Lateral B-2 | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 | 1+24.83 | 1+00.00 | 24.83 | B2 | 2.88 | 0.69 | 1.99 | 1.99 | 10.00 | 100 | 8.74 | 17.37 | 0.0273 | 18 | 9.83 | 0.68 | 1.50 | 2.25 | 0.04 | 10.04 | 685.31 | 685.99 | 688.24 | Area Inlet |
| 20 | 1+00.00 | 1+00.00 | 0.00 | - | - | - | - | 1.99 | 10.04 | 100 | 8.73 | 17.37 | 0.0273 | 18 | 9.83 | 0.00 | 0.25 | 0.00 | 0.00 | 10.04 | 685.31 | 685.31 | 685.31 | Connect to Line B |
| Line C | | | | | | | | | | | | | | | | | | | | | | | | |
| 30 | 11+77.62 | 11+42.98 | 34.64 | C1 | 1.21 | 0.90 | 1.09 | 1.09 | 10.00 | 100 | 8.74 | 9.52 | 0.0018 | 24 | 3.03 | 0.06 | 1.50 | 0.21 | 0.19 | 10.19 | 697.69 | 697.75 | 697.96 | Stubout for future |
| 31 | 11+42.98 | 11+24.35 | 18.63 | - | - | - | - | 1.09 | 10.19 | 100 | 8.69 | 9.52 | 0.0018 | 24 | 3.03 | 0.03 | 0.40 | 0.09 | 0.10 | 10.29 | 697.57 | 697.60 | 697.69 | 60° Bend |
| 32 | 11+24.35 | 9+88.46 | 135.89 | C2 | 0.71 | 0.90 | 0.64 | 1.73 | 10.29 | 100 | 8.67 | 14.98 | 0.0044 | 24 | 4.77 | 0.60 | 0.30 | 0.31 | 0.48 | 10.77 | 696.67 | 697.26 | 697.57 | 60° WYE |
| 33 | 9+88.46 | 9+84.76 | 3.70 | - | - | - | - | 1.73 | 10.77 | 100 | 8.55 | 14.98 | 0.0023 | 27 | 3.77 | 0.01 | 1.00 | 0.00 | 0.02 | 10.78 | 696.66 | 696.67 | 696.67 | Pipe Size Change |
| 34 | 9+84.76 | 8+80.46 | 104.30 | OS1 | 4.52 | 0.60 | 2.71 | 4.44 | 10.78 | 100 | 8.55 | 37.96 | 0.0150 | 27 | 9.55 | 1.57 | 0.60 | 1.28 | 0.18 | 10.97 | 693.81 | 695.37 | 696.66 | 60° WYE |
| 35 | 8+80.46 | 8+75.46 | 5.00 | - | - | - | - | 4.44 | 10.97 | 100 | 8.50 | 37.96 | 0.0032 | 36 | 5.37 | 0.02 | 1.00 | 0.00 | 0.02 | 10.98 | 693.79 | 693.81 | 693.81 | Pipe Size Change |
| 36 | 8+75.46 | 8+48.84 | 26.62 | C3 | 0.72 | 0.71 | 0.51 | 4.95 | 10.98 | 100 | 8.50 | 42.09 | 0.0040 | 36 | 5.95 | 0.11 | 0.40 | 0.37 | 0.07 | 11.06 | 693.31 | 693.42 | 693.79 | 60° WYE |
| 37 | 8+48.84 | 5+55.19 | 293.65 | C4 | 0.50 | 0.90 | 0.45 | 5.40 | 11.06 | 100 | 8.48 | 45.81 | 0.0047 | 36 | 6.48 | 1.39 | 0.40 | 0.43 | 0.76 | 11.81 | 691.50 | 692.88 | 693.31 | 60° WYE |
| 39 | 5+55.19 | 3+35.76 | 219.43 | C5 | 1.02 | 0.72 | 0.73 | 6.14 | 11.81 | 100 | 8.30 | 50.91 | 0.0058 | 36 | 7.20 | 1.28 | 0.40 | 0.54 | 0.51 | 12.32 | 689.67 | 690.95 | 691.50 | 60° WYE |
| 40 | 3+35.76 | 3+08.44 | 27.32 | C6 | 0.83 | 0.82 | 0.68 | 6.82 | 12.32 | 100 | 8.17 | 55.72 | 0.0070 | 36 | 7.88 | 0.19 | 0.40 | 0.64 | 0.06 | 12.38 | 688.84 | 689.03 | 689.67 | 60° WYE |
| 41 | 3+08.44 | 1+00.00 | 208.44 | C7 | 0.56 | 0.91 | 0.51 | 7.33 | 12.38 | 100 | 8.16 | 59.78 | 0.0080 | 36 | 8.46 | 1.67 | 0.40 | 0.72 | 0.41 | 12.79 | 686.44 | 688.11 | 688.84 | 60° WYE |
| 42 | 1+00.00 | 1+00.00 | 0.00 | - | - | - | - | 7.33 | 12.79 | 100 | 8.06 | 59.78 | 0.0080 | 36 | 8.46 | 0.00 | 0.00 | 1.11 | 0.00 | 12.79 | 685.33 | 685.33 | 686.44 | Connect to Culvert A |
| Lateral C-1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 43 | 1+58.66 | 1+00.00 | 58.66 | C7 | 0.56 | 0.91 | 0.51 | 0.51 | 10.00 | 100 | 8.74 | 4.45 | 0.0018 | 18 | 2.52 | 0.11 | 1.50 | 0.15 | 0.39 | 10.39 | 689.20 | 689.31 | 689.45 | Future Curb Inlet |
| 41 | 1+00.00 | 1+00.00 | 0.00 | - | - | - | - | 0.51 | 10.39 | 100 | 8.65 | 4.45 | 0.0018 | 18 | 2.52 | 0.00 | 0.25 | 1.09 | 0.00 | 10.39 | 688.11 | 688.11 | 689.20 | Connect to Line C |
| Lateral C-2 | | | | | | | | | | | | | | | | | | | | | | | | |
| 44 | 1+23.09 | 1+00.00 | 23.09 | C6 | 0.83 | 0.82 | 0.68 | 0.68 | 10.00 | 100 | 8.74 | 5.95 | 0.0032 | 18 | 3.37 | 0.07 | 1.50 | 0.26 | 0.11 | 10.11 | 689.95 | 690.02 | 690.29 | Curb Inlet |
| 40 | 1+00.00 | 1+00.00 | 0.00 | - | - | - | - | 0.68 | 10.11 | 100 | 8.71 | 5.95 | 0.0032 | 18 | 3.37 | 0.00 | 0.25 | 0.92 | 0.00 | 10.11 | 689.03 | 689.03 | 689.95 | Connect to Line C |
| Lateral C-3 | | | | | | | | | | | | | | | | | | | | | | | | |
| 45 | 1+23.09 | 1+00.00 | 23.09 | C5 | 1.02 | 0.72 | 0.73 | 0.73 | 10.00 | 100 | 8.74 | 6.42 | 0.0037 | 18 | 3.63 | 0.09 | 1.50 | 0.31 | 0.11 | 10.11 | 691.71 | 691.79 | 692.10 | Curb Inlet |
| 39 | 1+00.00 | 1+00.00 | 0.00 | - | - | - | - | 0.73 | 10.11 | 100 | 8.71 | 6.42 | 0.0037 | 18 | 3.63 | 0.00 | 0.25 | 0.75 | 0.00 | 10.11 | 690.95 | 690.95 | 691.71 | Connect to Line C |
| Lateral C-4 | | | | | | | | | | | | | | | | | | | | | | | | |
| 46 | 1+58.66 | 1+00.00 | 58.66 | C4 | 0.50 | 0.90 | 0.45 | 0.45 | 10.00 | 100 | 8.74 | 3.93 | 0.0014 | 18 | 2.23 | 0.08 | 1.50 | 0.12 | 0.44 | 10.44 | 697.56 | 697.65 | 697.76 | Future Curb Inlet |
| 37 | 1+00.00 | 1+00.00 | 0.00 | - | - | - | - | 0.45 | 10.44 | 100 | 8.63 | 3.93 | 0.0014 | 18 | 2.23 | 0.00 | 0.25 | 0.63 | 0.00 | 10.44 | 696.93 | 696.93 | 697.56 | Connect to Line C |
| Lateral C-5 | | | | | | | | | | | | | | | | | | | | | | | | |
| 47 | 1+23.09 | 1+00.00 | 23.09 | C3 | 0.72 | 0.71 | 0.51 | 0.51 | 10.00 | 100 | 8.74 | 4.47 | 0.0018 | 18 | 2.53 | 0.04 | 1.50 | 0.15 | 0.15 | 10.15 | 698.42 | 698.46 | 698.61 | Curb Inlet |
| 36 | 1+00.00 | 1+00.00 | 0.00 | - | - | - | - | 0.51 | 10.15 | 100 | 8.70 | 4.47 | 0.0018 | 18 | 2.53 | 0.00 | 0.25 | 0.53 | 0.00 | 10.15 | 697.89 | 697.89 | 698.42 | Connect to Line C |
| Lateral C-6 | | | | | | | | | | | | | | | | | | | | | | | | |
| 48 | 1+36.21 | 1+00.00 | 36.21 | OS1 | 4.52 | 0.60 | 2.71 | 2.71 | 10.00 | 100 | 8.74 | 23.70 | 0.0059 | 27 | 5.96 | 0.21 | 0.00 | 0.00 | 0.10 | 10.10 | 703.58 | 703.79 | 703.79 | Stubout for future |
| 34 | 1+00.00 | 1+00.00 | 0.00 | - | - | - | - | 2.71 | 10.10 | 100 | 8.72 | 23.70 | 0.0059 | 27 | 5.96 | 0.00 | 0.25 | 1.28 | 0.00 | 10.10 | 702.30 | 702.30 | 703.58 | Connect to Line C |
| ~~Lateral C-7~~ | | | | | | | | | | | | | | | | | | | | | | | | |
| ~~49~~ | ~~1+23.09~~ | ~~1+00.00~~ | ~~23.09~~ | ~~C2~~ | ~~0.71~~ | ~~0.90~~ | ~~0.64~~ | ~~0.64~~ | ~~10.00~~ | ~~100~~ | ~~8.74~~ | ~~5.58~~ | ~~0.0028~~ | ~~18~~ | ~~3.16~~ | ~~0.07~~ | ~~1.50~~ | ~~0.23~~ | ~~0.12~~ | ~~10.12~~ | ~~710.22~~ | ~~710.29~~ | ~~710.52~~ | ~~Curb Inlet~~ |
| ~~32~~ | ~~1+00.00~~ | ~~1+00.00~~ | ~~0.00~~ | | | | | ~~0.64~~ | ~~10.12~~ | ~~100~~ | ~~8.71~~ | ~~5.58~~ | ~~0.0028~~ | ~~18~~ | ~~3.16~~ | ~~0.00~~ | ~~0.25~~ | ~~0.31~~ | ~~0.00~~ | ~~10.12~~ | ~~709.91~~ | ~~709.91~~ | ~~710.22~~ | ~~Connect to Line C~~ |
| Lateral C-7 | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | 1+65.78 | 1+42.69 | 23.09 | C2 | 0.71 | 0.90 | 0.64 | 0.64 | 0.00 | 100 | 11.18 | 7.14 | 0.0046 | 18 | 4.04 | 0.11 | 1.50 | 0.25 | 0.10 | 0.10 | 710.26 | 710.37 | 710.62 | Curb Inlet |
| 50 | 1+42.69 | 1+03.00 | 39.69 | - | - | - | - | 0.64 | 0.10 | 100 | 11.16 | 7.14 | 0.0046 | 18 | 4.04 | 0.18 | 0.40 | 0.15 | 0.16 | 0.26 | 709.92 | 710.11 | 710.26 | 60° Bend |
| 31 | 1+03.00 | 1+00.00 | 3.00 | - | - | - | - | 0.64 | 0.26 | 100 | 11.12 | 7.14 | 0.0046 | 18 | 4.04 | 0.01 | 1.00 | 0.00 | 0.01 | 0.27 | 709.91 | 709.92 | 709.92 | Connect to Line C |

1

RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

24 / 75

Revision

| No. | Description | Date |
|---|---|---|
| 1 | Revised Storm Lateral 'C-7' | 4/8/15 |
| | | |
| | | |

Storm Drain Calculations

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 24 |

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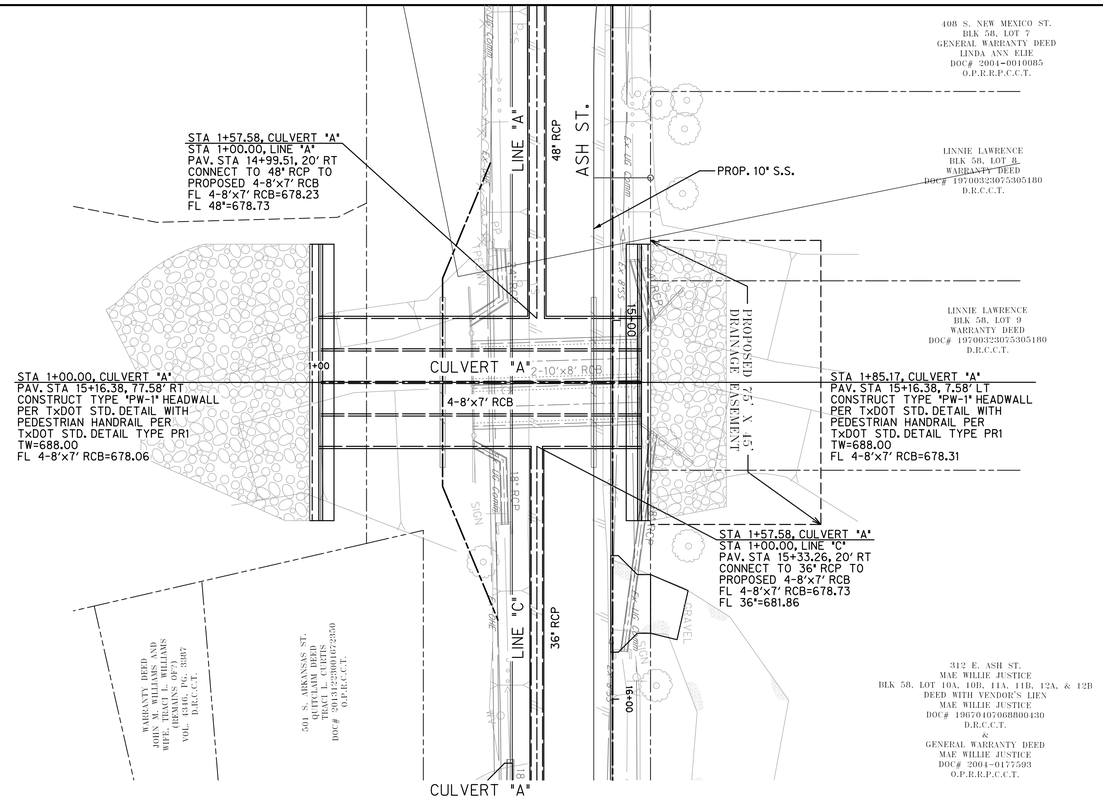
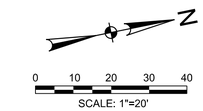


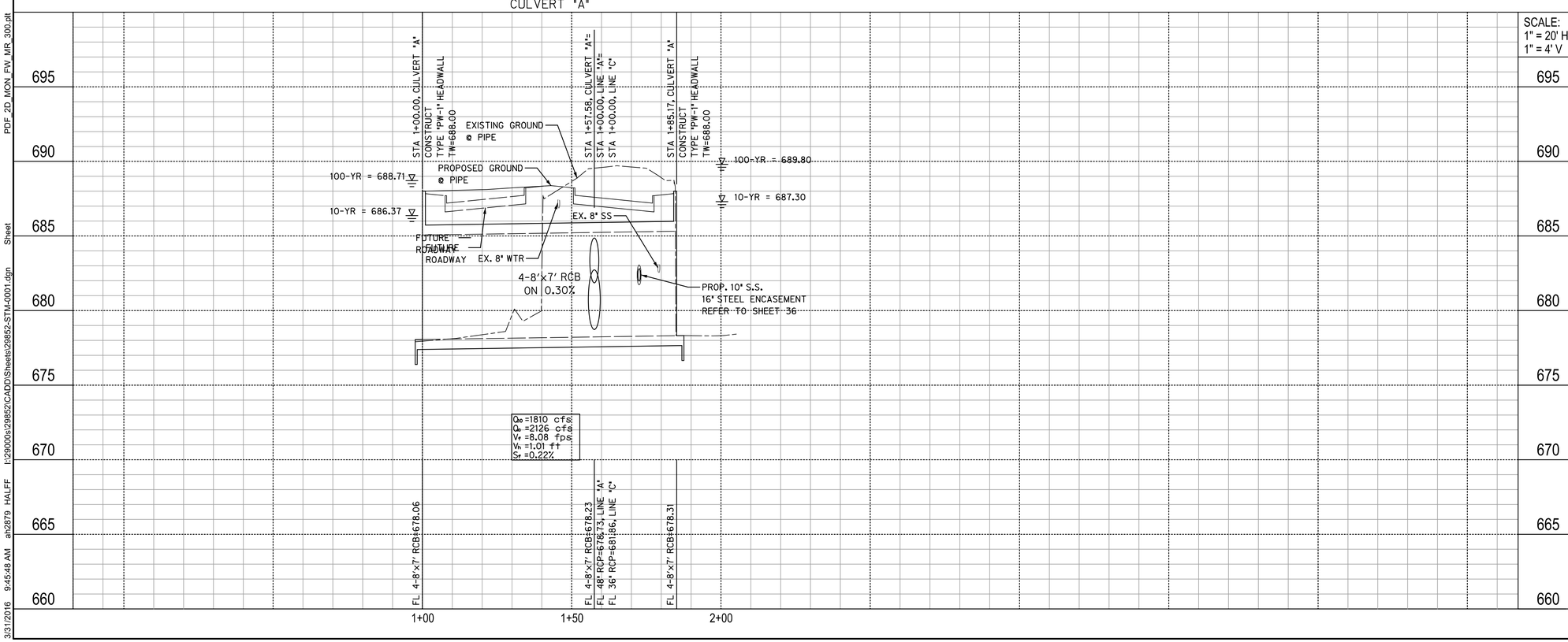




## LEGEND

- PROPOSED STORM DRAIN
- CURB INLET
- STORM DRAIN MANHOLE
- FUTURE STORM DRAIN

Storm Drain Notes:

1. Refer to General Notes for additional information.
2. Saw-cutting pavement and temporary pavement repairs incidental to storm drain construction shall be performed at no additional cost to the City (subsidiary to storm drain installation).
3. Factory fabricated 45-degree WYEs shall be installed at all proposed pipe connections. All pipe bends shall be standard 15, 30, 45 or 60 degree factory fabricated bends.
4. All connections to existing concrete pipe shall be made with concrete pipe.
5. Concrete collars shall be constructed at all proposed pipe to existing concrete pipe connections, at all concrete pipe size changes, at all concrete pipe PVIs and at all concrete pipe joints with more than half pipe tongue exposure.
6. Class III RCP shall be used unless noted otherwise.
7. C-850 Reinforced Concrete Box Culvert (RCB) shall be used unless noted otherwise.




RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

25/75

Revision

| No. | Description | Date |
|---|---|---|
| | | |

Culvert 'A'

Plan and Profile

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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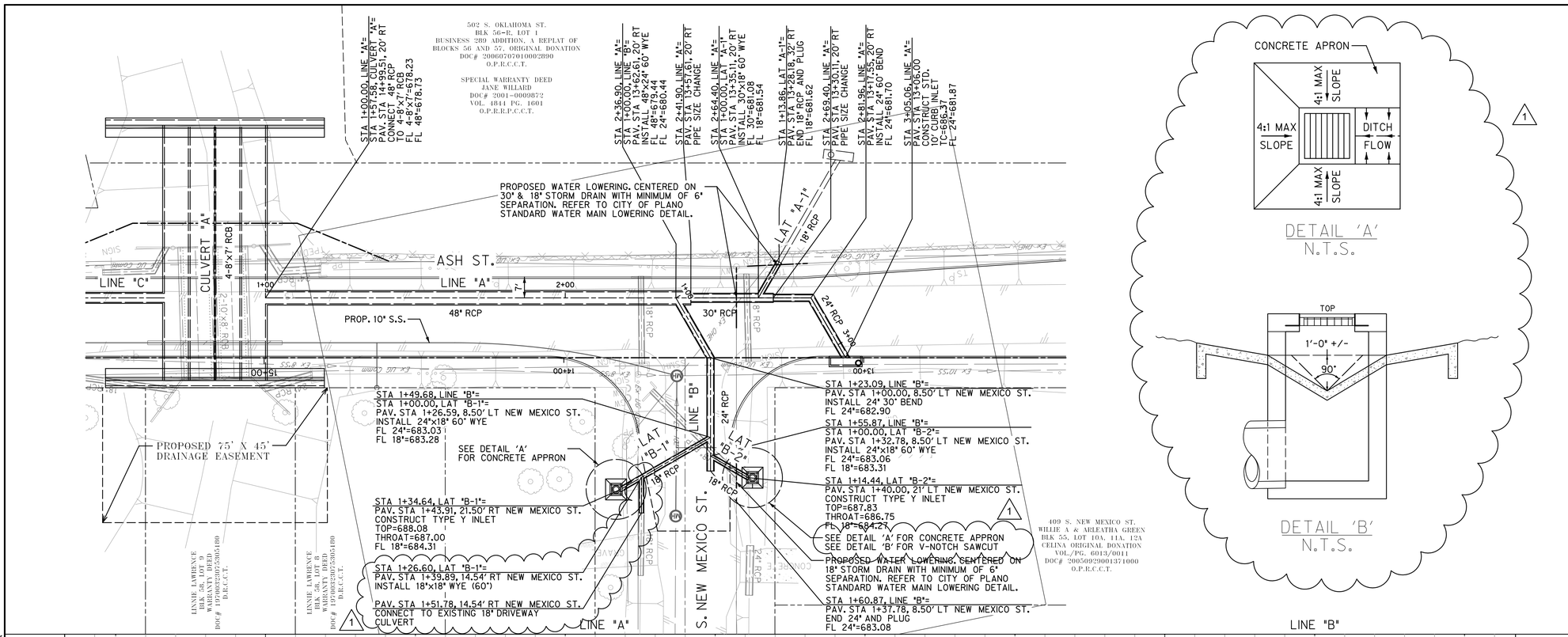
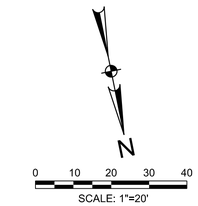






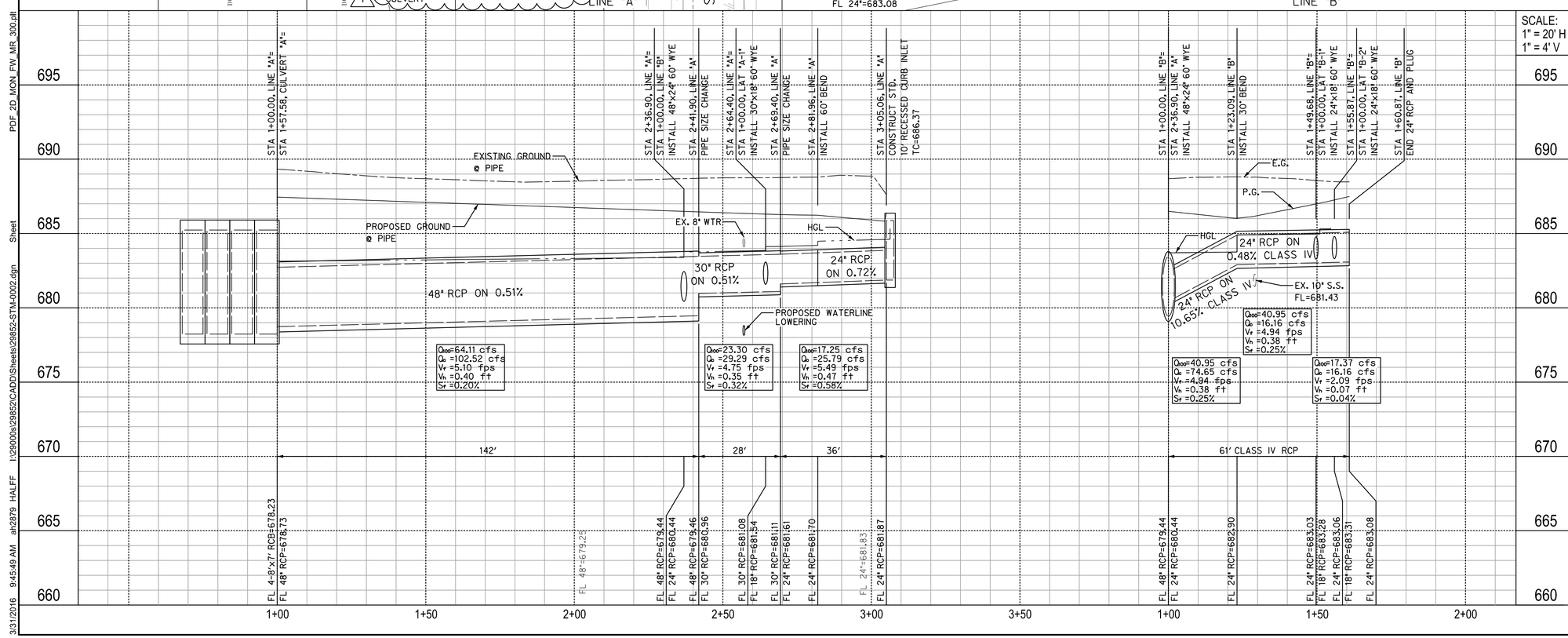



## LEGEND

- PROPOSED STORM DRAIN
- CURB INLET
- STORM DRAIN MANHOLE
- FUTURE STORM DRAIN

Storm Drain Notes:

1. Refer to General Notes for additional information.
2. Saw-cutting pavement and temporary pavement repairs incidental to storm drain construction shall be performed at no additional cost to the City (subsidiary to storm drain installation).
3. Factory fabricated 45-degree WYEs shall be installed at all proposed pipe connections. All pipe bends shall be standard 15, 30, 45 or 60 degree factory fabricated bends.
4. All connections to existing concrete pipe shall be made with concrete pipe.
5. Concrete collars shall be constructed at all proposed pipe to existing concrete pipe connections, at all concrete pipe size changes, at all concrete pipe PVIs and at all concrete pipe joints with more than half pipe tongue exposure.
6. Class III RCP shall be used unless noted otherwise.
7. C-850 Reinforced Concrete Box Culvert (RCB) shall be used unless noted otherwise.




RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

26 / 75

Revision

| No. | Description | Date |
|---|---|---|
| 1 | Revised Type 'Y' Inlet, Added 18" Pipe & Wye Inlet | 07/13/15 |

# Storm Drain Lines 'A' and 'B'

## Plan and Profile

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
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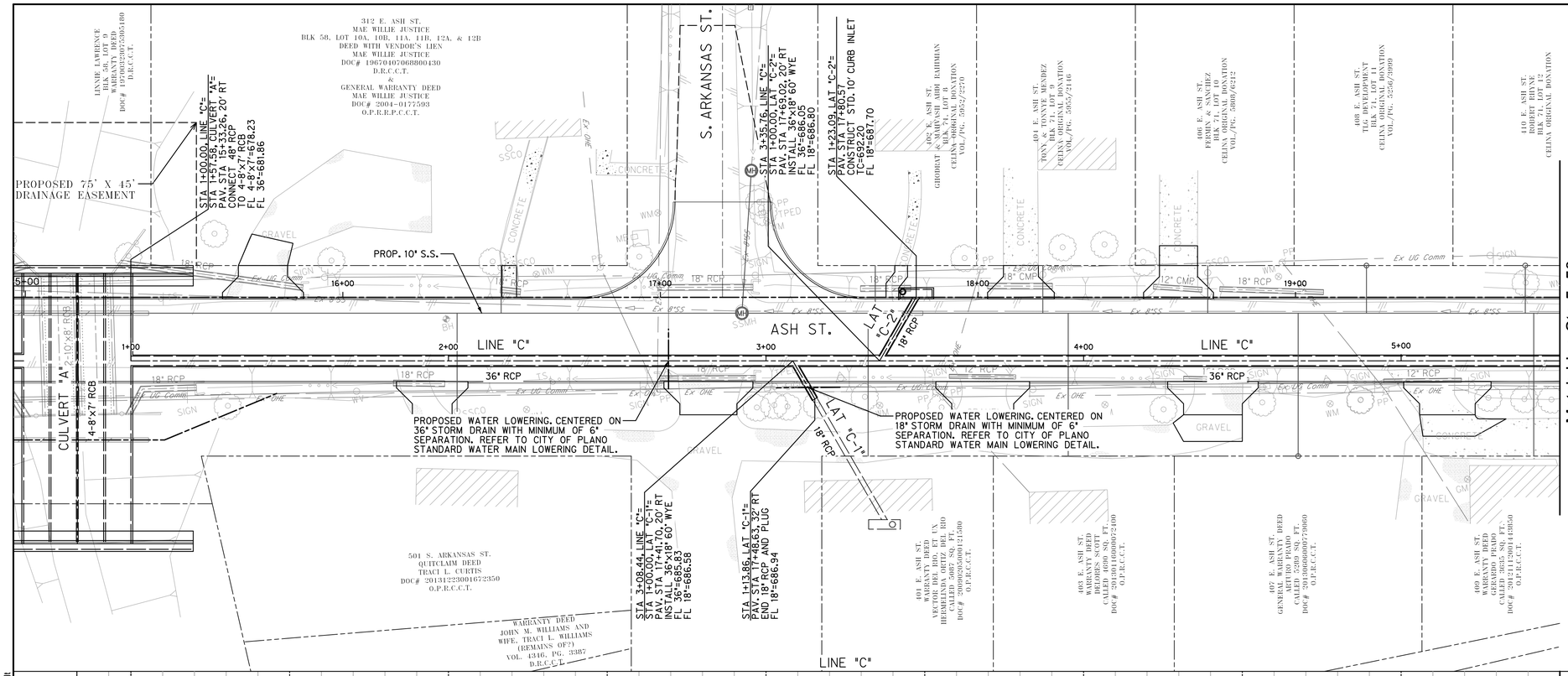


## LEGEND

- PROPOSED STORM DRAIN
- CURB INLET
- STORM DRAIN MANHOLE
- FUTURE STORM DRAIN

Storm Drain Notes:

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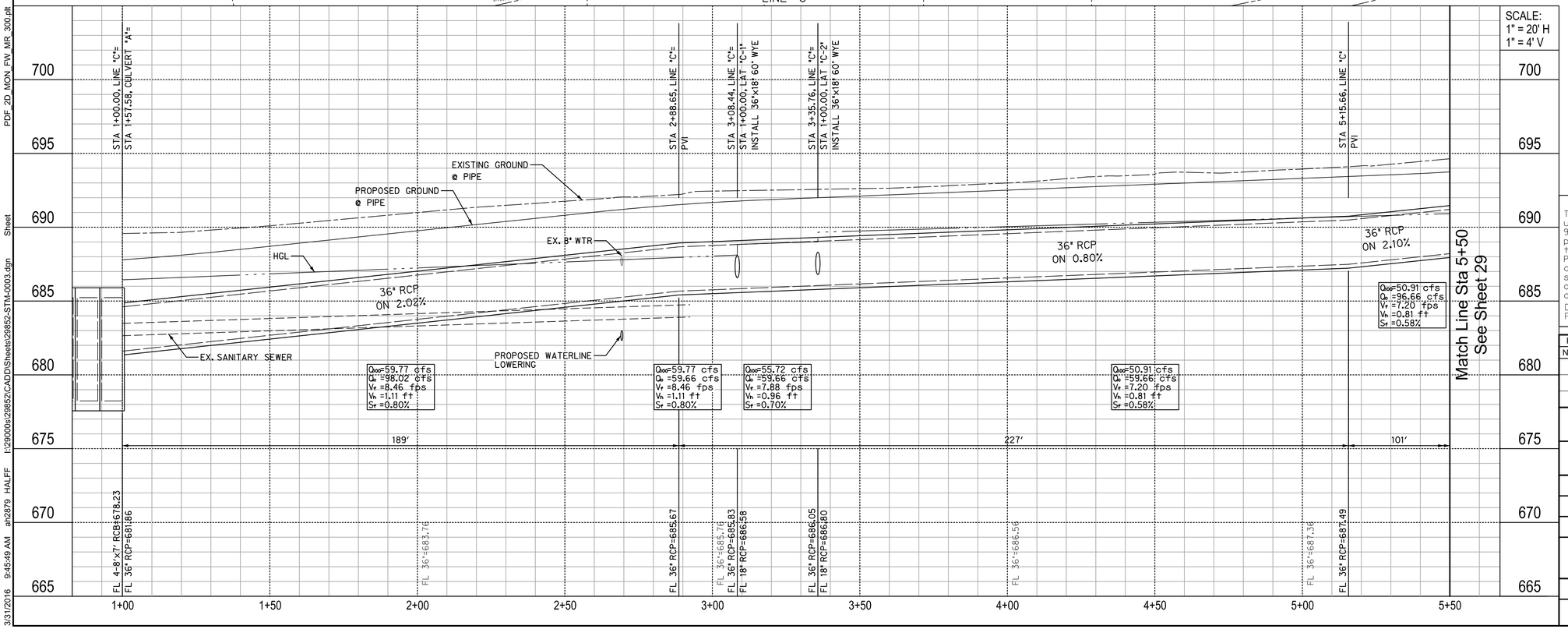


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Design Consultant: Halff Associates Inc. TBPE # F-312

27
75

Revision

| No. | Description | Date |
|---|---|---|
| | | |

# Storm Drain Line 'C' Plan and Profile

## Sta 1+00 to Sta 5+50

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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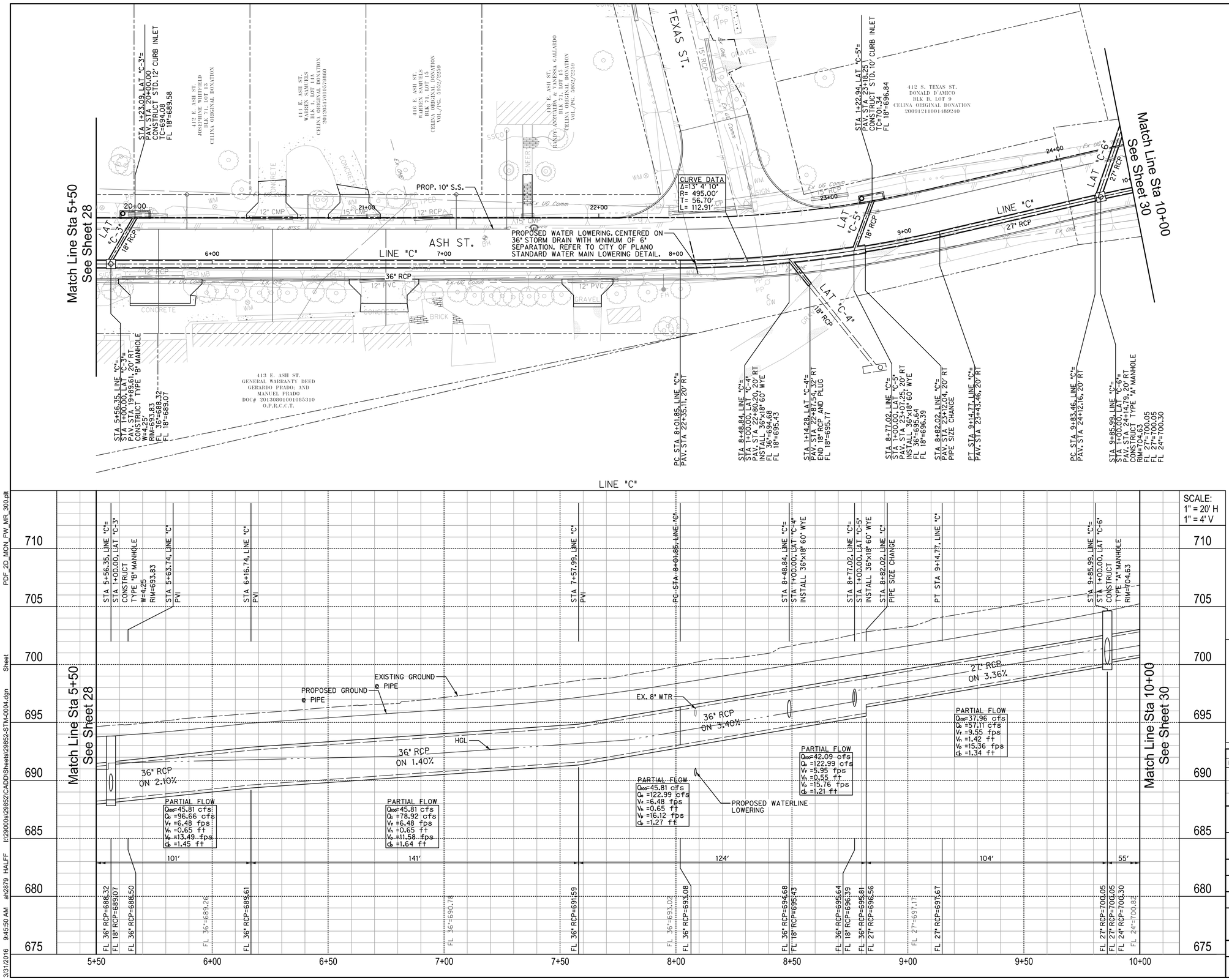


N

0 10 20 30 40

SCALE: 1"=20'

## LEGEND

- PROPOSED STORM DRAIN
- CURB INLET
- STORM DRAIN MANHOLE
- FUTURE STORM DRAIN

Storm Drain Notes:

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RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

28 / 75

Revision

| No. | Description | Date |
|---|---|---|
| | | |

Storm Drain Line 'C' Plan and Profile

Sta 5+50 to Sta 10+00

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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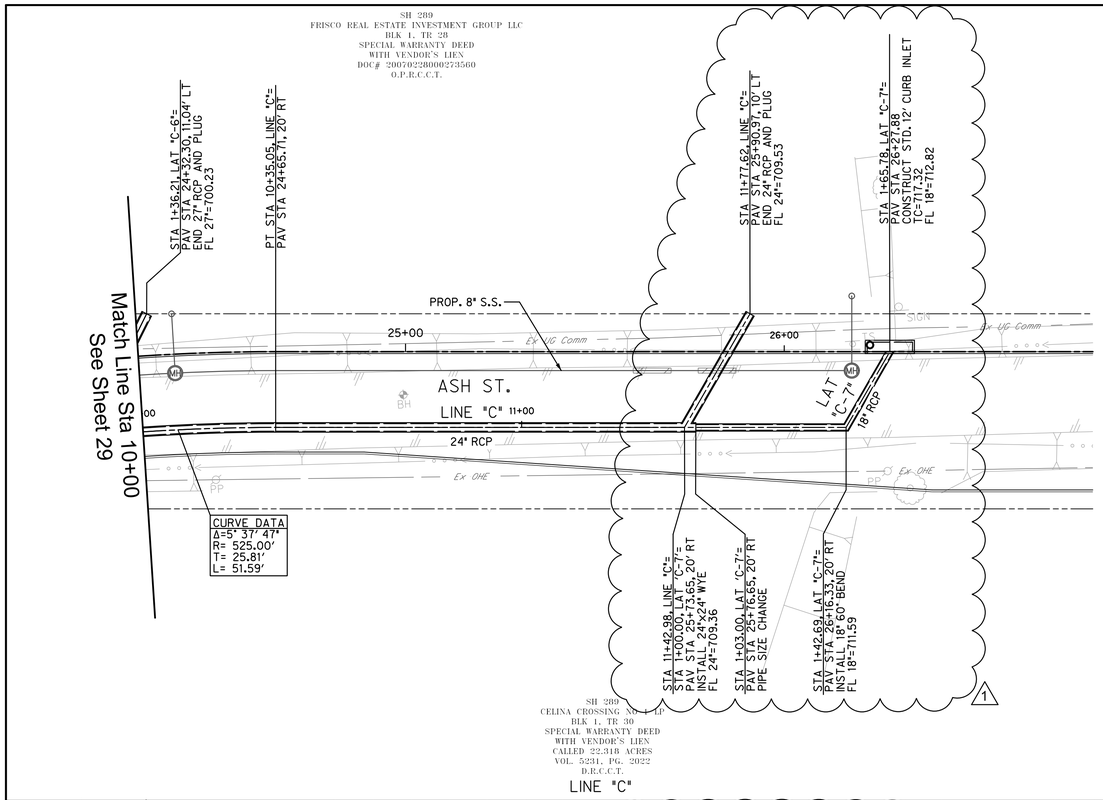


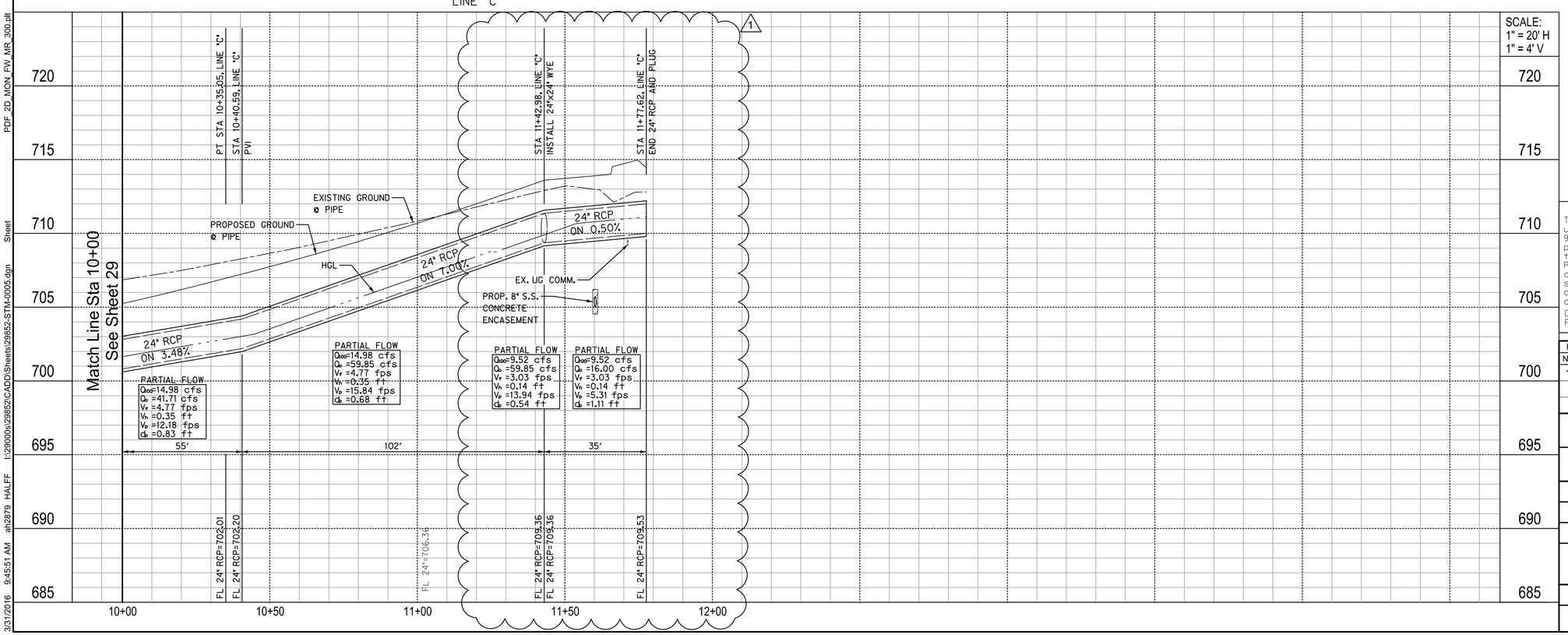


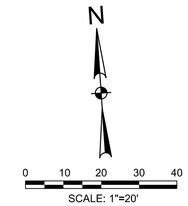


## LEGEND

- PROPOSED STORM DRAIN
- CURB INLET
- STORM DRAIN MANHOLE
- FUTURE STORM DRAIN

Storm Drain Notes:

1. Refer to General Notes for additional information.
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RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

29
75

| Revision | | |
|---|---|---|
| No. | Description | Date |
| 1 | Revised Storm Line 'C' | 4/8/15 |

