



**REVIEW BY FORT BEND COUNTY COMMISSIONERS COURT**

**Fort Bend County Engineering Department**  
301 Jackson Suite 401  
Richmond, Texas 77469  
281.633.7500  
Permits@fortbendcountytx.gov

- Right of Way Permit
- Commercial Driveway Permit

Permit No: 2017-14962

**Applicant:** Millis Equipment, LLC

**Job Location Site:** 18544 Old Richmond Road, Sugar Land , TX 77498

**Bond No.**                      **Date of Bond:** 7/31/2017 **Amount:** \$5,000.00

The above applicant came to make use of certain Fort Bend County property subject to, "The Order Regulating the Laying, Construction, Maintenance, and Repair of Buried Cables, Conduits, and Pole Lines, In, Under, Across or Along Roads, Streets, Highways, and Drainage Ditches in Fort Bend County, Texas, Under the Jurisdiction of the Commissioners Court of Fort Bend County, Texas," as passed by the Commissioners Court of Fort Bend County, Texas, of the Minutes of the Commissioners Court of Fort Bend County, Texas, to the extent that such order is not inconsistent with Chapter 181, Vernon's Texas Statutes and Codes Annotated.

**Notes:**

1. Evidence of review by the Commissioners Court must be kept on the job site and failure to do so constitutes grounds for job shutdown.
2. Written notices are required:
  - a. 48 hours in advance of construction start up, and
  - b. When construction is completed and ready for final inspection, submit notification to Permit Administrator thru MyGovernmentOnline.org portal.
3. This permit expires one (1) year from date of permit if construction has not commenced.

On this 22nd day of August, 2017, Upon Motion of Commissioner Meyers, seconded by Commissioner Morales, duly put and carried, it is ORDERED, ADJUDGED AND DECREED that said notice of said above purpose is hereby acknowledged by the Commissioners Court of Fort Bend County, Texas, and that said notice be placed on record according to the regulation order thereof.

**Signature**

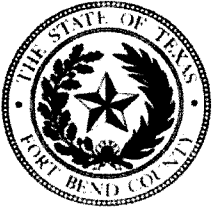
Presented to Commissioners Court and approved.

By: Charles O. Ay  
County Engineer

Date Recorded 9-6-2017 Comm. Court No. 12G

By: N/A  
Drainage District Engineer/Manager

Clerk of Commissioners Court  
By: Amely Willes  
Deputy



**PERMIT APPLICATION REVIEW FORM FOR  
CABLE, CONDUIT, AND POLE LINE ACTIVITY  
IN FORT BEND COUNTY**

**Fort Bend County  
Engineering Department**  
301 Jackson Suite 401  
Richmond, Texas 77469  
281.633.7500  
Permits@fortbendcountytexas.gov

- Right of Way Permit  
 Commercial Driveway Permit

Permit No: 2017-14962

The following "Notice of Proposed Cable, Conduit, and/or Pole Line activity in Fort Bend County" and accompanying attachments have been reviewed and the notice conforms to appropriate regulations set by Commissioner's Court of Fort Bend County, Texas.

**(1) COMPLETE APPLICATION FORM:**

- a. Name of road, street, and/or drainage ditch affected.  
 b. Vicinity map showing course of directions  
 c. Plans and specifications

**(2) BOND:**

- County Attorney, approval when applicable.
- Perpetual bond currently posted.      Bond No: \_\_\_\_\_ Amount: \_\_\_\_\_
- Performance bond submitted.      Bond No: [REDACTED] Amount: \$5,000.00
- Cashier's Check      Check No: \_\_\_\_\_ Amount: \_\_\_\_\_

**(3) DRAINAGE DISTRICT APPROVAL (WHEN APPLICABLE):**

\_\_\_\_\_  
Drainage District Approval

\_\_\_\_\_  
Date

**We have reviewed this project and agree it meets minimum requirements.**

*Charley O. AM*

\_\_\_\_\_  
Permit Administrator

*8/14/17*  
\_\_\_\_\_  
Date





POWER OF ATTORNEY

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company

St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

Attorney-In Fact No. 230961

Certificate No. 007101428

KNOW ALL MEN BY THESE PRESENTS: That Farmington Casualty Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company are corporations duly organized under the laws of the State of Connecticut, that Fidelity and Guaranty Insurance Company is a corporation duly organized under the laws of the State of Iowa, and that Fidelity and Guaranty Insurance Underwriters, Inc., is a corporation duly organized under the laws of the State of Wisconsin (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint

Kurt A. Risk, Sue Kohler, Sharon Cavanaugh, Francine Hay, David R. Groppe, Sharen R. Groppe, Roxanne G. Brune, Beverly A. Ireland, and Gloria Villa

of the City of Houston, State of Texas, their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed and their corporate seals to be hereto affixed, this 19th day of January, 2017.

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company

St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company



State of Connecticut
City of Hartford ss.

By: [Signature]
Robert L. Raney, Senior Vice President

On this the 19th day of January, 2017, before me personally appeared Robert L. Raney, who acknowledged himself to be the Senior Vice President of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

In Witness Whereof, I hereunto set my hand and official seal.
My Commission expires the 30th day of June, 2021.



[Signature]
Marie C. Tetreault, Notary Public

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, which resolutions are now in full force and effect, reading as follows:

**RESOLVED**, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

**FURTHER RESOLVED**, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

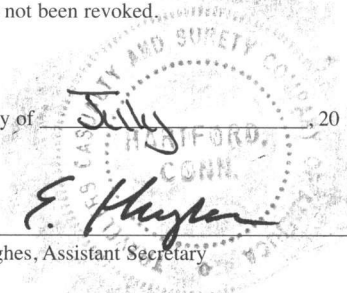
**FURTHER RESOLVED**, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary; or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

**FURTHER RESOLVED**, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any Power of Attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such Power of Attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or understanding to which it is attached.