# Storm Drain Line 'C' Plan and Profile

## Sta 10+00 to End

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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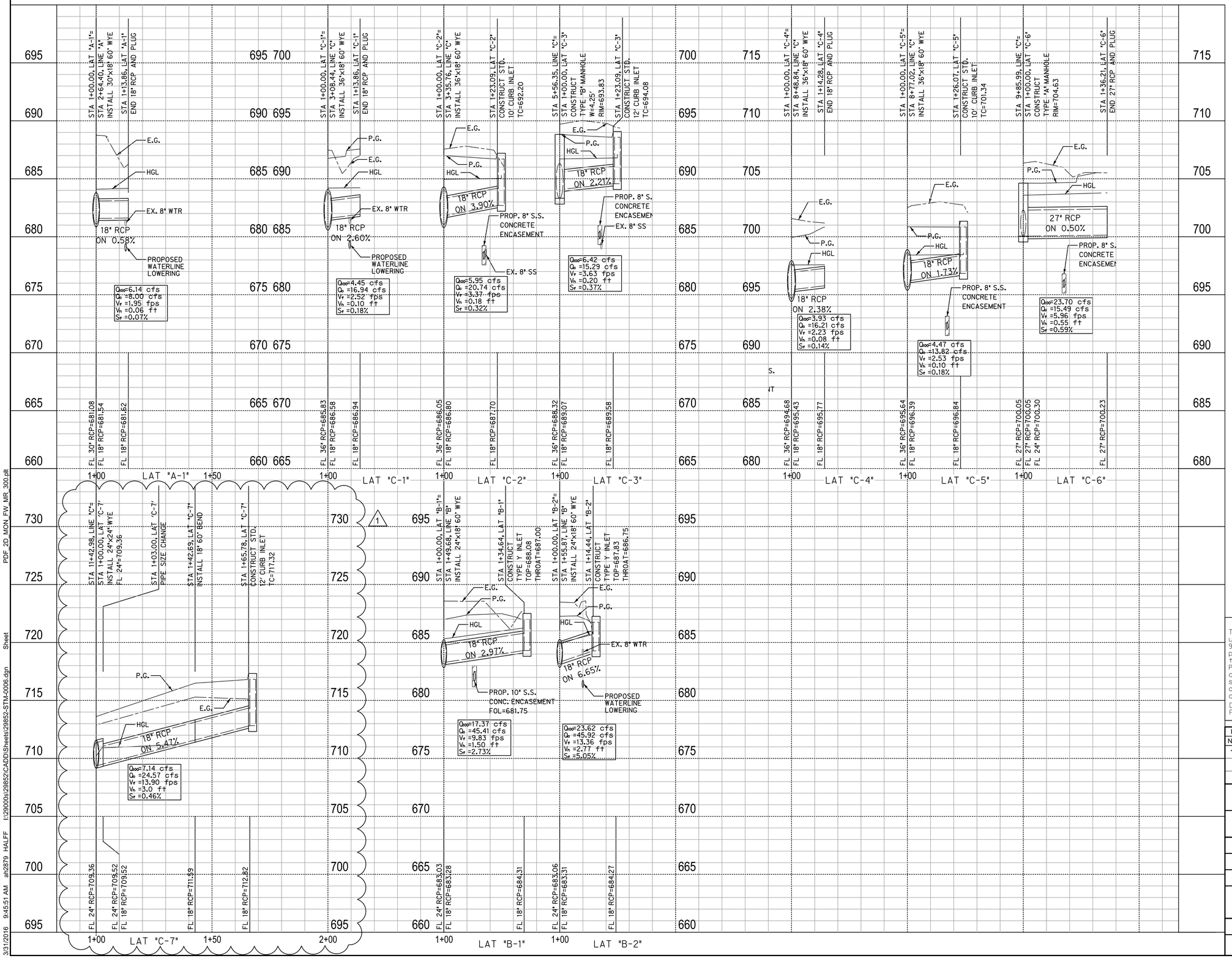


RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

30 / 75

| Revision | | |
|---|---|---|
| No. | Description | Date |
| 1 | Revised Storm Lateral 'C-7' | 4/8/15 |

Storm Drain

Lateral Profiles

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 30 |

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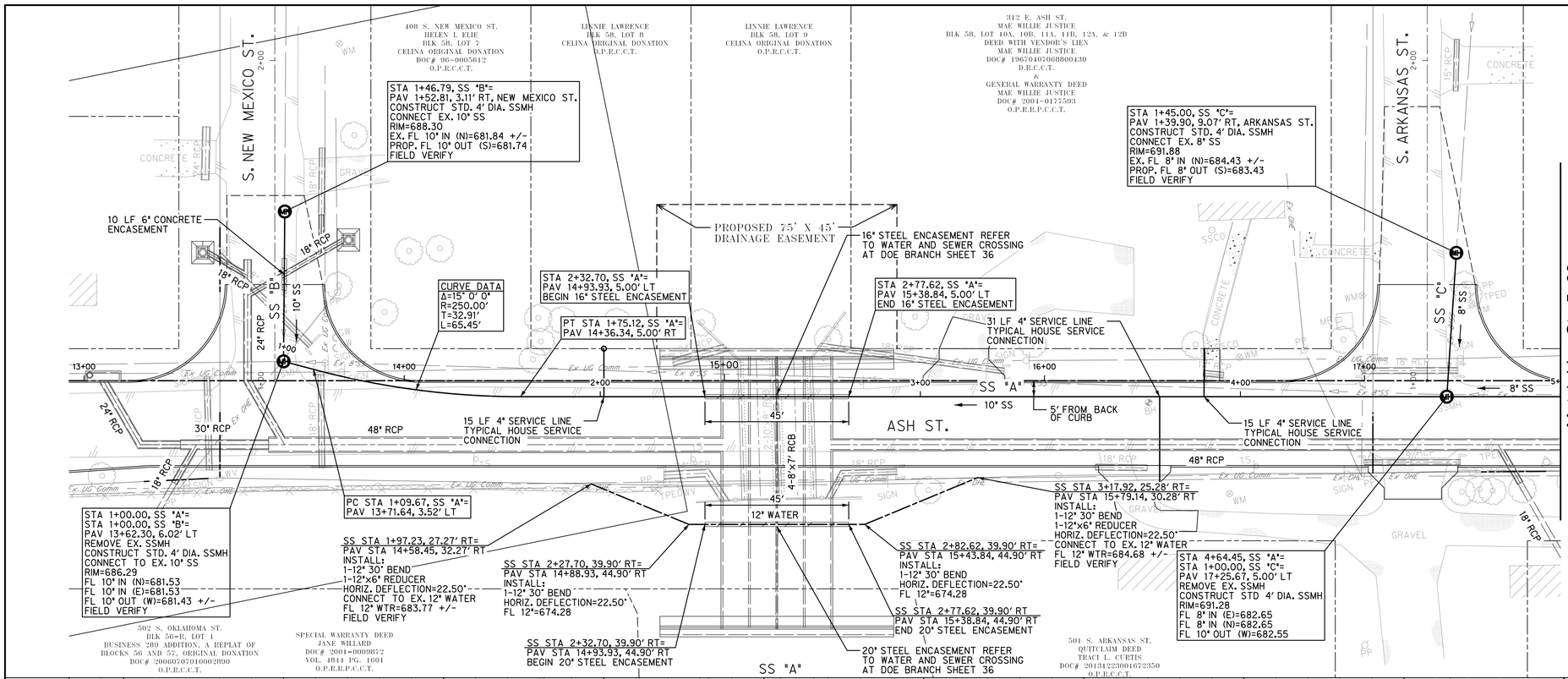


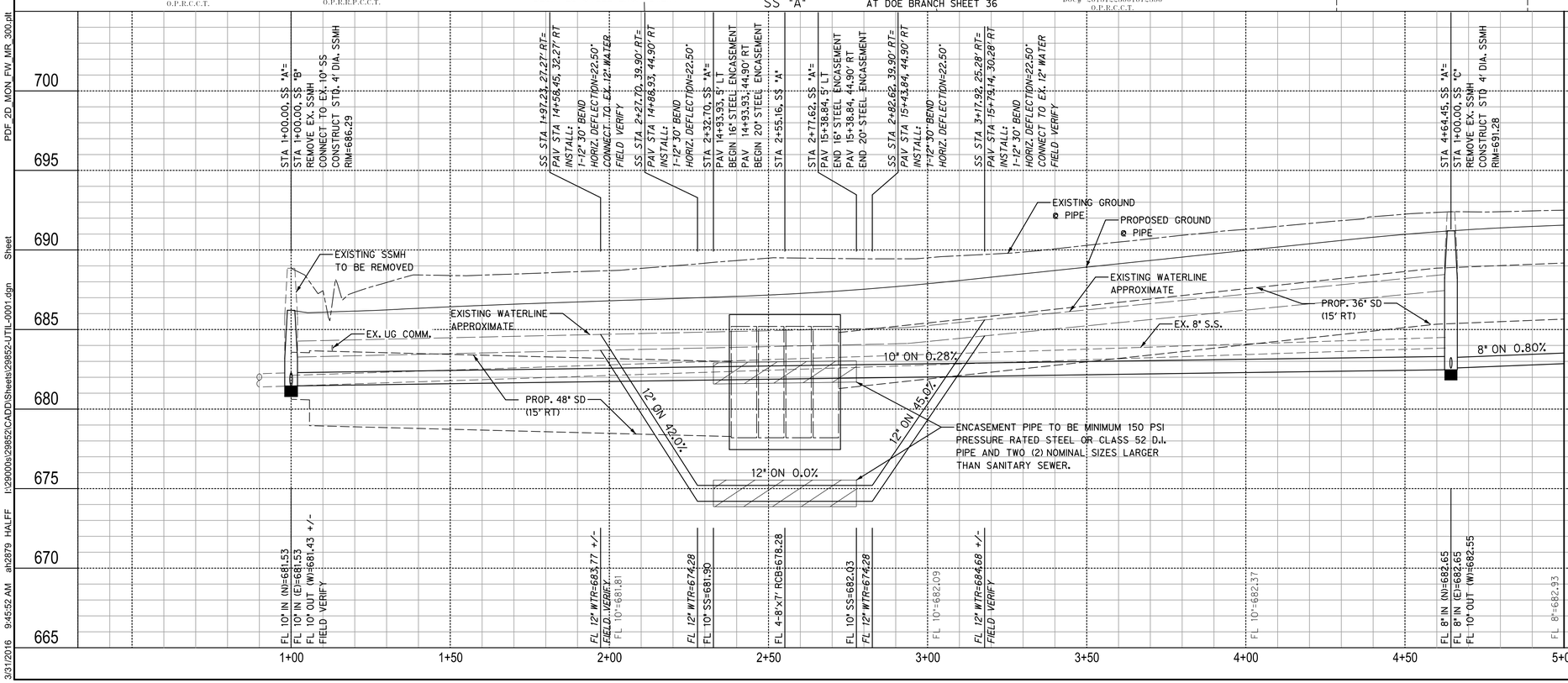


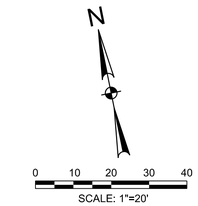


## LEGEND

- Ex SS — EXISTING SANITARY SEWER
- Ex W — EXISTING WATER
- PROPOSED SANITARY SEWER
- PROPOSED WATER
- MH — PROPOSED MANHOLE

Utility Notes:

1. Refer to General Notes for additional information.
2. Saw-cutting pavement and temporary pavement repairs incidental to utility construction shall be performed at no additional cost to the City (subsidiary to utility installation).
3. Sewer House Service connections shown to be replaced are intended for guidance only, and shall be adjusted as required to match existing sewer service locations.
4. Empty lots shall be provided with sewer connections as shown, new services shall be terminated with a standard clean-out with a cap set at final grade.

RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

31 / 75

Revision

| No. | Description | Date |
|---|---|---|
| | | |

# Sanitary Sewer Line 'A' Plan and Profile

## Sta 1+00 to Sta 5+00

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
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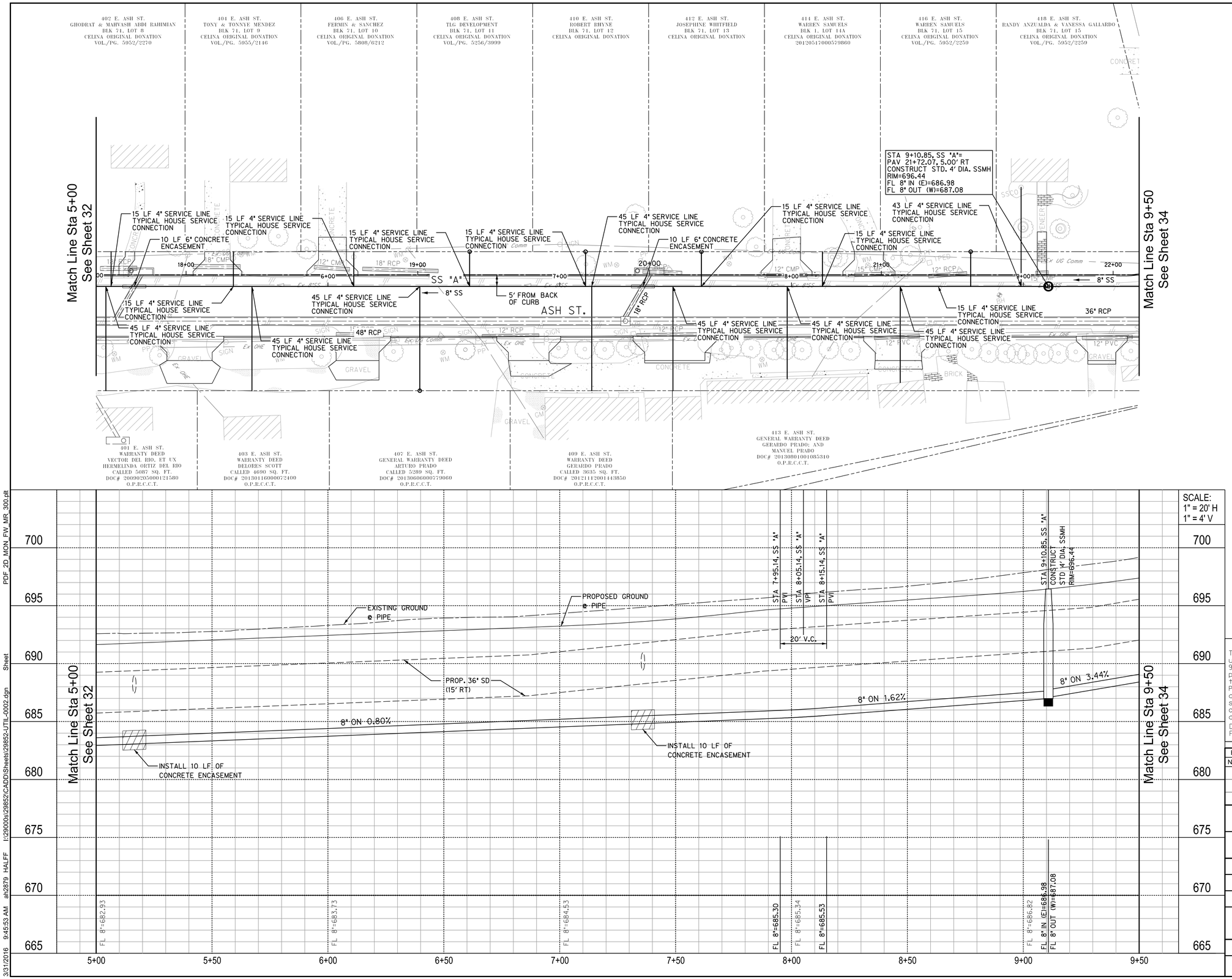


Utility Notes:

1. Refer to General Notes for additional information.
2. Saw-cutting pavement and temporary pavement repairs incidental to utility construction shall be performed at no additional cost to the City (subsidiary to utility installation).
3. Sewer House Service connections shown to be replaced are intended for guidance only, and shall be adjusted as required to match existing sewer service locations.
4. Empty lots shall be provided with sewer connections as shown, new services shall be terminated with a standard clean-out with a cap set at final grade.

RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

32
75

Revision

| No. | Description | Date |
|---|---|---|
| | | |

Sanitary Sewer Line 'A' Plan and Profile

Sta 5+00 to Sta 9+50

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 32 |

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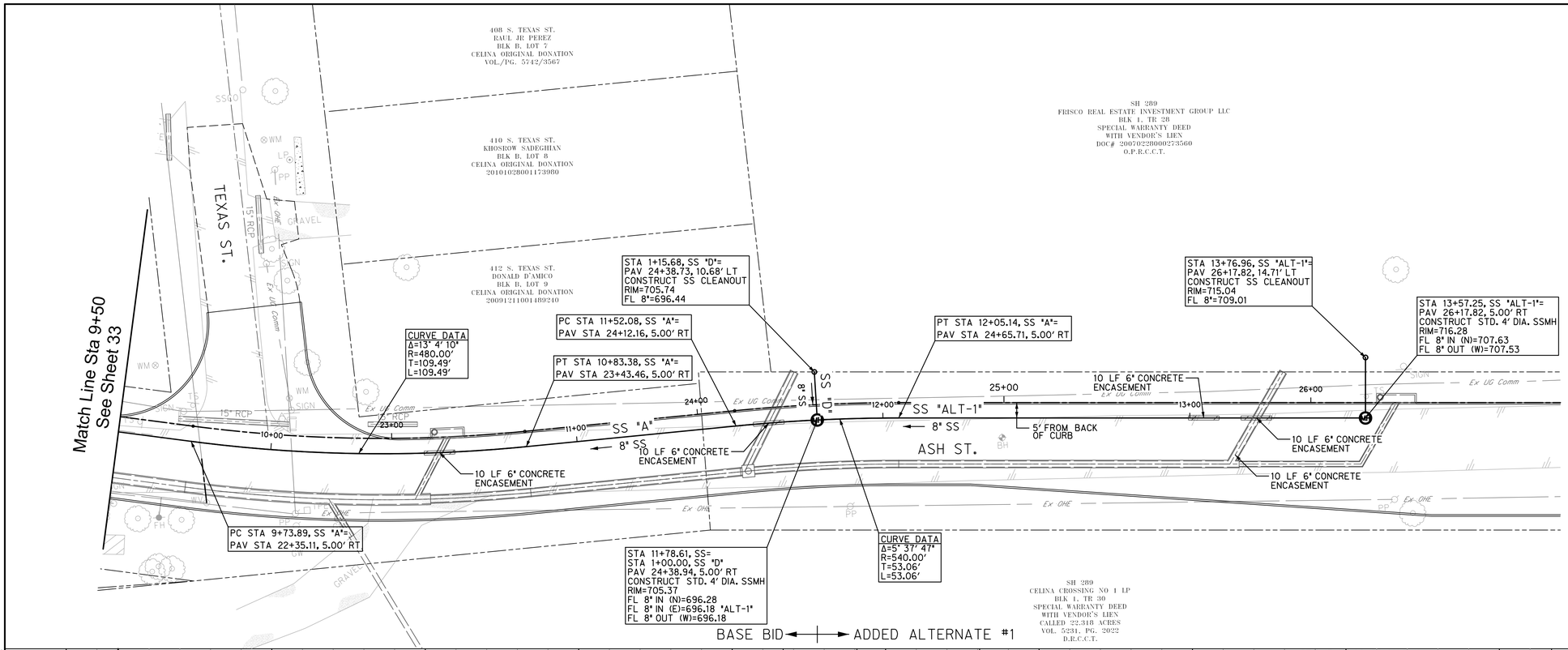
3/31/2016




N

0 10 20 30 40

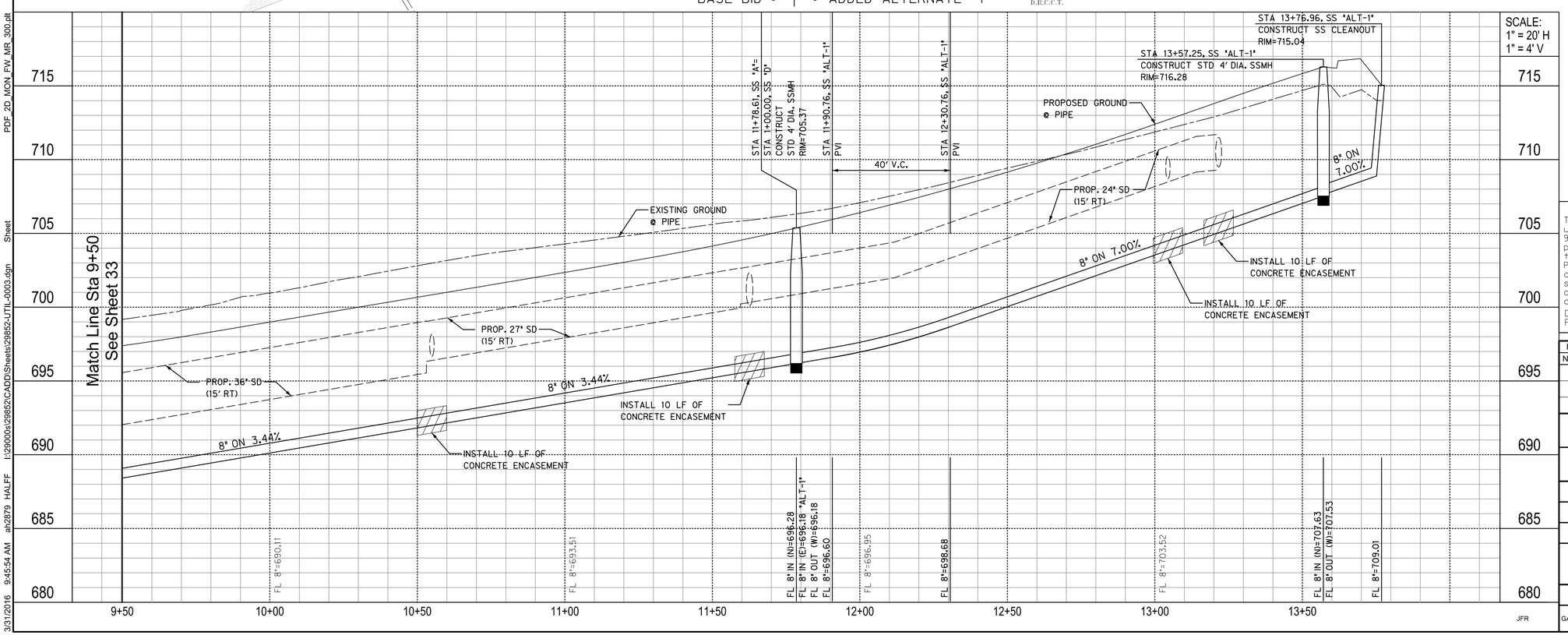
SCALE: 1"=20'

## LEGEND

| | |
|---|---|
| Ex SS | EXISTING SANITARY SEWER |
| Ex W | EXISTING WATER |
| | PROPOSED SANITARY SEWER |
| | PROPOSED WATER |
| MH | PROPOSED MANHOLE |

Utility Notes:

1. Refer to General Notes for additional information.
2. Saw-cutting pavement and temporary pavement repairs incidental to utility construction shall be performed at no additional cost to the City (subsidiary to utility installation).
3. Sewer House Service connections shown to be replaced are intended for guidance only, and shall be adjusted as required to match existing sewer service locations.
4. Empty lots shall be provided with sewer connections as shown, new services shall be terminated with a standard clean-out with a cap set at final grade.

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Design Consultant: Halff Associates Inc. TBPE # F-312

33 / 75

Revision

| No. | Description | Date |
|---|---|---|
| | | |

Sanitary Sewer Line 'A' Plan and Profile

Sta 9+50 to End

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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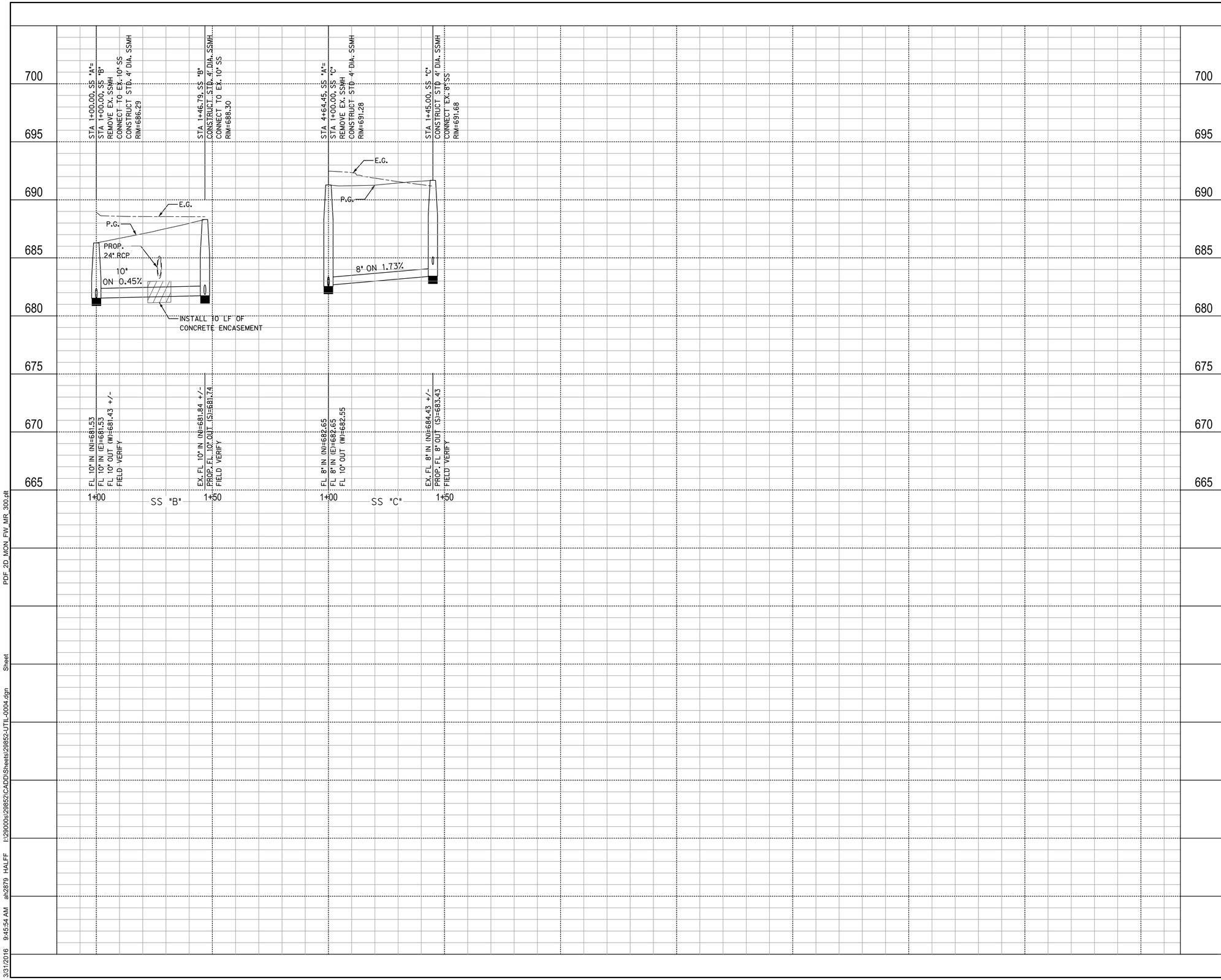


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Design Consultant: Halff Associates Inc. TBPE # F-312

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Revision

| No. | Description | Date |
|---|---|---|
| | | |
| | | |
| | | |

Sanitary Sewer

Profiles

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 34 |

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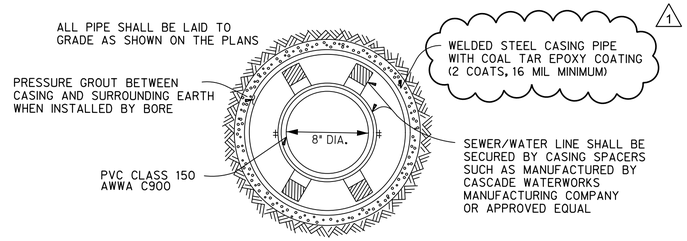
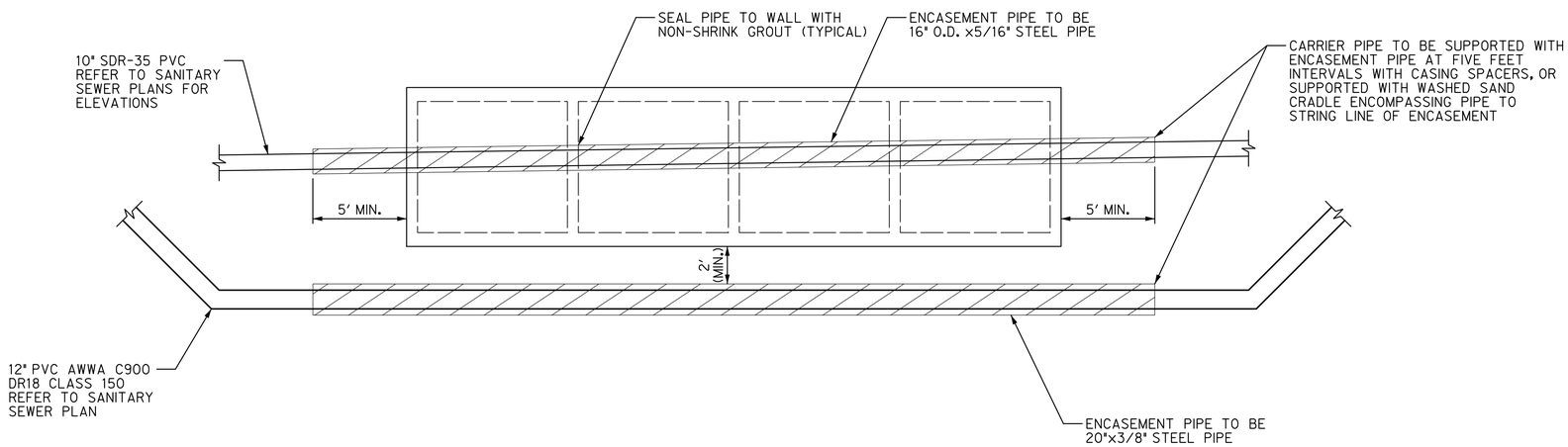



## TUNNEL BORE DETAIL FOR STEEL CASING PIPE

NOT TO SCALE

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Design Consultant: Halff Associates Inc. TBPE # F-312

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Revision

| No. | Description | Date |
|---|---|---|
| 1 | EPOXY COATING | 10/31/2014 |
| | | |
| | | |

Water and Sewer Crossing

at Doe Branch

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 35 |

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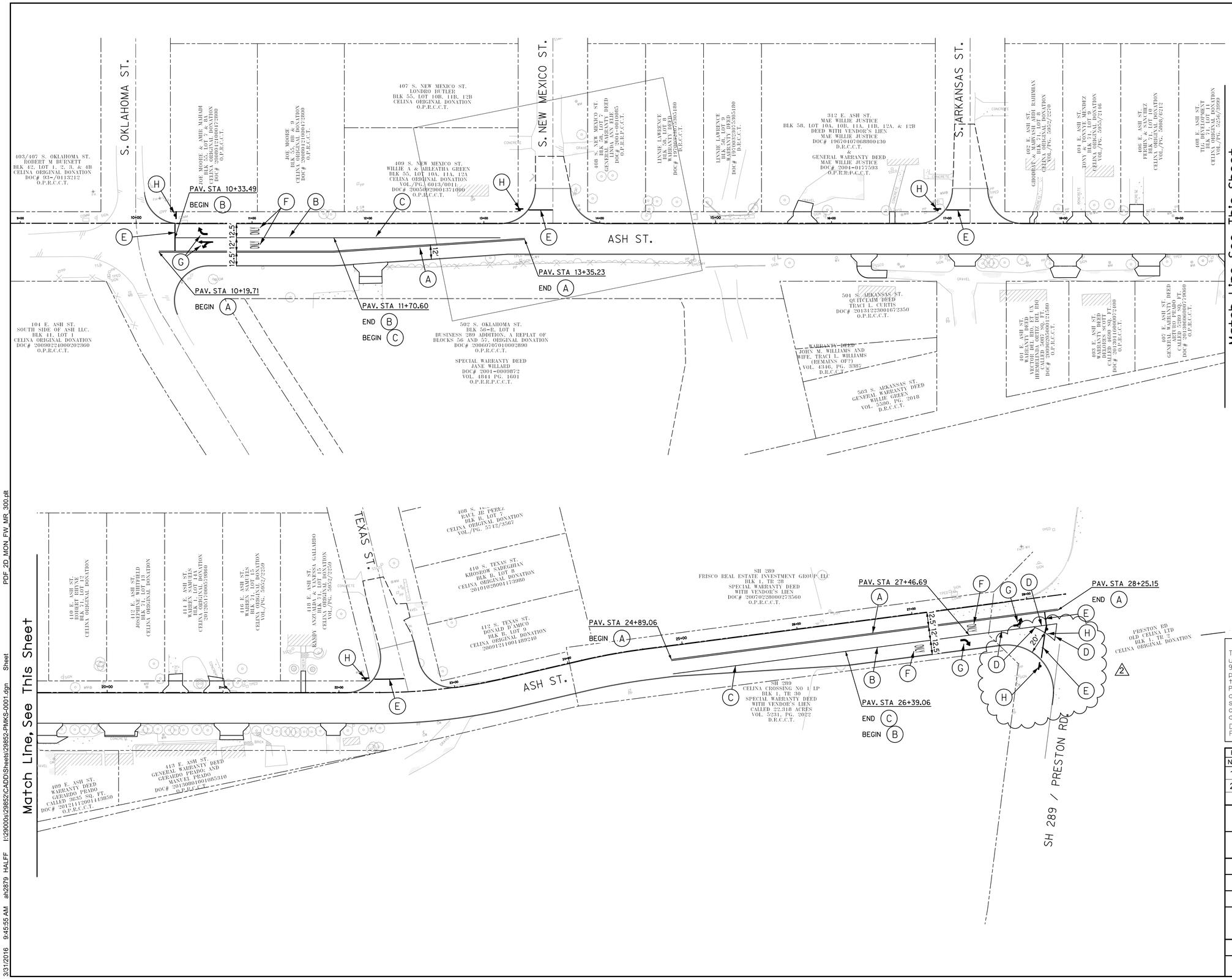


N

SCALE: 1"=40'

## LEGEND

- (A) DOUBLE 4" YELLOW SOLID THERMO PAVEMENT MARKING
- (B) 4" WHITE SOLID THERMO PAVEMENT MARKING
- (C) 4" WHITE DOTTED THERMO PAVEMENT MARKING
- (D) 8" WHITE SOLID THERMO PAVEMENT MARKING
- (E) 24" WHITE SOLID THERMO PAVEMENT MARKING (STOP BAR)
- (F) WHITE THERMO PAVEMENT MARKING (WORD)
- (G) WHITE THERMO PAVEMENT MARKING (ARROW)
- (H) 30"x30" STOP SIGN WITH CELINA STREET SIGNS

1. a standard clean-out with a cap set at final grade.

Pavement Marking Notes:

1. Refer to General Notes for additional information.
2. All signage, striping, and signage placement shall conform to the Texas Manual on Uniform Traffic Control Devices (TMUTCD) latest edition.
3. Pavement Markings shall be Type 1, 100 mil thick thermoplastic.
4. Refer to Traffic Sign Details for additional information.

RECORD DRAWINGS - APRIL 2016

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Design Consultant: Halff Associates Inc. TBPE # F-312

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| Revision | | |
|---|---|---|
| No. | Description | Date |
| 1 | Scale Correction | 10/29/14 |
| 2 | Revised Curb Radius | 5/22/15 |
| | | |

Street Signage and

Pavement Marking Plan

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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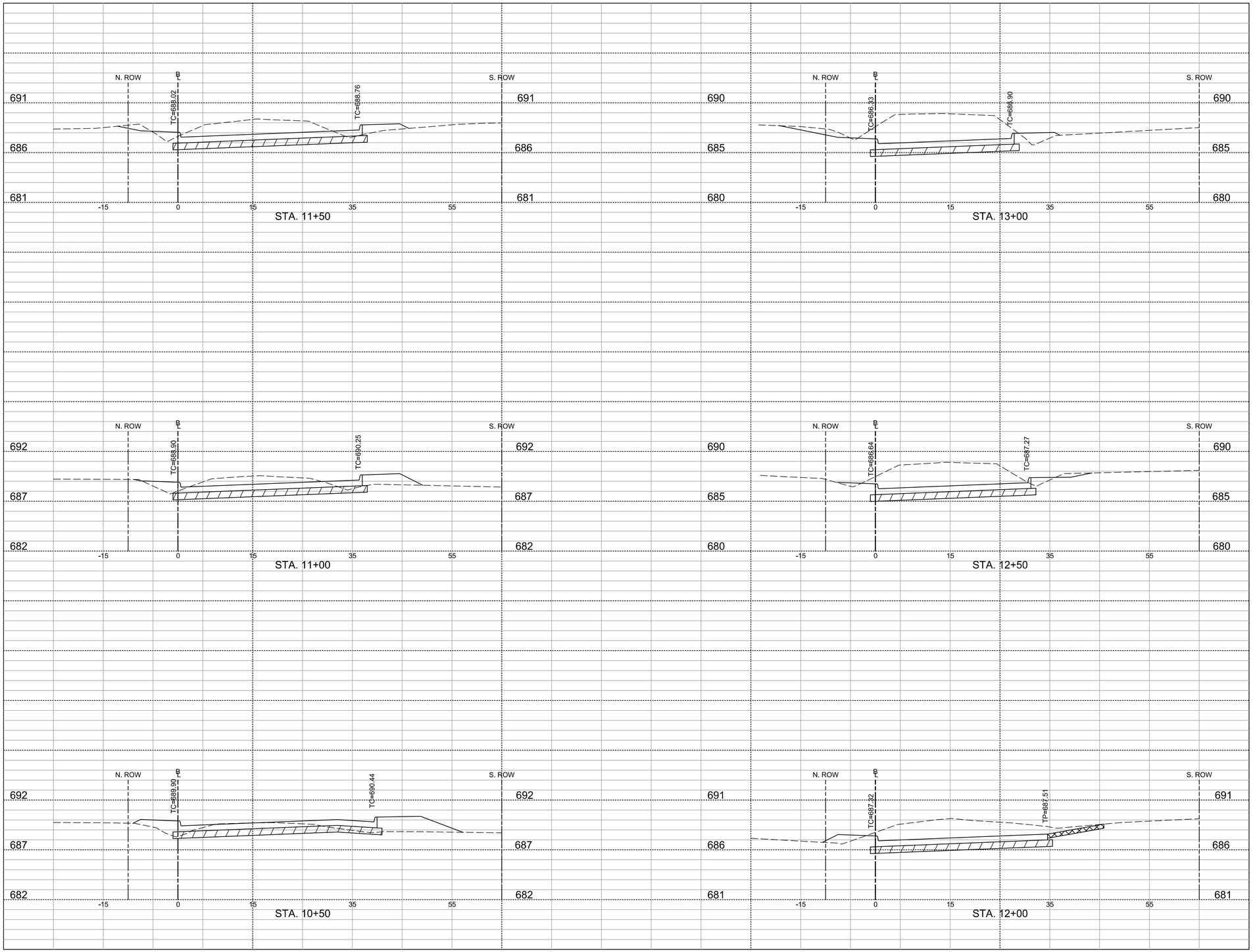


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Revision

| No. | Description | Date |
|---|---|---|
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| | | |

Cross Sections

Sheet 1 of 6

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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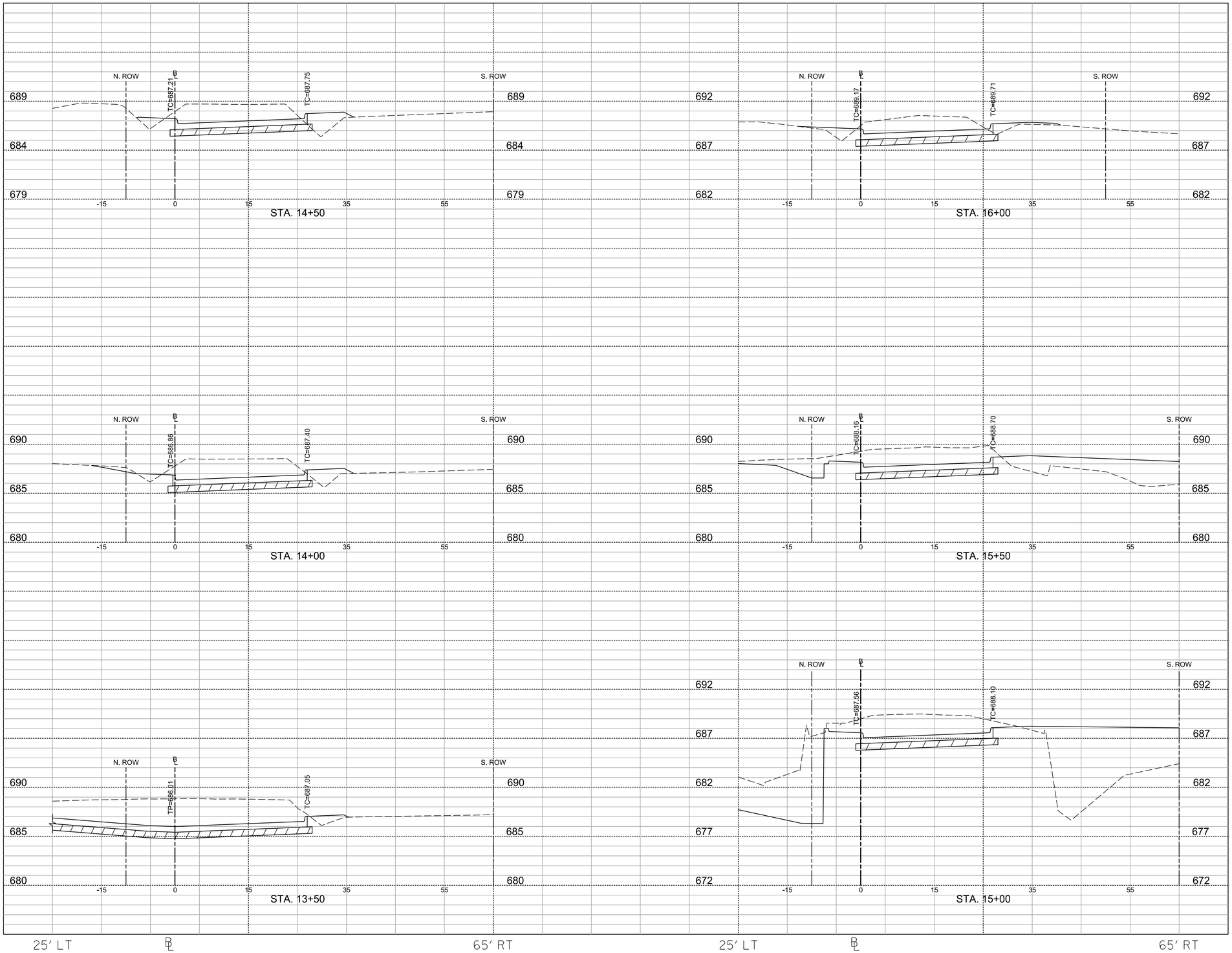


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| Revision | | |
|---|---|---|
| No. | Description | Date |
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| | | |