I, Kevin E. Hughes, the undersigned, Assistant Secretary, of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 31<sup>st</sup> day of July, 2017.

*Kevin E. Hughes*  
Kevin E. Hughes, Assistant Secretary



To verify the authenticity of this Power of Attorney, call 1-800-421-3880 or contact us at www.travelersbond.com. Please refer to the Attorney-In-Fact number, the above-named individuals and the details of the bond to which the power is attached.



## **IMPORTANT NOTICE**

### **TO OBTAIN INFORMATION OR MAKE A COMPLAINT:**

You may contact Travelers Casualty & Surety Company of America, Travelers Casualty & Surety Company, Travelers Indemnity Company, Standard Fire Insurance Company and/or Farmington Casualty Company for information or to make a complaint at:

Travelers Bond  
Attn: Claims  
1500 Market Street  
West Tower, Suite 2900  
Philadelphia, PA 19102

(267) 675-3057  
(267) 675-3102 Fax

You may contact the Texas Department of Insurance to obtain the information on companies, coverages, rights or complaints at:

Texas Department of Insurance  
P.O. Box 149104  
Austin, TX 78714-9104

(800) 252-3439

ATTACH THIS NOTICE TO YOUR BOND. This notice is for information only and does not become a part or a condition of the attached document and is given to comply with Section 2253-021, Government Code, and Section 53.202, Property Code, effective September 1, 2001.

**FILED AND RECORDED**  
**OFFICIAL PUBLIC RECORDS**

*Laura Richard*



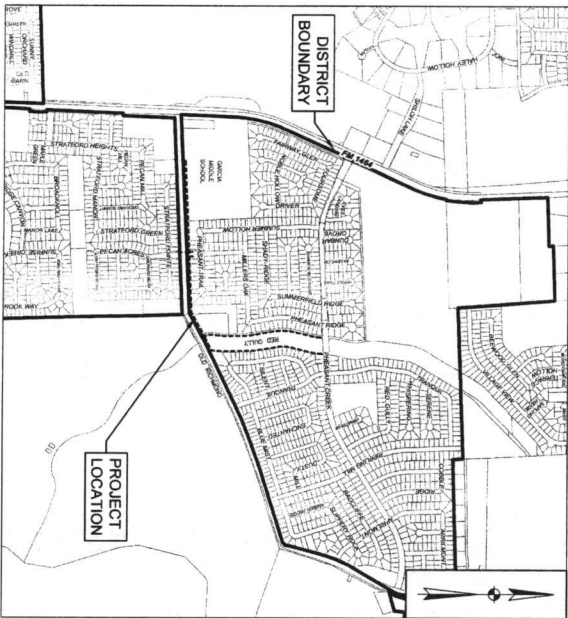
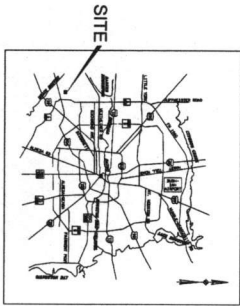
Laura Richard, County Clerk  
Fort Bend County, Texas

September 05, 2017 02:30:50 PM

FEE: \$0.00 JE  
BOND

2017097475

# FORT BEND COUNTY MUNICIPAL UTILITY DISTRICT NO. 25 CONSTRUCTION PLANS FOR TRAILS SYSTEM PHASE 1 FROM PHEASANT CREEK TO OLD RICHMOND ROAD TO GARCIA MIDDLE SCHOOL FT. BEND COUNTY, TEXAS



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KEY MAP NO. 587K, 587X  
VICINITY MAP  
NOT TO SCALE

PROJECT NO. 120-11942-000-400  
May 2017

APPROVED FOR CONSTRUCTION  
APPROVED BY: *[Signature]*  
DATE: 5/24/17

DESIGNED BY: *[Signature]*  
CHECKED BY: *[Signature]*  
APPROVED BY: *[Signature]*

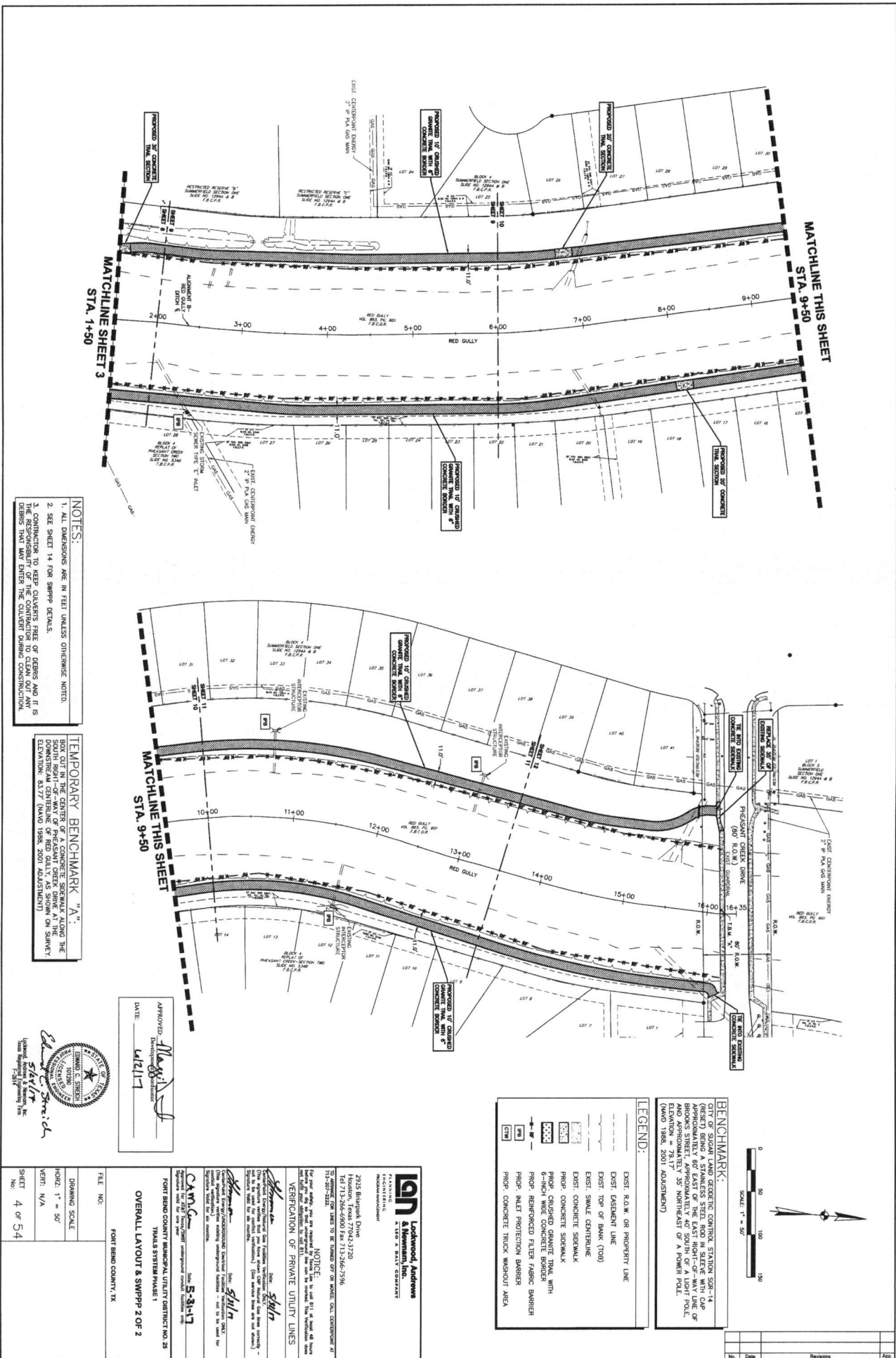
PROJECT NO. 120-11942-000-400  
SHEET NO. 1 OF 54

IGN  
Lodgwood, Andrews & Newman, Inc.  
2000 Westpark Mall, Suite 200  
Houston, TX 77056  
Tel: 281.466.1100  
Fax: 281.466.1101  
www.ign.com









**NOTES:**

1. ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE NOTED.
2. SEE SHEET 14 FOR SWPPP DETAILS.
3. CONTRACTOR TO KEEP CLAYERS FREE OF DEBRIS AND IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CLEAN OUT ANY DEBRIS THAT MAY ENTER THE DRAINAGE DURING CONSTRUCTION.

**TEMPORARY BENCHMARK "A":**  
 BOX CUT IN THE CENTER OF A CONCRETE SIDEWALK ALONG THE DOWNSTREAM CENTERLINE OF RED GULLY. SPKRM ON SINKY (ELEVATION: 83.77 (NAVD 1988, 2001 ADJUSTMENT))

APPROVED: *Shalin*  
 DATE: 4/21/17

Sealed: *Shalin*  
 State Registered Professional Engineer  
 License No. 12345

FILE NO.:  
 DRAWING SCALE:  
 HORIZ: 1" = 50'  
 VERT: N/A  
 SHEET: 4 OF 54

**Legend:**

- EXIST. R.O.W. OR PROPERTY LINE
- EXIST. EASEMENT LINE
- EXIST. TOP OF BANK (TOB)
- EXIST. SWALE CENTERLINE
- EXIST. CONCRETE SIDEWALK
- PROPOSED CONCRETE SIDEWALK
- PROPOSED CONCRETE BORDER WITH 6-INCH WIRE CONCRETE BORDER
- PROPOSED REINFORCED FIBER FABRIC BARRIER
- PROPOSED INLET PROTECTION BARRIER
- PROPOSED CONCRETE TRUCK WASHOUT AREA

**BENCHMARK:**  
 QTY OF STAINLESS STEEL GENERIC CONTROL STATION 5392-14 (RESET) BEING A STAINLESS STEEL ROD IN SLEEVE WITH CAP APPROXIMATELY 60" EAST OF THE EAST RIGHT-OF-WAY LINE OF CAP AND APPROXIMATELY 35' NORTHEAST OF A POWER POLE (NAVD 1988, 2001 ADJUSTMENT) ELEVATION = 79.17'

**Legend:**

- EXIST. R.O.W. OR PROPERTY LINE
- EXIST. EASEMENT LINE
- EXIST. TOP OF BANK (TOB)
- EXIST. SWALE CENTERLINE
- EXIST. CONCRETE SIDEWALK
- PROPOSED CONCRETE SIDEWALK
- PROPOSED CONCRETE BORDER WITH 6-INCH WIRE CONCRETE BORDER
- PROPOSED REINFORCED FIBER FABRIC BARRIER
- PROPOSED INLET PROTECTION BARRIER
- PROPOSED CONCRETE TRUCK WASHOUT AREA