Cross Sections

Sheet 2 of 6

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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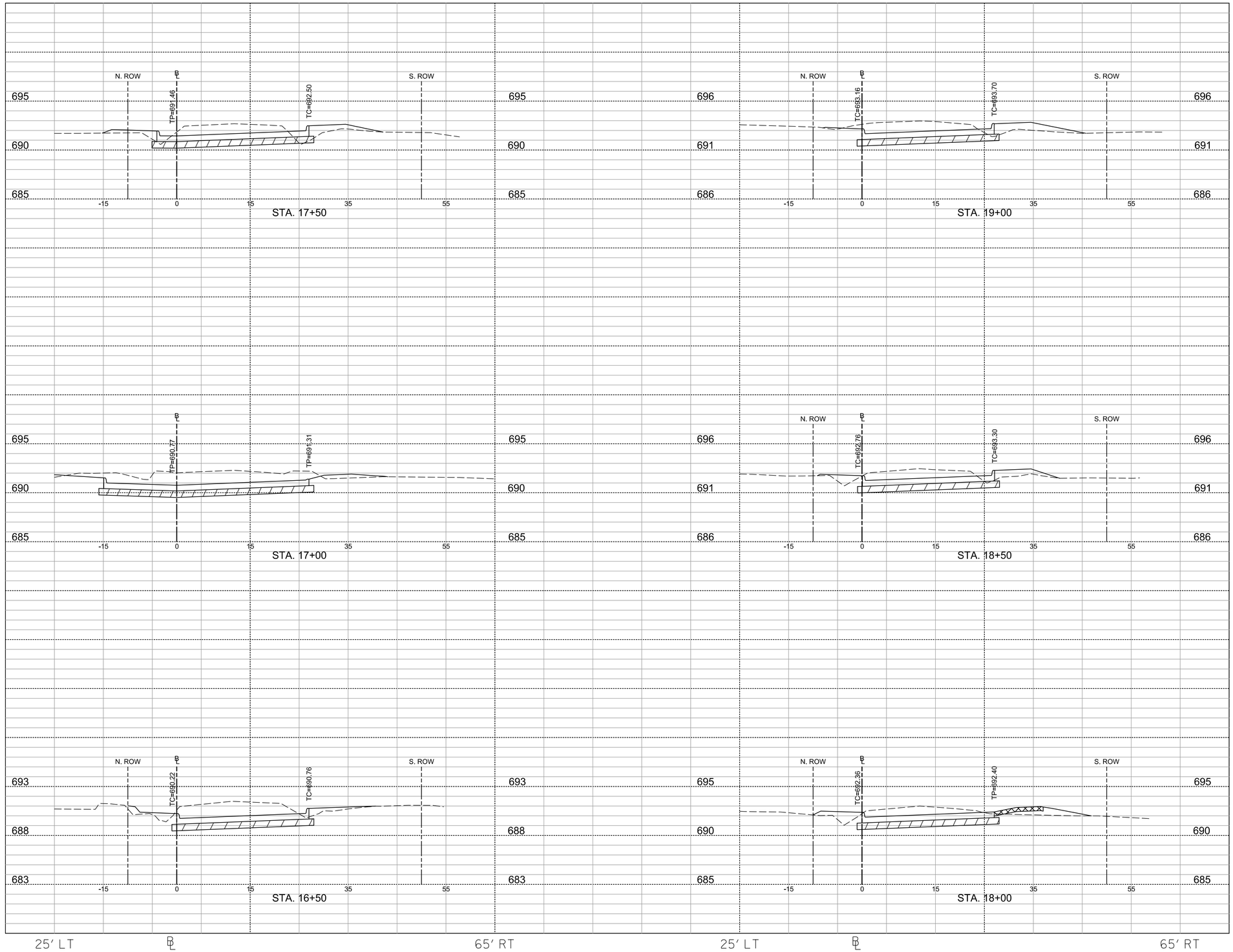


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| Revision | | |
|---|---|---|
| No. | Description | Date |
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| | | |

Cross Sections

Sheet 3 of 6

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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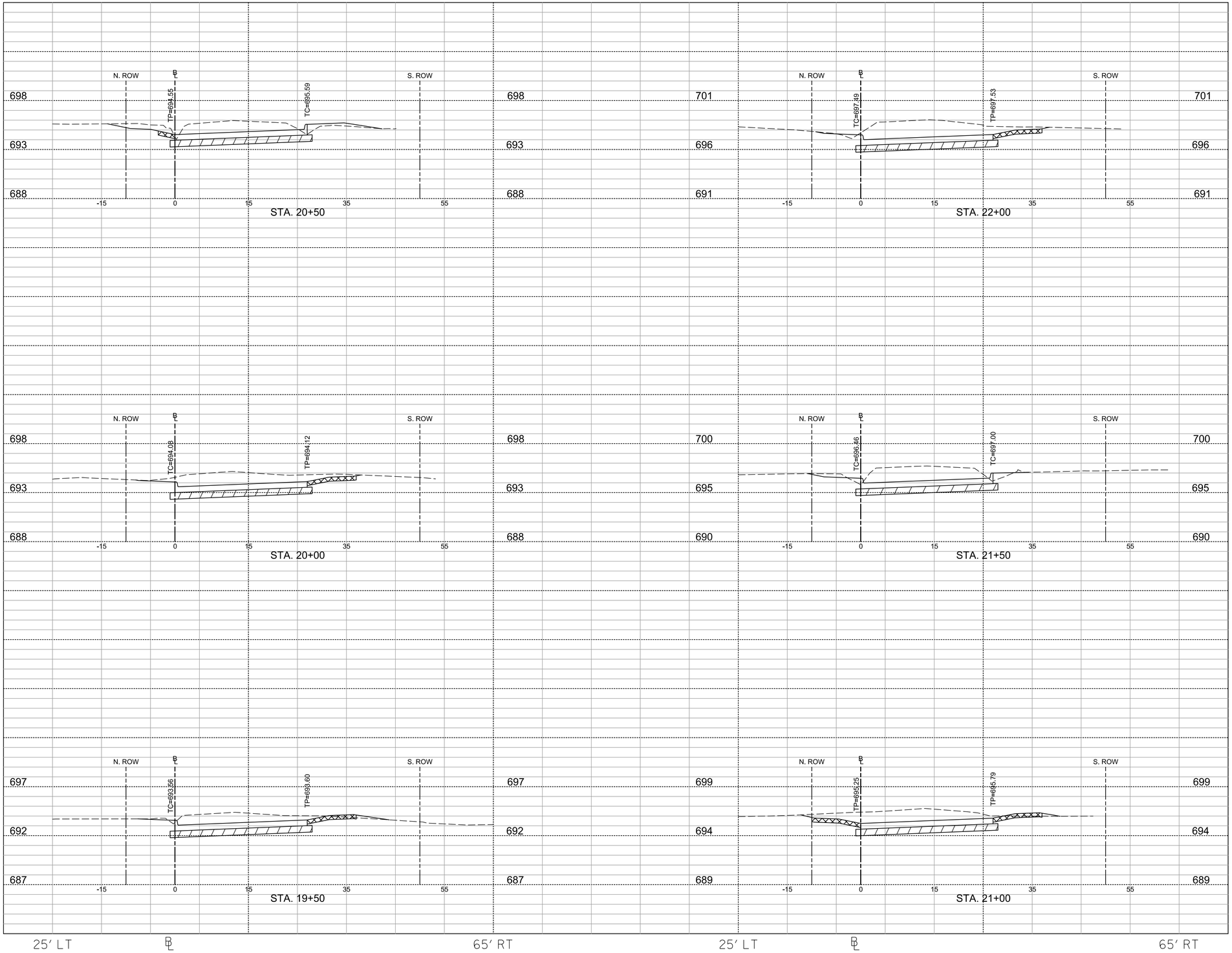


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| Revision | | |
|---|---|---|
| No. | Description | Date |
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| | | |

Cross Sections

Sheet 4 of 6

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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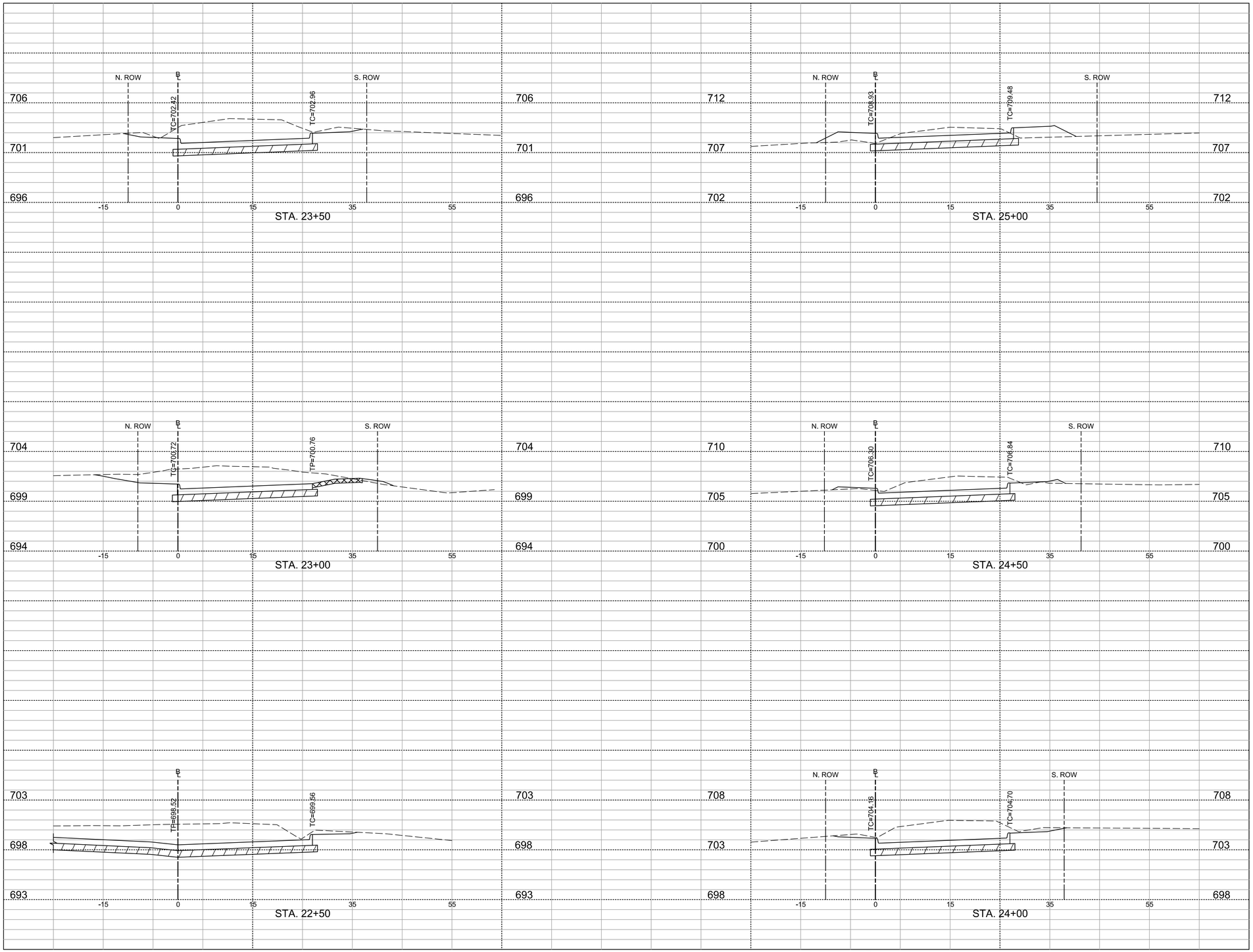


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75

Revision

| No. | Description | Date |
|---|---|---|
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| | | |

Cross Sections

Sheet 5 of 6

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
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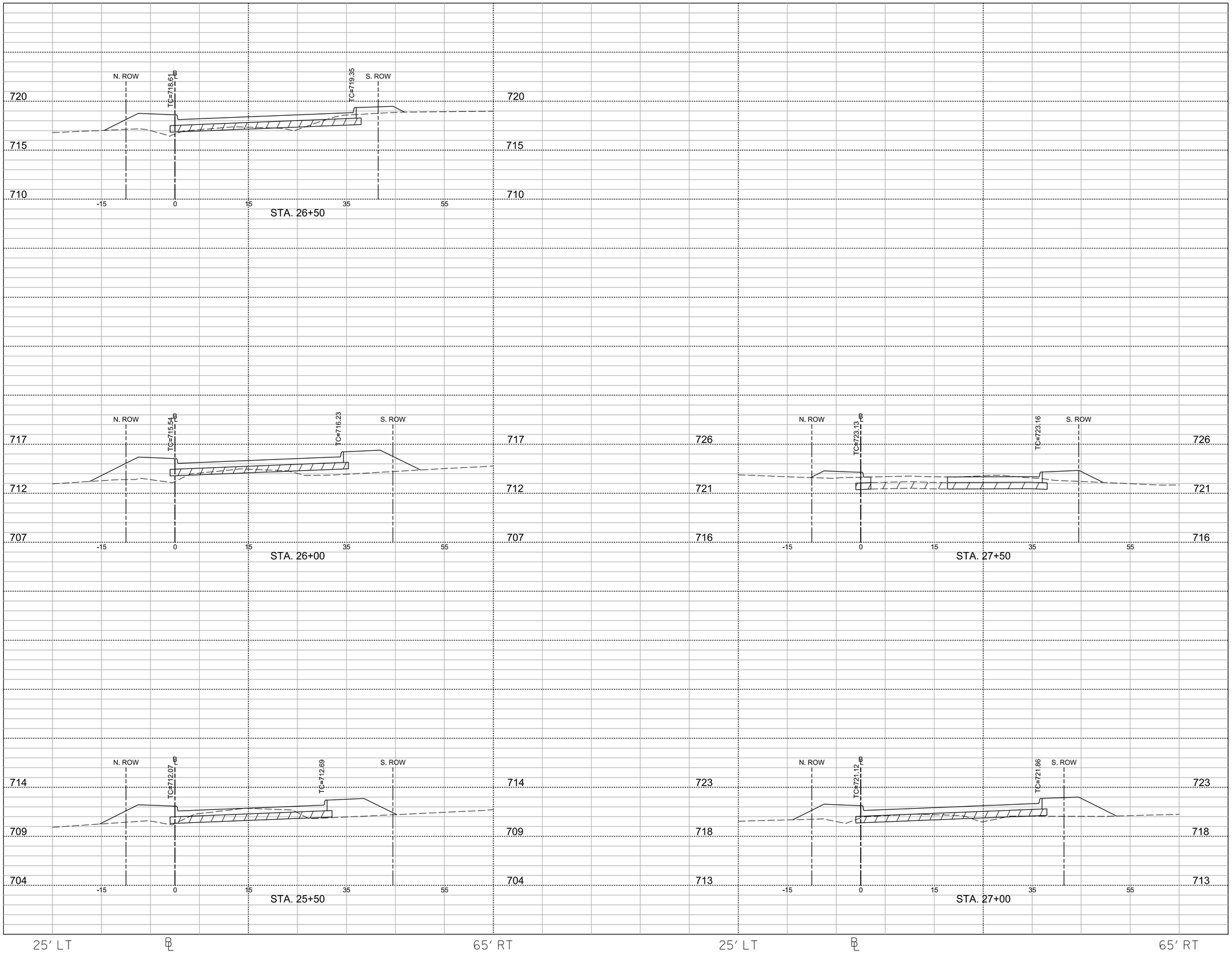


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Revision

| No. | Description | Date |
|---|---|---|
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| | | |

Cross Sections

Sheet 6 of 6

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
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## 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. As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.

11. Except for devices required by Note 10, 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 APPAREL 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" 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.

Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found on-line at the web address given below or by contacting:

Texas Department of Transportation
Traffic Operations Division - TE
Phone (512) 416-3118

| 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 |

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DATE:
FILE:



Texas Department of Transportation — Traffic Operations Division Standard

# BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

# BC(1)-13

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|---|---|---|---|---|
| © TxDOT November 2002 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS 4-03 5-10 9-07 7-13 | DIST | COUNTY | | SHEET NO. |

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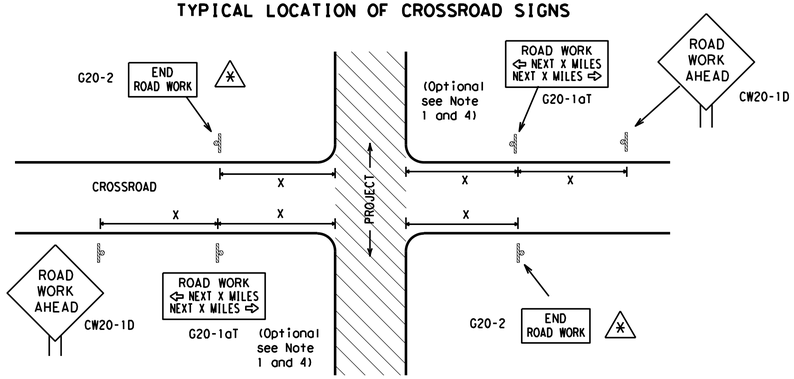
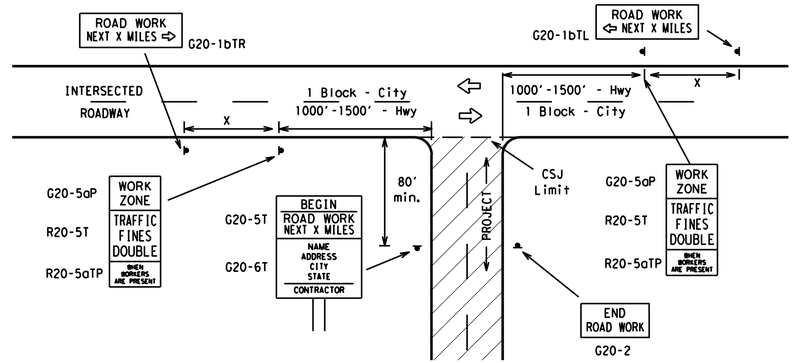
## TYPICAL LOCATION OF CROSSROAD SIGNS




✱ 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. 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" Δ |
|---|---|
| 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.

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

## GENERAL NOTES

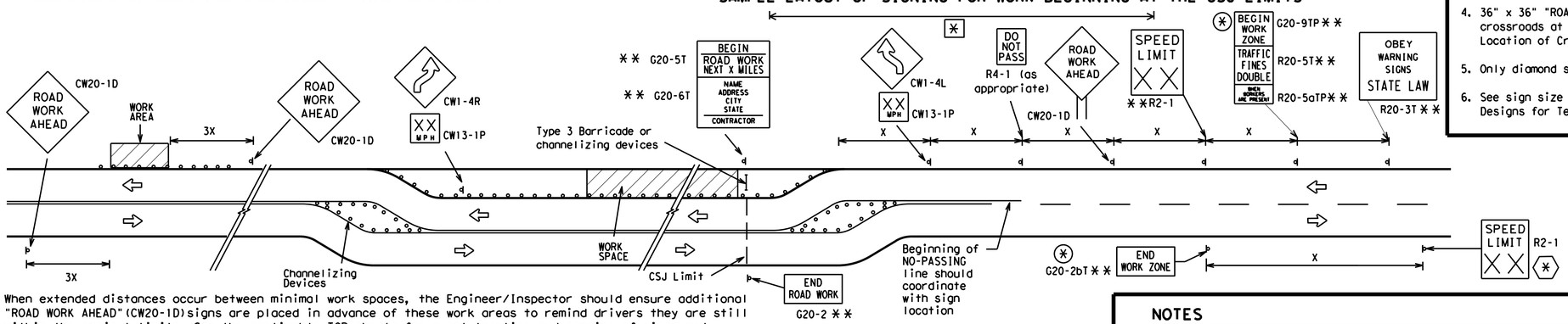
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may be used on low volume crossroads at the discretion of the Engineer. 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

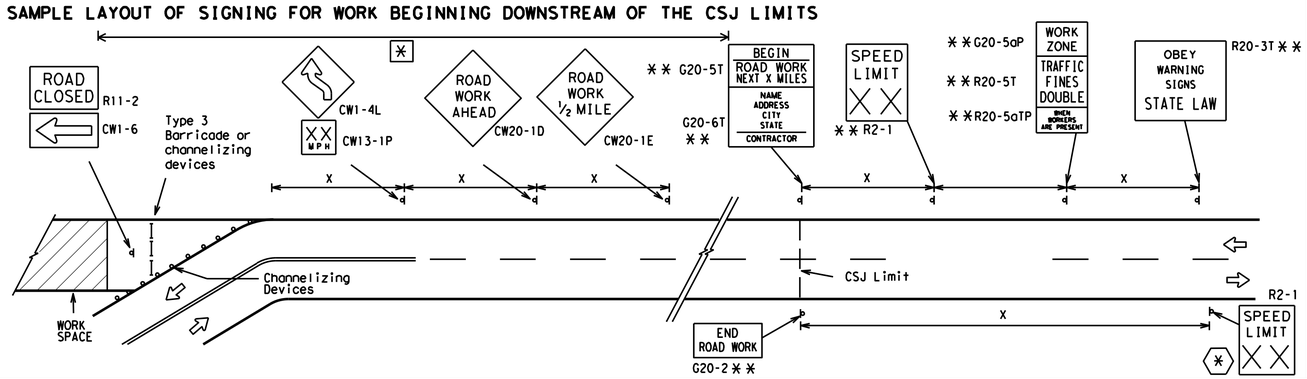



When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

✱✱ Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.

[✱] 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 |
| O O O | 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 Operations Division Standard

# BARRICADE AND CONSTRUCTION PROJECT LIMIT

# BC(2)-13

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## 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. As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.

11. Except for devices required by Note 10, 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 APPAREL 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" 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.

Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found on-line at the web address given below or by contacting:

Texas Department of Transportation
Traffic Operations Division - TE
Phone (512) 416-3118

| 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 |

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Texas Department of Transportation — Traffic Operations Division Standard

# BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

# BC(1)-13

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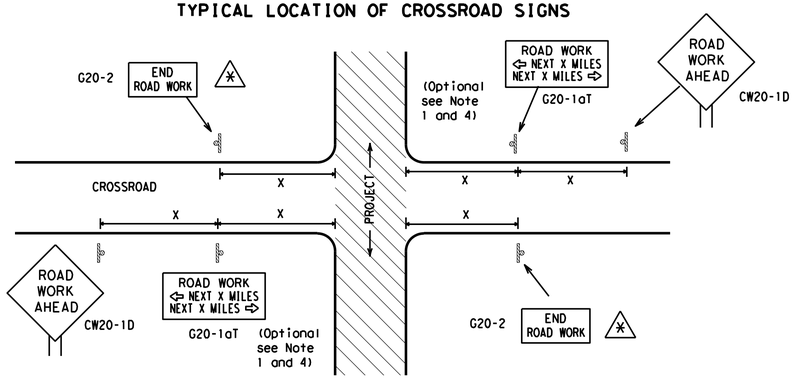
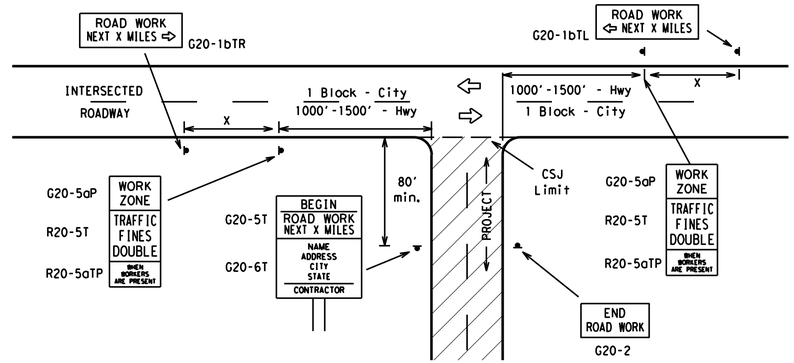
## TYPICAL LOCATION OF CROSSROAD SIGNS




✱ 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. 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" Δ |
|---|---|
| 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.

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

## GENERAL NOTES

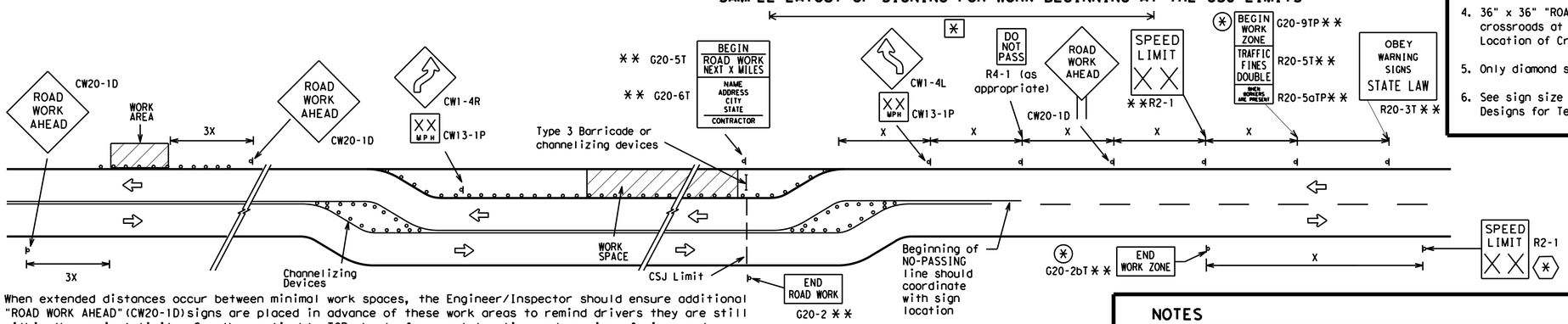
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may be used on low volume crossroads at the discretion of the Engineer. 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

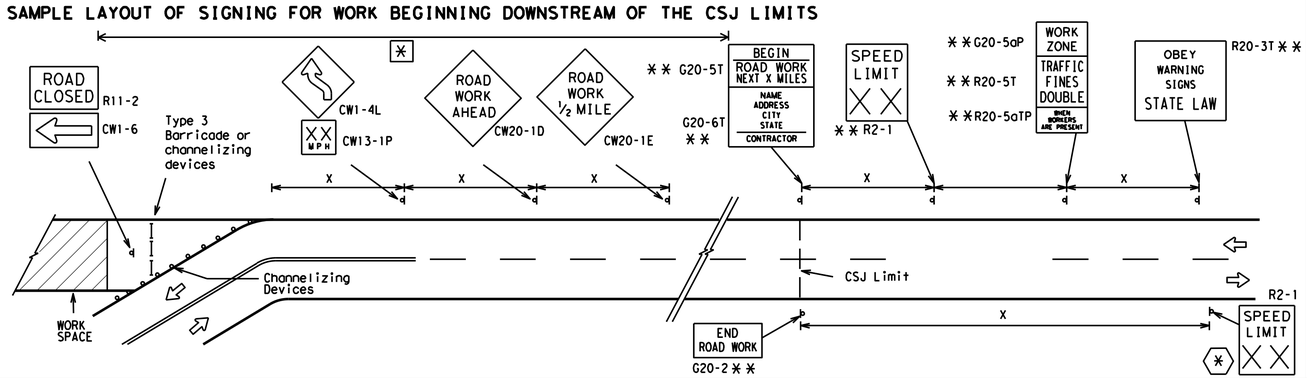



When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

✱✱ Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.

[✱] 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 |
| O O O | 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 Operations Division Standard

# BARRICADE AND CONSTRUCTION PROJECT LIMIT

# BC(2)-13

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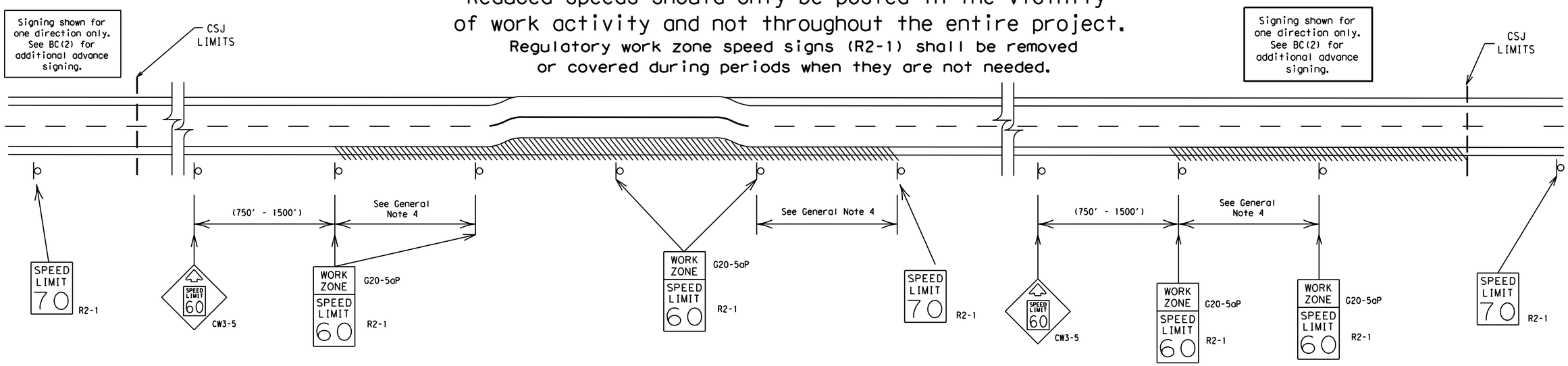
# TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

**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 travelled 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.

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**BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT**

**BC(3)-13**

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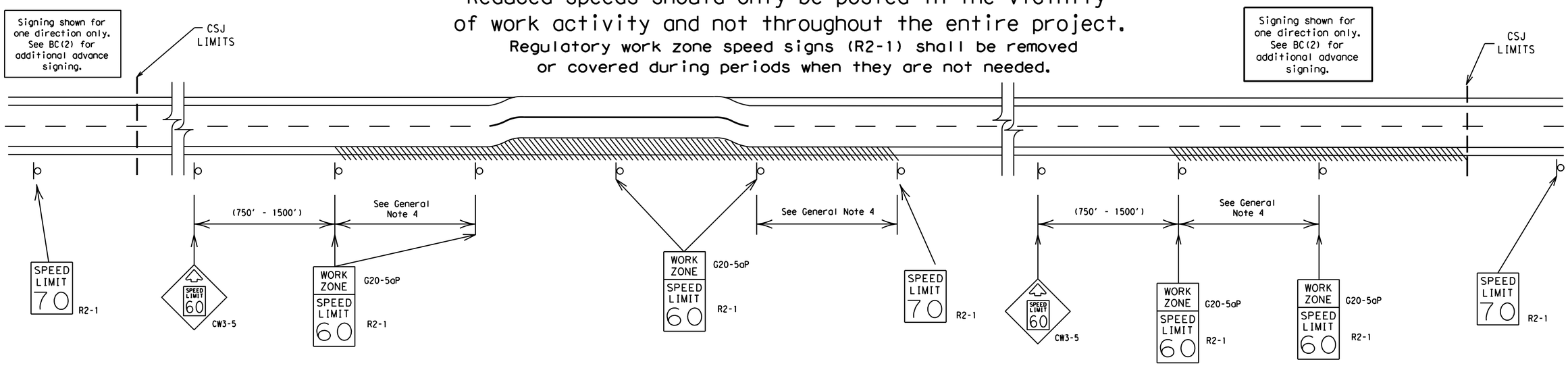


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As long as any of these conditions exist, the work zone speed limit signs should remain in place.

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(See Removing or Covering on BC(4)).

### GENERAL NOTES

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**BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT**

**BC(3)-13**

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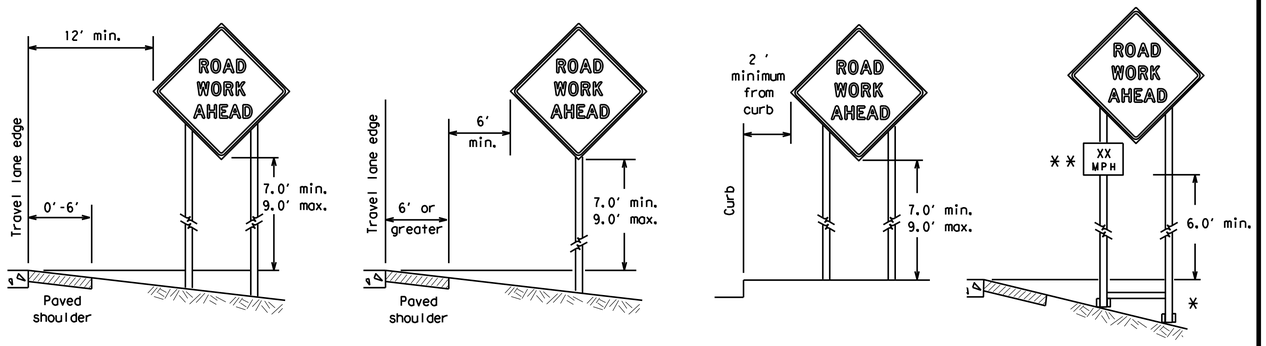
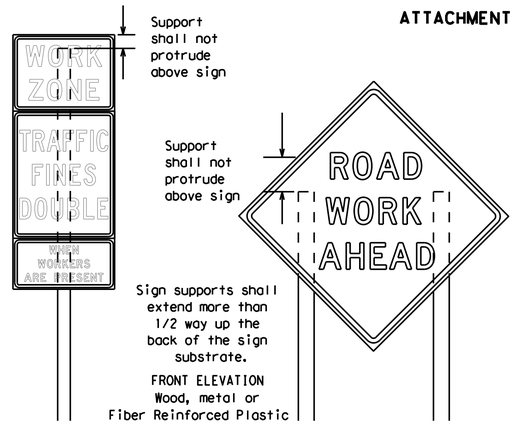
## TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



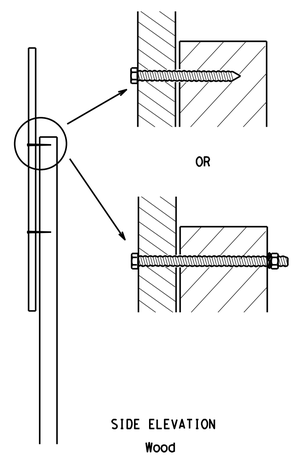

* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** 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




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.

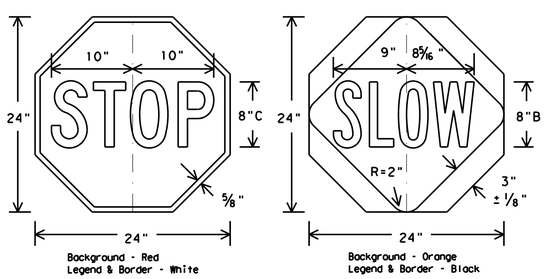



Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

**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.**

## 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" as detailed below.
2. When used at night, the STOP/SLOW paddle shall be retroreflectorized.
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.




## 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, 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.
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 sheets or the CWZTCD. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards 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). 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 Operations Division Standard

# BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

# BC(4)-13

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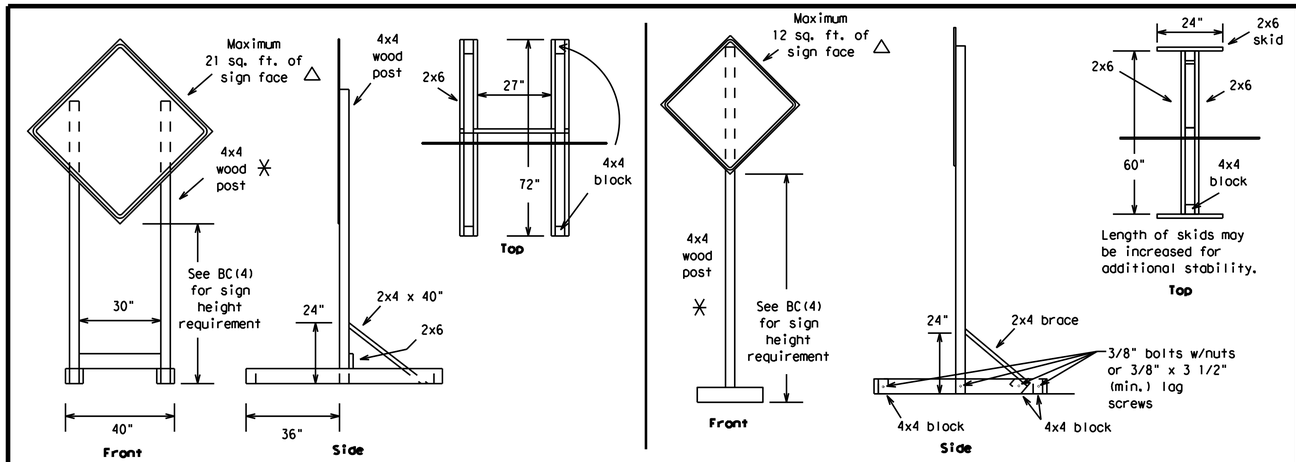
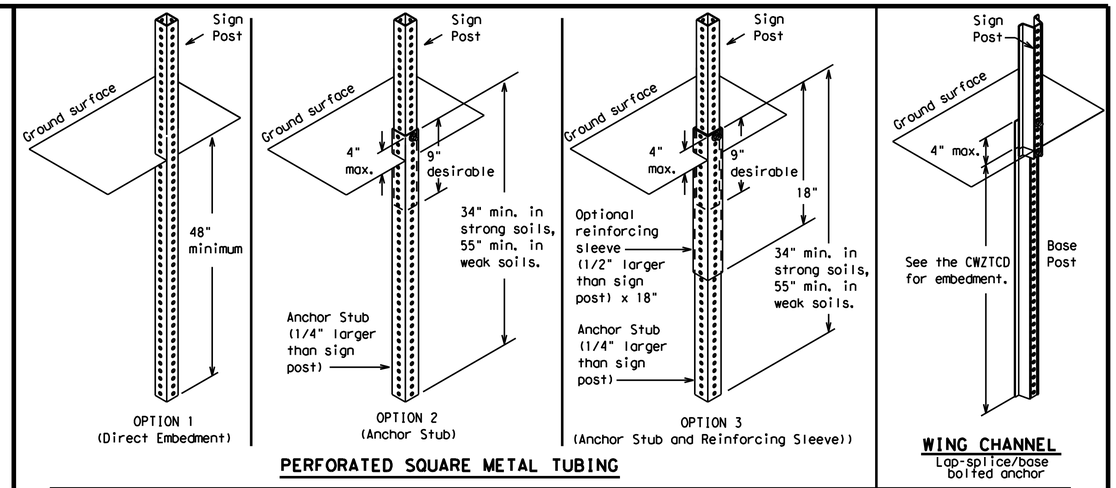



## SKID MOUNTED WOOD SIGN SUPPORTS

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

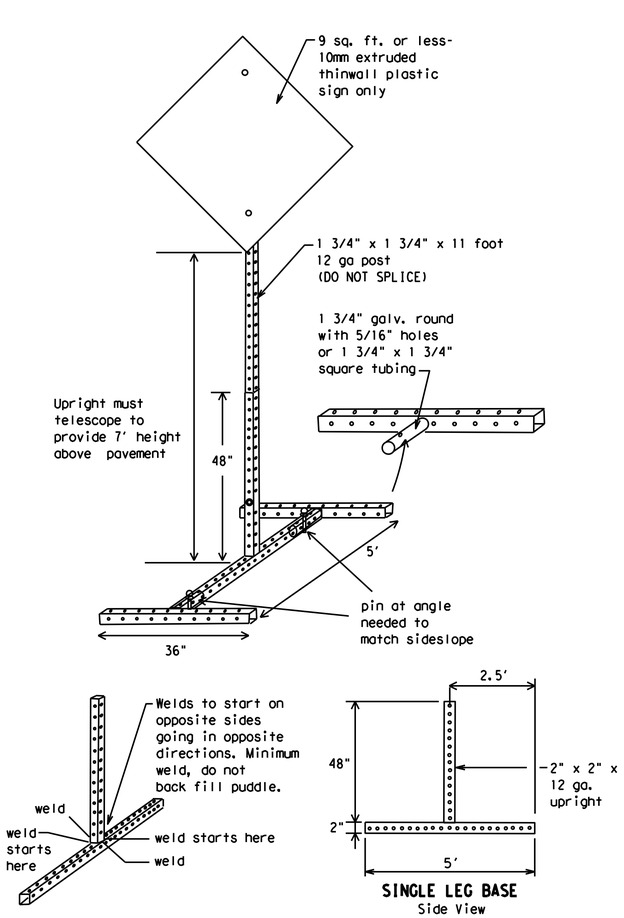


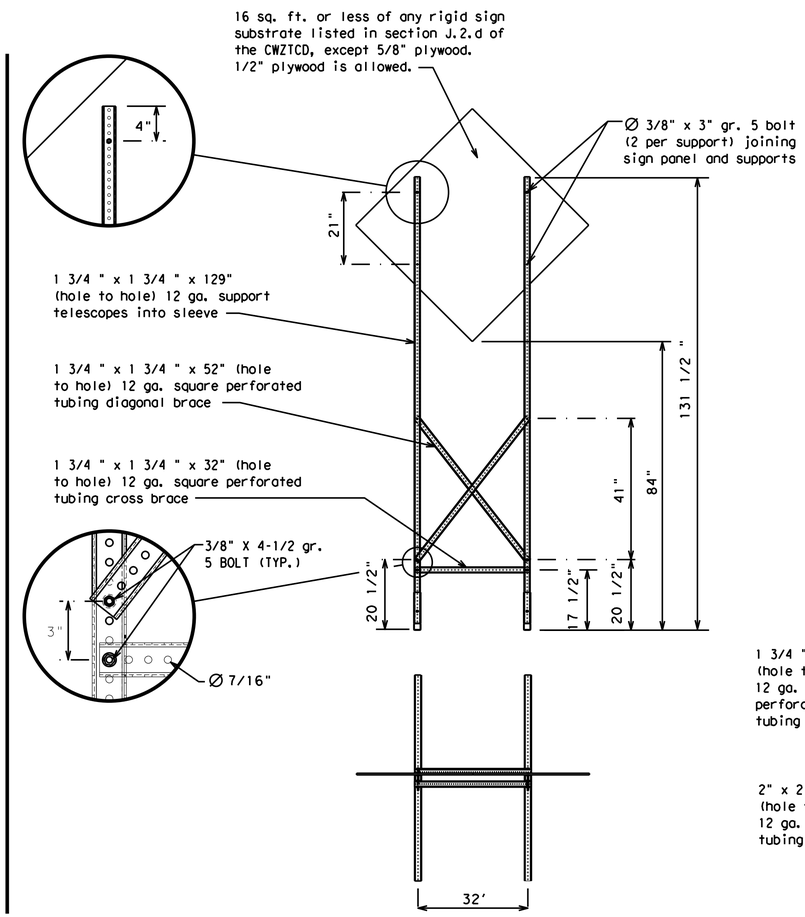

PERFORATED SQUARE METAL TUBING

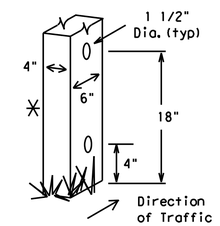
WING CHANNEL
Lap-splice/base bolted anchor

## 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.

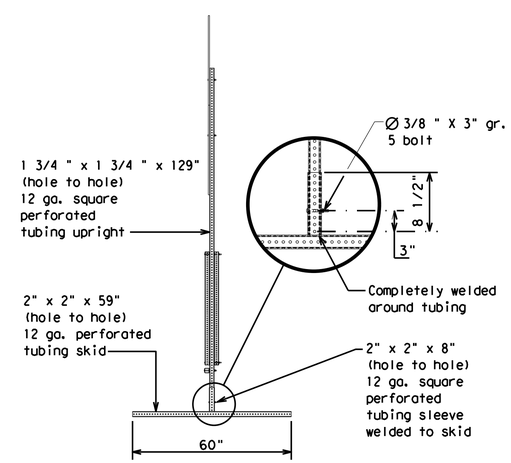



| Nominal Post Size | Number of Posts | Maximum Sq. feet of Sign Face | Minimum Soil Embedment | Drilled Hole(s) Required |
|---|---|---|---|---|
| 4 x 4 | 1 | 12 | 36" | NO |
| 4 x 4 | 2 | 21 | 36" | NO |
| 4 x 6 | 1 | 21 | 36" | YES |
| 4 x 6 | 2 | 36 | 36" | YES |

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS




## SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

## 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 Operations Division Standard

# BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

# BC(5)-13

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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.

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# BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

# BC(6)-13

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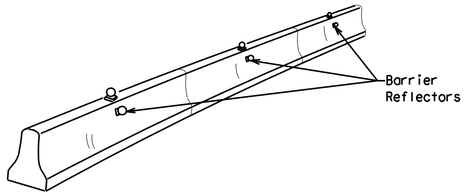
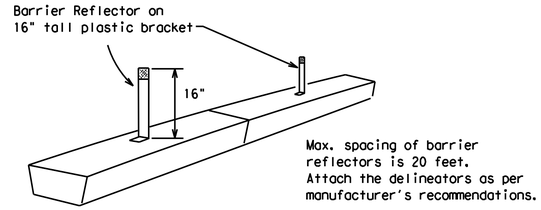
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

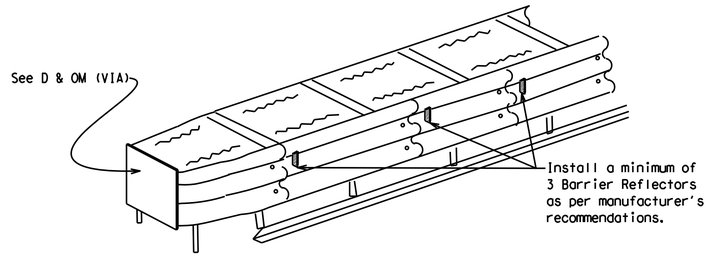



## CONCRETE TRAFFIC BARRIER (CTB)

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)

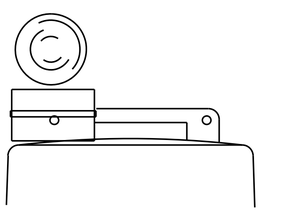



## DELINEATION OF END TREATMENTS

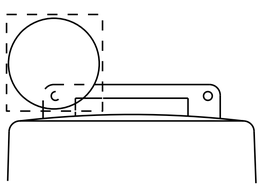
**END TREATMENTS FOR CTB'S USED IN WORK ZONES**

End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. 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

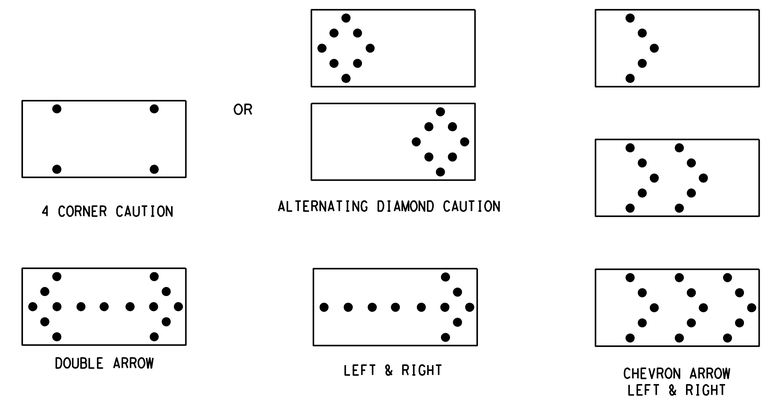
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing 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 National Cooperative Highway Research Report No. 350 (NCHRP 350) or 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 Operations Division Standard

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

# BC(7)-13

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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:

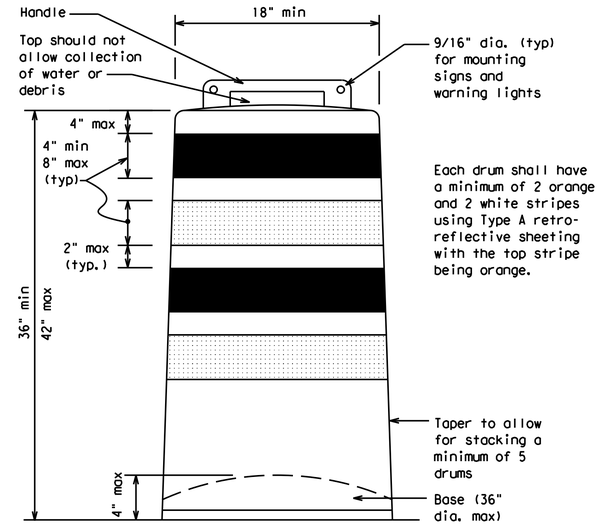
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents 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.