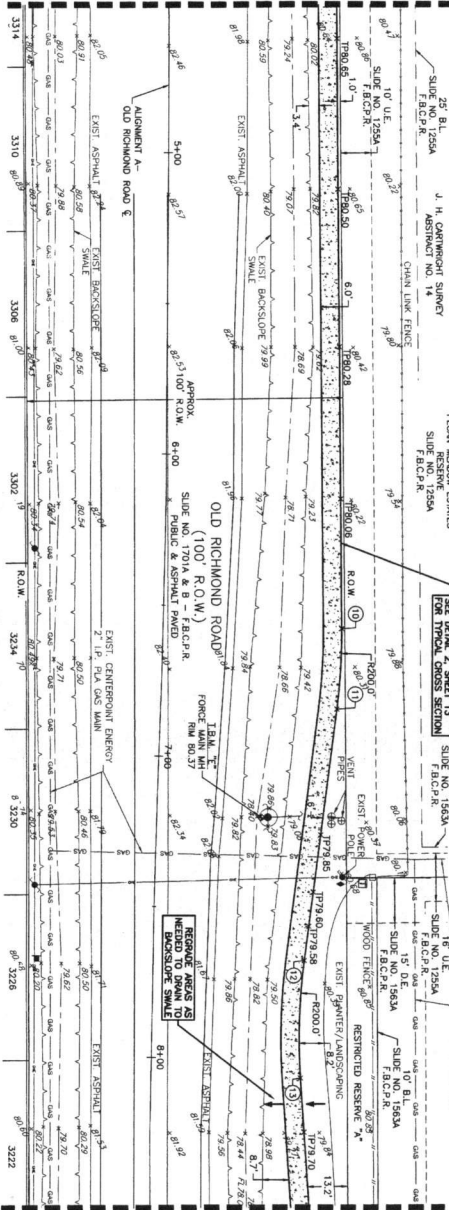
**Legend:**

- EXIST. R.O.W. OR PROPERTY LINE
- EXIST. EASEMENT LINE
- EXIST. TOP OF BANK (TOB)
- EXIST. SWALE CENTERLINE
- EXIST. CONCRETE SIDEWALK
- PROPOSED CONCRETE SIDEWALK
- PROPOSED CONCRETE BORDER WITH 6-INCH WIRE CONCRETE BORDER
- PROPOSED REINFORCED FIBER FABRIC BARRIER
- PROPOSED INLET PROTECTION BARRIER
- PROPOSED CONCRETE TRUCK WASHOUT AREA

**Legend:**

- EXIST. R.O.W. OR PROPERTY LINE
- EXIST. EASEMENT LINE
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- PROPOSED CONCRETE SIDEWALK
- PROPOSED CONCRETE BORDER WITH 6-INCH WIRE CONCRETE BORDER
- PROPOSED REINFORCED FIBER FABRIC BARRIER
- PROPOSED INLET PROTECTION BARRIER
- PROPOSED CONCRETE TRUCK WASHOUT AREA

**MATCHLINE THIS SHEET  
STA. 4+50**



**MATCHLINE SHEET 6  
STA. 8+50**

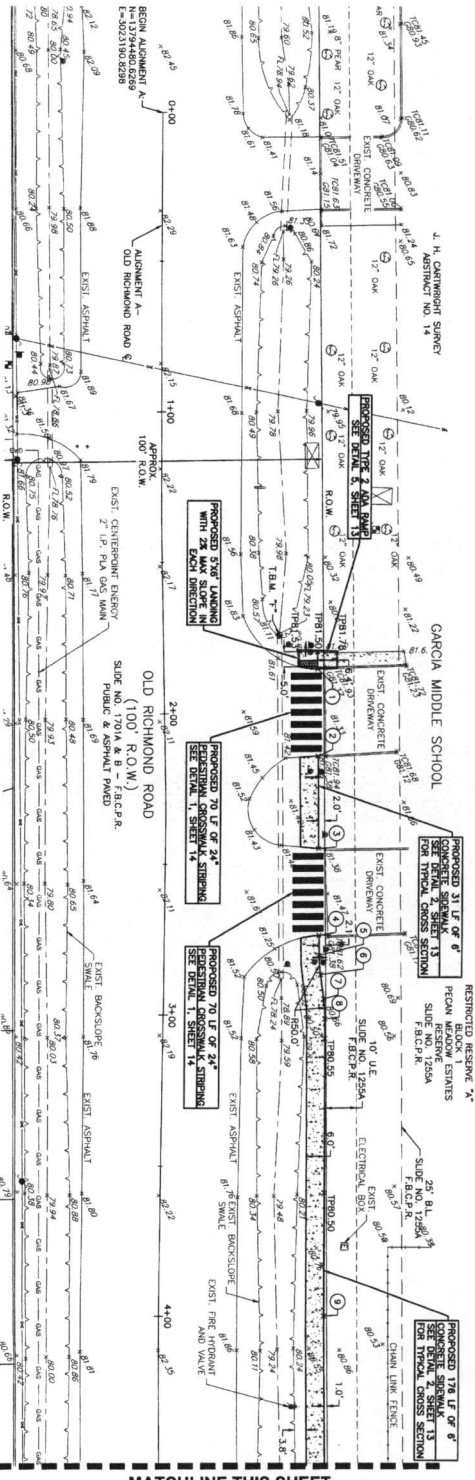
**NOTES:**

1. ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE NOTED.
2. EXISTING UTILITY LINE LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY ALL LINE SIZES, DEPTHS AND LOCATIONS PRIOR TO EXCAVATION.
3. TOP OF PAVEMENT ELEVATIONS ARE ONLY APPROXIMATE, AND WORK NEED TO BE ADJUSTED AS TO MEET ALL REQUIREMENTS.
4. THE MAXIMUM TRANSVERSE SLOPE (SIDEWALK CROSS SLOPE) CONTRIBUTOR SHALL MAKE IT BETWEEN 1.5-2%.
5. THE MAXIMUM SLOPE FOR THE CONCRETE PAVEMENT IS: 1:12 FOR 8.5X32.
6. CONCRETE SIDEWALK SHALL HAVE EXPANSION JOINTS AT 40 FEET MAXIMUM AND CONTROL JOINTS AT 5 FEET MAXIMUM.
7. CRIBBED GRANITE TRAIL SHALL HAVE 6-INCH WIDE CONCRETE CROSS SLOPE ON THE ONEN ELEVATION OF THE TRAIL WITH 1.5-2% BANK AS NEEDED TO REGRADE BACKSLOPE SWALE AND DITCH HIGH.
8. CONTRACTOR TO REGRADE BACKSLOPE SWALE AND DITCH HIGH.
9. THE CONTRACTOR SHALL ADJUST ALL BOXES, VALVES, MANHOLES AND OTHER OBJECTS IN THE GROUND THAT ARE IN THE PATH OF THE TRAIL TO MATCH TRAIL ELEVATION.
10. THE CONTRACTOR SHALL RESTORE THE LANDSCAPE TO ITS ORIGINAL CONDITION. ANY SOIL SHALL BE REPLACED IN ANY CHANNEL OR GORGE. ANY TREE BEING SOIL SHALL BE USED TO REPLACE ANY REMOVED TREE.
11. THE CONTRACTOR SHALL MAINTAIN PROPER GRADIENT ALONG DITCHES AND TO INTERFERE CONSTRUCTION, ANY DITCHES AND OTHER FEATURES SHALL BE RECONSTRUCTED TO ORIGINAL CONDITIONS.
12. SURVEY BY CIVIL-SURVEY LAND SURVEYING, L.C. COMPANY & ASSOCIATES, INC. DATE: 5/18/12.

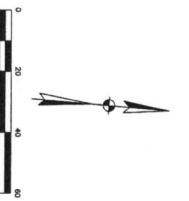
**TEMPORARY BENCHMARK**  
BOX CUT ABOVE WEST END OF A 12" REINFORCED CONCRETE BOX CUT ALONG THE NORTH RIGHT-OF-WAY LINE OF OLD RICHMOND ROAD, APPROXIMATELY 1464' AND OLD RICHMOND ROAD AT THE INTERSECTION OF OLD RICHMOND ROAD AS SHOWN ON SURVEY. POINTS DRIVE AND ELEVATION: 79.87' (NAVD 1988, 2001 ADJUSTMENT)

STATION	NORTHING	EASTING	ELEV.
1	13794539.2868	3023133.8801	81.40
2	13794540.8446	3023142.8100	81.28
3	13794542.0115	3023143.8528	81.39
4	13794543.3332	3023148.2840	81.31
5	13794544.8379	3023148.2840	81.12
6	13794544.3386	3023147.2884	80.94
7	13794544.7369	3023143.2434	80.60
8	13794544.4466	3023148.8723	80.65
9	13794550.4190	3023588.4121	80.70
10	13794552.6480	3023845.8444	80.00
11	13794552.1316	3023872.8841	79.90
12	13794554.8834	3023955.5129	79.85
13	13794555.3395	3023955.5129	79.85