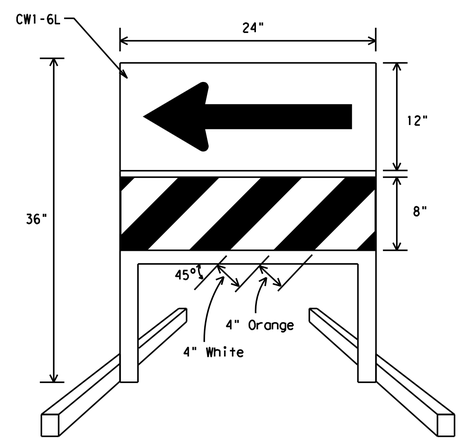
## RETROREFLECTIVE SHEETING

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 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.

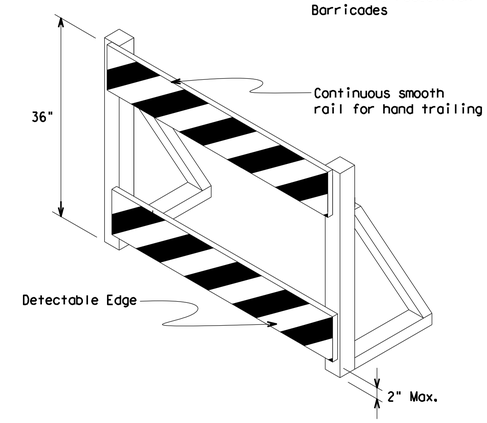



## DIRECTION INDICATOR BARRICADE

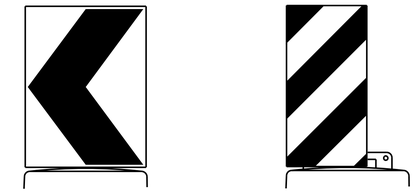
1. The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
2. If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
3. The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type $B_{FL}$ or Type $C_{FL}$ Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
4. Double arrows on the Direction Indicator Barricade will not be allowed.
5. Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.

This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades




## 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.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
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 for Buildings and Facilities (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 may 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 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.



Texas Department of Transportation — Traffic Operations Division Standard

# BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

## BC(8)-13

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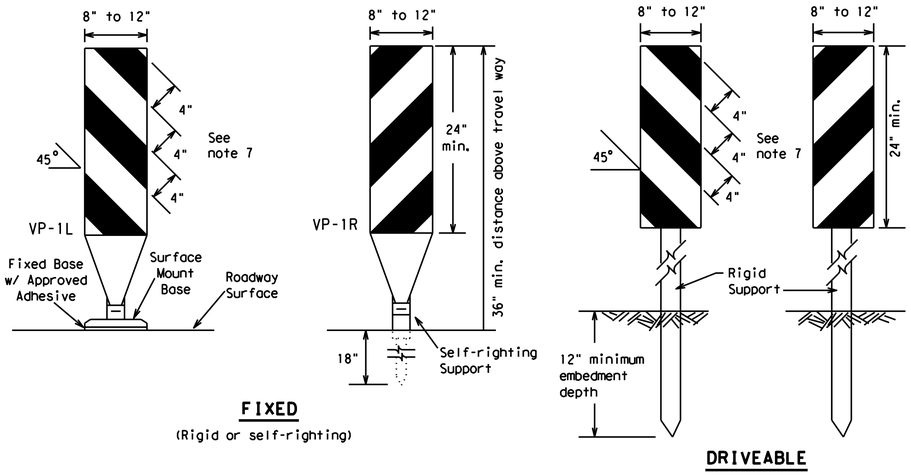
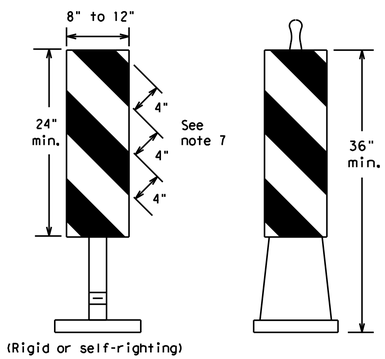



**FIXED**

(Rigid or self-righting)

**DRIVEABLE**

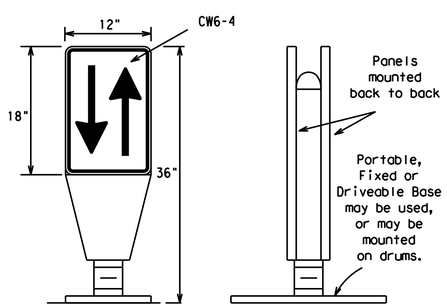



(Rigid or self-righting)

**PORTABLE**

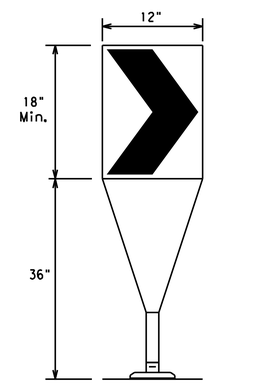
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of 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 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)



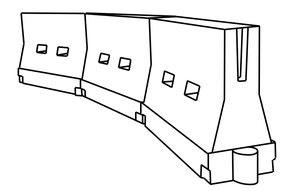

Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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) placed 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 NCHRP 350 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 ** | | | Suggested Maximum Spacing of Channelizing Devices | |
|---|---|---|---|---|---|---|
| | | 10' Offset | 11' Offset | 12' Offset | 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



Texas Department of Transportation — Traffic Operations Division Standard

# BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

# BC(9)-13

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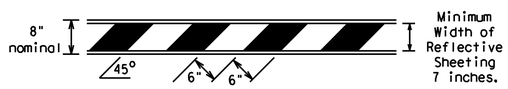
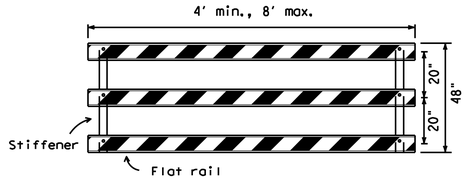
## TYPE 3 BARRICADES

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 conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



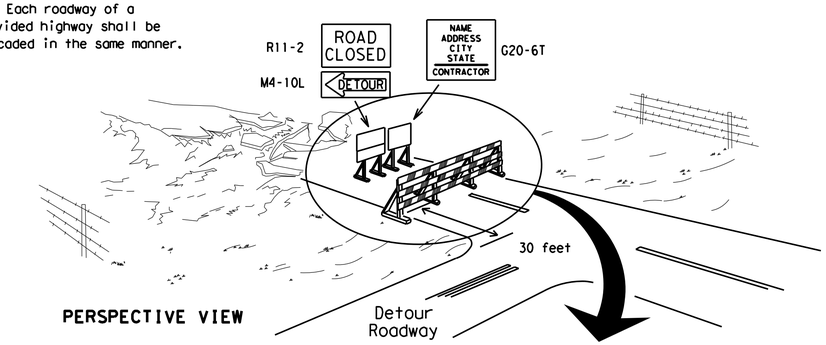

### TYPICAL STRIPING DETAIL FOR BARRICADE RAIL




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

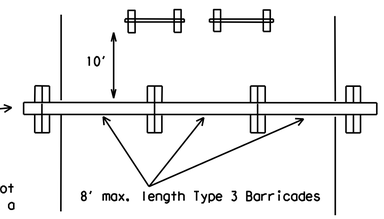
### TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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




PERSPECTIVE VIEW

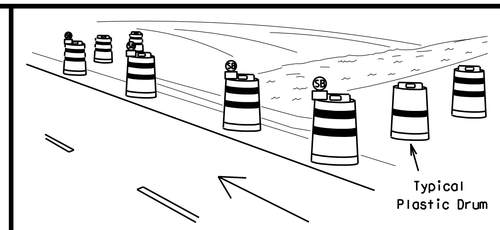
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.




PLAN VIEW

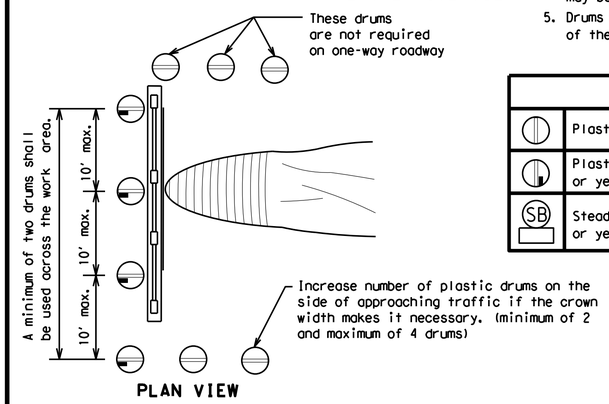
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

### TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION




PERSPECTIVE VIEW

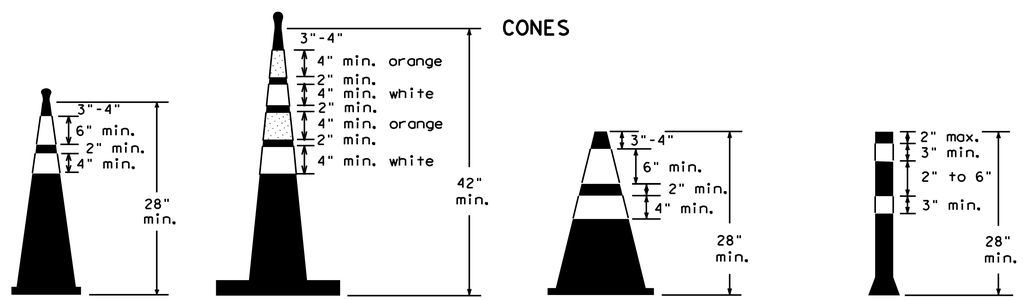
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder 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.




PLAN VIEW

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

### CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS




Two-Piece cones

One-Piece cones

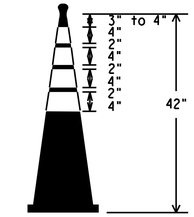
Tubular Marker

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.

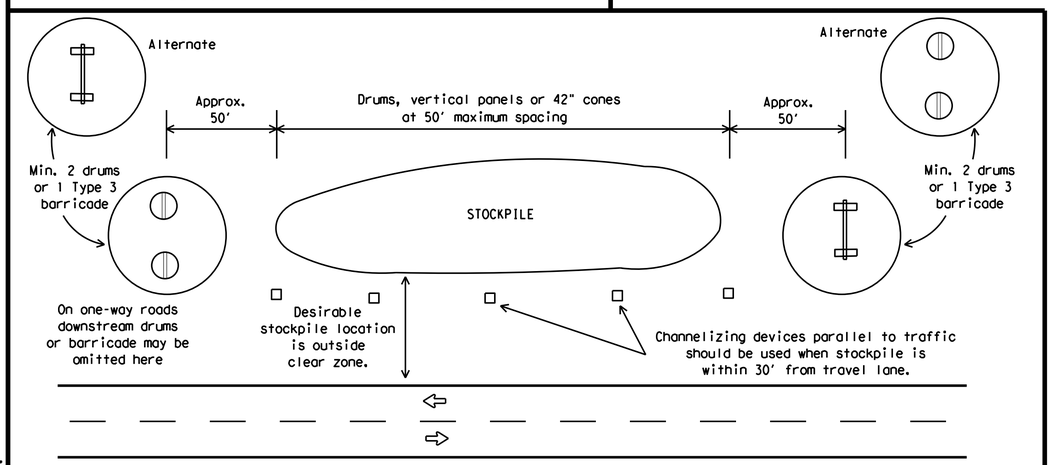
1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added 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 used at night 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.
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.

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.




EDGELINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.




### TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation — Traffic Operations Division Standard

# BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

## BC(10)-13

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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.

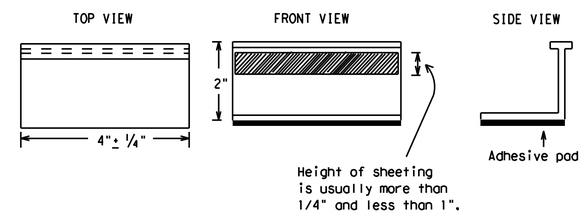
## MAINTAINING WORK ZONE PAVEMENT MARKINGS

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 Operations Division Standard

# BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

# BC(11)-13

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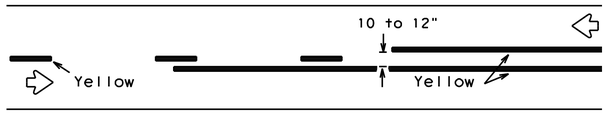
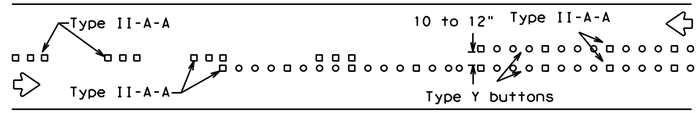
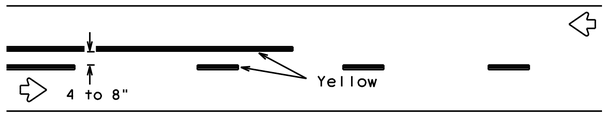
# PAVEMENT MARKING PATTERNS



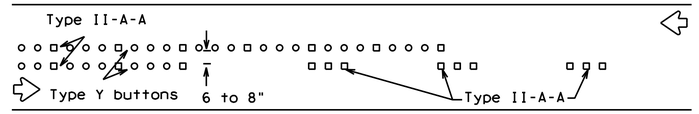

REFLECTORIZED PAVEMENT MARKINGS - PATTERN A




RAISED PAVEMENT MARKERS - PATTERN A



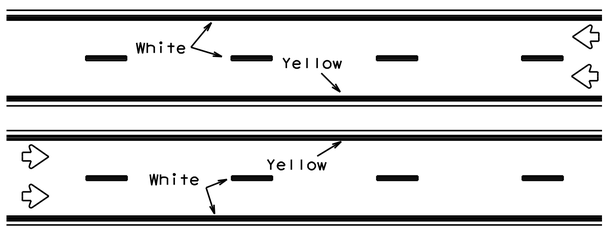

REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



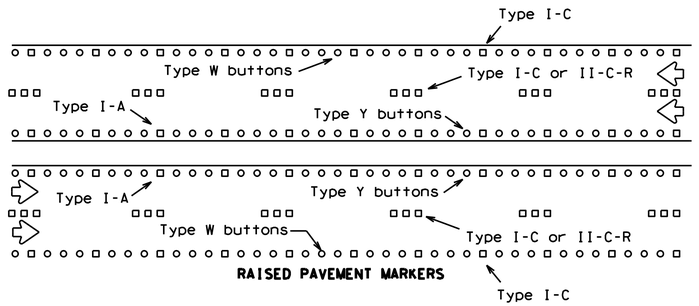

RAISED PAVEMENT MARKERS - PATTERN B

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



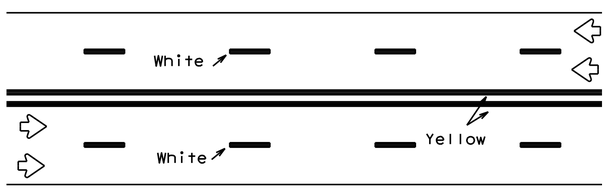

REFLECTORIZED PAVEMENT MARKINGS



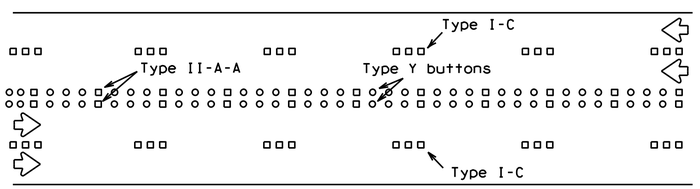

RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

## EDGE & LANE LINES FOR DIVIDED HIGHWAY



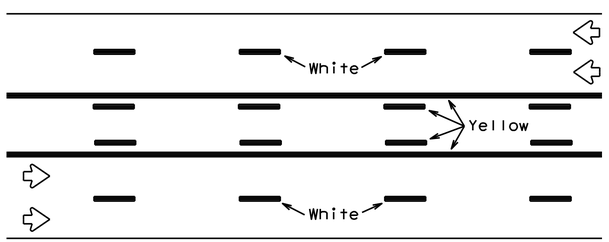

REFLECTORIZED PAVEMENT MARKINGS



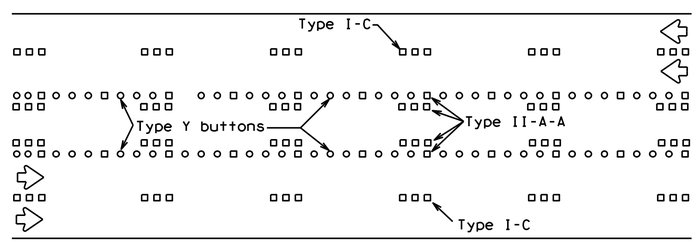

RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

## LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS




REFLECTORIZED PAVEMENT MARKINGS




RAISED PAVEMENT MARKERS

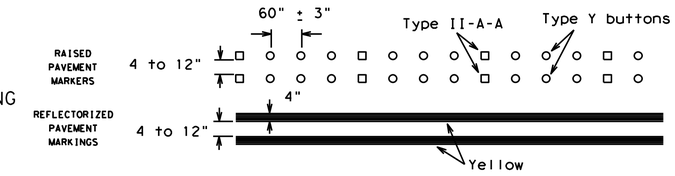
Prefabricated markings may be substituted for reflectorized pavement markings.

## TWO-WAY LEFT TURN LANE

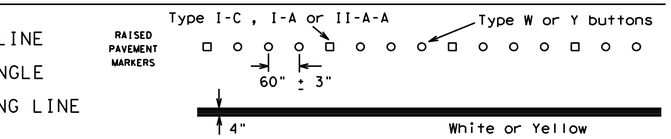
# STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

## SOLID LINES

### DOUBLE NO-PASSING LINE

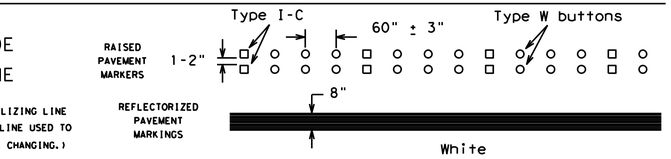



### EDGE LINE OR SINGLE NO-PASSING LINE



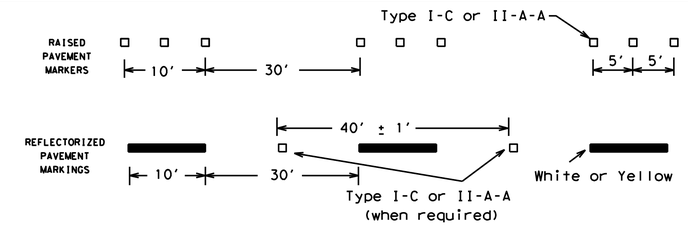

### WIDE LINE

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

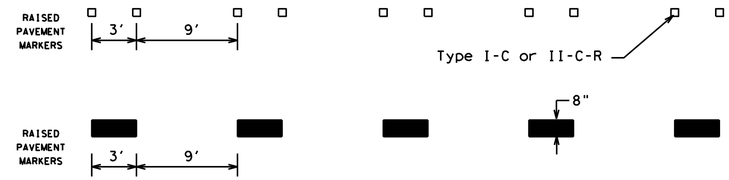



## BROKEN LINES

### CENTER LINE OR LANE LINE

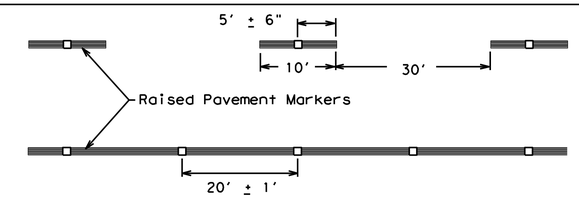



### AUXILIARY OR LANEDROP LINE




### 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."

SHEET 12 OF 12

Texas Department of Transportation — Traffic Operations Division Standard

# BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

## BC(12)-13

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

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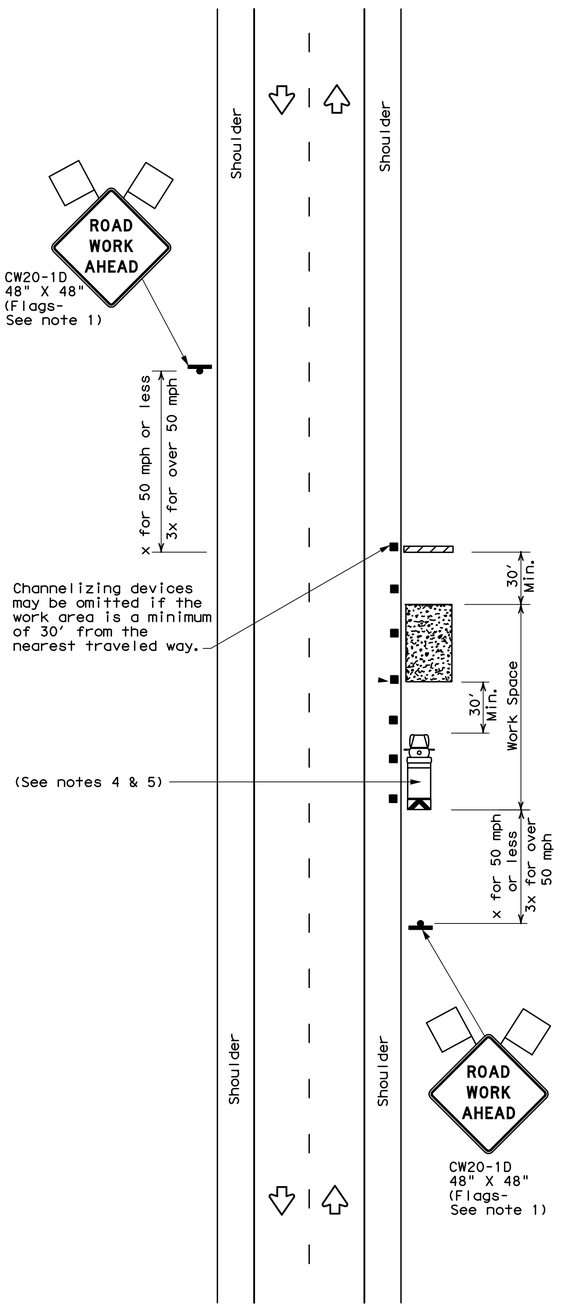
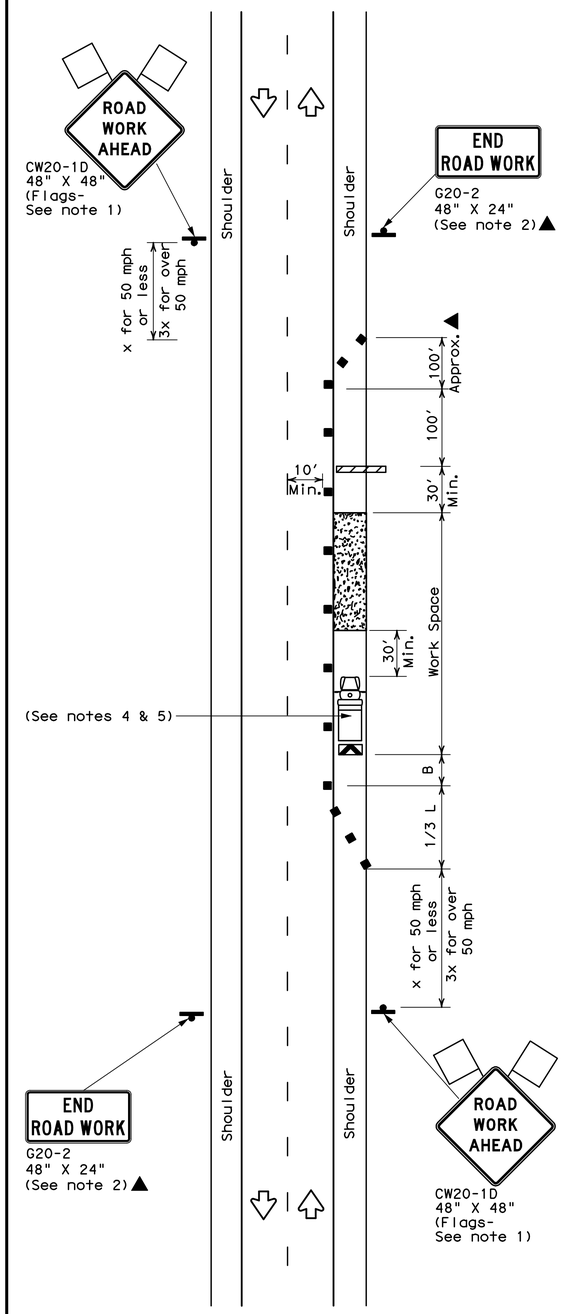



TCP (2-1a)

## WORK SPACE NEAR SHOULDER

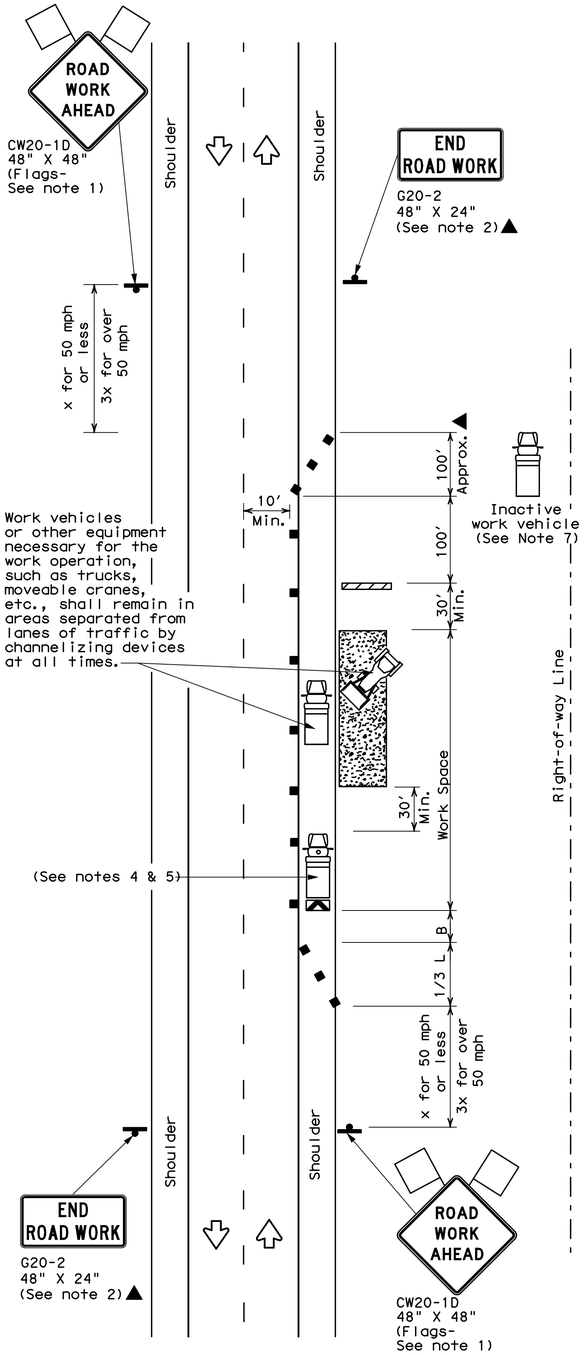
Conventional Roads




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 ✳✳ | | | Suggested Maximum Spacing of Channelizing Devices | | Minimum Sign Spacing "X" Distance | Suggested Longitudinal Buffer Space "B" |
|---|---|---|---|---|---|---|---|---|
| | | 10' Offset | 11' Offset | 12' Offset | On a Taper | On a Tangent | | |
| 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 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.
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 CW21-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

For construction or maintenance contract work, specific project requirements for shadow vehicles can be found in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

Texas Department of Transportation
Traffic Operations Division

# TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-12

© TxDOT December 1985

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|---|---|---|---|
| CONT | SECT | JOB | HIGHWAY |
| DIST | COUNTY | | SHEET NO. |

REVISIONS
2-94 2-12
8-95
1-97
4-98

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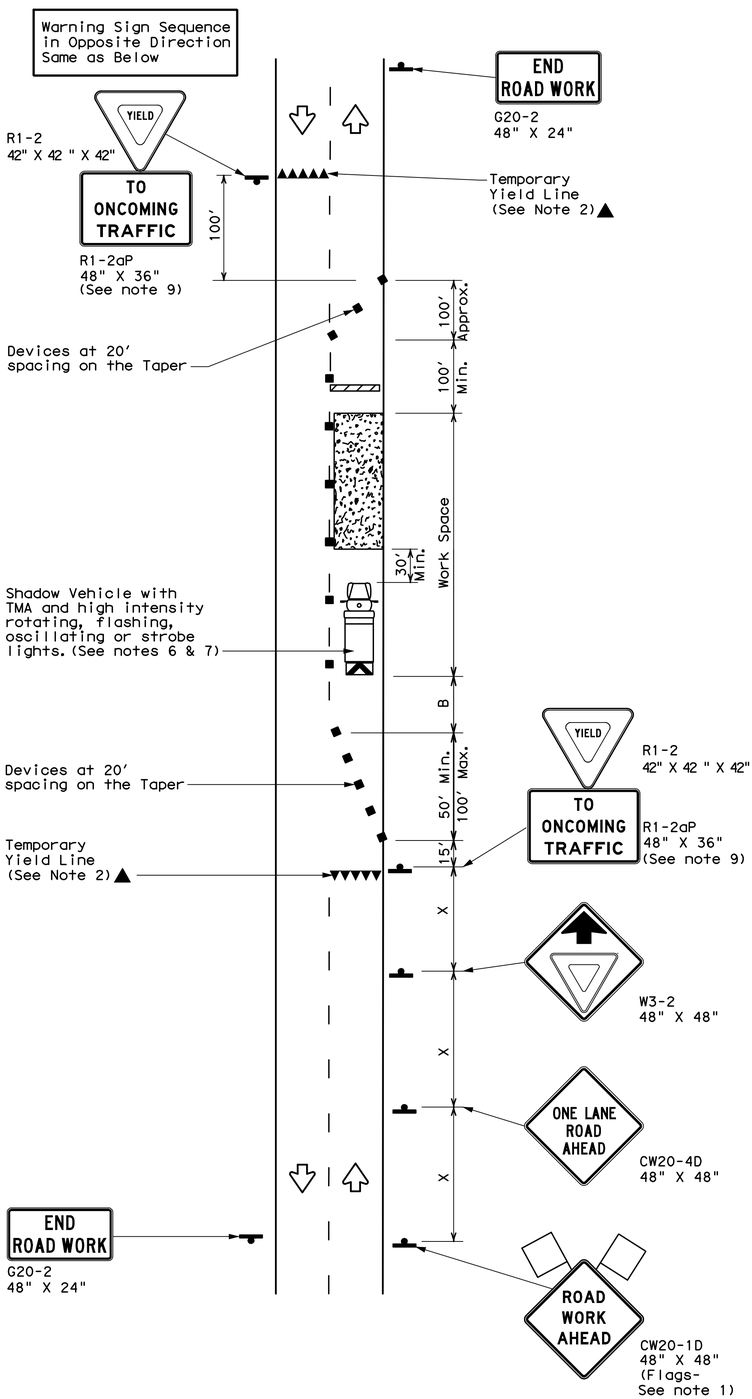


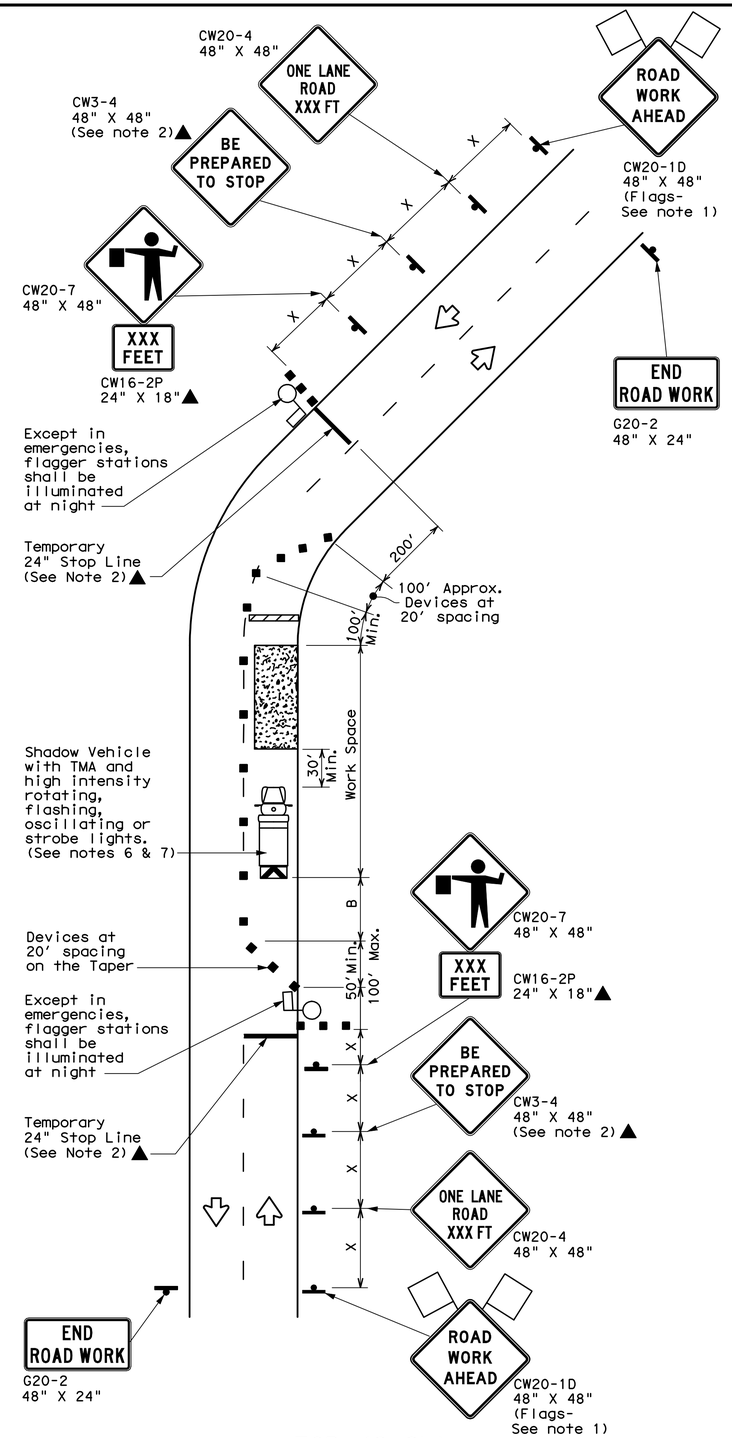

TCP (2-2a)

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. 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.

For construction or maintenance contract work, specific project requirements for shadow vehicles can be found in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

Texas Department of Transportation
Traffic Operations Division

# TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-12

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| DN: TXDOT | CK: TXDOT | DW: TXDOT | CK: TXDOT |
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REVISIONS
8-95 2-12
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| | | | |

| DIST | COUNTY | SHEET NO. |
|---|---|---|
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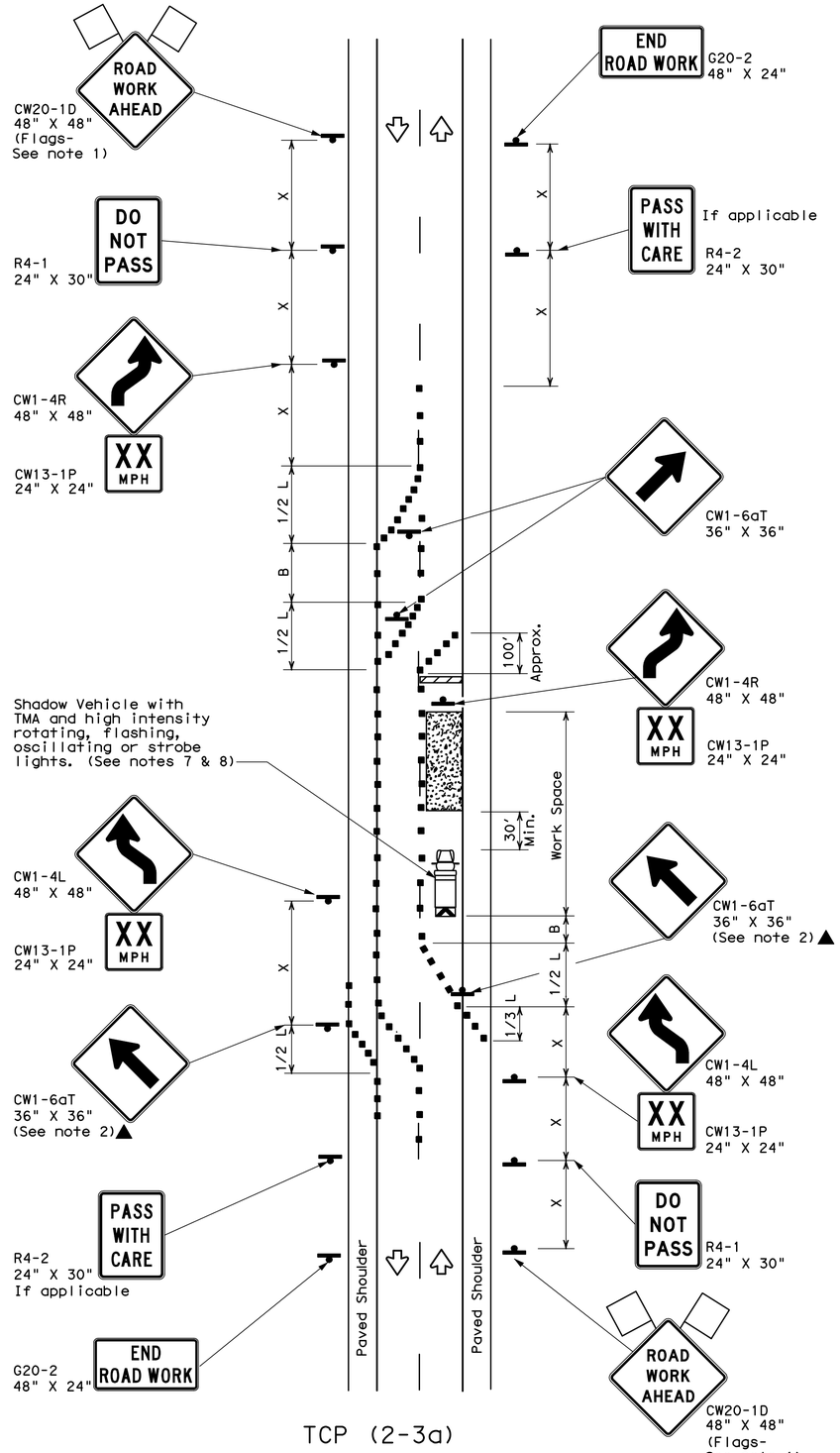
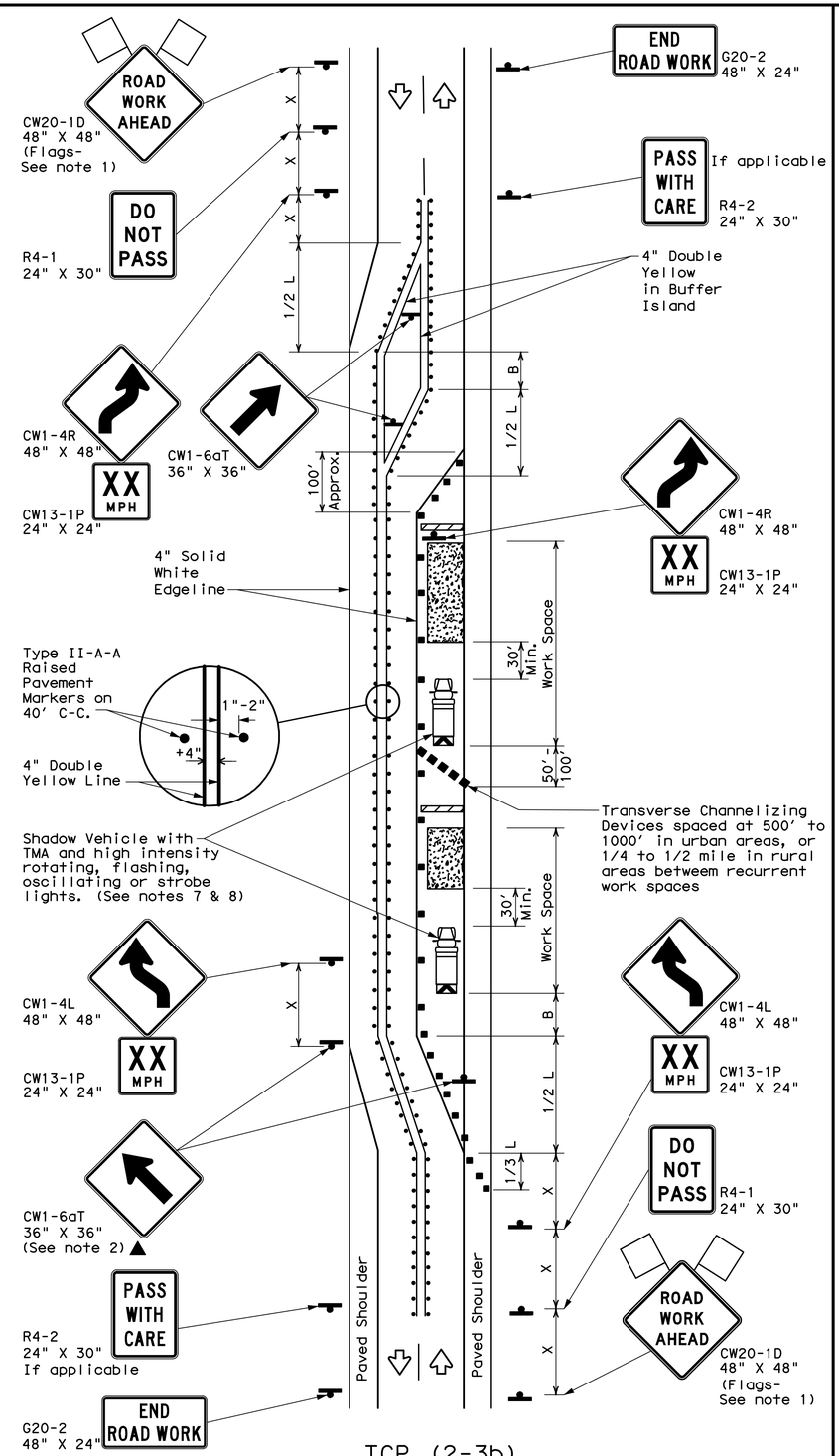



TCP (2-3a)

2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED

ADEQUATE FIELD OF VIEW




TCP (2-3b)

2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED

INADEQUATE FIELD OF VIEW

## LEGEND

| | | | |
|---|---|---|---|
| | Type 3 Barricade | | Channelizing Devices |
| | Heavy Work Vehicle | | Truck Mounted Attenuator (TMA) |
| | Trailer Mounted Flashing Arrow Board | | Raised Pavement Markers Ty II-AA |
| | 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 TCP(2-3b) ONLY |
|---|---|---|---|---|
| | | | ✓ | ✓ |

## 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. When work space will be in place less than three days existing pavement markings may remain in place. Channelizing devices shall be used to separate traffic.
4. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Flagger should be positioned at end of traffic queue.
5. The R4-1 "DO NOT PASS," R4-2 " PASS WITH CARE" and construction regulatory speed zone signs may be installed within CW20-1D "ROAD WORK AHEAD" signs. Proper spacing of signs shall be maintained.
6. Conflicting pavement marking shall be removed for long term projects.
7. 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.
8. 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 (2-3a)

9. Conflicting pavement markings shall be removed for long-term projects. For shorter durations where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2(S) where S is the speed in mph. This tighter device spacing is intended for the area of the conflicting markings, not the entire work zone.