APPROVED: *[Signature]*  
DATE: 4/2/17



**MATCHLINE THIS SHEET  
STA. 4+50**

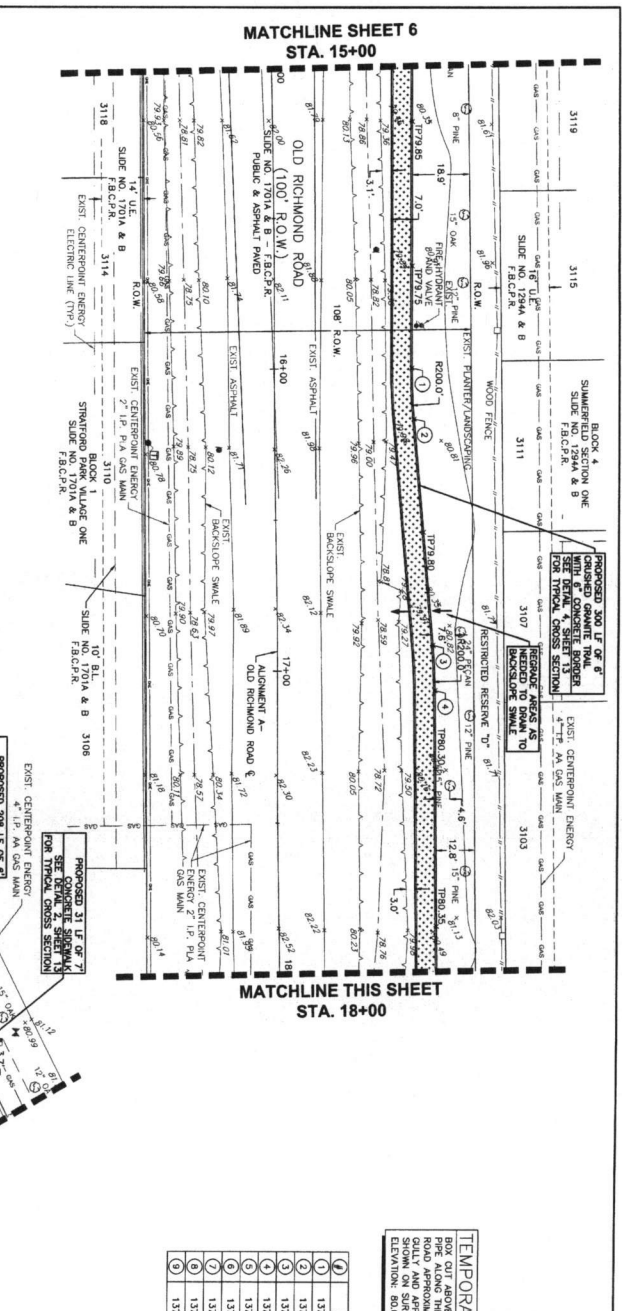
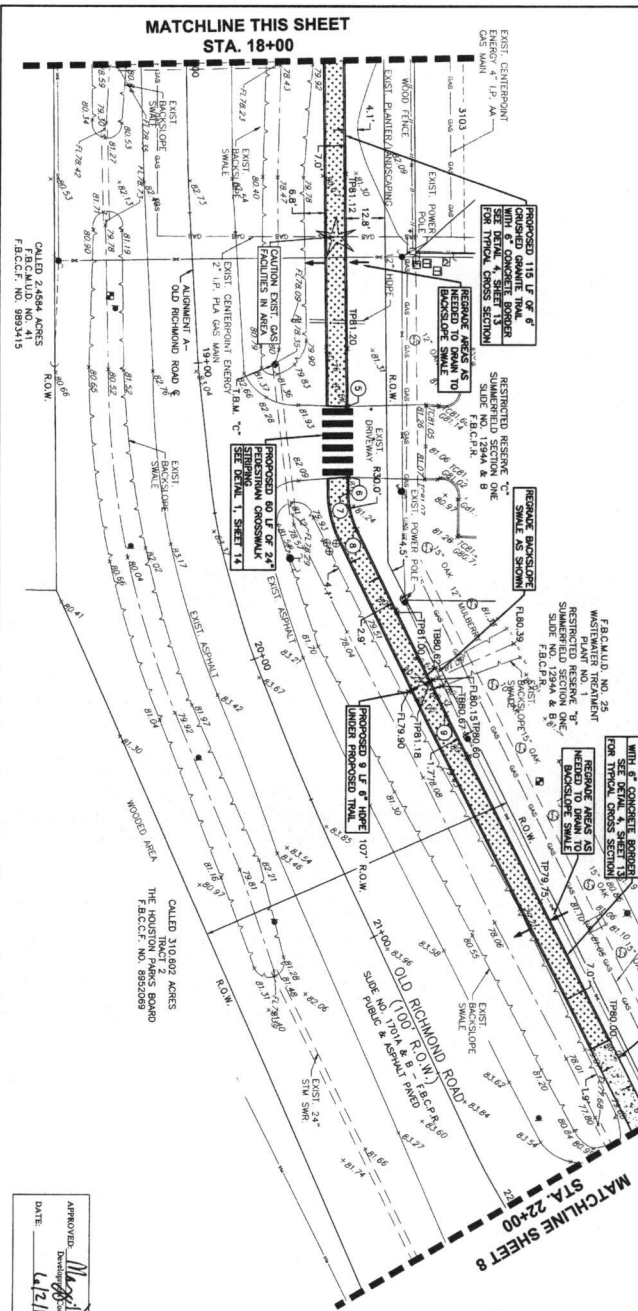


**BENCHMARK:**  
CITY OF SIGAR LAND GEODETIC CONTROL STATION 558-14 (BES1) BEING A STAINLESS STEEL ROD IN STEEL WITH CAP APPROXIMATELY 60' EAST OF THE EAST RIGHT-OF-WAY LINE OF OLD RICHMOND ROAD, APPROXIMATELY 55' NORTHEAST OF A POWER POLE. ELEVATION = 79.17' (NAVD 1988, 2001 ADJUSTMENT)

**LEGEND:**  
 --- EXIST. R.O.W. OR PROPERTY LINE  
 --- EXIST. EASEMENT LINE  
 --- EXIST. TOP OF BANK (TOB)  
 --- EXIST. SHALE CENTERLINE  
 --- EXIST. CONCRETE SIDEWALK  
 --- PROP. CRIBBED GRANITE TRAIL WITH 6-INCH WIDE CONCRETE BORDER  
 --- EXIST. ELEVATIONS  
 --- TOP OF 12" BENCH/TOP-OF-PAVEMENT/PROP. POINTS. SEE TABLE THIS SHEET  
 --- REDUCED SIGN IN PATH OF SIDEWALK  
 --- DRAINAGE DIRECTION ARROW

FILE NO.:  
DRAWING SCALE:  
HORIZ. 1" = 20'  
VERT. N/A  
SHEET NO.: 5 OF 54





**NOTES:**

1. ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE NOTED.
2. EXISTING UTILITY LINE LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY ALL LINE SIZES, DEPTHS AND LOCATIONS PRIOR TO EXCAVATION.
3. TOP OF PAVEMENT ELEVATIONS ARE ONLY APPROXIMATE AND MAY NEED TO BE ADJUSTED AS TO MEET ADA REQUIREMENTS.
4. THE MAXIMUM TRANSVERSE SLOPE (SIDEWALK CROSS SLOPE) SHALL BE 1:50 (2%) UNLESS OTHERWISE SHOWN.
5. THE MAXIMUM RUNNING SLOPE IS 1:20 (5%) AND A MAXIMUM LONGITUDINAL SLOPE FOR THE CONCRETE SHALL BE 1:12 (8.33%).
6. CONCRETE SIDEWALK SHALL HAVE EXPANSION JOINTS AT 40 FEET MAXIMUM AND CONTROL JOINTS AT 5 FEET MAXIMUM.
7. CRUSHED GRANITE TRAIL SHALL HAVE 6-INCH WIDE CONCRETE CURBS ON EITHER SIDE OF THE TRAIL WITH 1:5-2% CROSS SLOPE.
8. CONTRACTOR TO REPAIR BROKEN SIDEWALK AND DITCH HIGH BANK AS NEEDED ALONG PROPOSED TRAIL.
9. THE CONTRACTOR SHALL ADJUST ALL BOXES, VALVES, MANHOLETS AND OTHER OBJECTS IN THE GROUND THAT ARE IN THE PATH OF THE TRAIL TO MATCH TRAIL ELEVATION.
10. THE CONTRACTOR SHALL RESTORE THE LANDSCAPE TO ITS ORIGINAL CONDITION AND REPLACE ANY PLANTS OR TREES TO BE REPLACED THAT HAVE BEEN DISTURBED IN ANY CHANNEL. ANY GRASS THAT HAS BEEN SOBBED BE USED TO REPLACE ANY GRASS THAT HAS BEEN DISTURBED.
11. THE CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE ALONG DITCHES AND TO INTERCEPTOR STRUCTURES & PREVENT INLETS FROM BEING DISTURBED. ANY DITCHES AND PRE-EXISTING CHANNELS SHALL BE MAINTAINED TO ORIGINAL LOCATION AND SIZE AS PRE-CONSTRUCTION CONDITIONS.
12. SURVEY BY CIVIL-SURVEY AND SURVEYING, L.C. NOVEMBER 8, 2016. CONTRACTOR MAY REQUEST A COPY OF SURVEY FROM BENCHMARK.

**TEMPORARY BENCHMARK "C"**

BOX CUT ABOVE THE EAST END OF A 24" REINFORCED CONCRETE DRAINAGE DITCH ON THE EAST RIGHT-OF-WAY LINE OF OLD RICHMOND ROAD, APPROXIMATELY 910' EAST OF FINE ACRES DRIVE AS SHOWN ON SURVEY.

ELEVATION: 81.00 (NAVD 1988, 2001 ADJUSTMENT)

STATION	EXISTING	ELEV.
1	13794588.8115	302.4787, 2.580
2	13794590.1548	302.4804, 2.068
3	13794592.5252	302.4829, 2.313
4	13794600.2916	302.4883, 3.045
5	13794610.4888	302.5101, 2.298
6	13794611.5831	302.5124, 2.874
7	13794611.8189	302.5129, 2.832
8	13794615.0479	302.5141, 2.857
9	13794646.7479	302.5501, 2.888

**BENCHMARK:**

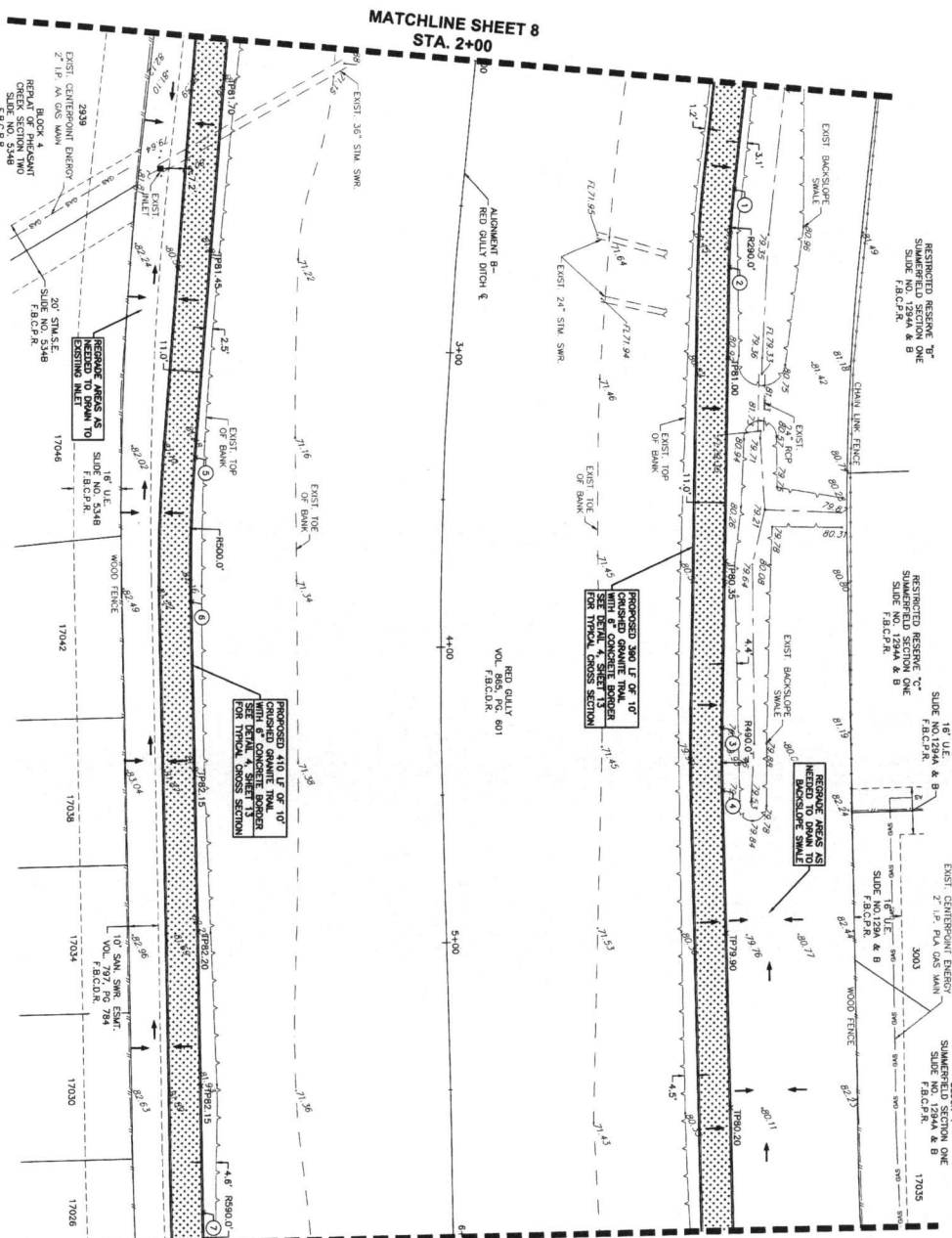
CITY OF SUGAR LAND GEOTECH CONTROL STATION SGR-14 (REAR) BEING A STAINLESS STEEL ROD IN SLEEVE WITH CAP PROTRUDING 60" FROM THE EAST RIGHT-OF-WAY LINE OF OLD RICHMOND ROAD, APPROXIMATELY 25' NORTHEAST OF A POWER POLE. ELEVATION = 79.17' (NAVD 1988, 2001 ADJUSTMENT)