For construction or maintenance contract work, specific project requirements for shadow vehicles can be found in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

Texas Department of Transportation
Traffic Operations Division

# TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-12

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|---|---|---|---|

REVISIONS
8-95 2-12
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| CONT | SECT | JOB | HIGHWAY |
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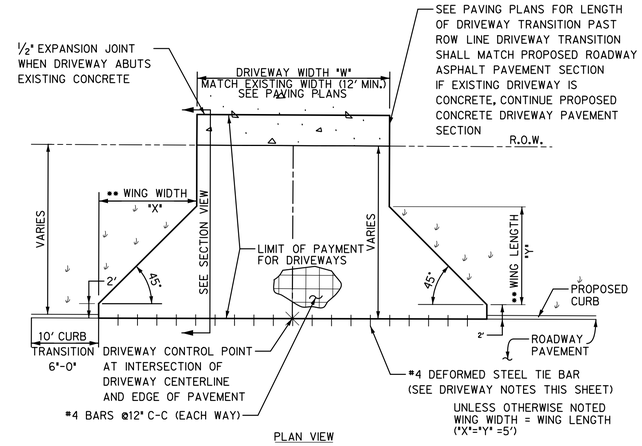
|---|---|---|
| | | |

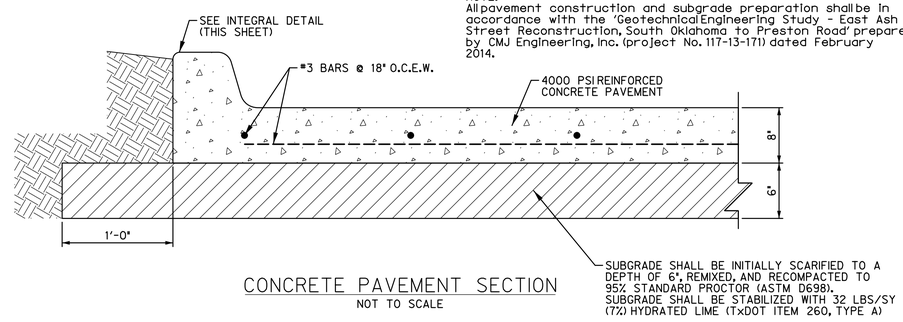


DATE:

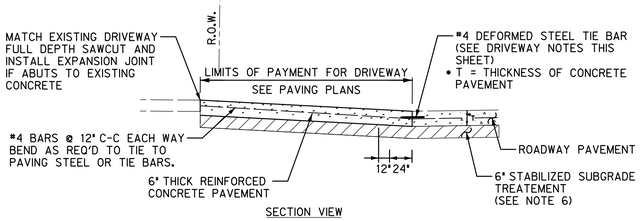



PLAN VIEW

NOTE:
All pavement construction and subgrade preparation shall be in accordance with the 'Geotechnical Engineering Study - East Ash Street Reconstruction, South Oklahoma to Preston Road' prepared by CMJ Engineering, Inc. (project No. 117-13-171) dated February 2014.

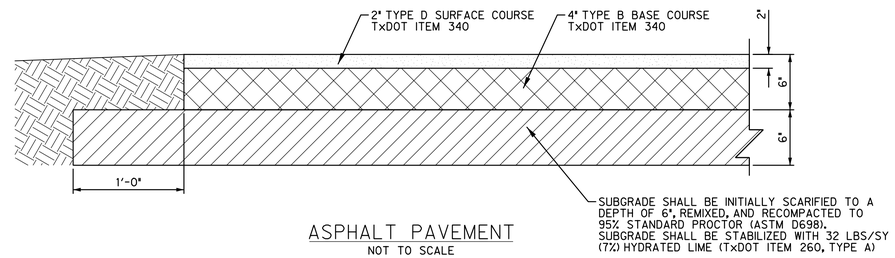



CONCRETE PAVEMENT SECTION
NOT TO SCALE

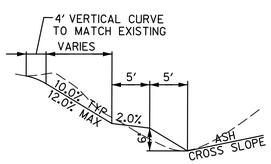



SECTION VIEW

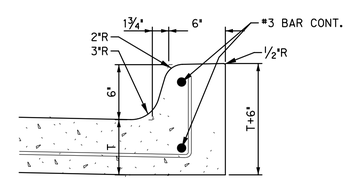
CONCRETE DRIVEWAY APPROACH
NOT TO SCALE




ASPHALT PAVEMENT
NOT TO SCALE




TYPICAL DRIVEWAY PROFILE
NOT TO SCALE




INTEGRAL CURB DETAIL
NOT TO SCALE

RECORD DRAWINGS - APRIL 2016

These Record Drawings were prepared by or under the supervision of Brian C. Haynes, P.E. 90985. These Record Drawings have been prepared based on information provided by the City of Celina, Texas. The Design Professional has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated hereinas a result.

Design Consultant: Halff Associates Inc. TBPE # F-312

58 / 75

| Revision | | |
|---|---|---|
| No. | Description | Date |
| | | |
| | | |
| | | |

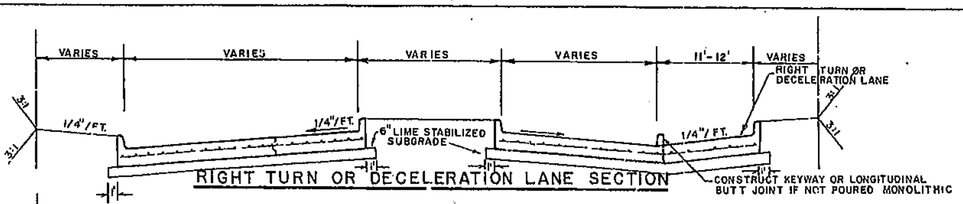
Misc. Pavement Details

ASH STREET RECONSTRUCTION
OKLAHOMA ST. TO PRESTON RD.
CITY OF CELINA, TEXAS

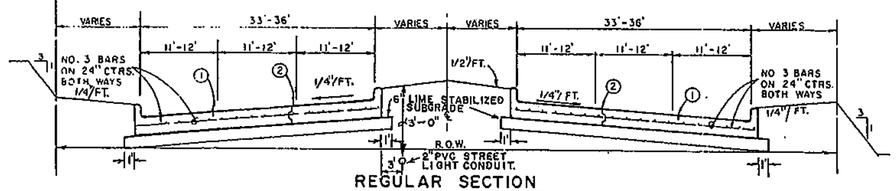
HALFF
TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 58 |

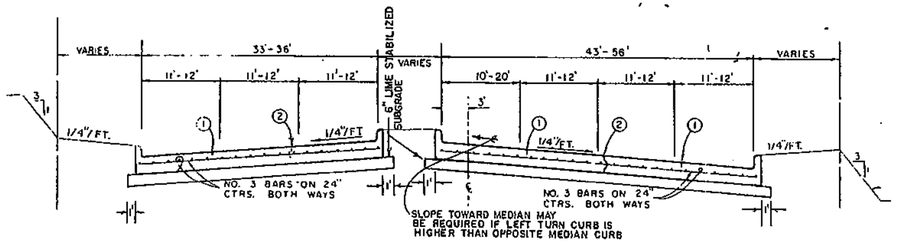
3/31/2016 9:45:59 AM ah2879 HALFF I:\29000s\29852\CADD\Sheets\29852-PAV-0008.dgn Sheet PDF_2D_MON_FW_MR_300.plt



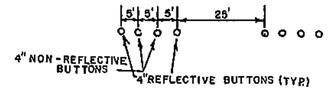

RIGHT TURN OR DECELERATION LANE SECTION



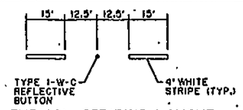

REGULAR SECTION



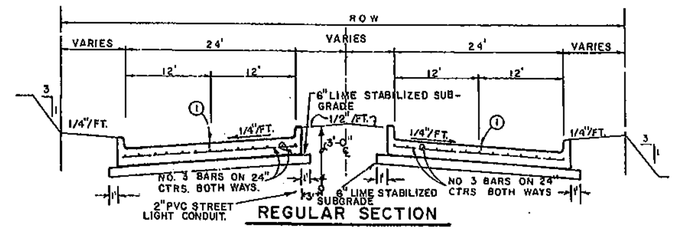

LEFT TURN SECTION



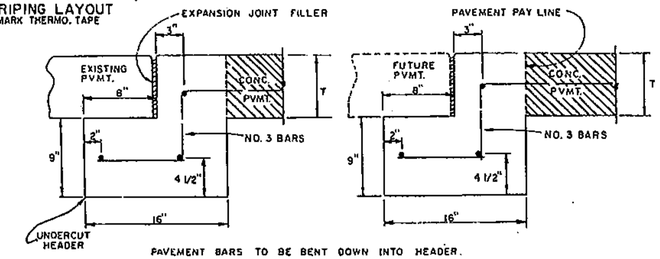

PAVEMENT MARKING DETAIL




TYPICAL STRIPING LAYOUT
USING 3M STAMARK THERMO. TAPE

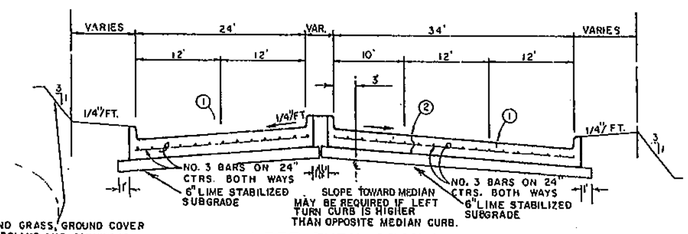



REGULAR SECTION




PAVEMENT BARS TO BE BENT DOWN INTO HEADER. HEADER AND PAVEMENT TO BE MONOLITHIC.

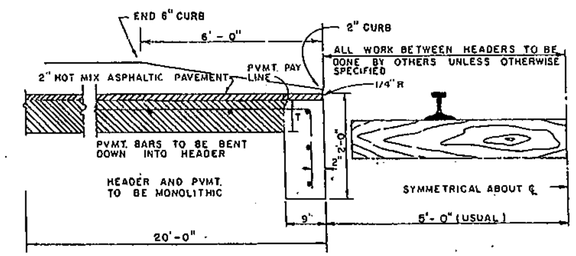
STREET HEADER



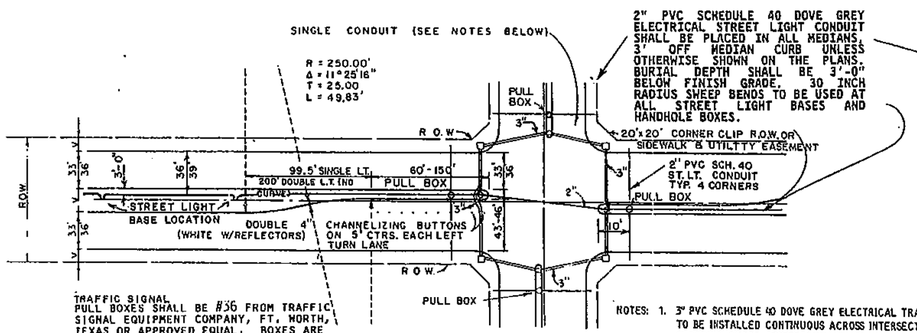

MIN. 6" TOP SOIL AND GRASS, GROUND COVER (TYP) ALL SLOPES, MEDIANS AND PARKWAYS PER ITEM 2.15, 3.10.1, 3.10.2 AND 3.10.3 OF THE SPECIAL PROVISIONS.

LEFT TURN SECTION

NOTE: FOR RETROFIT TURN LANES AND MEDIAN OPENINGS, TWO (2) ADDITIONAL INCHES OF CONCRETE CAN BE INSTALLED IN PLACE OF LINE STABILIZATION.




RAIL HEADER

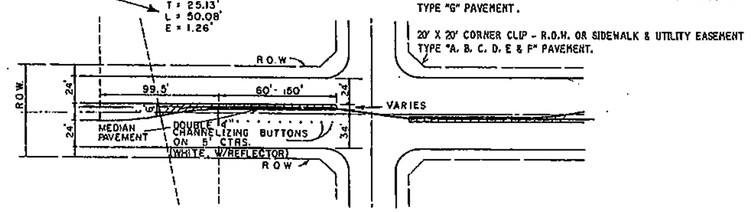



TRAFFIC SIGNAL PULL BOXES SHALL BE #36 FROM TRAFFIC SIGNAL EQUIPMENT COMPANY, FT. WORTH, TEXAS OR APPROVED EQUAL. BOXES ARE APPROXIMATELY 10½" x 17" x 12" AND SHALL BE PROVIDED WITH A CONCRETE COVER. BURIAL DEPTH OF 3" CONDUIT SHALL BE 36" INCHES BELOW CURB GRADES. BOXES TO BE INSTALLED 1/4" PER FOOT ABOVE TOP OF CURB.

PLAN

TYPE A,B,B+,C PAVEMENT

2" PVC SCHEDULE 40 DOVE GREY ELECTRICAL STREET LIGHT CONDUIT SHALL BE PLACED IN ALL MEDIANS, 3' OFF MEDIAN CURB UNLESS OTHERWISE SHOWN ON THE PLANS. BURIAL DEPTH SHALL BE 3'-0" BELOW FINISH GRADE. 30 INCH RADIUS SWEEP BENDS TO BE USED AT ALL STREET LIGHT BASES AND HANDHOLE BOXES.




PLAN

TYPE D PAVEMENT

NOTES:
1. 3" PVC SCHEDULE 40 DOVE GREY ELECTRICAL TRAFFIC SIGNAL CONDUIT TO BE INSTALLED CONTINUOUS ACROSS INTERSECTION, EXTENDING TO 2' BEHIND CURBS. SWEEP BENDS TO BE USED AT ALL PULL BOXES.
2. RED MARKER TAPE IS TO BE INSTALLED ON THE ENDS OF THE CONDUIT WITH 3" CAP.
3. A NO. 9 GALVANIZED WIRE SHALL BE PLACED IN ALL CONDUIT. THIS WIRE SHALL EXTEND A MINIMUM OF 1' FROM THE END OF THE CONDUIT. ITEM 8.10.3
4. CONTACT T.U. ELECTRIC CO. PRIOR TO INSTALLING STREET LIGHT ELECTRIC CONDUIT. PLACEMENT OF ELECTRIC HANDHOLE BOXES SHALL BE AS DIRECTED BY T.U. ELECTRIC CO. BOXES MAY BE OBTAINED FROM T.U. ELECTRIC.
5. RED DOT CURB MARKERS, DAS 2.5 NSL FOR STREET LIGHTING & 2.5 NTS FOR TRAFFIC SIGNALS TO BE INSTALLED ON FACE OF CURBS.

LEGEND: ① - SAWED LONGITUDINAL DUMMY JOINT

② - CONSTRUCTION JOINT (FULL WIDTH PVMT. IS ALLOWED WHERE APPROVED BY CITY OF PLANO) DELETE IF PAVING IS 25 FT. WIDTH TO BE WIDENED LATER. INSTALL CURB IF PAVING IS LESS THAN FULL WIDTH OF 33'-36'.

NOTE:
SEE SD-6 FOR TYPICAL CONTOUR OF MAJOR/MAJOR INTERSECTION. FOR INTERSECTION WIDENING DETAIL.

PAVEMENT SECTIONS

| STREET TYPE | STREET WIDTH | R.O.W. WIDTH |
|---|---|---|
| EXPRESSWAY/A | 2-36' | 144'-244' |
| MAJOR/B+ | 2-48' | 140' |
| MAJOR/B | 2-36' | 130'-160' |
| MAJOR/C | 2-33' | 110' |
| SECONDARY/D | 2-24' | 92' |

## GENERAL NOTES

A. GENERAL.
PAVEMENT THICKNESS FOR STRAIGHT CROWN STREETS SHALL BE AS SPECIFIED BELOW IN SPECIAL NOTES.

STANDARD SPECIFICATIONS.

B. REINFORCED CONCRETE PAVEMENTS.
1. ALL CURBS SHALL BE PLACED INTEGRAL WITH PAVEMENT.
2. CURBS SHALL MEET THE SAME STRENGTH AS SPECIFIED FOR THE CONCRETE PAVEMENT.
3. DETAIL AND ARRANGEMENT OF JOINTS. ALL TYPES, SHALL BE AS SHOWN ON SHEET SD-3 OF THE STANDARD CONSTRUCTION DETAILS.
4. BAR LAPS SHALL BE 30 DIAMETERS.

C. SUBGRADE - SEE GENERAL NOTE C, SHEET SD-2.

D. BAR CHAIRS SHALL BE FURNISHED.

E. CROSS SLOPE SHALL BE 1/4" PER FOOT UNLESS APPROVED BY ENGINEERING DEPARTMENT.

F. SUBGRADE UNDER ALL PAVEMENT SHALL BE 6 - INCHES THICK AND SHALL BE STABILIZED WITH AT LEAST 27 LBS. PER SQ. YD. HYDRATED LIME, COMPACTED TO A DENSITY NOT LESS THAN 95 PERCENT. LABORATORY TESTS MUST BE SUBMITTED TO THE ENGINEERING DEPARTMENT FOR APPROVAL TO DETERMINE AMOUNT OF LIME REQUIRED. LABORATORY TEST MAY BE WAIVED PROVIDED AT LEAST 36 LBS. OF LIME PER SQ. YD. IS USED. SEE ITEM 4.6.4. SPECIAL PROVISIONS, OR AS REQUIRED TO REDUCE THE PI TO 15.

G. FIRE LANES CAN BE CONSTRUCTED OF 5"-3600 PSI CONCRETE, (6 SACK MIX) 6"-3000 PSI CONCRETE, 7" ASPHALTIC CONCRETE (5" TYPE A BASE, 2" TYPE C SURFACE) OR GRASSCRETE, TO BE LOCATED AS PER FIRE CODE.

## SPECIAL NOTES

PAVEMENT THICKNESS AND STRENGTHS SHALL BE AS FOLLOWS UNLESS OTHERWISE SHOWN ON THE PLANS.

TYPE A OR B ; 8" MIN. -6000 P.S.I. COMP.

TYPE C : 8" MIN. -6000 P.S.I. COMP.

TYPE D ; 7"-4200 P.S.I. COMP.

ALL MEDIANS & PARKWAYS SHALL BE PROVIDED WITH GRASSED GROUNDCOVER. MATERIALS SHALL BE AS SPECIFIED IN ITEM 2.15. TOP SOIL & SEEDING SHALL BE IN ACCORDANCE WITH ITEMS 3.8, 3.9, 3.10 AND 3.11 OF THE SPECIAL PROVISIONS AND SPECIFICATIONS.

STRIPES OR BUTTONS FOR RIGHT TURN LANES WILL BE REQUIRED TO BE THE SAME AS FOR LEFT TURN LANES.

STATE OF TEXAS — ALAN L. UPCHURCH — 39209 — REGISTERED PROFESSIONAL ENGINEER

7-22-96

| NO. | REVISION | BY | DATE |
|---|---|---|---|
| | NCT STANDARD SPECIFICATIONS | S.A.S. | 9-21-87 |

CITY OF PLANO, TEXAS
PUBLIC WORKS
DEPARTMENT OF ENGINEERING

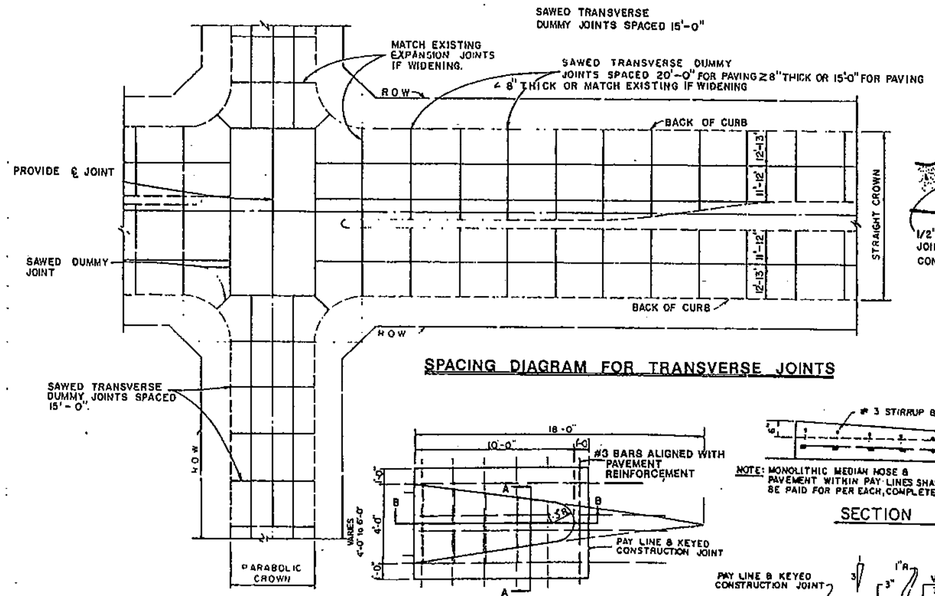
STANDARD CONSTRUCTION DETAILS
PAVING

STRAIGHT CROWN STREETS

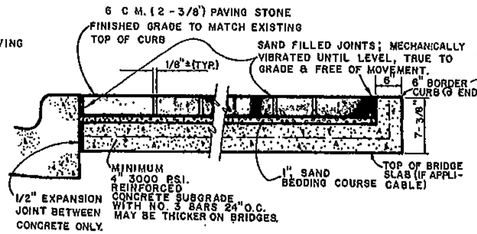
APPROVED Alan L. Upchurch
ALAN L. UPCHURCH, P.E.

DATE: JULY, 1996

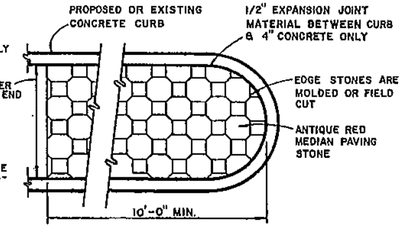
SHEET SD-1




## SPACING DIAGRAM FOR TRANSVERSE JOINTS




TYPICAL CROSS SECTION



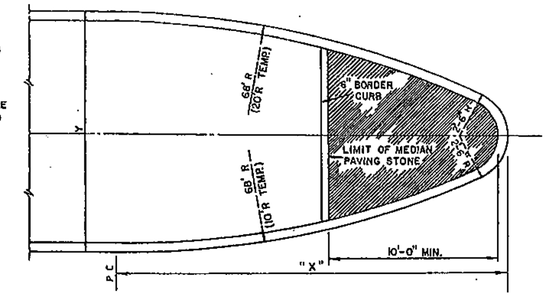

PLAN

## MEDIAN PAVING STONE DETAIL

PAVING STONE SHALL BE INTERLOCKING CONCRETE PER ITEMS 2.3.7 AND 5.8.6 OF THE SPECIAL PROVISIONS AND SHALL BE ANTIQUE RED COLOR.

NOTE: SEE SD-2 FOR STREET PAVING STONE DETAILS.

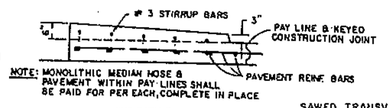
MEDIAN PAVING SHALL EXTEND TO A POINT WHERE MEDIAN IS 6' WIDE. IF MEDIAN IS 6' WIDE, PAVING SHALL EXTEND 15' FROM NOSE. FOR MEDIANS WIDER THAN 6', PAVING SHALL EXTEND 10' FROM NOSE. ALL DISTANCES ARE MINIMUM.




## DETAIL OF NOSE FOR MEDIAN ISLAND

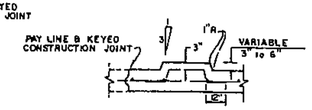



## MONOLITHIC MEDIAN NOSE



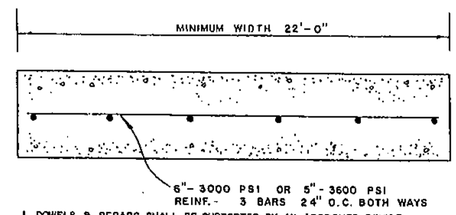

NOTE: MONOLITHIC MEDIAN NOSE & PAVEMENT WITHIN PAY LINES SHALL BE PAID FOR PER EACH, COMPLETE IN PLACE

SECTION B-B



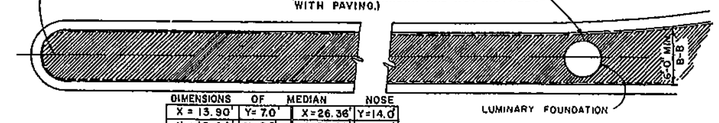

SECTION A-A

SAWED TRANSVERSE DUMMY JOINT SHALL BE SPACED 20'-0"



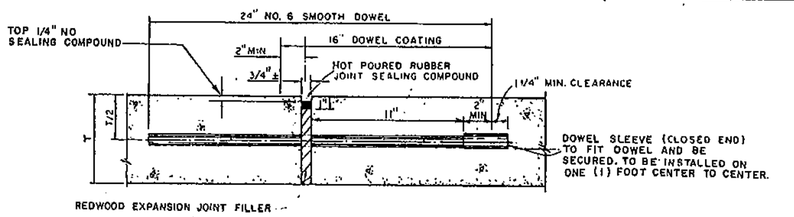

1. DOWELS & REBARS SHALL BE SUPPORTED BY AN APPROVED DEVICE.
2. EXPANSION JOINTS TO BE THE SAME AS USED FOR CONCRETE STREET PAVING.

## FIRE LANE PAVING & JOINT DETAIL




| DIMENSIONS OF MEDIAN NOSE | | | |
|---|---|---|---|
| X = 13.90' | Y= 7.0' | X=26.36' | Y=14.0' |
| X = 16.44' | Y= 8.0' | X=29.89' | Y=17.0' |
| X = 18.06' | Y=9.0' | X=32.93' | Y=20.0' |
| X = 20.42' | Y=10.0' | X=36.47' | Y=24.0' |

## DETAIL OF MEDIAN PAVEMENT

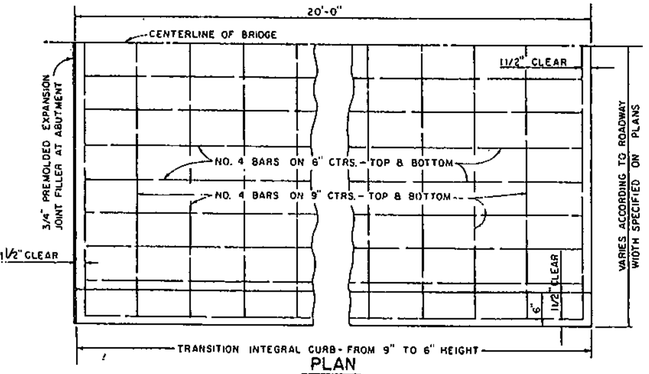



## TRANSVERSE EXPANSION JOINT

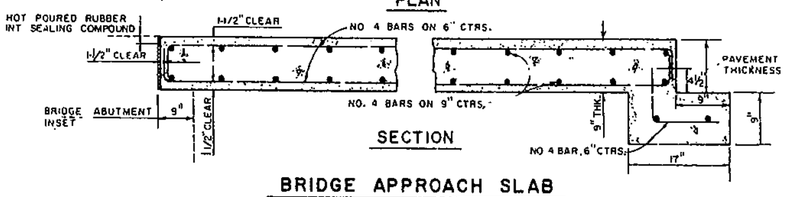
(SPACED 600 FT. MAXIMUM, LOCATE AT INTERSECTIONS)

T = PAVEMENT THICKNESS

NOTE:
DOWELS & REINFORCING BARS SHALL BE SUPPORTED BY A BASKET OR OTHER APPROVED DEVICE.

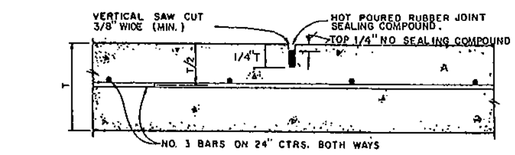



PLAN



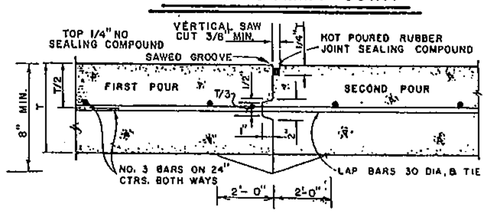

SECTION

## BRIDGE APPROACH SLAB




T = PAVEMENT THICKNESS

## SAWED DUMMY JOINT



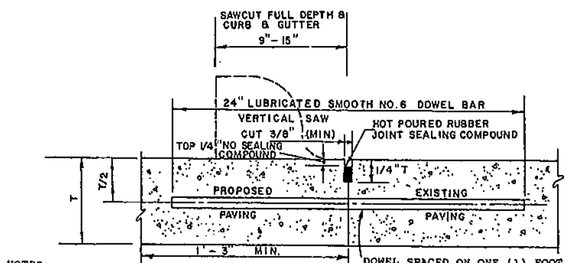

## CONSTRUCTION JOINT FOR PAVEMENTS

TRANSVERSE AND LONGITUDINAL JOINTS

NOTE: CONTRACTOR SHALL PROTECT KEYWAY PRIOR TO SECOND POUR. IF LONGITUDINAL KEYWAY IS DAMAGED, CONTRACTOR SHALL REPAIR WITH THE USE OF LONGITUDINAL BUTT JOINT. DRILL DOWELS INTO FIRST POUR.

T = PAVEMENT THICKNESS

THICKENED EDGES ARE REQUIRED FOR FUTURE WIDENING ONLY.




T = PAVEMENT THICKNESS

NOTES:

1. NO. 5 SMOOTH DOWEL BAR MAY BE USED IN 5 INCH AND 6 INCH PAVEMENT THICKNESS.
2. LONGITUDINAL BUTT CONSTRUCTION MAY BE UTILIZED IN PLACE OF LONGITUDINAL HINGED (KEYWAY) JOINT AT CONTRACTORS OPTION.
3. DOWEL BARS SHALL BE DRILLED INTO PAVEMENT HORIZONTALLY BY USE OF A MECHANICAL RIG.

DRILLING BY HAND IS NOT ACCEPTABLE, PUSHING DOWEL BARS INTO GREEN CONCRETE NOT ACCEPTABLE.

## LONGITUDINAL BUTT JOINT

STATE OF TEXAS — ALAN LEE UPCHURCH — 39239 — REGISTERED PROFESSIONAL ENGINEER

7-22-96

| NCT STANDARD SPECIFICATIONS | S.A.S. | 9-23-87 |
|---|---|---|
| REVISION | BY | DATE |

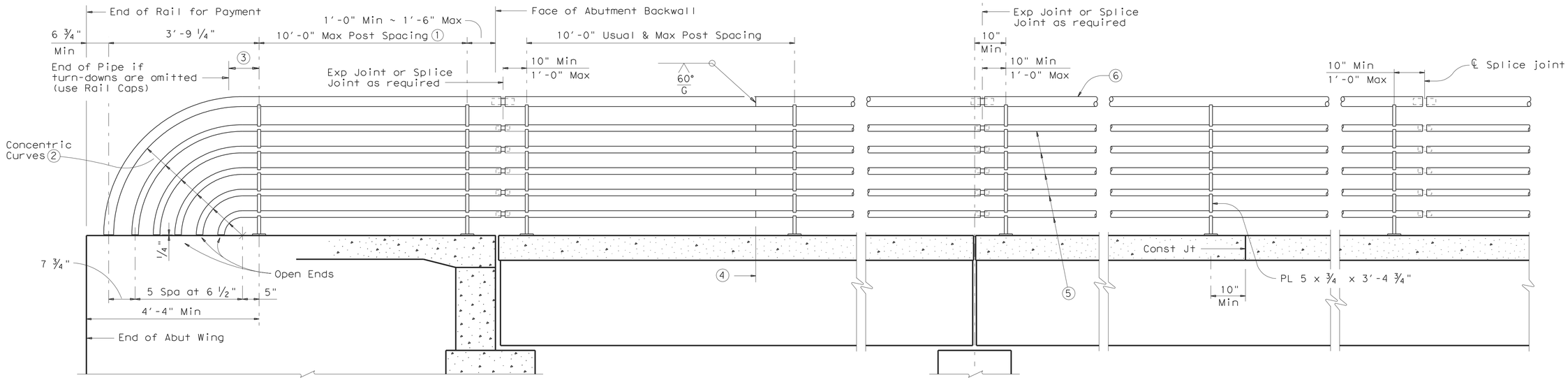
CITY OF PLANO, TEXAS
PUBLIC WORKS
DEPARTMENT OF ENGINEERING

STANDARD CONSTRUCTION DETAILS
PAVING

PAVEMENT JOINTS & PAVING STONES

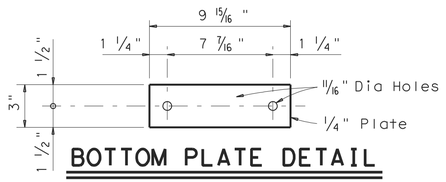
APPROVED: Alan L. Upchurch
ALAN L. UPCHURCH, P.E.

DATE: JULY, 1996 | SHEET SD-3

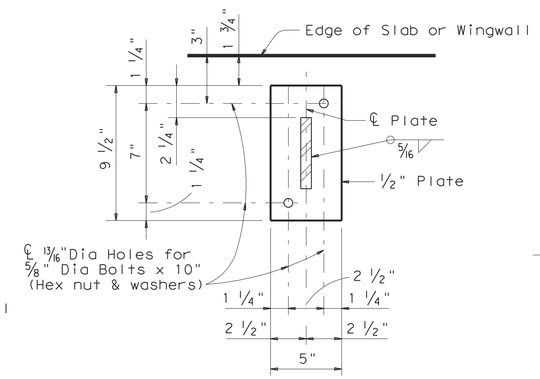



AT ABUTMENT BENTS | AT SHOP SPLICE | AT ENDS OF UNIT | AT SLAB CONST JOINT | AT SPLICE JOINT

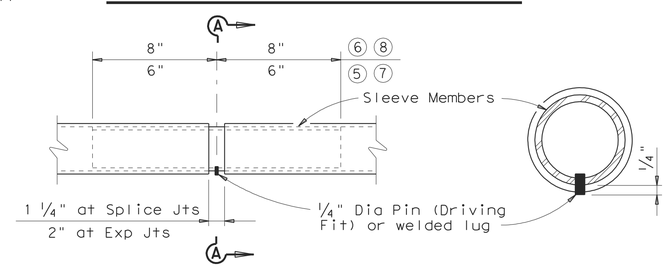
## ROADWAY ELEVATION OF RAIL




BOTTOM PLATE DETAIL

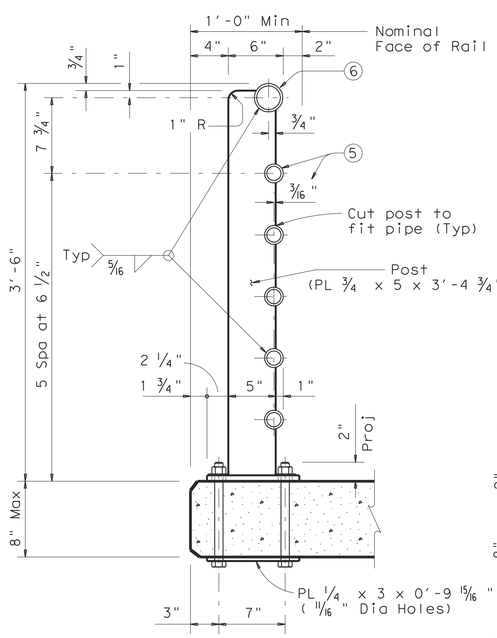



BASE PLATE DETAIL

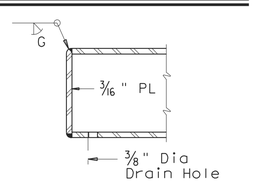



AT SPLICE OR EXP JTS | SECTION A-A

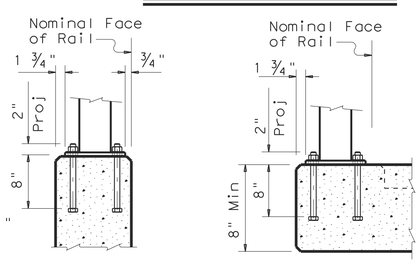
## PIPE SPLICE DETAIL




BASIC CONDITION




RAIL CAP DETAIL




ON ABUT WING OR CIP RETAINING WALL | ON CULVERTS OR SLABS OVER 8" THICK

## POST MOUNTING DETAILS

① Min of 2 posts required on wingwall

② Portion of railing with turn-downs to be used or omitted as indicated on Bridge Layout.

③ 10" Min ~ 1'-6" Max if turn-downs are omitted.

④ One shop splice per panel is permitted (with minimum 85 percent penetration). The weld may be square groove or single vee groove. Grind smooth.

⑤ 2" Std Pipe (2.375" O.D., 0.154" wall thickness)

⑥ 3" Std Pipe (3.500" O.D., 0.216" wall thickness)

⑦ 1 ½" Std Pipe Sleeve (1.900" O.D., 0.145" wall thickness)

⑧ 2 ½" Std Pipe Sleeve (2.875" O.D., 0.203" wall thickness)

### CONSTRUCTION NOTES:

Panel lengths of railing must be attached to a minimum of three posts except at abutment wingwalls.

Face of rail and posts must be vertical transversely unless otherwise approved by the Engineer. Posts must be perpendicular to adjacent roadway grade. Use epoxy mortar under post base plates if gaps larger than 1/16" exist.

For curved railing applications, fabricate the pipe rails to the radius when the radius is 600' or less. Submit shop drawings for approval when tubes are required to be fabricated to a radius. Shop drawings must be submitted to the Engineer for approval.

Exposed edges of pipe rail and pipe rail posts must be rounded or chamfered to approximately 1/16" by grinding.

### MATERIAL NOTES:

Pipe for pipe rail must conform to ASTM A53 Gr B, or A500 Gr B. Posts and Plates must be ASTM A36.

All steel components to be galvanized unless otherwise shown in plans.

Anchor bolts must be ⅝" Dia ASTM A307 Grade A bolts (or A36 threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer at each bolt. Threaded rods may be 0.557" minimum diameter with rolled threads. Nuts must conform to A563 requirements.

### GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

This railing cannot be used on bridges with expansion joints providing more than 5" movement.

For all rails, erection drawings showing section lengths, splice locations, rail post spacing and anchor bolt setting must be submitted to the Engineer for approval.

Average weight of railing is 30 plf.

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.

ACC:

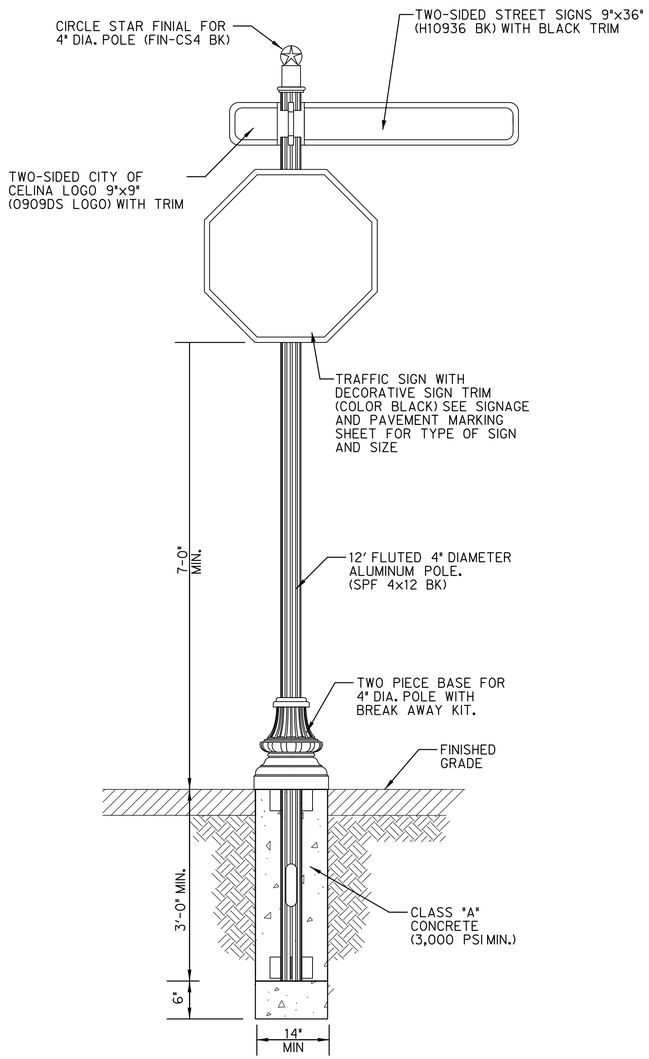
LEVELS DISPLAYED

Texas Department of Transportation
Bridge Division

# PEDESTRIAN RAIL

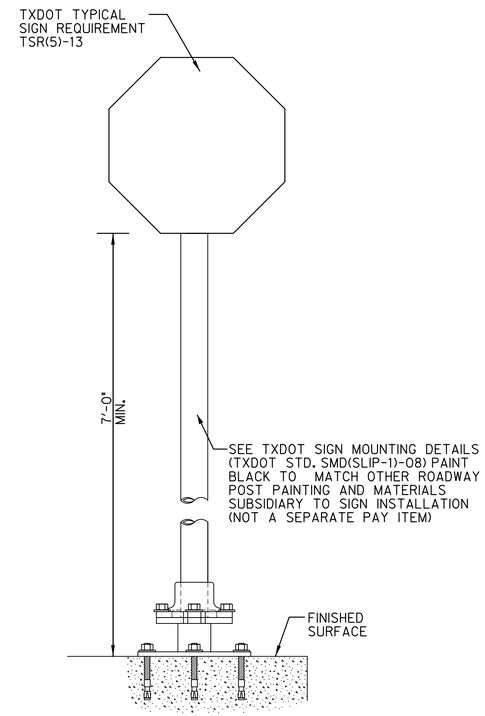
## TYPE PR1

| FILE: rlstd028.dgn | DN: TxDOT | CK: TxDOT | DW: JTR | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT April 2009 | DISTRICT | FEDERAL AID PROJECT | | SHEET |
| REVISIONS | | | | |
| | COUNTY | CONTROL | SECT | JOB | HIGHWAY |




CLAMP-ON TRAFFIC SIGN AND ROADWAY POST WITH BASE

(A)




TRAFFIC SIGN (TX DOT RIGHT-OF-WAY)

(B)

Traffic Sign Notes:

1. Signage shall conform to the "Texas Manual on Unifrom Traffic Control Devices."
2. Street signs located in City Right-of-Way shall conform to the details shown on the sheet.
3. Street signs located in TXDOT right-of-way shall conform to the TXDOT standard details shown in these plans.
4. Bottom of sign shall be a minimum of 7'-0" above finished grade.
5. For sign assembly Type 'A':
   a. Use a foundation a minimum 3'-0" below finished surface and anchored with concrete as shown.
   b. Refer to the manufacture's installation procedure for material and installation.
   c. Assembly detail and part information based on the below manufactures information, and are not meant to exclude any other manufacture. Any specifications may be replaced with an approved equal upon approval by the City of Celina.

Manufacture Information:

Brandon Industries, Inc.
1601 W. Wilmeth Road
McKinney, Texas
75069-8250
Phone: 1-800-247-1274
Contact: Travis Trotter

RECORD DRAWINGS - APRIL 2016

These Record Drawings were prepared by or under the supervision of Brian C. Haynes, P.E. 90985. These Record Drawings have been prepared based on information provided by the City of Celina, Texas. The Design Professional has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated hereinas a result.

Design Consultant: Halff Associates Inc. TBPE # F-312

62 / 75

Revision

| No. | Description | Date |
|---|---|---|
| | | |
| | | |
| | | |

# Traffic Sign Details

ASH STREET RECONSTRUCTION
OKLAHOMA ST. TO PRESTON RD.
CITY OF CELINA, TEXAS

HALFF
TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 62 |

3/31/2016 9:45:59 AM ah2879 HALFF I:\29000s\29852\CADD\Sheets\29852-TRSN-0001.dgn Sheet PDF_2D_MON_FW_MR_300.plt

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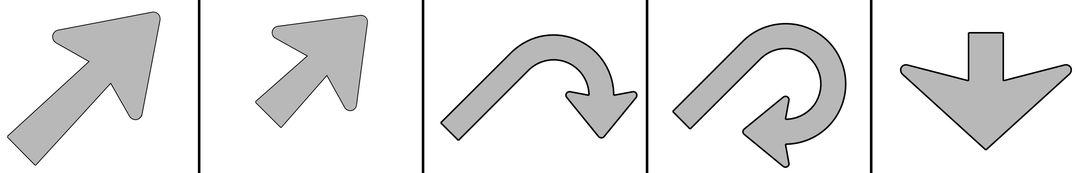
## ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



Type A | Type B | E-3 | E-4 | Down Arrow

| TYPE | LETTER SIZE | USE |
|---|---|---|
| A-1 | 10.67" U/L and 10" Caps | Single Lane Exits |
| A-2 | 13.33" U/L and 12" Caps | |
| A-3 | 16" & 20" U/L | |
| B-1 | 10.67" U/L and 10" Caps | Multiple Lane Exits |
| B-2 | 13.33" U/L and 12" Caps | |
| B-3 | 16" & 20" U/L | |

| CODE | USED ON SIGN NO. |
|---|---|
| E-3 | E5-1aT |
| E-4 | E5-1bT |

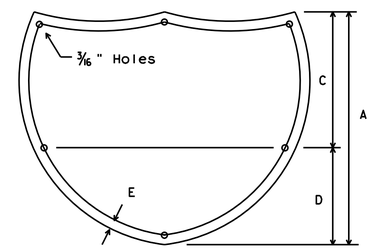
**NOTE**

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

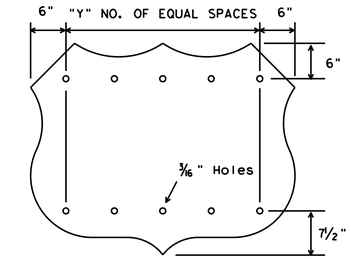
http://www.txdot.gov/

## SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)



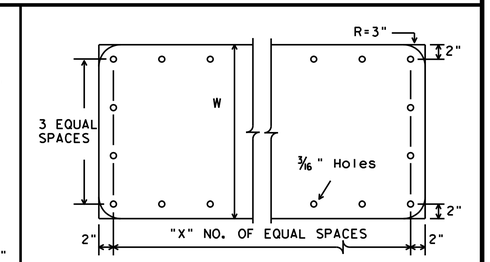

INTERSTATE ROUTE MARKERS

| A | C | D | E |
|---|---|---|---|
| 36 | 21 | 15 | 1 1/2 |
| 48 | 28 | 20 | 1 3/4 |



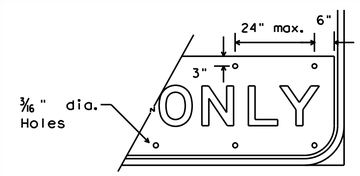

U.S. ROUTE MARKERS

| Sign Size | "Y" |
|---|---|
| 24x24 | 2 |
| 30x24 | 3 |
| 36x36 | 3 |
| 45x36 | 4 |
| 48x48 | 4 |
| 60x48 | 5 |



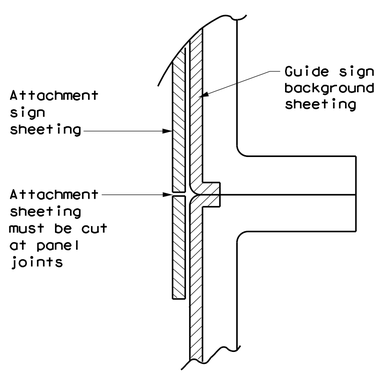

STATE ROUTE MARKERS

| No. of Digits | W | X |
|---|---|---|
| 4 | 24 | 4 |
| 4 | 36 | 5 |
| 4 | 48 | 6 |
| 3 | 24 | 3 |
| 3 | 36 | 4 |
| 3 | 48 | 5 |

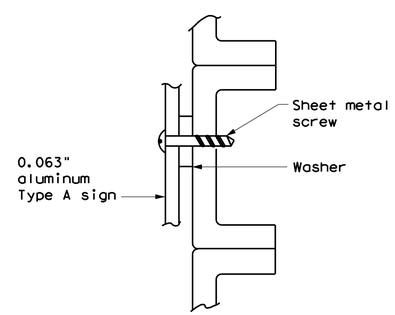



EXIT ONLY PANEL

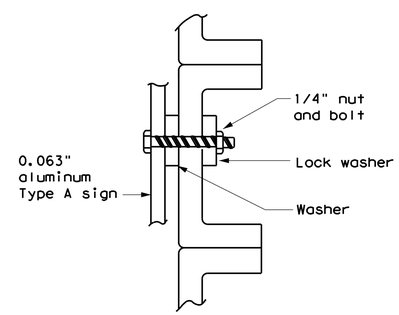
## MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)




DIRECT APPLIED ATTACHMENT




SCREW ATTACHMENT




NUT/BOLT ATTACHMENT

**NOTE:**

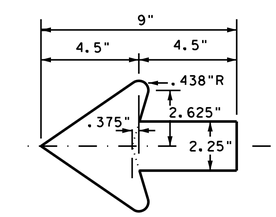
1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".

**NOTE:**

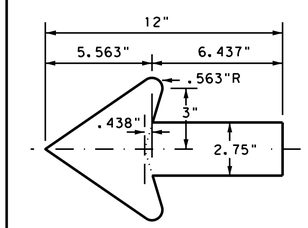
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

## ARROW DETAILS

for Destination Signs (Type D)




Standard arrow to be used with 6 inch letters.




Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

Traffic Operations Division Standard

# TYPICAL SIGN REQUIREMENTS

## TSR(5)-13

| FILE: tsr5-13.dgn | DN: TxDOT | CK: TxDOT | DW: TxDOT | CK: TxDOT |
|---|---|---|---|---|
| ©TxDOT October 2003 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS 12-03 7-13 9-08 | DIST | COUNTY | | SHEET NO. |

DATE:
FILE:

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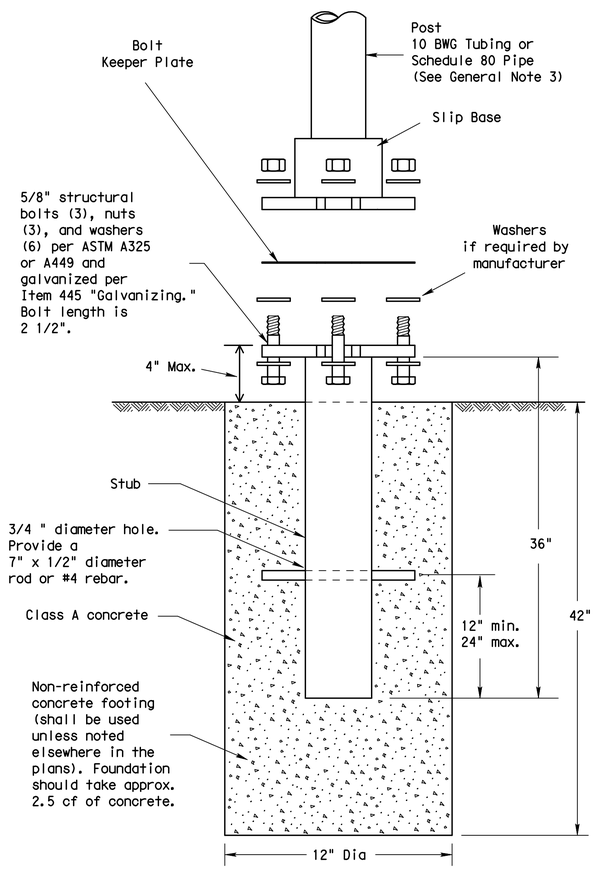
# TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS




SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is:
   http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

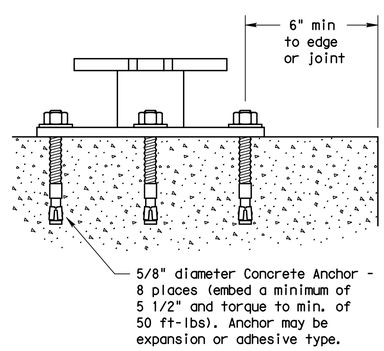
Foundation

1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support

1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

## CONCRETE ANCHOR




SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

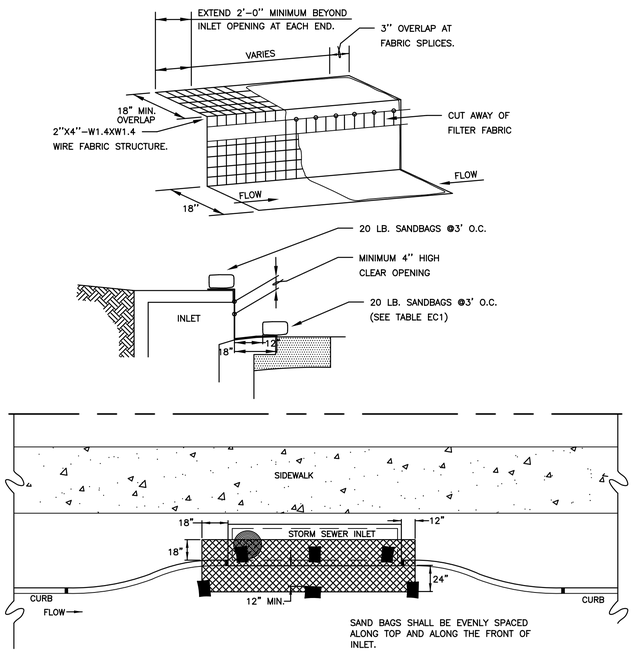
Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

| | | | | |
|---|---|---|---|---|
| © TxDOT July 2002 | DN: TXDOT | CK: TXDOT | DW: TXDOT | CK: TXDOT |
| 9-08 REVISIONS | COUNT | SECT | JOB | HIGHWAY |
| | DIST | COUNTY | | SHEET NO. |

DATE:
FILE:




## CURB INLET ON GRADE PROTECTION DETAIL

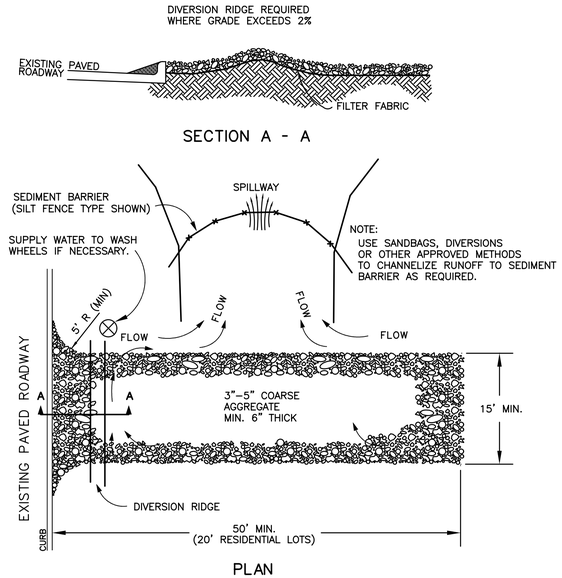
N.T.S.

NOTES:

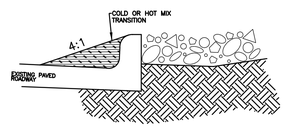
1. A SECTION OF FILTER FABRIC SHALL BE REMOVED AS SHOWN ON THIS DETAIL TO PROVIDE A 4" MINIMUM CLEAR OPENING. FABRIC MUST BE SECURED TO WIRE BACKING WITH CLIPS OR HOG RINGS AT THIS LOCATION.
2. INSPECTION SHALL BE MADE BY THE CONTRACTOR AND SILT ACCUMULATION MUST BE REMOVED WHEN DEPTH REACHES 2".
3. CONTRACTOR SHALL MONITOR THE PERFORMANCE OF INLET PROTECTION DURING EACH RAINFALL EVENT AND IMMEDIATELY REMOVE THE INLET PROTECTIONS IF THE STORM-WATER BEGINS TO OVERTOP THE CURB.
4. INLET PROTECTIONS SHALL BE REMOVED AS SOON AS THE SOURCE OF SEDIMENT IS STABILIZED.

TABLE EC1

| INLET OPENING | MINIMUM NUMBER OF SAND BAGS | |
|---|---|---|
| | TOP | FRONT |
| 5' | 2 | 3 |
| 10' | 3 | 3 |
| 15' | 3 | 4 |
| 20' | 4 | 4 |




WHEN SEDIMENT HAS SUBSTANTIALLY CLOGGED THE VOID AREA BETWEEN THE ROCKS, THE AGGREGATE MAT MUST BE WASHED DOWN OR REPLACED. PERIODIC RE-GRADING AND TOP DRESSING WITH ADDITIONAL STONE MUST BE DONE TO KEEP THE EFFICIENCY OF THE ENTRANCE FROM DIMINISHING.




TRANSITION

## TEMPORARY STONE CONSTRUCTION ENTRANCE/EXIT

N.T.S.

## ESTABLISHMENT OF GROUND COVER

1. EIGHTY PERCENT (80%) EVENLY DISTRIBUTED GROUND COVER, WITHOUT LARGE BARE AREAS, SHALL BE ESTABLISHED AFTER THE DESIGNATED AREAS HAVE BEEN COMPLETED TO THE LINES, GRADES AND CROSS SECTIONS SHOWN ON THE PLANS AND PRIOR TO FINAL ACCEPTANCE BY THE CITY ENGINEER.
2. GROUND COVER SHALL BE ESTABLISHED AS PER NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS (N.C.T.C.O.G.) "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" 202.6 SEEDING TURFGRASS. COPIES MAY BE OBTAINED FROM THE "NORTH CENTRAL COUNCIL OF GOVERNMENTS", PO DRAWER 5888, ARLINGTON, TEXAS, 76005-5888, PHONE (817) 640-3300, ALSO AVAILABLE AT WWW.PUBLICWORKS.DFWINFO.COM. A COPY OF THE CONTRACT DOCUMENTS, PLANS AND SPECIFICATIONS SHALL BE AVAILABLE ON-SITE AT ALL TIMES BY THE CONTRACTOR.
3. PRIOR TO PLANTING, CONTRACTOR SHALL PROVIDE THE CITY ENGINEER, OR HIS DESIGNEE, WITH THE STATE OF TEXAS CERTIFICATE STATING ANALYSIS OF PURITY AND GERMINATION OF SEED.
4. PLANTING SEASON AND APPLICATION RATES. ALL PLANTING SHALL BE DONE BETWEEN THE DATES SPECIFIED IN TABLE 1, FOR EACH GRASS TYPE EXCEPT WHEN SPECIFICALLY AUTHORIZED IN WRITING. THE SEEDS PLANTED PER ACRE SHALL BE OF A TYPE SPECIFIED WITH THE MIXTURE, RATE AND PLANTING DATES AS SHOWN IN THE TABLE 1, OR AS SPECIFIED BY THE ENGINEER.

Table 1. Seeding Turfgrass

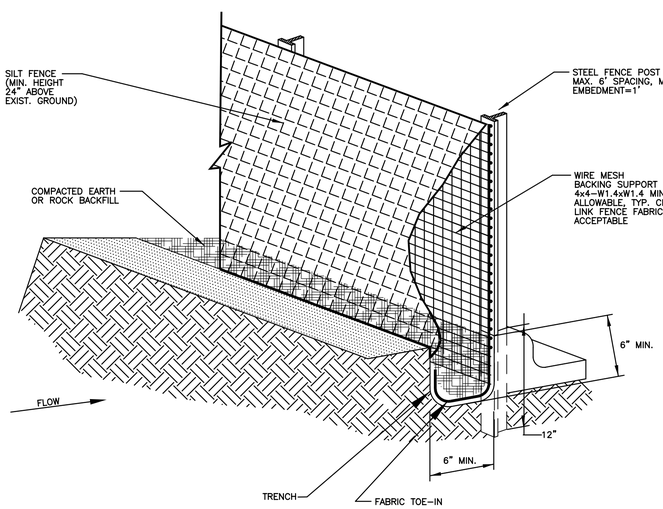
| TYPE | PLANTING SEASON | SEED AND RATE |
|---|---|---|
| TYPE I | MARCH THROUGH SEPTEMBER | BERMUDA GRASS, HULLED 50-LB (22.7-KG) PLS[1] PER ACRE |
| TYPE II | OCTOBER THROUGH FEBRUARY | RYE GRASS, 100-LB (45.4-KG) PLS PER ACRE COMBINED WITH BERMUDA GRASS, HULLED 20-LB (9.1-KG) PLS[1] PER ACRE. |
| OTHER | AS SPECIFIED ON PLANS | AS SPECIFIED ON PLANS |

[1]PLS - Pure Live Seed is determined by multiplying the gross weight times purity times the germination [For example, a 100-lb bag with 85% purity and 80% germination. (PLS=pounds in bag x Purity x germination) 100 x 0.85 x 0.8 = 60.8 -lbs of pure live seed.)

5. SEEDED AREAS SHALL BE MAINTAINED, INCLUDING WATERING AND MOWING, AT SUCH TIME AND IN A MANNER AND QUALITY TO ESTABLISH A MINIMUM 80% EVENLY DISTRIBUTED GROUND COVER, WITHOUT LARGE BARE AREAS, UNTIL COMPLETION AND FINAL ACCEPTANCE OF THE PROJECT BY THE CITY ENGINEER.
6. IN LIEU OF SILT FENCES, THE CONTRACTOR MAY USE TEMPORARY EROSION CONTROL MATTING AND/OR MULCHING PERIMETER GUARD BY ERTEC (OR EQUAL) TO STABILIZE DISTURBED SOIL AREA. EROSION CONTROL MATTING AND MULCHING SHALL BE INSTALLED IN COMPLIANCE WITH N.C.T.C.O.G. STANDARD SPECIFICATIONS 201.16 AND 201.17. PROPRIETARY PRODUCTS SHALL BE INSTALLED PER MANUFACURERS RECOMMENDATIONS. EROSION CONTROL MATS USED AGAINST PAVED AREAS SHALL HAVE A WIDTH OF NO LESS THAN 10 FEET. NO HAY PRODUCTS SHALL BE USED.
7. ALL MATERIAL INCORPORATED IN THE CONSTRUCTION SHALL BE NEW.

### GENERAL NOTES

1. INSPECTIONS SHALL BE PERFORMED EVERY 7 DAYS AND ANY REPAIR OR MAINTENANCE ON EROSION CONTROLS AND BEST MANAGEMENT PRACTICES WILL BE MADE PROMPTLY AS NEEDED.
2. NO EXCAVATION OR CURB CUT-BACKS WILL BE ALLOWED WITHIN 18 INCHES OF THE STREET OR CURB WITHOUT APPROVAL FROM THE CITY ENGINEER.
3. STREETS WILL BE KEPT FREE FROM MUD OR EARTH MATERIALS DURING THE CONSTRUCTION.
4. USE OF ALTERNATE EROSION CONTROL DEVICES MUST BE APPROVED IN ADVANCE BY CITY ENGINEER AND SHOWN CLEARLY ON THE EROSION CONTROL PLANS PRIOR TO ANY EARTH DISTURBING ACTIVITIES.
5. THE REQUIREMENTS OF NCTCOG BEST MANAGEMENT PRACTICES STANDARDS SHALL APPLY TO ALL ALTERNATE EROSION CONTROL DEVICES AS AMENDED BY THE CITY.
6. CONCRETE WASH-OUT SHALL BE MAINTAINED AND SHALL HAVE SIGNAGE AND SHOWN ON EROSION CONTROL DRAWINGS.




## ISOMETRIC PLAN VIEW

N.T.S.

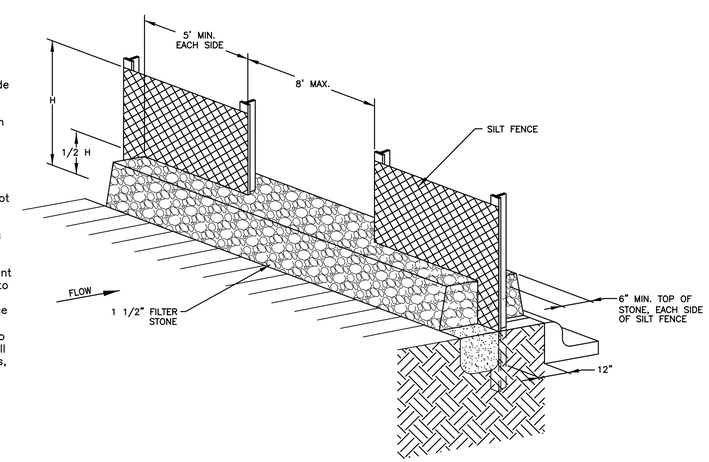
### Silt Fence General Notes

1. Steel posts which support the silt fence shall be installed on a slight angle toward the anticipated runoff source. Post must be embedded a minimum of one foot
2. The toe of the silt fence shall be trenched-in with spade or mechanical trencher, so that the down slope face of the trench is flat and perpendicular to the line of flow. Where silt fence cannot be trenched-in (e.g. pavement or rock surface), weight fabric flap with rock on uphill side to prevent flow from seeping under fence.
3. The trench must be a minimum of 6 inches deep and 6 inches wide to allow for the silt fence fabric to be laid in the ground and backfilled with compacted material.
4. Silt fence should be securely fastened to each steel support post or to woven wire which in turn is attached to the steel fence post. There shall be a 3 foot overlap, securely fastened where ends of fabric meet.
5. Accumulated silt shall be removed when it reaches a depth 1'. The silt shall be disposed of at an approved site and in such a manner as to not contribute to additional siltation.
6. Silt fence shall be removed when the site is completely stabilized.
7. Rock filter dams shall be used at concentrated high flow discharge areas in lieu of silt fence.

### Erosion Control Mat Notes

5. Erosion control mats shall be in compliance with NCTCOG Best Management Practices. Erosion control mats may be used in place of, or in addition to silt fence for sheet flow filtering applications.
6. Mats shall be installed and anchored securely to the ground in compliance with the manufacturer's recommendations.
7. The width requirement of the erosion control mats shall be comparable to the width of the disturbed surface to be filtered. The minimum width shall be 10 feet for Single Family lots and 20 feet for Commercial applications, unless otherwise approved from the Storm Water Utility Manager.
8. The width of erosion control mats can be reduced when used in conjunction with silt fence and block sod vegetative buffer strips. In no applications will erosion control mats be less than 4 feet wide.

NOTE: STONE OVERFLOW STRUCTURES OR OTHER OUTLET CONTROL DEVICES SHALL BE INSTALLED AT ALL LOW POINTS ALONG THE FENCE AT A MINIMUM OF EVERY 300 FEET.




## SILT FENCE STONE OVERFLOW STRUCTURE

RECORD DRAWINGS - APRIL 2016

These Record Drawings were prepared by or under the supervision of Brian C. Haynes, P.E. 90985. These Record Drawings have been prepared based on information provided by the City of Celina, Texas. The Design Professional has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result.

Design Consultant: Halff Associates Inc. TBPE # F-312

65 / 75

Revision

| No. | Description | Date |
|---|---|---|
| | | |
| | | |
| | | |

Erosion Control Details

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 65 |

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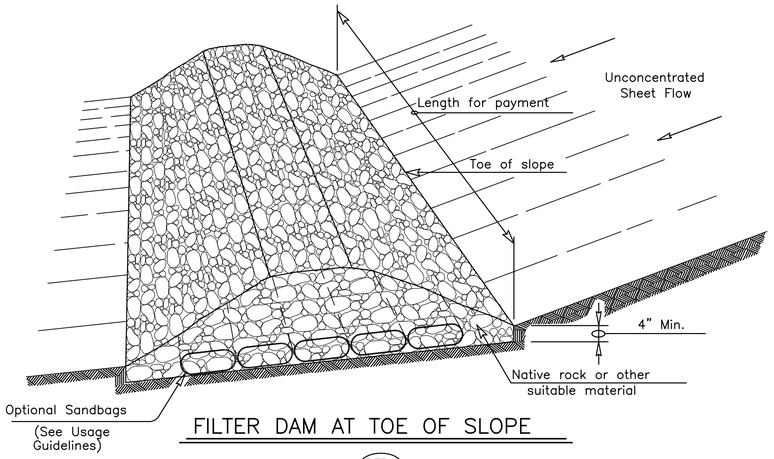
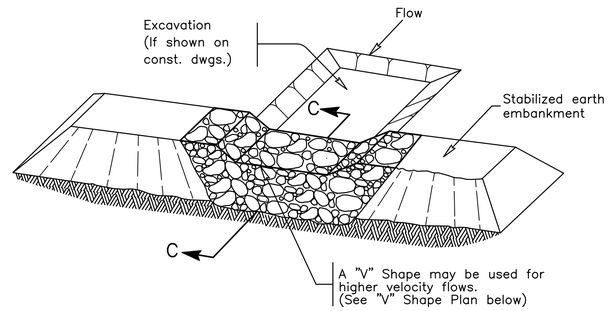



## FILTER DAM AT TOE OF SLOPE

RFD1

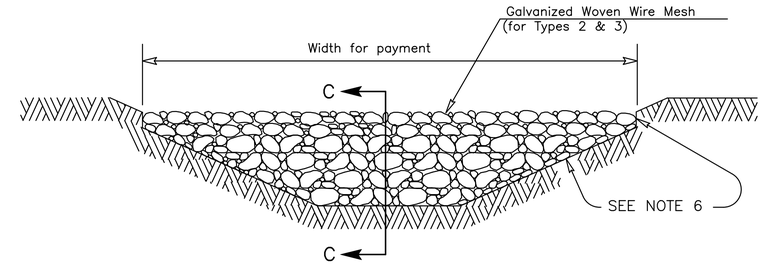
TYPE 1




## FILTER DAM AT SEDIMENT TRAP

RFD1 OR RFD2

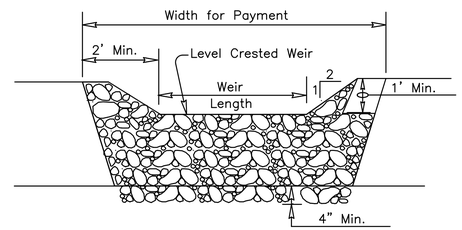
TYPE 1 OR TYPE 2



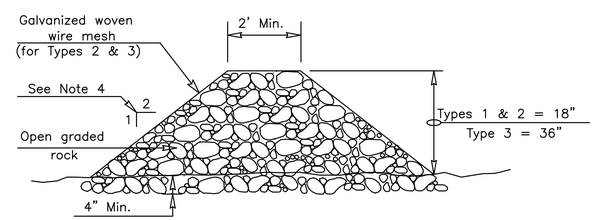

## FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

TYPE 1 OR TYPE 2



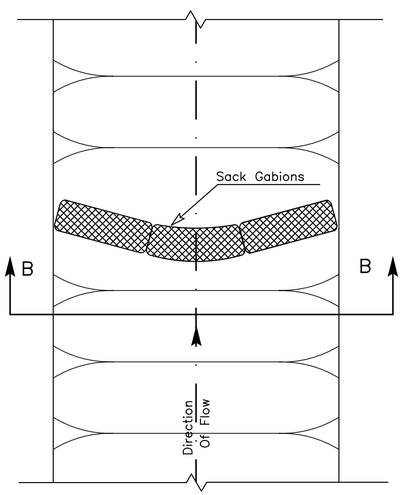

## PROFILE



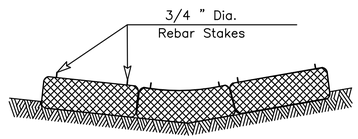

## SECTION C–C

## GENERAL NOTES

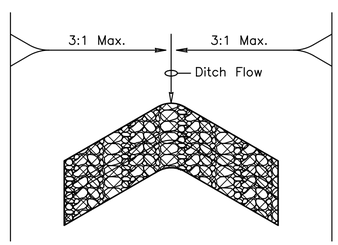
1. IF SHOWN ON THE PLANS OR DIRECTED BY THE ENGINEER, FILTER DAMS SHOULD BE PLACED NEAR THE TOE OF SLOPES WHERE EROSION IS ANTICIPATED, UPSTREAM AND/OR DOWNSTREAM AT DRAINAGE STRUCTURES, AND IN ROADWAY DITCHES AND CHANNELS TO COLLECT SEDIMENT.
2. MATERIALS (AGGREGATE, WIRE MESH, SANDBAGS, ETC.) SHALL 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 SWPPP OR EROSION CONTROL PLANS.
4. STONE SIDE SLOPES SHOULD BE 2:1 OR FLATTER. DAMS WITHIN THE SAFETY ZONE SHALL HAVE SIDE SLOPES 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. 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 3/4" DIA. REBAR STAKES.
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.
12. ALL MATERIAL INCORPORATED IN THE CONSTRUCTION SHALL BE NEW.
13. MAX TEMPORARY EARTH SLOPE IS 3:1 WITH 4:1 RECOMMENDED IF PRACTICAL




## PLAN VIEW




## SECTION B–B

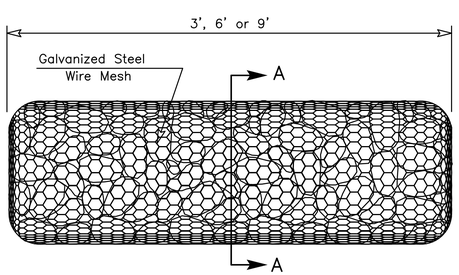



## "V" SHAPE

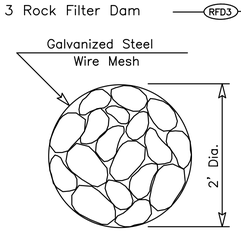
(Plan View)

### PLANS SHEET LEGEND

| | |
|---|---|
| Type 1 Rock Filter Dam | RFD1 |
| Type 2 Rock Filter Dam | RFD2 |
| Type 3 Rock Filter Dam | RFD3 |




## TYPE 4 (SACK GABIONS)




## SECTION A–A

## 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 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): 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 (approx. 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): Type 2 may be used in ditches and at dike or swale outlets.

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

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

RECORD DRAWINGS - APRIL 2016

These Record Drawings were prepared by or under the supervision of Brian C. Haynes, P.E. 90985. These Record Drawings have been prepared based on information provided by the City of Celina, Texas. The Design Professional has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated hereinas a result.

Design Consultant: Halff Associates Inc. TBPE # F-312

66 / 75

| Revision | | |
|---|---|---|
| No. | Description | Date |
| | | |
| | | |
| | | |

Erosion Control Details

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

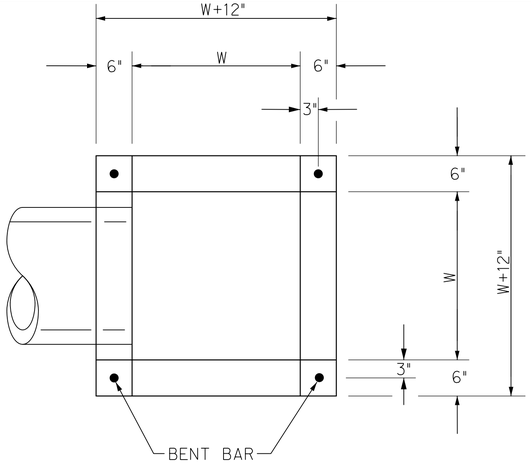
CITY OF CELINA, TEXAS

HALFF

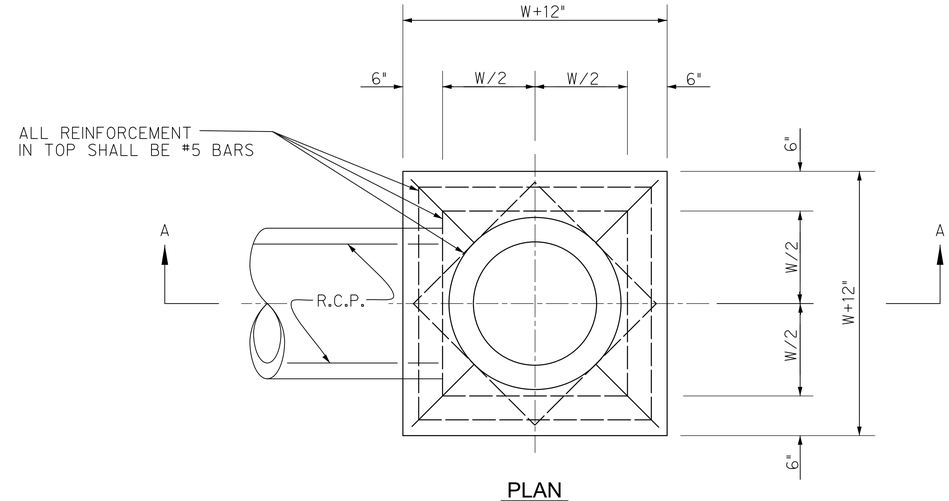
TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 66 |

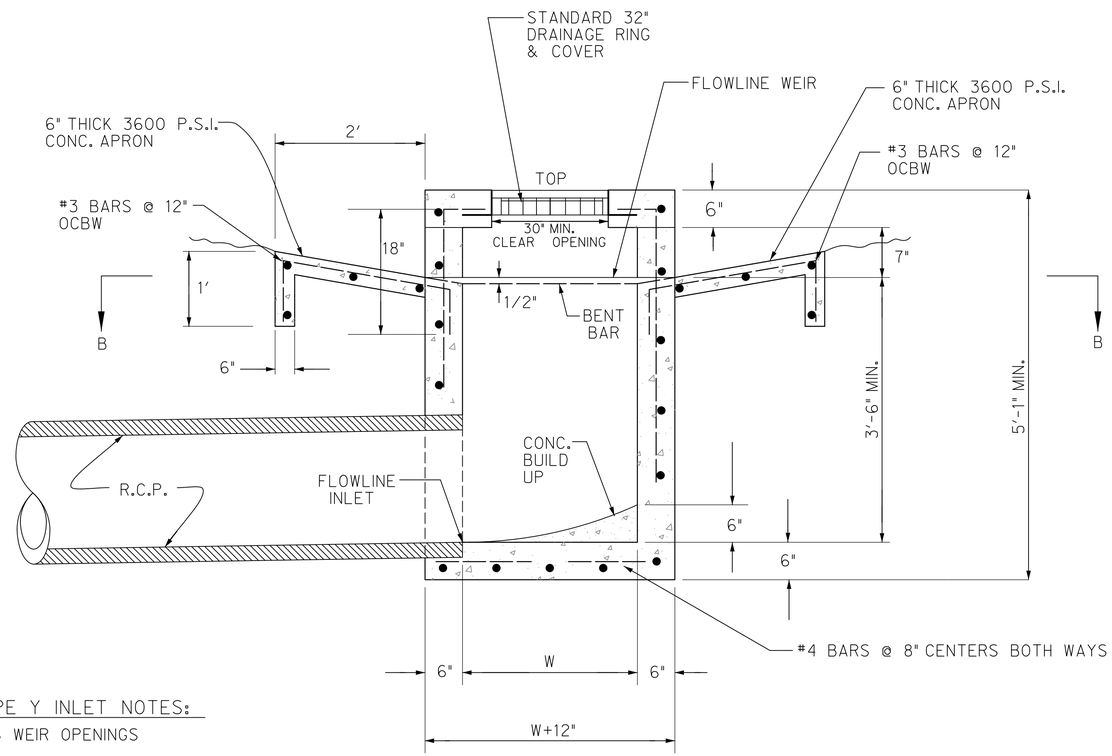
3/31/2016 9:46:00 AM ah2879 HALFF I:\29000s\29852\CADD\Sheets\29852-SWP3-0004.dgn Sheet PDF_2D_MON_FW_MR_300.plt



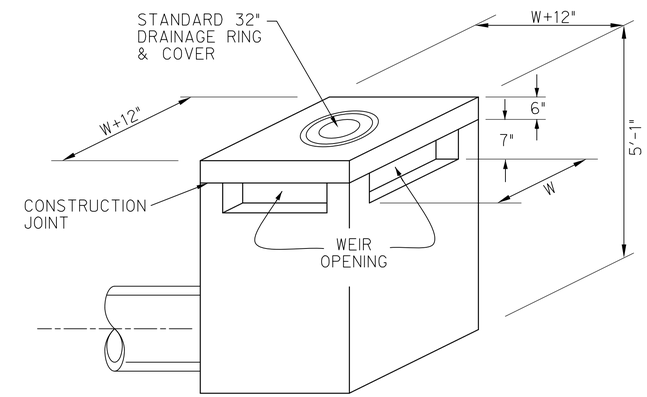

SECTION B-B




PLAN




SECTION A-A




ISOMETRIC DETAIL

TYPE Y AND SPECIAL TYPE Y INLET NOTES:

1. SPECIAL TYPE Y INLET HAS WEIR OPENINGS REQUIRED ON TWO SIDES.
2. TYPE Y INLET HAS WEIR OPENINGS REQUIRED ON FOUR SIDES.
3. THE MINIMUM OPENINGS FOR TYPE Y AND SPECIAL TYPE Y INLETS IS W=3 FEET
4. ALL REINFORCING SHALL BE WITH #4 BARS @ 12 INCH CENTERS, EXCEPT IN TOP.

# TYPE Y & SPECIAL TYPE Y INLET

N.T.S.

NOTE: MINIMUM DIMENSION FOR "W" = 36 INCHES

RECORD DRAWINGS - APRIL 2016

These Record Drawings were prepared by or under the supervision of Brian C. Haynes, P.E. 90985. These Record Drawings have been prepared based on information provided by the City of Celina, Texas. The Design Professional has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated hereinas a result.

Design Consultant: Halff Associates Inc. TBPE # F-312

67
75

Revision

| No. | Description | Date |
|---|---|---|
| | | |
| | | |
| | | |

Type Y Inlet Details

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

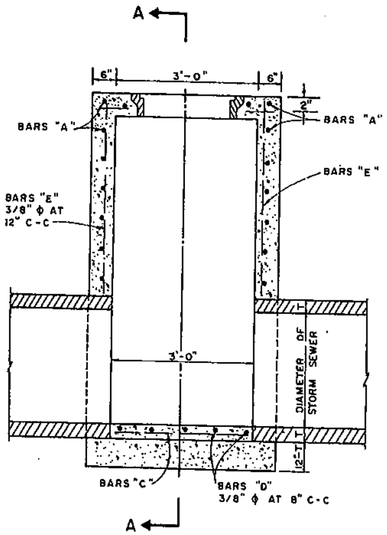
CITY OF CELINA, TEXAS

HALFF

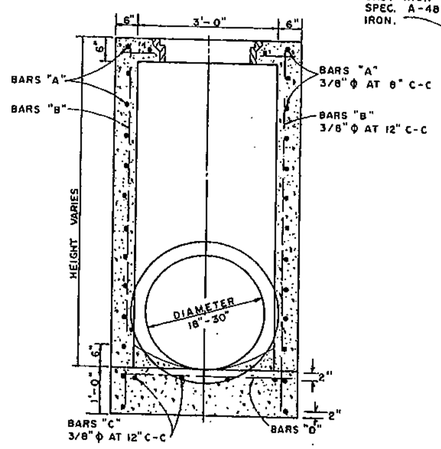
TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 67 |

3/31/2016 9:46:01 AM ah2879 HALFF I:\29000s\29852\CADD\Sheets\29852-STM-0007.dgn Sheet PDF_2D_MON_FW_MR_300.plt




ELEVATION

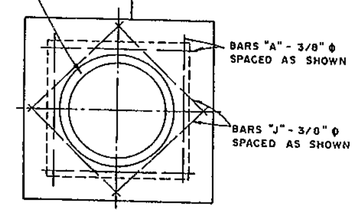



SECTION A-A

## TYPE A STORM SEWER MANHOLE

(FOR PIPE 18" TO 30" IN DIAMETER)

NOTE: FRAME AND COVER SHALL BE BASS & HAYS PATTERN NO. 400-24 OR EQUAL AND SHALL BE OF GRAY CAST IRON CONFORMING TO A.S.T.M. SPEC. A-48 FOR CLASS 30 CAST IRON.

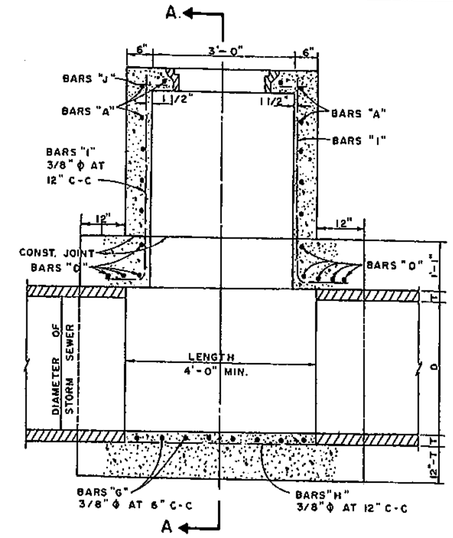



TOP PLAN

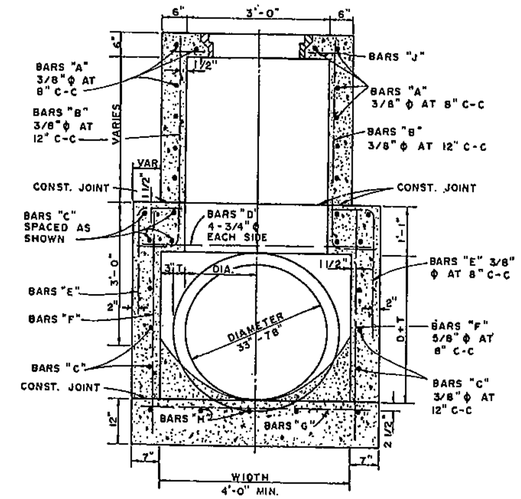
TYPE A & TYPE B

STORM SEWER MANHOLE

NOTE: MAXIMUM PIPE SIZE TO BE USED 78"




ELEVATION

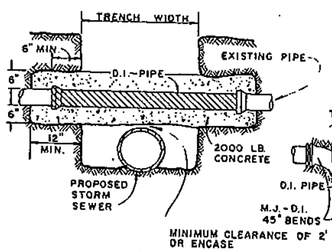



SECTION A-A

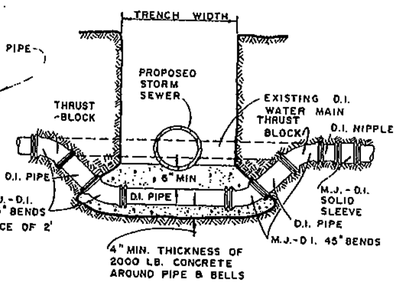
## TYPE B STORM SEWER MANHOLE

(FOR PIPE 33" TO 78" IN DIAMETER)

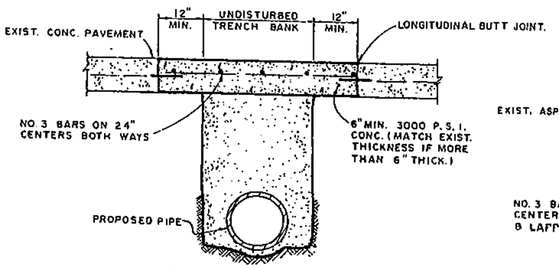
NOTE:
1) STRUCTURAL CONCRETE TO BE MIN. 4200 PSI UNLESS NOTED.




DETAIL OF UTILITY SUPPORT

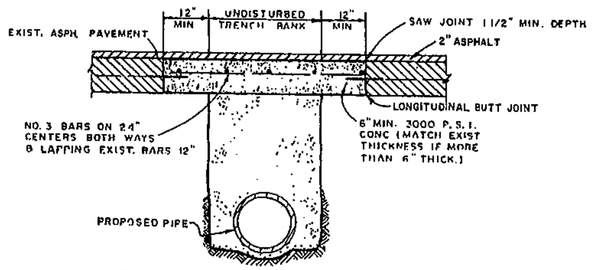



DETAIL FOR WATER MAIN LOWERING



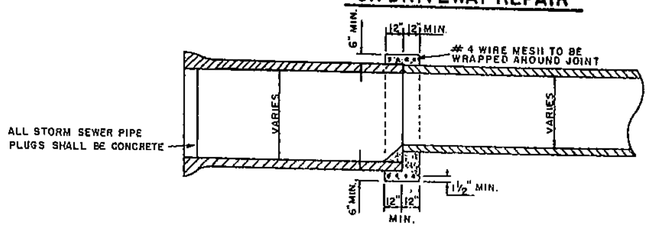

SEE EMBEDMENT FOR TYPE OF PIPE

CONCRETE STREET OR DRIVEWAY REPAIR

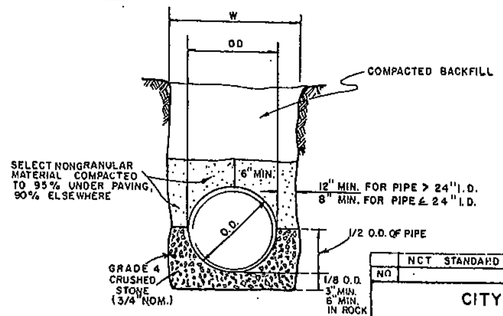



SEE EMBEDMENT FOR TYPE OF PIPE

ASPHALT STREET OR DRIVEWAY REPAIR




DETAIL OF CONCRETE COLLAR FOR PIPE CONNECTIONS




STORM SEWER PIPE BEDDING DETAIL

DEPTH OF TRENCH BELOW PIPE:
3" MIN. FOR 27" PIPE & SMALLER
4" MIN. FOR 30" TO 60" PIPE
6" MIN. FOR 66" PIPE & LARGER

STATE OF TEXAS
ALAN L. UPCHURCH
39239
REGISTERED PROFESSIONAL ENGINEER
7-22-96

| NO | REVISION | BY | DATE |
|---|---|---|---|
| | NCT STANDARD SPECIFICATIONS | S.A.S. | 10-5-87 |

CITY OF PLANO, TEXAS
PUBLIC WORKS
DEPARTMENT OF ENGINEERING

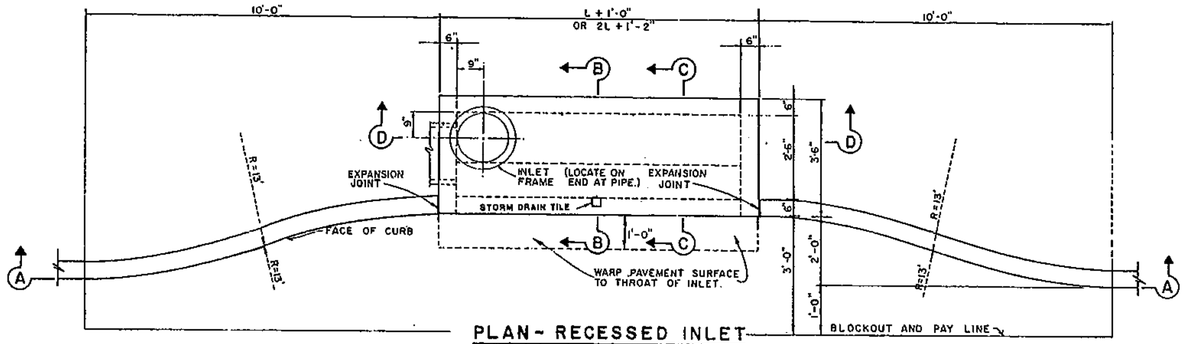
STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

MANHOLES & STORM SEWER

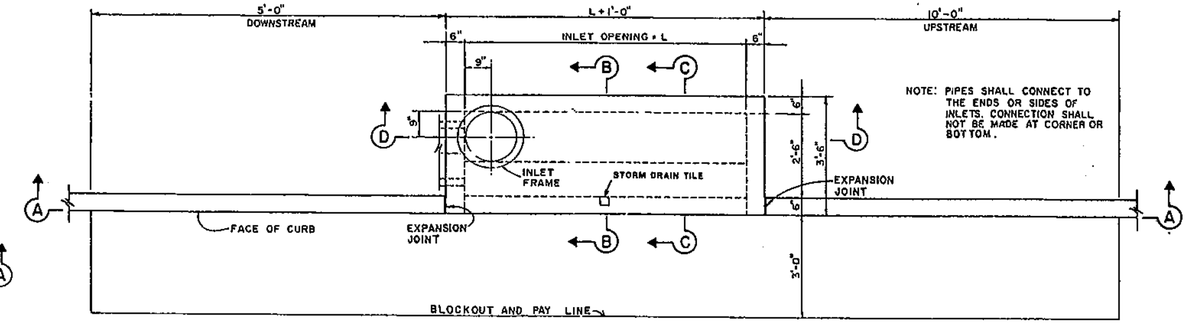
APPROVED Alan L. Upchurch
ALAN L. UPCHURCH, P.E.

DATE: JULY, 1996

SHEET SD-8

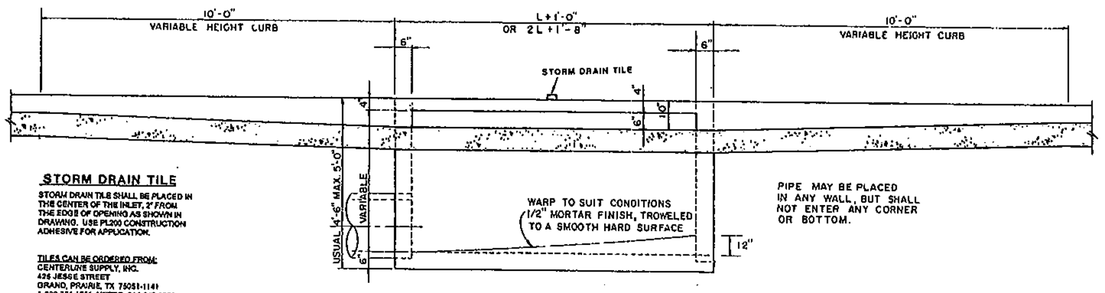



PLAN - RECESSED INLET




NOTE: PIPES SHALL CONNECT TO THE ENDS OR SIDES OF INLETS. CONNECTION SHALL NOT BE MADE AT CORNER OR BOTTOM.

PLAN - STANDARD INLET




PIPE MAY BE PLACED IN ANY WALL, BUT SHALL NOT ENTER ANY CORNER OR BOTTOM.

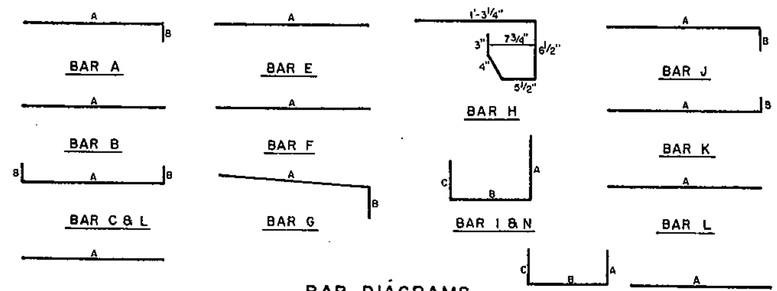
**STORM DRAIN TILE**

STORM DRAIN TILE SHALL BE PLACED IN THE CENTER OF THE INLET, 2" FROM THE EDGE OF OPENING AS SHOWN IN DRAWING. USE PL200 CONSTRUCTION ADHESIVE FOR APPLICATION.

TILES CAN BE ORDERED FROM:
CENTERLINE SUPPLY, INC.
426 JESSE STREET
GRAND PRAIRIE, TX 75051-1141
1-800-331-1751 METRO: 214-647-6300
FAX: 214-641-1221

SECTION A-A-RECESSED AND STANDARD INLETS

## 4, 6, 8 AND 10 FOOT INLETS



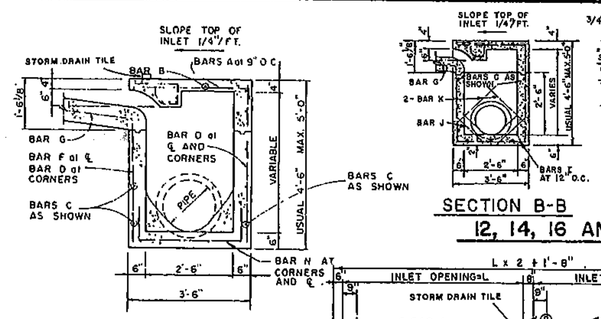

BAR DIAGRAMS

## REINFORCING STEEL SCHEDULE

DIMENSIONS SHOWN ARE FOR MAXIMUM SIZE INLETS

| INLET LENGTH | BAR TYPE | BAR DIA. (1/8 IN.) | NO. REQ'D | BAR DIMENSIONS A | B | C |
|---|---|---|---|---|---|---|
| 4 | A | 3 | 6 | 3'-2" | 0'-3" | – |
| | B | 3 | 1 | 2'-10" | – | – |
| | C | 4 | 15 | 4'-8" | 0'-6" | – |
| | D | 4 | 5 | 4'-8" | – | – |
| | F | 4 | 1 | 3'-2" | – | – |
| | G | 3 | 5 | 2'-0" | 1'-3" | – |
| | H | 3 | 3 | * | * | 4 |
| | N | 3 | 3 | 3'-2" | 3'-2" | 3'-2" |
| 6 | A | 3 | 9 | 3'-2" | 0'-3" | – |
| | B | 3 | 1 | 4'-10" | – | – |
| | C | 4 | 15 | 6'-8" | 0'-6" | – |
| | D | 4 | 5 | 4'-8" | – | – |
| | F | 4 | 1 | 3'-2" | – | – |
| | G | 3 | 5 | 2'-0" | 1'-3" | – |
| | H | 3 | 3 | * | * | 4 |
| | N | 3 | 3 | 3'-2" | 3'-2" | 3'-2" |
| 8 | A | 3 | 12 | 3'-2" | 0'-3" | – |
| | B | 3 | 1 | 6'-10" | – | – |
| | C | 4 | 15 | 8'-8" | 0'-6" | – |
| | D | 4 | 5 | 4'-8" | – | – |
| | F | 4 | 1 | 3'-2" | – | – |
| | G | 3 | 5 | 2'-0" | 1'-3" | – |
| | H | 3 | 4 | * | * | 4 |
| | N | 3 | 3 | 3'-2" | 3'-2" | 3'-2" |
| 10 | A | 3 | 10 | 3'-2" | 0'-3" | – |
| | B | 3 | 2 | 8'-10" | – | – |
| | C | 4 | 16 | 10'-8" | 0'-6" | – |
| | D | 4 | 4 | 4'-8" | – | – |
| | E | 5 | 6 | 10'-8" | – | – |
| | G | 3 | 5 | 2'-0" | 1'-3" | – |
| | H | 3 | 15 | * | * | * |
| | I | 4 | 8 | 4'-8 | 3'-2" | 3'-2" |
| | L | 4 | 5 | 4'-3" | | |

* SEE DIAGRAM FOR DIMENSIONS.
4', 6', 8' AND 10' INLETS



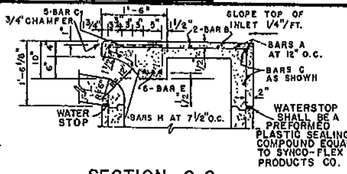

SECTION B-B

4, 6, 8 AND 10 FT. INLETS

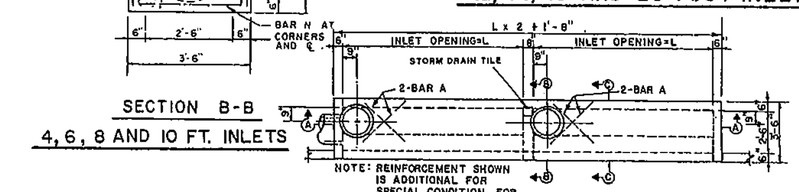



SECTION B-B

## 12, 14, 16 AND 20 FOOT INLETS



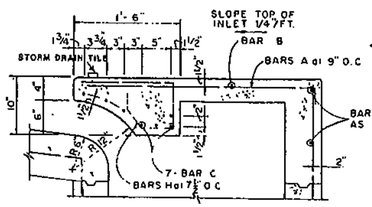

SECTION C-C




NOTE: REINFORCEMENT SHOWN IS ADDITIONAL FOR SPECIAL CONDITION, FOR REMAINDER OF REINF. SEE SECTIONS.

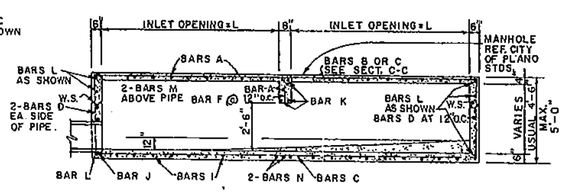
PLAN

## 12, 14, 16, AND 20 FOOT INLETS




SECTION C-C

## 4, 6, 8 AND 10 FOOT INLETS




SECTION D D

## 12, 14, 16 AND 20 FOOT INLETS

## REINFORCING STEEL SCHEDULE

### DOUBLE INLETS

DIMENSIONS SHOWN ARE FOR MAXIMUM SIZE INLETS

| INLET LENGTH L | BAR TYPE | BAR DIA. (1/8" IN.) | NO. REQ. | BAR DIMENSIONS A | B | C |
|---|---|---|---|---|---|---|
| 6 FT. | A | 3 | 15 | 3'-2" | 0'-6" | --- |
| | B | 3 | 2 | 11'-8" | --- | --- |
| | C | 4 | 15 | 15'-4" | 0'-6" | --- |
| | D | 4 | 9 | 4'-8" | --- | --- |
| | E | 5 | 6 | 13'-4" | --- | --- |
| | F | 4 | 5 | 1'-2" | --- | --- |
| | G | 3 | 12 | 2'-0" | 1'-3" | --- |
| | H | 3 | 26 | * | * | * |
| | I | 4 | 12 | 4'-8" | 3'-2" | 3'-2" |
| | J | 5 | 1 | * | * | * |
| | K | 5 | 6 | 3'-2" | 0'-6" | --- |
| | L | 4 | 11 | 3'-2" | 0'-6" | --- |
| | M | 4 | 2 | 3'-0"* | --- | --- |
| | N | 4 | 2 | 4'-8" | 3'-2" | 4'-8" |
| 7 FT. | A | 3 | 17 | 3'-2" | 0'-6" | --- |
| | B | 3 | 2 | 13'-6" | --- | --- |
| | C | 4 | 15 | 15'-4" | 0'-6" | --- |
| | D | 4 | 9 | 4'-8" | --- | --- |
| | E | 5 | 6 | 15'-4" | --- | --- |
| | F | 4 | 5 | 1'-2" | --- | --- |
| | G | 3 | 15 | 2'-0" | 1'-3" | --- |
| | H | 3 | 32 | * | * | * |
| | I | 4 | 14 | 4'-8" | 3'-2" | 3'-2" |
| | J | 5 | 1 | * | * | * |
| | K | 5 | 6 | 3'-2" | 0'-6" | --- |
| | L | 4 | 11 | 3'-2" | 0'-6" | --- |
| | M | 4 | 2 | 3'-0"* | --- | --- |
| | N | 4 | 2 | 4'-8" | 3'-2" | 4'-8" |
| 8 FT. | A | 3 | 19 | 3'-2" | 0'-6" | --- |
| | B | 3 | 2 | 15'-6" | --- | --- |
| | C | 4 | 16 | 17'-4" | 0'-6" | --- |
| | D | 4 | 9 | 4'-8" | --- | --- |
| | E | 5 | 6 | 17'-4" | --- | --- |
| | F | 4 | 5 | 1'-2" | --- | --- |
| | G | 3 | 12 | 2'-0" | 1'-3" | --- |
| | H | 3 | 26 | * | * | * |
| | I | 4 | 16 | 4'-8" | 3'-2" | 3'-2" |
| | J | 5 | 1 | * | * | * |
| | K | 5 | 6 | 3'-2" | 0'-6" | --- |
| | L | 4 | 11 | 3'-2" | 0'-6" | --- |
| | M | 4 | 2 | 3'-0"* | --- | --- |
| | N | 4 | 2 | 4'-8" | 3'-2" | 4'-8" |
| 10 FT. | A | 3 | 23 | 3'-2" | 0'-6" | --- |
| | B | 3 | 2 | 19'-6" | --- | --- |
| | C | 4 | 16 | 21'-4" | 0'-6" | --- |
| | D | 4 | 9 | 4'-8" | --- | --- |
| | E | 5 | 6 | 21'-4" | --- | --- |
| | F | 4 | 5 | 1'-2" | --- | --- |
| | G | 3 | 15 | 2'-0" | 1'-3" | --- |
| | H | 3 | 32 | * | * | * |
| | I | 4 | 20 | 4'-8" | 3'-2" | 3'-2" |
| | J | 5 | 1 | * | * | * |
| | K | 5 | 6 | 3'-2" | 0'-6" | --- |
| | L | 4 | 11 | 3'-2" | 0'-6" | --- |
| | M | 4 | 2 | 3'-0" | --- | --- |
| | N | 4 | 2 | 4'-8" | 3'-2" | 4'-8" |

* SEE DIAGRAM FOR DIMENSIONS
** FIELD CUT AS REQD. TO ACCOMMODATE DRAIN PIPE.
12', 14', 16' AND 20' INLETS

## NOTES FOR PRECAST INLET

(1) THE FLOOR OF THE EXCAVATION MUST PROVIDE A FIRM, LEVEL BED FOR THE BASE SECTION TO REST UPON.

(2) A MINIMUM OF 6 INCHES OF 1" DIAMETER (MAXIMUM) ROCK OR GRAVEL SHALL BE USED TO PREPARE THE BEDDING TO FINAL GRADE OR IN LIEU OF THIS, AT LEAST 6 INCHES OF 2-SACK CEMENT STABILIZED SAND SHALL BE USED TO PREPARE THE BEDDING TO GRADE. CEMENT STABILIZED-SAND SHALL BE ALLOWED TO SET BY KEEPING HOLE PUMPED DRY.

(3) AFTER CASTING HAS BEEN INSTALLED ON THE PROPER BEDDING, THE BACKFILL MATERIAL, WHICH IS FREE FLOWING AND CLEAR OF ROCKS, IN EXCESS OF 4" DIAMETER AND OTHER LUMPS WHICH WOULD PROHIBIT PROPER COMPACTION, SHALL BE COMMENCED IN LIFTS OF NO MORE THAN 18". THE MATERIAL USED FOR BACKFILL SHOULD BE OF A TYPE SUITABLE TO OBTAIN THE DENSITY REQUIREMENTS FOR THE SPECIFIC JOB.

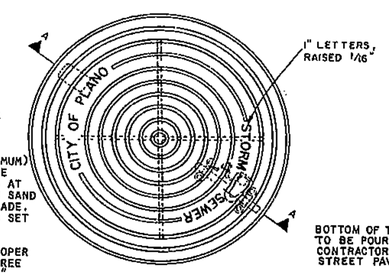
(4) PRECAST INLETS MUST BE APPROVED BY CITY ENGINEER.

(5) CONCRETE TO BE MIN. 4200 PSI.

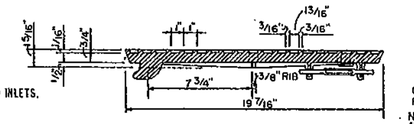
(6) LOCKING DEVICE IS REQUIRED ON ALL STORM SEWER LIDS.

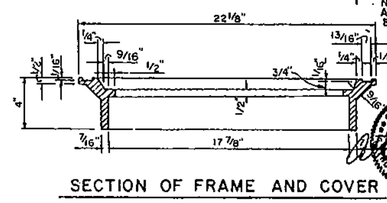
(7) "NO DUMPING" WARNING PLAQUE TO BE INSTALLED ON ALL STANDARD AND RECESSED INLETS.

NOTE:
CAST-IN-PLACE INLETS TO BE MIN. 4200 PSI CONCRETE




PLAN OF FRAME

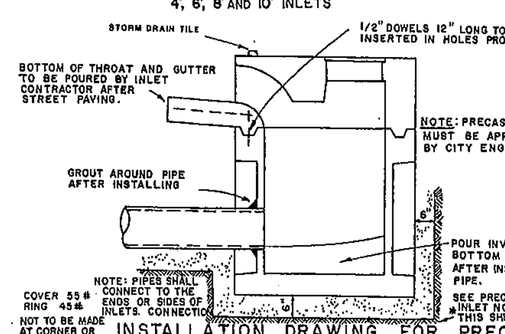



SECTION OF FRAME AND COVER

INLET FRAME AND COVER

## REINFORCING STEEL SCHEDULE




INSTALLATION DRAWING FOR PRECAST 5' & 10' CURB INLETS

| NO. | REVISION | BY | DATE |
|---|---|---|---|
| | NCT STANDARD SPECIFICATIONS | S.A.S. | 10-5-87 |

CITY OF PLANO, TEXAS
PUBLIC WORKS
DEPARTMENT OF ENGINEERING

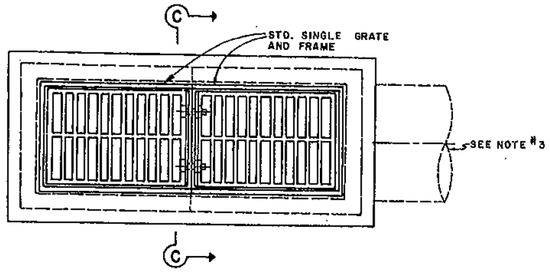
STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

CURB INLETS

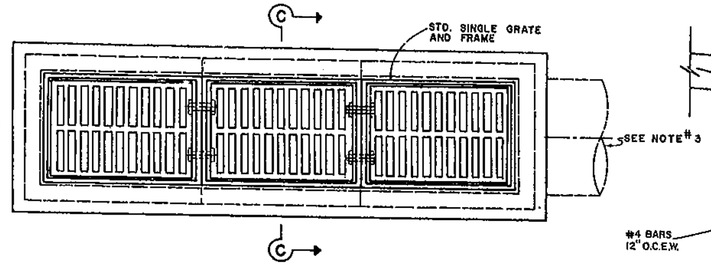
APPROVED Alan L. Upchurch
ALAN L. UPCHURCH, P.E.

DATE: JULY, 1996 | SHEET SD-9

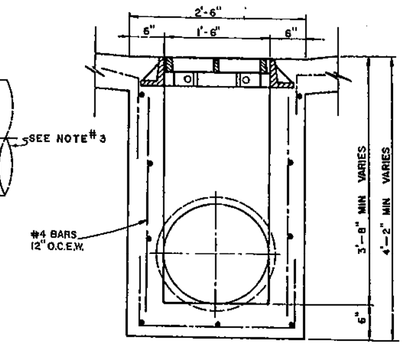
STATE OF TEXAS — ALAN L. UPCHURCH — 39139 — REGISTERED PROFESSIONAL ENGINEER
7-22-96



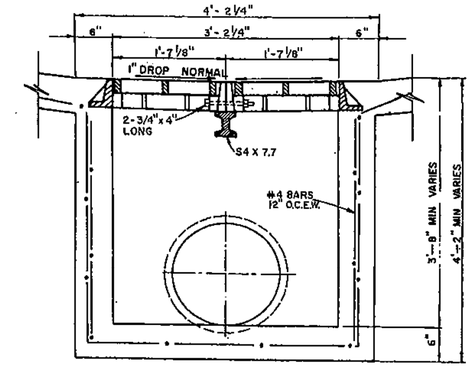

TWO GRATE INLET




THREE GRATE INLET



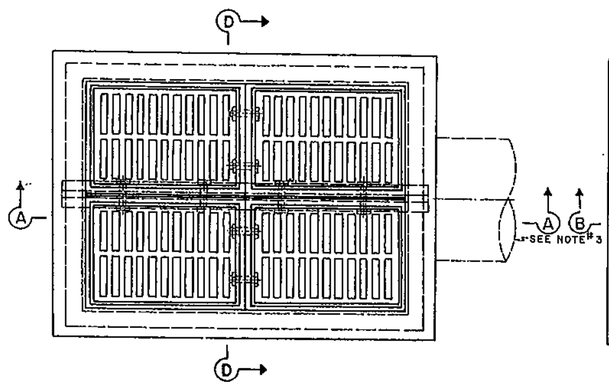

SECTION C-C



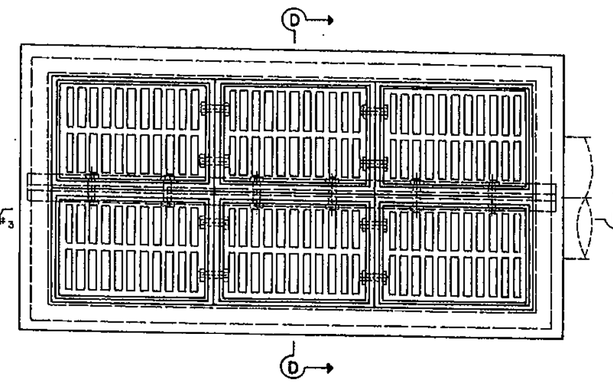

SECTION D-D

## NOTES

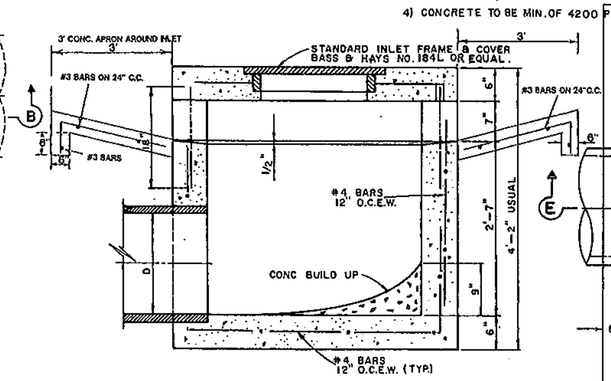
1. ALL LAPS AND EXTENSIONS OF REINFORCING BARS SHALL BE 30 BAR DIAMETERS UNLESS NOTED OTHERWISE.
2. TACK WELD GRATES IN PLACE OR USE GRATE LOCK.
3. PIPE MAY BE PLACED IN ANY WALL, BUT SHALL NOT ENTER ANY CORNER, OR BOTTOM.
4. CONCRETE TO BE MIN. OF 4200 PSI.



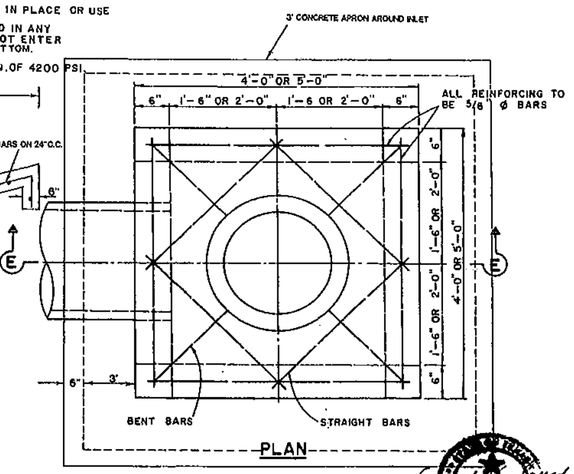

FOUR GRATE INLET



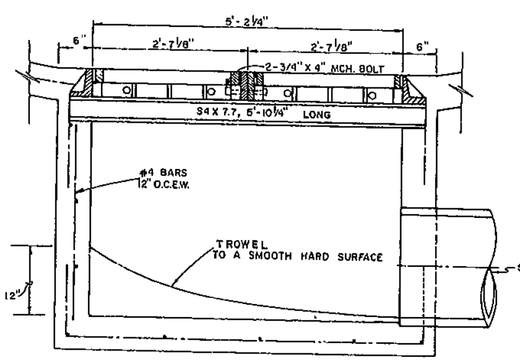

SIX GRATE INLET




SECTION E-E

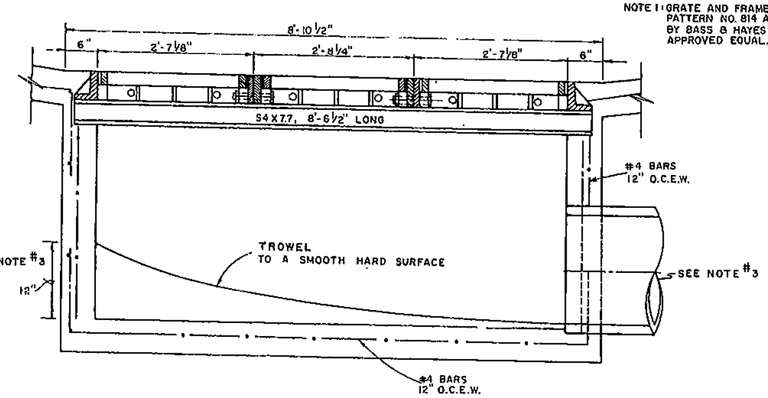



PLAN



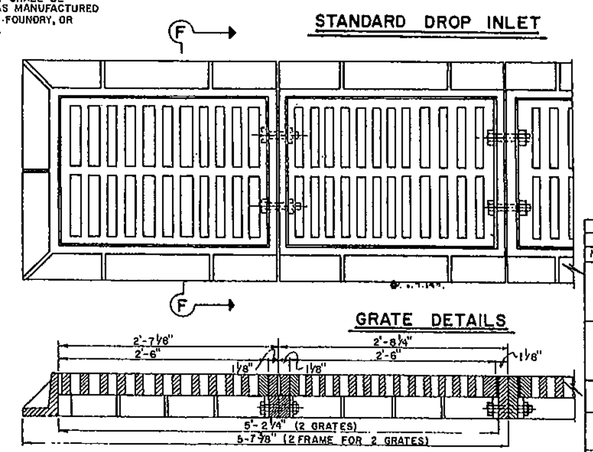

SECTION A-A

NOTE 1: GRATE AND FRAME SHALL BE PATTERN NO. 814 AS MANUFACTURED BY BASS & HAYES FOUNDRY, OR APPROVED EQUAL.

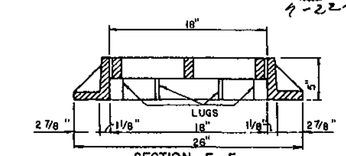



SECTION B-B

STANDARD DROP INLET




GRATE DETAILS




SECTION F-F

| NO. | REVISION | BY | DATE |
|---|---|---|---|
| | NCT STANDARD SPECIFICATIONS | S.A.S. | 10-9-87 |

CITY OF PLANO, TEXAS
PUBLIC WORKS
DEPARTMENT OF ENGINEERING

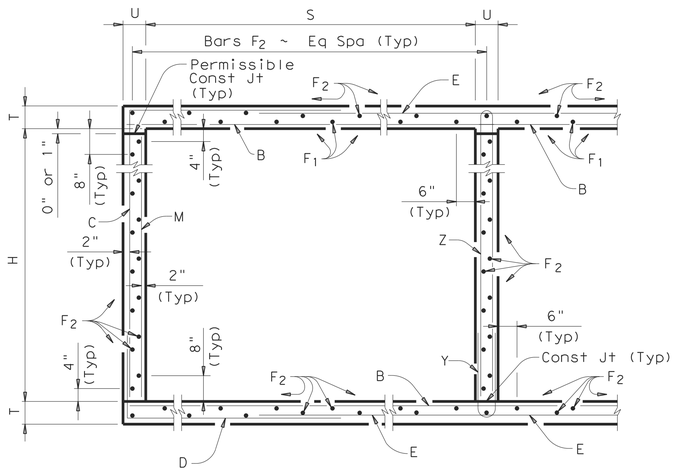
STANDARD CONSTRUCTION DETAILS
STORM DRAINAGE

# GRATE INLET - DROP INLET

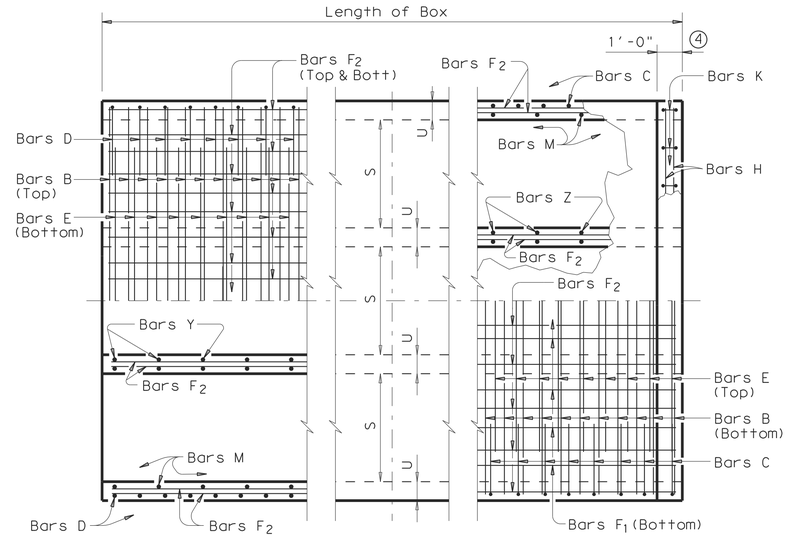
APPROVED Alan L. Upchurch
ALAN L. UPCHURCH, P.E.

DATE: JULY, 1996

SHEET SD-11




## TYPICAL SECTION




BOTTOM SLAB

TOP SLAB

## PART PLANS

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 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.

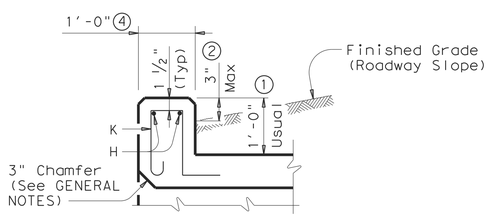
2. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, curbs shall project no more than 3" above finished grade.
   - For structures with bridge rail, curbs shall be flush with finished grade.
   Curb heights shall be reduced, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

3. 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.

4. 1'-0" typical. 2'-0" when RAC standard is referred to elsewhere in the plans.

Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown at the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes.

Example Conversion: Replacement of No. 6 Gr 60 at 6" Spacing with WWR.
WWR required = (0.44 sq in/ 0.5') x (60 ksi/70 ksi) = 0.754 sq in/ft.
If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = (0.306 sq in/ 0.754 sq in/ft) x 12 in/ft = 4.87" Max spacing.
Required lap length for the provided D30.6 wire is 2'-2" (Lap required for uncoated No. 5 bars, as shown in Item 440).

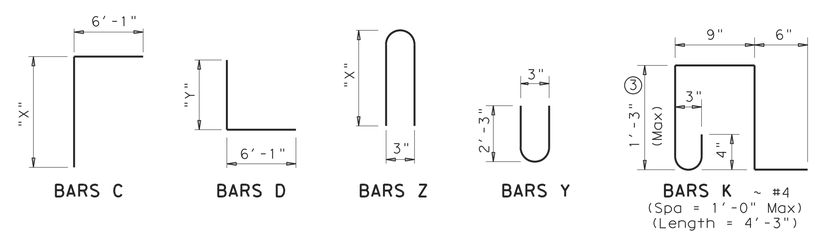



## SECTION THRU CURB

| H | Bar Dimensions | |
|---|---|---|
| | "X" | "Y" |
| 4'-0" | 4'-6" | 2'-3" |
| 5'-0" | 5'-6" | 2'-3" |
| 6'-0" | 6'-6" | 2'-3" |
| 7'-0" | 7'-6" | 2'-3" |
| 8'-0" | 8'-6" | 2'-8" |

**GENERAL NOTES:**

Designed according to AASHTO LRFD Specifications.
Designed to the maximum fill height shown.
All reinforcing steel shall be Grade 60.
All concrete shall be Class "C" with these exceptions: use Class "S" for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.
Class "C" concrete shall have a minimum compressive strength of 3,600 psi. Class "S" concrete shall have a minimum compressive strength of 4,000 psi.
The use of permanent forms is not allowed.
The bottom edge of the top slab shall be chamfered 3" at the entrance.
Reinforcing bars shall be adjusted to provide a minimum of 1 1/4" clear cover.
Construction joints shown at the flow line may be raised a maximum of 6" at the Contractor's option. If this option is used, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.
See standard MC-MD for skewed ends, angle sections and lengthening details.




HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation
Bridge Division

# MULTIPLE BOX CULVERTS CAST-IN-PLACE
## 8'-0" SPAN
## 0' TO 13' FILL

## MC-8-13

| FILE: mc813ste.dgn | DN: GAF | CK: LMW | DW: BWH/TxDOT | CK: GAF |
|---|---|---|---|---|
| © TxDOT February 2010 | DISTRICT | FEDERAL AID PROJECT | | SHEET |
| REVISIONS | | | | |
| 10-12: Added WWR | COUNTY | CONTROL | SECT | JOB | HIGHWAY |

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.

ACC:
LEVELS DISPLAYED
1

# BILLS OF REINFORCING STEEL (For Box Length = 40 feet)

| NUMBER OF SPANS | SECTION DIMENSIONS | | | | Bars B | | | | | Bars C & D | | | | | | | Bars E | | | | | Bars $F_1$ ~#4 | | | | Bars $F_2$ ~#4 at 1'-6" Max | | | Bars M~#4 at 1'-6" Max | | | Bars Y & Z~#4 at 10" Max | | | | | Bars H 4~#4 | | Bars K | | QUANTITIES: Per foot of Barrel | | Curb | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Bar C | | Bar D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | S | H | T | U | No. | Size | Spa | Length | Wt | No. | Size | Spa | Length | Wt | Length | Wt | No. | Size | Spa | Length | Wt | No. | Spa | Length | Wt | No. | Length | Wt | No. | Length | Wt | No. | Bar Y Length | Bar Y Wt | Bar Z Length | Bar Z Wt | Length | Weight | No. | Weight | Conc (CY) | Reinf (Lb) | Conc (CY) | Reinf (Lb) | Conc (CY) | Reinf (Lb) |
| 2 | 8'-0" | 4'-0" | 8" | 7" | 162 | #5 | 6" | 17'- 6" | 2,957 | 194 | #4 | 5" | 10'- 7" | 1,372 | 8'- 4" | 1,080 | 194 | #6 | 5" | 8'-10" | 2,574 | 22 | 9" | 39'-9" | 584 | 56 | 39'-9" | 1,487 | 56 | 4'- 0" | 150 | 49 | 4'- 8" | 153 | 9'- 2" | 300 | 17'- 6" | 47 | 38 | 108 | 1.136 | 266.4 | 1.3 | 155 | 46.7 | 10,812 |
| 3 | 8'-0" | 4'-0" | 8" | 7" | 162 | #5 | 6" | 26'- 1" | 4,407 | 194 | #4 | 5" | 10'- 7" | 1,372 | 8'- 4" | 1,080 | 194 | #6 | 5" | 17'- 5" | 5,075 | 36 | 8" | 39'-9" | 956 | 80 | 39'-9" | 2,124 | 56 | 4'- 0" | 150 | 98 | 4'- 8" | 305 | 9'- 2" | 600 | 26'- 1" | 70 | 54 | 153 | 1.646 | 401.7 | 2.0 | 223 | 67.8 | 16,292 |
| 4 | 8'-0" | 4'-0" | 8" | 7" | 162 | #5 | 6" | 34'- 8" | 5,857 | 194 | #4 | 5" | 10'- 7" | 1,372 | 8'- 4" | 1,080 | 194 | #6 | 5" | 26'- 0" | 7,576 | 48 | 8" | 39'-9" | 1,275 | 104 | 39'-9" | 2,762 | 56 | 4'- 0" | 150 | 147 | 4'- 8" | 458 | 9'- 2" | 900 | 34'- 8" | 93 | 72 | 204 | 2.156 | 535.8 | 2.6 | 297 | 88.8 | 21,727 |
| 5 | 8'-0" | 4'-0" | 8" | 7" | 162 | #5 | 6" | 43'- 3" | 7,308 | 194 | #4 | 5" | 10'- 7" | 1,372 | 8'- 4" | 1,080 | 194 | #6 | 5" | 34'- 7" | 10,077 | 60 | 8" | 39'-9" | 1,593 | 128 | 39'-9" | 3,399 | 56 | 4'- 0" | 150 | 196 | 4'- 8" | 611 | 9'- 2" | 1,200 | 43'- 3" | 116 | 90 | 256 | 2.667 | 669.8 | 3.2 | 372 | 109.9 | 27,162 |
| 6 | 8'-0" | 4'-0" | 8" | 7" | 162 | #5 | 6" | 51'-10" | 8,758 | 194 | #4 | 5" | 10'- 7" | 1,372 | 8'- 4" | 1,080 | 194 | #6 | 5" | 43'- 2" | 12,578 | 72 | 8" | 39'-9" | 1,912 | 152 | 39'-9" | 4,036 | 56 | 4'- 0" | 150 | 245 | 4'- 8" | 764 | 9'- 2" | 1,500 | 51'-10" | 138 | 106 | 301 | 3.177 | 803.8 | 3.9 | 439 | 131.0 | 32,589 |
| 2 | 8'-0" | 5'-0" | 8" | 7" | 194 | #5 | 5" | 17'- 6" | 3,541 | 194 | #4 | 5" | 11'- 7" | 1,501 | 8'- 4" | 1,080 | 194 | #6 | 5" | 8'-10" | 2,574 | 22 | 9" | 39'-9" | 584 | 62 | 39'-9" | 1,646 | 56 | 5'- 0" | 187 | 49 | 4'- 8" | 153 | 11'- 2" | 366 | 17'- 6" | 47 | 38 | 108 | 1.201 | 290.8 | 1.3 | 155 | 49.3 | 11,787 |
| 3 | 8'-0" | 5'-0" | 8" | 7" | 194 | #5 | 5" | 26'- 1" | 5,278 | 194 | #4 | 5" | 11'- 7" | 1,501 | 8'- 4" | 1,080 | 194 | #6 | 5" | 17'- 5" | 5,075 | 36 | 8" | 39'-9" | 956 | 88 | 39'-9" | 2,337 | 56 | 5'- 0" | 187 | 98 | 4'- 8" | 305 | 11'- 2" | 731 | 26'- 1" | 70 | 54 | 153 | 1.733 | 436.3 | 2.0 | 223 | 71.3 | 17,673 |
| 4 | 8'-0" | 5'-0" | 8" | 7" | 194 | #5 | 5" | 34'- 8" | 7,015 | 194 | #4 | 5" | 11'- 7" | 1,501 | 8'- 4" | 1,080 | 194 | #6 | 5" | 26'- 0" | 7,576 | 48 | 8" | 39'-9" | 1,275 | 114 | 39'-9" | 3,027 | 56 | 5'- 0" | 187 | 147 | 4'- 8" | 458 | 11'- 2" | 1,097 | 34'- 8" | 93 | 72 | 204 | 2.264 | 580.4 | 2.6 | 297 | 93.2 | 23,513 |
| 5 | 8'-0" | 5'-0" | 8" | 7" | 194 | #5 | 5" | 43'- 3" | 8,751 | 194 | #4 | 5" | 11'- 7" | 1,501 | 8'- 4" | 1,080 | 194 | #6 | 5" | 34'- 7" | 10,077 | 60 | 8" | 39'-9" | 1,593 | 140 | 39'-9" | 3,717 | 56 | 5'- 0" | 187 | 196 | 4'- 8" | 611 | 11'- 2" | 1,462 | 43'- 3" | 116 | 90 | 256 | 2.796 | 724.5 | 3.2 | 372 | 115.0 | 29,351 |
| 6 | 8'-0" | 5'-0" | 8" | 7" | 194 | #5 | 5" | 51'-10" | 10,488 | 194 | #4 | 5" | 11'- 7" | 1,501 | 8'- 4" | 1,080 | 194 | #6 | 5" | 43'- 2" | 12,578 | 72 | 8" | 39'-9" | 1,912 | 166 | 39'-9" | 4,408 | 56 | 5'- 0" | 187 | 245 | 4'- 8" | 764 | 11'- 2" | 1,828 | 51'-10" | 138 | 106 | 301 | 3.328 | 868.7 | 3.9 | 439 | 137.0 | 35,185 |
| 2 | 8'-0" | 6'-0" | 8" | 7" | 194 | #5 | 5" | 17'- 6" | 3,541 | 194 | #4 | 5" | 12'- 7" | 1,631 | 8'- 4" | 1,080 | 194 | #6 | 5" | 8'-10" | 2,574 | 22 | 9" | 39'-9" | 584 | 68 | 39'-9" | 1,806 | 56 | 6'- 0" | 224 | 49 | 4'- 8" | 153 | 13'- 2" | 431 | 17'- 6" | 47 | 38 | 108 | 1.265 | 300.6 | 1.3 | 155 | 51.9 | 12,179 |
| 3 | 8'-0" | 6'-0" | 8" | 7" | 194 | #5 | 5" | 26'- 1" | 5,278 | 194 | #4 | 5" | 12'- 7" | 1,631 | 8'- 4" | 1,080 | 194 | #6 | 5" | 17'- 5" | 5,075 | 36 | 8" | 39'-9" | 956 | 96 | 39'-9" | 2,549 | 56 | 6'- 0" | 224 | 98 | 4'- 8" | 305 | 13'- 2" | 862 | 26'- 1" | 70 | 54 | 153 | 1.819 | 449.0 | 2.0 | 223 | 74.8 | 18,183 |
| 4 | 8'-0" | 6'-0" | 8" | 7" | 194 | #5 | 5" | 34'- 8" | 7,015 | 194 | #4 | 5" | 12'- 7" | 1,631 | 8'- 4" | 1,080 | 194 | #6 | 5" | 26'- 0" | 7,576 | 48 | 8" | 39'-9" | 1,275 | 124 | 39'-9" | 3,293 | 56 | 6'- 0" | 224 | 147 | 4'- 8" | 458 | 13'- 2" | 1,293 | 34'- 8" | 93 | 72 | 204 | 2.372 | 596.1 | 2.6 | 297 | 97.5 | 24,142 |
| 5 | 8'-0" | 6'-0" | 8" | 7" | 194 | #5 | 5" | 43'- 3" | 8,751 | 194 | #4 | 5" | 12'- 7" | 1,631 | 8'- 4" | 1,080 | 194 | #6 | 5" | 34'- 7" | 10,077 | 60 | 8" | 39'-9" | 1,593 | 152 | 39'-9" | 4,036 | 56 | 6'- 0" | 224 | 196 | 4'- 8" | 611 | 13'- 2" | 1,724 | 43'- 3" | 116 | 90 | 256 | 2.926 | 743.2 | 3.2 | 372 | 120.2 | 30,099 |
| 6 | 8'-0" | 6'-0" | 8" | 7" | 194 | #5 | 5" | 51'-10" | 10,488 | 194 | #4 | 5" | 12'- 7" | 1,631 | 8'- 4" | 1,080 | 194 | #6 | 5" | 43'- 2" | 12,578 | 72 | 8" | 39'-9" | 1,912 | 180 | 39'-9" | 4,780 | 56 | 6'- 0" | 224 | 245 | 4'- 8" | 764 | 13'- 2" | 2,155 | 51'-10" | 138 | 106 | 301 | 3.479 | 890.3 | 3.9 | 439 | 143.1 | 36,051 |
| 2 | 8'-0" | 7'-0" | 8" | 7" | 194 | #5 | 5" | 17'- 6" | 3,541 | 194 | #4 | 5" | 13'- 7" | 1,760 | 8'- 4" | 1,080 | 194 | #6 | 5" | 8'-10" | 2,574 | 22 | 9" | 39'-9" | 584 | 68 | 39'-9" | 1,806 | 56 | 7'- 0" | 262 | 49 | 4'- 8" | 153 | 15'- 2" | 496 | 17'- 6" | 47 | 38 | 108 | 1.330 | 306.4 | 1.3 | 155 | 54.5 | 12,411 |
| 3 | 8'-0" | 7'-0" | 8" | 7" | 194 | #5 | 5" | 26'- 1" | 5,278 | 194 | #4 | 5" | 13'- 7" | 1,760 | 8'- 4" | 1,080 | 194 | #6 | 5" | 17'- 5" | 5,075 | 36 | 8" | 39'-9" | 956 | 96 | 39'-9" | 2,549 | 56 | 7'- 0" | 262 | 98 | 4'- 8" | 305 | 15'- 2" | 993 | 26'- 1" | 70 | 54 | 153 | 1.905 | 456.5 | 2.0 | 223 | 78.2 | 18,481 |
| 4 | 8'-0" | 7'-0" | 8" | 7" | 194 | #5 | 5" | 34'- 8" | 7,015 | 194 | #4 | 5" | 13'- 7" | 1,760 | 8'- 4" | 1,080 | 194 | #6 | 5" | 26'- 0" | 7,576 | 48 | 8" | 39'-9" | 1,275 | 124 | 39'-9" | 3,293 | 56 | 7'- 0" | 262 | 147 | 4'- 8" | 458 | 15'- 2" | 1,489 | 34'- 8" | 93 | 72 | 204 | 2.480 | 605.2 | 2.6 | 297 | 101.8 | 24,505 |
| 5 | 8'-0" | 7'-0" | 8" | 7" | 194 | #5 | 5" | 43'- 3" | 8,751 | 194 | #4 | 5" | 13'- 7" | 1,760 | 8'- 4" | 1,080 | 194 | #6 | 5" | 34'- 7" | 10,077 | 60 | 8" | 39'-9" | 1,593 | 152 | 39'-9" | 4,036 | 56 | 7'- 0" | 262 | 196 | 4'- 8" | 611 | 15'- 2" | 1,986 | 43'- 3" | 116 | 90 | 256 | 3.056 | 753.9 | 3.2 | 372 | 125.4 | 30,528 |
| 6 | 8'-0" | 7'-0" | 8" | 7" | 194 | #5 | 5" | 51'-10" | 10,488 | 194 | #4 | 5" | 13'- 7" | 1,760 | 8'- 4" | 1,080 | 194 | #6 | 5" | 43'- 2" | 12,578 | 72 | 8" | 39'-9" | 1,912 | 180 | 39'-9" | 4,780 | 56 | 7'- 0" | 262 | 245 | 4'- 8" | 764 | 15'- 2" | 2,482 | 51'-10" | 138 | 106 | 301 | 3.631 | 902.7 | 3.9 | 439 | 149.1 | 36,545 |
| 2 | 8'-0" | 8'-0" | 8" | 7" | 194 | #5 | 5" | 17'- 6" | 3,541 | 162 | #5 | 6" | 14'- 7" | 2,464 | 8'- 9" | 1,478 | 194 | #6 | 5" | 8'-10" | 2,574 | 22 | 9" | 39'-9" | 584 | 74 | 39'-9" | 1,965 | 56 | 8'- 0" | 299 | 49 | 4'- 8" | 153 | 17'- 2" | 562 | 17'- 6" | 47 | 38 | 108 | 1.395 | 340.5 | 1.3 | 155 | 57.1 | 13,775 |
| 3 | 8'-0" | 8'-0" | 8" | 7" | 194 | #5 | 5" | 26'- 1" | 5,278 | 162 | #5 | 6" | 14'- 7" | 2,464 | 8'- 9" | 1,478 | 194 | #6 | 5" | 17'- 5" | 5,075 | 36 | 8" | 39'-9" | 956 | 104 | 39'-9" | 2,762 | 56 | 8'- 0" | 299 | 98 | 4'- 8" | 305 | 17'- 2" | 1,124 | 26'- 1" | 70 | 54 | 153 | 1.992 | 493.5 | 2.0 | 223 | 81.7 | 19,964 |
| 4 | 8'-0" | 8'-0" | 8" | 7" | 194 | #5 | 5" | 34'- 8" | 7,015 | 162 | #5 | 6" | 14'- 7" | 2,464 | 8'- 9" | 1,478 | 194 | #6 | 5" | 26'- 0" | 7,576 | 48 | 8" | 39'-9" | 1,275 | 134 | 39'-9" | 3,558 | 56 | 8'- 0" | 299 | 147 | 4'- 8" | 458 | 17'- 2" | 1,686 | 34'- 8" | 93 | 72 | 204 | 2.588 | 645.2 | 2.6 | 297 | 106.1 | 26,106 |
| 5 | 8'-0" | 8'-0" | 8" | 7" | 194 | #5 | 5" | 43'- 3" | 8,751 | 162 | #5 | 6" | 14'- 7" | 2,464 | 8'- 9" | 1,478 | 194 | #6 | 5" | 34'- 7" | 10,077 | 60 | 8" | 39'-9" | 1,593 | 164 | 39'-9" | 4,355 | 56 | 8'- 0" | 299 | 196 | 4'- 8" | 611 | 17'- 2" | 2,248 | 43'- 3" | 116 | 90 | 256 | 3.185 | 796.9 | 3.2 | 372 | 130.6 | 32,248 |
| 6 | 8'-0" | 8'-0" | 8" | 7" | 194 | #5 | 5" | 51'-10" | 10,488 | 162 | #5 | 6" | 14'- 7" | 2,464 | 8'- 9" | 1,478 | 194 | #6 | 5" | 43'- 2" | 12,578 | 72 | 8" | 39'-9" | 1,912 | 194 | 39'-9" | 5,151 | 56 | 8'- 0" | 299 | 245 | 4'- 8" | 764 | 17'- 2" | 2,809 | 51'-10" | 138 | 106 | 301 | 3.782 | 948.6 | 3.9 | 439 | 155.2 | 38,382 |

Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown at the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes.

Example Conversion: Replacement of No. 6 Gr 60 at 6" Spacing with WWR.
WWR required = (0.44 sq in/ 0.5') x (60 ksi/70 ksi) = 0.754 sq in/ft.
If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = (0.306 sq in/ 0.754 sq in/ft) x 12 in/ft = 4.87" Max spacing.
Required lap length for the provided D30.6 wire is 2'-2" (Lap required for uncoated No. 5 bars, as shown in Item 440).

HL93 LOADING



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LEVELS DISPLAYED

ACC:

Texas Department of Transportation
Bridge Division

# MULTIPLE BOX CULVERTS CAST-IN-PLACE
## 8'-0" SPAN
## 0' TO 13' FILL

## MC-8-13

| | | | | | |
|---|---|---|---|---|---|
| FILE: mc813ste.dgn | DN: GAF | CK: LMW | DW: BWH/TxDOT | CK: GAF | |
| © TxDOT February 2010 | DISTRICT | FEDERAL AID PROJECT | | | SHEET |
| REVISIONS | | | | | |
| 10-12: Added WWR | COUNTY | | CONTROL | SECT | JOB | HIGHWAY |

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

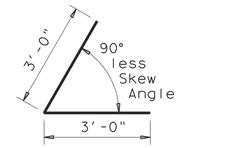
| Dimensions | | | | | Variable Reinforcing | | | | Estimated (4) Quantities per ft of wing (2~Wings) | | Estimated Quantities per ft of Toewall (1~Toewall) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Bars J1 | | Bars J2 | | | | | |
| Maximum Wingwall Height Hw | W | X | Y | Z | Size | Spa | Size | Spa | Reinf (Lb/Ft) | Conc (CY/Ft) | Reinf (Lb/Ft) | Conc (CY/Ft) |
| 2'-6" | 2'-10" | 10" | 1'- 0" | 7" | #4 | 1'-0" | #4 | 1'-0" | 48.64 | 0.406 | 6.85 | 0.071 |
| 2'-9" | 2'-10" | 10" | 1'- 0" | 7" | #4 | 1'-0" | #4 | 1'-0" | 49.31 | 0.424 | 6.85 | 0.071 |
| 3'-0" | 2'-10" | 10" | 1'- 0" | 7" | #4 | 1'-0" | #4 | 1'-0" | 49.98 | 0.444 | 6.85 | 0.071 |
| 3'-3" | 2'-10" | 10" | 1'- 0" | 7" | #4 | 1'-0" | #4 | 1'-0" | 53.32 | 0.462 | 6.85 | 0.071 |
| 3'-6" | 2'-10" | 10" | 1'- 0" | 7" | #4 | 1'-0" | #4 | 1'-0" | 53.98 | 0.480 | 6.85 | 0.071 |
| 4'-0" | 3'- 2" | 1'- 2" | 1'- 0" | 7" | #4 | 1'-0" | #4 | 1'-0" | 55.77 | 0.532 | 6.85 | 0.071 |
| 4'-6" | 3'- 2" | 1'- 2" | 1'- 0" | 7" | #4 | 1'-0" | #4 | 1'-0" | 59.77 | 0.568 | 6.85 | 0.071 |
| 5'-0" | 3'- 9" | 1'- 7" | 1'- 2" | 7" | #4 | 1'-0" | #4 | 1'-0" | 63.45 | 0.632 | 6.96 | 0.075 |
| 5'-6" | 3'- 9" | 1'- 7" | 1'- 2" | 7" | #4 | 1'-0" | #4 | 1'-0" | 67.46 | 0.668 | 6.96 | 0.075 |
| 6'-0" | 4'- 4" | 2'- 0" | 1'- 4" | 7" | #5 | 1'-0" | #5 | 1'-0" | 80.67 | 0.730 | 7.07 | 0.078 |
| 6'-6" | 4'- 4" | 2'- 0" | 1'- 4" | 7" | #5 | 1'-0" | #5 | 1'-0" | 85.05 | 0.768 | 7.07 | 0.078 |
| 7'-0" | 5'- 0" | 2'- 3" | 1'- 9" | 8" | #5 | 1'-0" | #5 | 1'-0" | 92.15 | 0.864 | 8.07 | 0.093 |
| 7'-6" | 5'- 0" | 2'- 3" | 1'- 9" | 8" | #5 | 1'-0" | #5 | 1'-0" | 96.54 | 0.902 | 8.07 | 0.093 |
| 8'-0" | 5'- 6" | 2'- 8" | 1'-10" | 8" | #5 | 6" | #5 | 6" | 139.04 | 0.962 | 8.13 | 0.095 |
| 8'-6" | 5'- 6" | 2'- 8" | 1'-10" | 8" | #5 | 6" | #5 | 6" | 144.47 | 1.000 | 8.13 | 0.095 |
| 9'-6" | 6'- 0" | 2'-10" | 2'- 2" | 9" | #5 | 6" | #5 | 6" | 156.93 | 1.136 | 8.41 | 0.110 |
| 10'-6" | 6'- 5" | 3'- 0" | 2'- 5" | 9" | #6 | 6" | #5 | 6" | 196.27 | 1.234 | 8.57 | 0.117 |
| 11'-6" | 7'- 2" | 3'- 6" | 2'- 8" | 11" | #6 | 6" | #6 | 6" | 230.13 | 1.438 | 9.52 | 0.140 |
| 12'-6" | 7'- 8" | 3'- 9" | 2'-11" | 1'- 0" | #7 | 6" | #6 | 6" | 283.41 | 1.592 | 9.74 | 0.157 |
| 13'-6" | 8'- 2" | 4'- 0" | 3'- 2" | 1'- 2" | #8 | 6" | #6 | 6" | 348.72 | 1.804 | 10.02 | 0.186 |
| 14'-6" | 8'-10" | 4'- 5" | 3'- 5" | 1'- 4" | #9 | 6" | #6 | 6" | 432.94 | 2.046 | 10.30 | 0.218 |
| 15'-6" | 9'- 6" | 4'-10" | 3'- 8" | 1'- 6" | #9 | 6" | #7 | 6" | 489.52 | 2.302 | 11.24 | 0.253 |
| 16'-0" | 9'-11" | 5'- 0" | 3'-11" | 1'- 7" | #9 | 6" | #7 | 6" | 505.72 | 2.448 | 11.47 | 0.279 |

## TABLE OF WINGWALL REINFORCING (2~Wings)

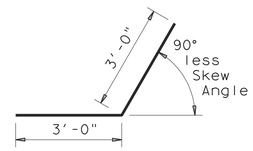
| Bar | Size | No. | Spa |
|---|---|---|---|
| D1 | #6 | ~ | 1'-0" |
| D2 | #6 | ~ | 1'-0" |
| E1 | #4 | ~ | 1'-0" |
| F | #4 | ~ | 1'-0" |
| G | #6 | ~ | 8" |
| M1 | #4 | 4 | ~ |
| P | #4 | ~ | 1'-0" |
| V | #4 | ~ | 1'-0" |
| | | | |
| | | | |

## TABLE OF TOEWALL REINFORCING

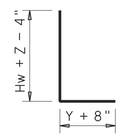
| Bar | Size | No | Spa |
|---|---|---|---|
| J3 | #4 | ~ | 1'-0" |
| M2 | #4 | 2 | ~ |
| E2 | #4 | ~ | 1'-0" |
| | | | |
| | | | |



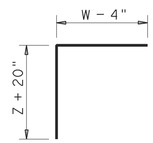

BARS D1



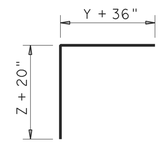

BARS D2



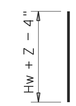

BARS J1




BARS J2




BARS J3




BARS V

## WING DIMENSION CALCULATIONS:

Formulas: (All values are in Feet)

Hw = H + T + C
Lw = (Hw) (SL) ÷ Cosine θ for Ty PW-1
= (Hw - 1') (SL) ÷ Cosine θ for Ty PW-2 and Hw ≥ 4'
= (Hw - 0.5') (SL) ÷ Cosine θ for Ty PW-2 and Hw < 4'

For Cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ Cosine θ

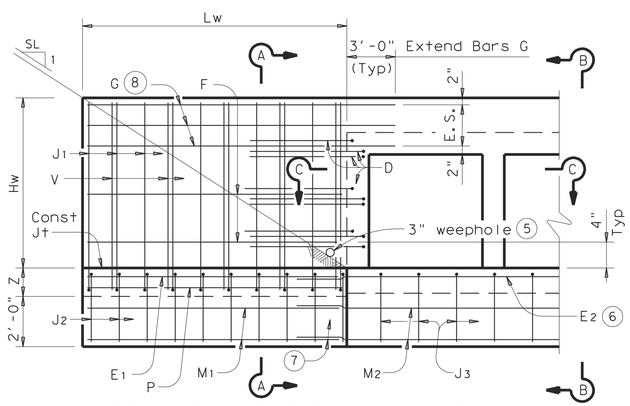
For Precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ Cosine θ
Total Wingwall Area (Two Wings ~ SF)
= (2)(Hw)(Lw) for Ty PW-1
= (2)(Hw)(Lw) - 6 SF for Ty PW-2 and Hw ≥ 4'
= (2)(Hw)(Lw) - 1.5 SF for Ty PW-2 and Hw < 4'

Hw = Height of Wingwall
Lw = Length of Wingwall
Ltw = Culvert Toewall Length
N = Number of Culvert Spans
SL:1 = Channel Slope ratio. (Horizontal: 1 Vertical, Usual value is 2:1)
θ = Culvert Skew

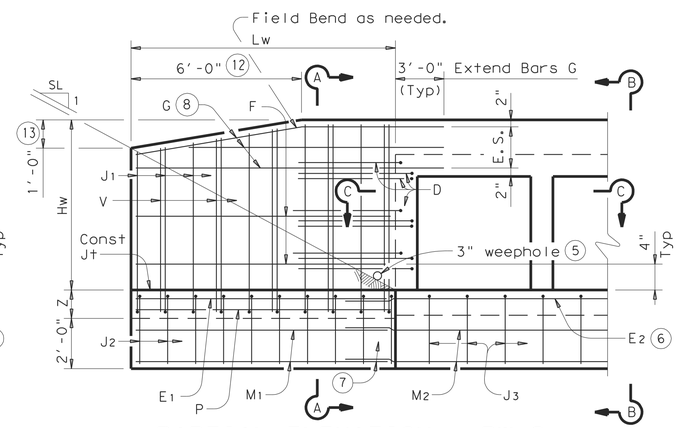
See applicable box culvert standard for S, H, T and U values.

1. Skew Angle = 0°
2. At discharge end, chamfer may be ¾".
3. For 15° Skew ~ 1"
   For 30° Skew ~ 2"
   For 45° Skew ~ 3"
4. Quantities shown are for two Type PW-1 wings. Adjust concrete volume for Type PW-2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.
5. Provide weepholes for Hw = 5'-0" and greater. Fill around weepholes with coarse gravel.
6. Extend Bars E2 1'-6" minimum into the wingwall footing.
7. Lap Bars M1 1'-6" minimum with Bars M2.
8. Bars G equally spaced at 8" maximum, place as shown. Provide at least two pair Bars G per wing.
9. 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.
10. For vehicle safety, the following requirements must be met:
    - For structures without bridge rail, curbs cannot project more than 3" above finished grade.
    - For structures with bridge rail, build curbs flush with finished grade.

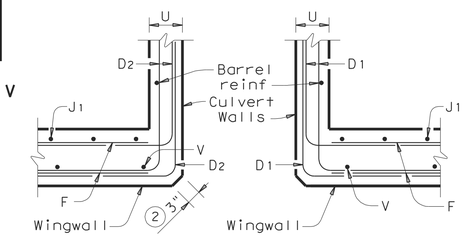
    Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
11. 1'-0" typical. 2'-0" typical when RAC standard is referenced elsewhere in the plans.
12. 3'-0" for Hw < 4'.
13. 6" for Hw < 4'.



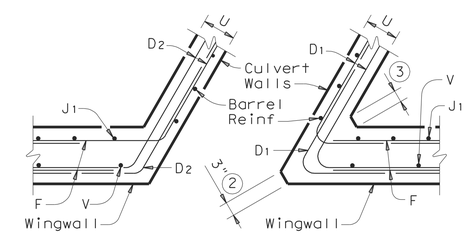

PARTIAL ELEVATION - PW-1




PARTIAL ELEVATION - PW-2




SECTION C-C

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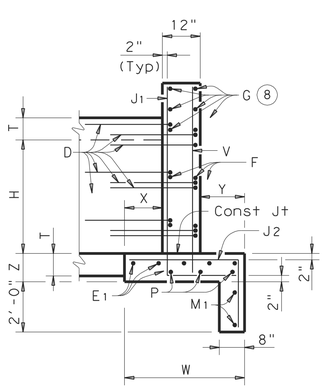
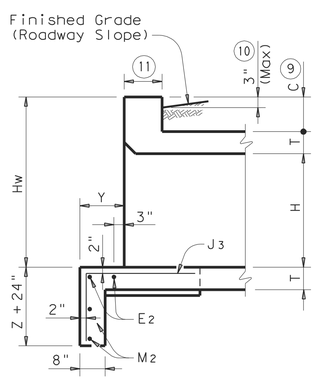
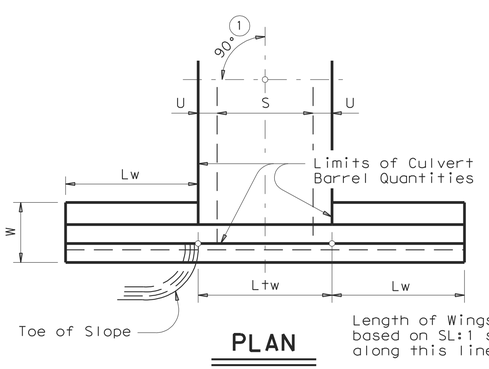



SECTION A-A
(Showing Wing Reinf)

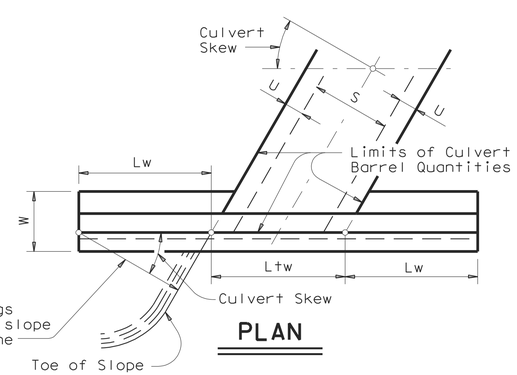



SECTION B-B
(Showing Wing Reinf)




PLAN

DETAILS FOR NON-SKEWED BOX CULVERTS




PLAN

DETAILS FOR SKEWED BOX CULVERTS
(Showing 30° Skew)

## GENERAL NOTES:

Designed in accordance with AASHTO LRFD Bridge Design Specifications.
Provide Class "C" Concrete (f'c = 3,600 psi Min) and Grade 60 reinforcing steel.
Provide 1 ¼" Min clear cover to reinforcing steel.
Depth of toewalls for wingwalls and culverts may be reduced or eliminated when founded on solid rock, when directed by the Engineer.
See BCS sheet for wingwall type and additional dimensions and information.
The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for the Contractor's information only.

## DESIGNER NOTES:

Type PW-1 can be used for all applications and must be used if railing is to be mounted to the wingwall.
Type PW-2 can only be used for applications without a railing mounted to the wingwall.


DISCLAIMER:
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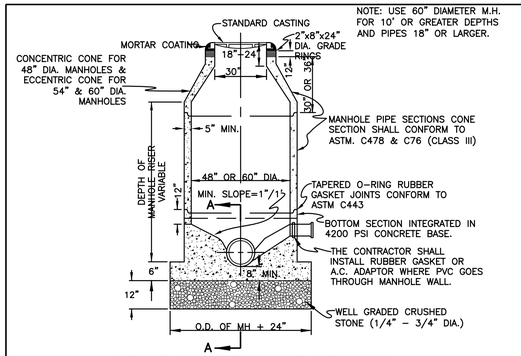
ACC:
LEVELS DISPLAYED
1

Texas Department of Transportation
Bridge Division

# CONCRETE WINGWALLS
## WITH PARALLEL WINGS FOR BOX CULVERTS
## TYPES PW-1 AND PW-2

PW

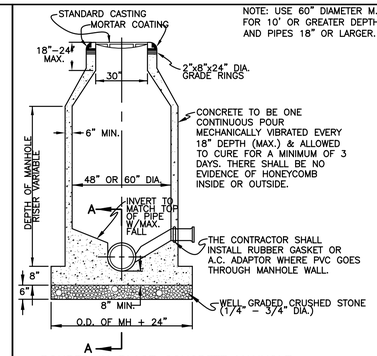
| FILE: pwstde01.dgn | DN: GAF | CK: CAT | DW: TxDOT | CK: GAF |
|---|---|---|---|---|
| © TxDOT February 2010 | DISTRICT | FEDERAL AID PROJECT | | SHEET |
| REVISIONS 11-10: Reinforcing Quantities. 01-12: PW-1 & PW-2. | COUNTY | CONTROL | SECT | JOB | HIGHWAY |




NOTE: USE 60" DIAMETER M.H. FOR 10' OR GREATER DEPTHS AND PIPES 18" OR LARGER.

**PRECAST CONCRETE MANHOLE (ASTM C478)**

N.T.S. SEE CONCRETE MANHOLE NOTES.




NOTE: USE 60" DIAMETER M.H. FOR 10' OR GREATER DEPTHS AND PIPES 18" OR LARGER.

**POURED IN PLACE CONCRETE MANHOLE**

N.T.S. SEE CONCRETE MANHOLE NOTES.

CONCRETE MANHOLE NOTES:

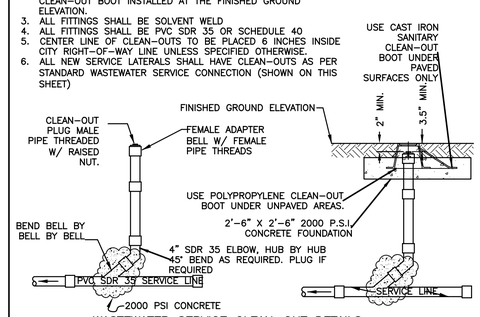
1. CONCRETE FOR ALL PRECAST AND POURED IN PLACE MANHOLES SHALL BE MIN. 6 SACK 4000 P.S.I. SULPHATE RESISTANT CONCRETE, SUCH AS : TYPE II OR TYPE V CEMENT
2. THE DIAMETER OF THE CONCRETE BASE SHALL NOT BE LESS THAN THE INSIDE DIAMETER OF THE MANHOLE PLUS 2 FT.
3. STEPS SHALL NOT BE INSTALLED IN MANHOLE.
4. ALL NEW MANHOLES SHALL BE MARKED WITH "MH" STAMPED OR CUT IN THE CURB.
5. USE DROP CONNECTIONS WHEN CONNECTING LINE EXCEEDS 24" ABOVE THE MANHOLE FLOWLINE.
6. USE OUTSIDE DROP CONNECTIONS ON ALL NEW MANHOLES.
7. USE INSIDE DROP CONNECTION ON EXISTING MANHOLES ONLY.
8. MANHOLE WALLS SHALL BE CORE DRILLED FOR SEWER CONNECTIONS.

MANHOLE ABANDONMENT

1. REMOVE FRAME, LID AND CONE.
2. CUT AND PLUG ALL ABANDONED SEWER MAINS AT MANHOLE.
3. FILL BOTTOM 12" OF MANHOLE WITH 2000 PSI CONCRETE.
4. BACKFILL AND COMPACT MANHOLE CAVITY WITH SAND AND/OR GRAVEL.
5. REPAIR SURFACE TO MATCH EXISTING AS PER CITY STANDARDS.

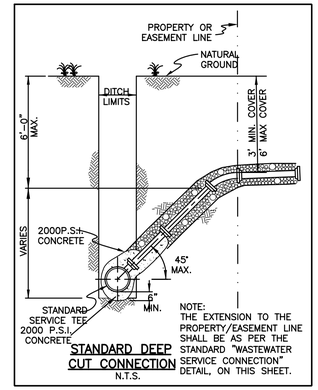
WASTEWATER SERVICE CLEAN-OUT NOTES:

1. FOR NEW DEVELOPMENT EXTEND PVC CLEAN-OUT ABOVE FINISHED GRADE WITH PLUG.
2. AT THE TIME OF SERVICE CONNECTION THE CLEAN-OUT EXTENSION SHALL BE ADJUSTED AND THE APPROPRIATE CLEAN-OUT BOOT INSTALLED AT THE FINISHED GROUND ELEVATION.
3. ALL FITTINGS SHALL BE SOLVENT WELD
4. ALL FITTINGS SHALL BE PVC SDR 35 OR SCHEDULE 40
5. CENTER LINE OF CLEAN-OUTS TO BE PLACED 6 INCHES INSIDE CITY RIGHT-OF-WAY LINE UNLESS SPECIFIED OTHERWISE.
6. ALL NEW SERVICE LATERALS SHALL HAVE CLEAN-OUTS AS PER STANDARD WASTEWATER SERVICE CONNECTION (SHOWN ON THIS SHEET)




**WASTEWATER SERVICE CLEAN-OUT DETAILS**

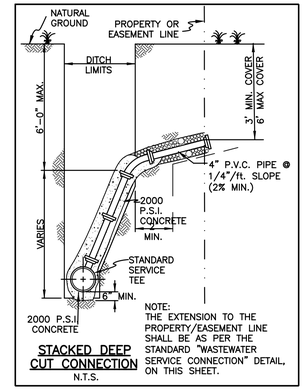
N.T.S.




NOTE: THE EXTENSION TO THE PROPERTY/EASEMENT LINE SHALL BE AS PER THE STANDARD "WASTEWATER SERVICE CONNECTION" DETAIL, ON THIS SHEET.

**STANDARD DEEP CUT CONNECTION**

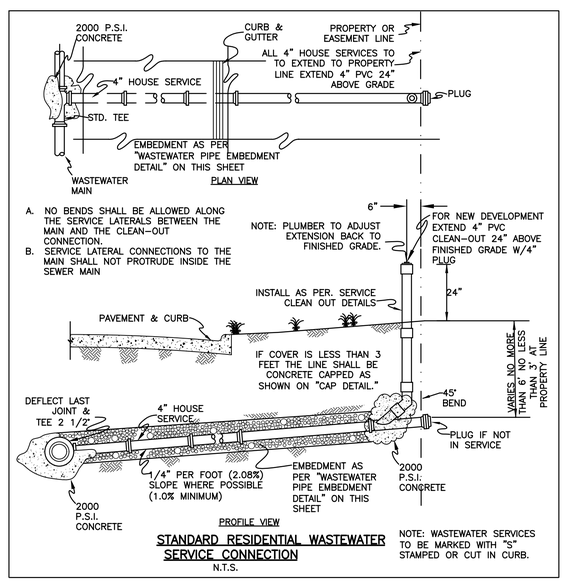
N.T.S.




NOTE: THE EXTENSION TO THE PROPERTY/EASEMENT LINE SHALL BE AS PER THE STANDARD "WASTEWATER SERVICE CONNECTION" DETAIL, ON THIS SHEET.

**STACKED DEEP CUT CONNECTION**

N.T.S.




**STANDARD RESIDENTIAL WASTEWATER SERVICE CONNECTION**

N.T.S.

NOTE: WASTEWATER SERVICES TO BE MARKED WITH "S" STAMPED OR CUT IN CURB.

RECORD DRAWINGS - APRIL 2016

These Record Drawings were prepared by or under the supervision of Brian C. Haynes, P.E. 90985. These Record Drawings have been prepared based on information provided by the City of Celina, Texas. The Design Professionalhas not verified the accuracy and/or completeness of this information and shallnot be responsible for any errors or omissions which may be incorporated hereinas a result.

Design Consultant: Halff Associates Inc. TBPE # F-312

74 / 75

Revision

| No. | Description | Date |
|---|---|---|
| | | |
| | | |
| | | |

# SANITARY SEWER DETAILS

ASH STREET RECONSTRUCTION

OKLAHOMA ST. TO PRESTON RD.

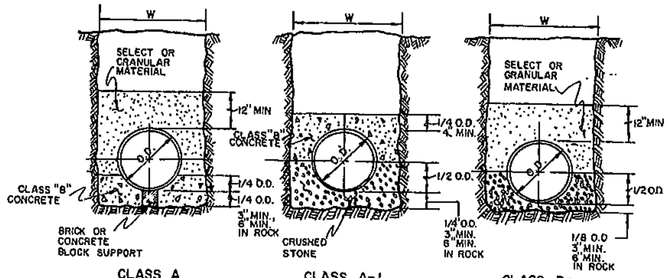
CITY OF CELINA, TEXAS

HALFF

TBPE FIRM #F-312

| DESIGN | DRAWN | DATE | SCALE | AVO | CIP NO. (CLIENT USE) | NO. |
|---|---|---|---|---|---|---|
| JFR | GAH | 3/28/2014 | AS NOTED | 29852 | P-201401-01 | 74 |

3/31/2016 9:46:02 AM ah2879 HALFF I:\29000s\29852\CADD\Sheets\29852-UTIL-0005.dgn Sheet PDF_2D_MON_FW_MR_300.plt




CLASS A EMBEDMENT — CONCRETE CRADLE

CLASS A-1 EMBEDMENT — CONCRETE CAP

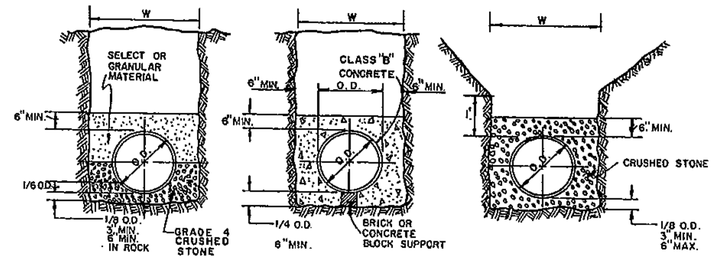
CLASS B+ EMBEDMENT

NOTE: DEPTH OF TRENCH BELOW PIPE SHALL BE:

3" (MIN.) FOR PIPE 27" AND SMALLER

4" (MIN.) FOR PIPE 30" TO 60"

6" (MIN.) FOR PIPE 66" AND LARGER




CLASS C EMBEDMENT

CLASS G EMBEDMENT — CONCRETE ENCASEMENT

CLASS H EMBEDMENT — P.V.C. PIPE ONLY

STD. P.V.C. SEWER INSTALLATION
STD. P.V.C., R.C.C.P. & DUCTILE WATER INSTALLATION.

NOTE: TYPE OF EMBEDMENT OR ENCASEMENT SHALL BE SHOWN IN THE PROFILES FOR ALL LINES. LOAD CALCULATIONS SHALL BE SUBMITTED TO THE ENGINEERING DEPARTMENT. WIDTH OF TRENCH SHALL BE 24 INCHES PLUS O.D. FOR PIPE > 24" I.D., O.D. PLUS 16" FOR PIPE ≤ 24" I.D.

## MANHOLE NOTES CONT'D. FROM SD-19:

9) The use of brick manholes is not permitted in the City of Plano.

Brick, stones, concrete rubble, and construction debris shall not be used to adjust manholes to final grade.

All backfill shall be free of organic matter and any other unstable material.

Where sewer lines enter a manhole more than 24 inches above the invert, the invert shall be filleted to prevent solids deposition.

Provide a U-shaped channel through all manholes:
- For pipes less than 15 inches diameter, channel depth must be at least one-half the pipe diameter;
- For pipes more than 15 inches but less than 24 inches diameter, channel depth must be at least 3/4 the pipe diameter;
- For pipes greater than 24 inches diameter, channel depth must be at least equal to the pipe diameter.

All manhole bench areas shall have a slope of at least 0.5 inches per foot.

**Exterior STOMA seal or approved equal is required on all sanitary sewer manholes.**

The following manhole tests are adopted by the City of Plano to comply with Chapter 317 of 30 Texas Administrative Code. These tests supercede those listed in Item 6.7.2(c) of The Standard Specifications for Public Works Construction – North Central Texas:

### EXFILTRATION TEST

1) Plug all lines entering the manhole.

2) For concrete manholes, fill manhole with water 24 hours prior to beginning test. This will allow for saturation of the manhole.

3) After the wetting period maintain the manhole full for one hour.

4) The maximum allowable leakage shall be 0.025 gallons per foot diameter per foot of manhole depth per hour.

5) If the manhole exceeds the leakage rate specified above, identify the source of leakage, repair, and retest the manhole. Continue with testing and repair until the manhole passes the test.

## LOW PRESSURE AIR TESTING OF SANITARY SEWERS

The following revision to Item 6.7.2(f) of The Standard Specifications for Public Works Construction – North Central Texas is adopted by the City of Plano to comply with Chapter 317 of 30 Texas Administrative Code:

When ground water is encounter during sanitary sewer construction, the pipe shall be pressurized to 3.5 psig greater than the pressure exerted by the ground water above the pipe.

### VACUUM TESTING

After the completion of the manhole, the manholes shall be visually inspected by the Engineer and the Owner before final acceptance. In addition, the Contractor shall perform low pressure vacuum air testing on each manhole. Each manhole shall be tested separately and independently of the sanitary sewer lines. All sanitary sewer lines coming into the manhole shall be sealed with an internal pipe plug. The method of testing shall be by means of creating an air vacuum within the manhole, whereby, a 10" Hg. (mercury) vacuum will be developed. The air vacuum shall then be monitored once it has reached 10" Hg. for a test period of two minutes. The allowance drop in air vacuum shall be no greater than 1" Hg. during the two-minute test period.

The air vacuum testing procedures for the rehabilitated manholes shall be according to the recommendations of Cherne Industries, Inc., (Air-Loc Vacuum Manhole Tester), or such other manufacturers/suppliers that would have acceptable equipment designed specifically for air vacuum testing of manholes.

The Contractor shall provide the Owner with certified documentation that the test procedures were conducted as recommended by the equipment manufacturers and the test results were actual numbers recorded in the field. The contractor shall record and certify to the following information:

a. Date and time of testing.
b. Name of contractor's representative performing the tests.
c. Equipment used and calibration procedures.
d. Manhole location(s).
e. Air-vacuum maximum (Hg.)
f. Test period.
g. Drop of air vacuum within the test period.
h. Other observers at the testing site.

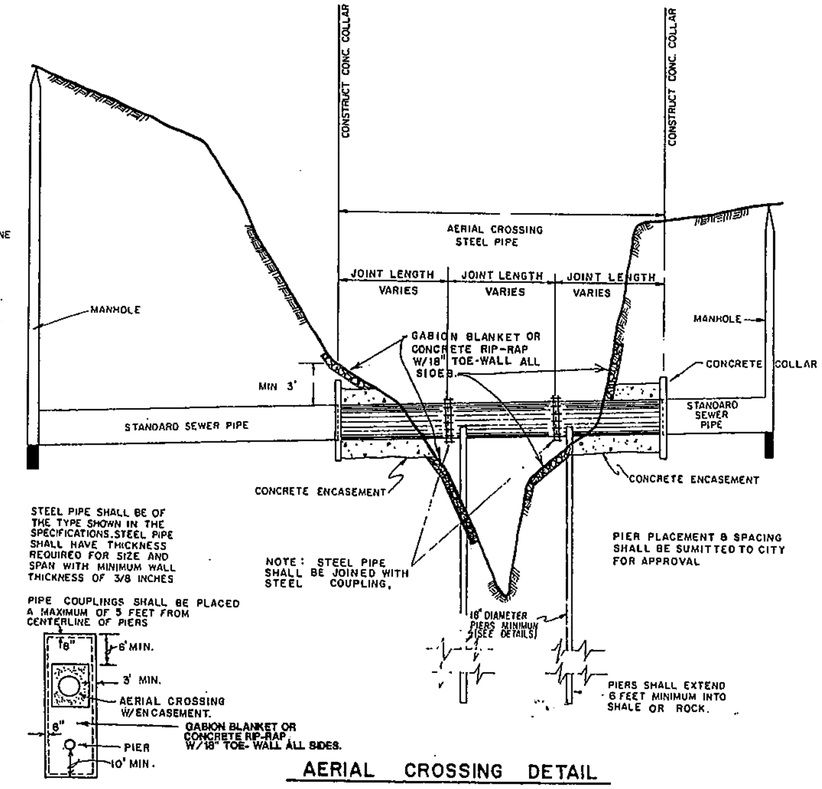
The following Tables presents 5% deflection mandrel sizes adopted by the City of Plano to comply with Chapter 317 of 30 Texas Administrative Code. Dimensions listed below supercede the dimensions given in Item 6.7.2(g) of The Standard Specifications for Public Works Construction – North Central Texas.

### 5 PERCENT DEFLECTION MANDREL

| NOMINAL I. D., Inches | Mandrel O. D., Inches | Nearest 1/16 Inches | Minimum Runner Length, Inches | Minimum Number of Mandrel Runners |
|---|---|---|---|---|
| 6 | 5.70 | 5-11/16 | 4-1/2 | 9 |
| 8 | 7.60 | 7-10/16 | 6 | 9 |
| 10 | 9.50 | 9-1/2 | 7-1/2 | 9 |
| 12 | 11.40 | 11-3/8 | 9 | 9 |
| 15 | 14.25 | 14-1/4 | 11-1/4 | 9 |
| 18 | 17.10 | 17-1/8 | 13-1/2 | 9 |
| 21 | 19.95 | 19-15/16 | 15-3/4 | 9 |
| 24 | 22.80 | 22-13/16 | 18 | 9 |
| 27 | 25.65 | 25-5/8 | 20-1/4 | 9 |
| 30 | 28.50 | 28-1/2 | 22-1/2 | 9 |
| 33 | 31.35 | 31-3/8 | 24-3/4 | 9 |
| 36 | 34.20 | 34-3/16 | 27 | 9 |
| 42 | 39.90 | 39-7/8 | 31-1/2 | 9 |

### NOTES

1) Deflection tests shall be done without mechanical pulling devices.
2) Tests shall be done after the backfill has been in place for 30 days.
3) The rigid mandrel shall be constructed of a metal or rigid plastic that can withstand 200 psi without deforming.
4) Adjustable or flexible mandrels are prohibited.
5) Mandrels with removeable legs or runners may be accepted on a case by case basis.
5) A proving ring shall be provided for each size mandrel used.

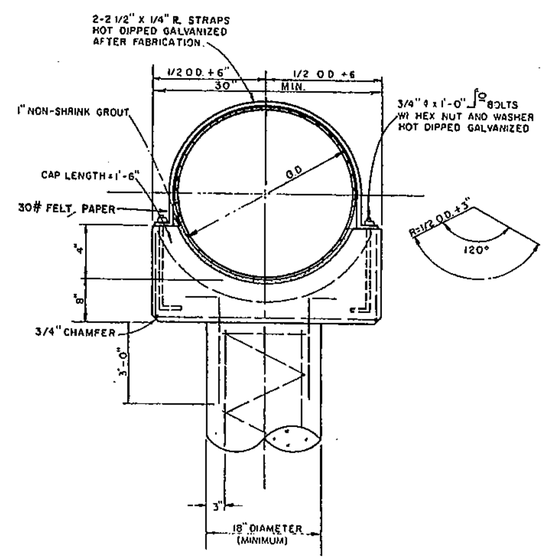



AERIAL CROSSING DETAIL

BANK PROTECTION (TYP)

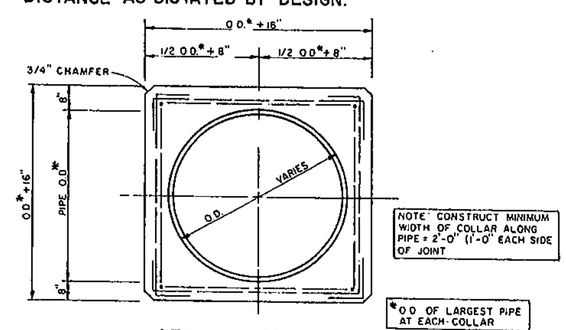
MATERIALS SHALL CONFORM TO THE SPECIAL PROVISIONS AND/OR THE STANDARD SPECIFICATIONS

**NOTE:** ENGINEERING DESIGN SHALL BE SUBMITTED FOR EACH CROSSING. PIERS SHALL BE PLACED AT MAXIMUM SPAN DISTANCE AS DICTATED BY DESIGN.




AERIAL CROSSING PIER CAP DETAIL

N T S




AERIAL CROSSING CONCRETE COLLAR DETAIL

N T S

| NO. | REVISION | BY | DATE |
|---|---|---|---|
| | NCT STANDARD SPECIFICATIONS | S. A. S. | 10-13-87 |

CITY OF PLANO, TEXAS
PUBLIC WORKS
DEPARTMENT OF ENGINEERING

STANDARD CONSTRUCTION DETAILS
SANITARY SEWER

EMBEDMENT - AERIAL CROSSING

STATE OF TEXAS — ALAN L. UPCHURCH — 39238 — REGISTERED PROFESSIONAL ENGINEER

7-22-96

APPROVED Alan L. Upchurch
ALAN L. UPCHURCH, P.E.

DATE: JULY, 1996

SHEET SD-20