**LEGEND:**

- EXIST. R.O.W. OR PROPERTY LINE
- EXIST. EXISTENCE LINE
- EXIST. TOP OF BANK (TOB)
- EXIST. SMALL CENTERLINE
- EXIST. CONCRETE SIDEWALK
- PROP. CRUSHED GRANITE TRAIL WITH 6" WIDE CONCRETE BORDERS
- PROP. CONCRETE SIDEWALK
- PROP. CRUSHED GRANITE TRAIL WITH 6" WIDE CONCRETE BORDERS
- EXIST. ELONGATIONS
- TOP OF CURB/ADJUTIVE
- PROP. POINTS, SEE TABLE THIS SHEET
- RELOCATE SIGN IN PATH OF SIDEWALK
- DRAINAGE DIRECTION ARROW



**MATCHLINE SHEET 8  
STA. 2+00**



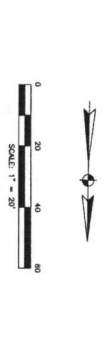
NO.	NORTHING	EASTING	ELEV.
1	13795032.5395	3025466.1846	81.15
2	13795028.9431	3025467.3285	81.20
3	13795215.1526	3025466.9993	80.10
4	13795236.3420	3025466.4504	80.00
5	13795128.2386	3025466.4931	81.50
6	13795175.1285	3025466.9741	82.10
7	13795392.0418	3025468.8750	82.25

**MATCHLINE SHEET 10  
STA. 6+00**

- NOTES:**
- ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE NOTED.
  - EXISTING UTILITY LINE LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY ALL LINE SIZES, DEPTHS AND LOCATIONS FROM TO EXAMINATION.
  - TOP OF PARALLEL ELEVATIONS ARE ONLY APPROXIMATE AND MAY NEED TO BE ADJUSTED AS TO FIELD MEASUREMENTS.
  - THE MAXIMUM TRANSVERSE SLOPE (GENERAL CROSS SLOPE) SHALL BE 1% TO 2%.
  - THE MAXIMUM RUNNING SLOPE IS 1:30 OR 3% AND MAXIMUM LONGITUDINAL SLOPE FOR THE CONCRETE MAIN IS 1:12 OR 8.33%.
  - CONCRETE SEWERMAIN SHALL HAVE EXPANSION JOINTS AT 40 FEET MAXIMUM AND CONTROL JOINTS AT 5 FEET MAXIMUM.
  - CONCRETE MAIN SHALL HAVE 6-INCH WIDE CONCRETE CROSS SLOPE.
  - SHALL EXIST WITHIN THE 15'-25' BENCH MARK AS INDICATED ON THE PLAN.
  - CONTRACTOR TO RESURFACE BACKSLOPE SWALE AND DITCH HIGH BARK AS NECESSARY TO MAINTAIN PROPOSED TRAIL.
  - CONTRACTOR SHALL ADJUST ALL BODIES, VALVES, MANHOLES AND OTHER OBJECTS IN THE GROUND THAT ARE IN THE PATH OF THE PROPOSED TRAIL ELEVATION.
  - THE CONTRACTOR SHALL BE RESPONSIBLE TO GET THE GROUND CONDITION OF BETTER TO AROUND THE PROPOSED TRAIL TO REPLACE GRASS THAT HAS BEEN DISTURBED IN ANY CHANNEL OR ANY GRASS THAT HAS BEEN DISTURBED.
  - THE CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE ALONG DITCHES AND TO INTERCEPTOR STRUCTURES & PROTECT INLETS FROM SEDIMENT, OTHER CONTRIBUTION, AIR DROPS AND SAME LOCATION AND SIZE AS THE CONSTRUCTION CONDITIONS.
  - SURVEY BY CIVIL-SURV LAND SURVEYING, L.C. NOVEMBER 4, 2016. CONTRACTOR MAY REQUEST A COPY OF SURVEY FROM ENGINEER.

**BENCHMARK:**

CITY OF SUGAR LAND GEOMETRIC CONTROL STATION 58-14 (REBUILT) BEING A STAINLESS STEEL ROD IN SLEEVE WITH CAP OF BROOKS STREET, APPROXIMATELY 40' SOUTH OF A LIGHT POLE AND APPROXIMATELY 35' NORTHEAST OF A POWER POLE (ELEVATION = 79.17' (MVD 1988, 2001 ADJUSTMENT))



APPROVED: *[Signature]*  
DATE: 12/17



FILE NO. \_\_\_\_\_  
DRAWING SCALE \_\_\_\_\_  
HORIZ. 1" = 20'  
VERT. N/A  
SHEET 9 OF 54

**Landwood Andrews & Neumann, Inc.**  
A LEO A BAYLOR COMPANY

3235 Harland Drive  
Houston, Texas 77044-3720  
Tel 713-266-6900 Fax 713-266-7796

**NOTICE:**  
This drawing was prepared by the undersigned professional engineer and is a true and correct copy of the original drawing as shown to the client. The undersigned professional engineer is not responsible for any errors or omissions in this drawing or any other drawings prepared by the undersigned professional engineer. The undersigned professional engineer is not responsible for any errors or omissions in this drawing or any other drawings prepared by the undersigned professional engineer.

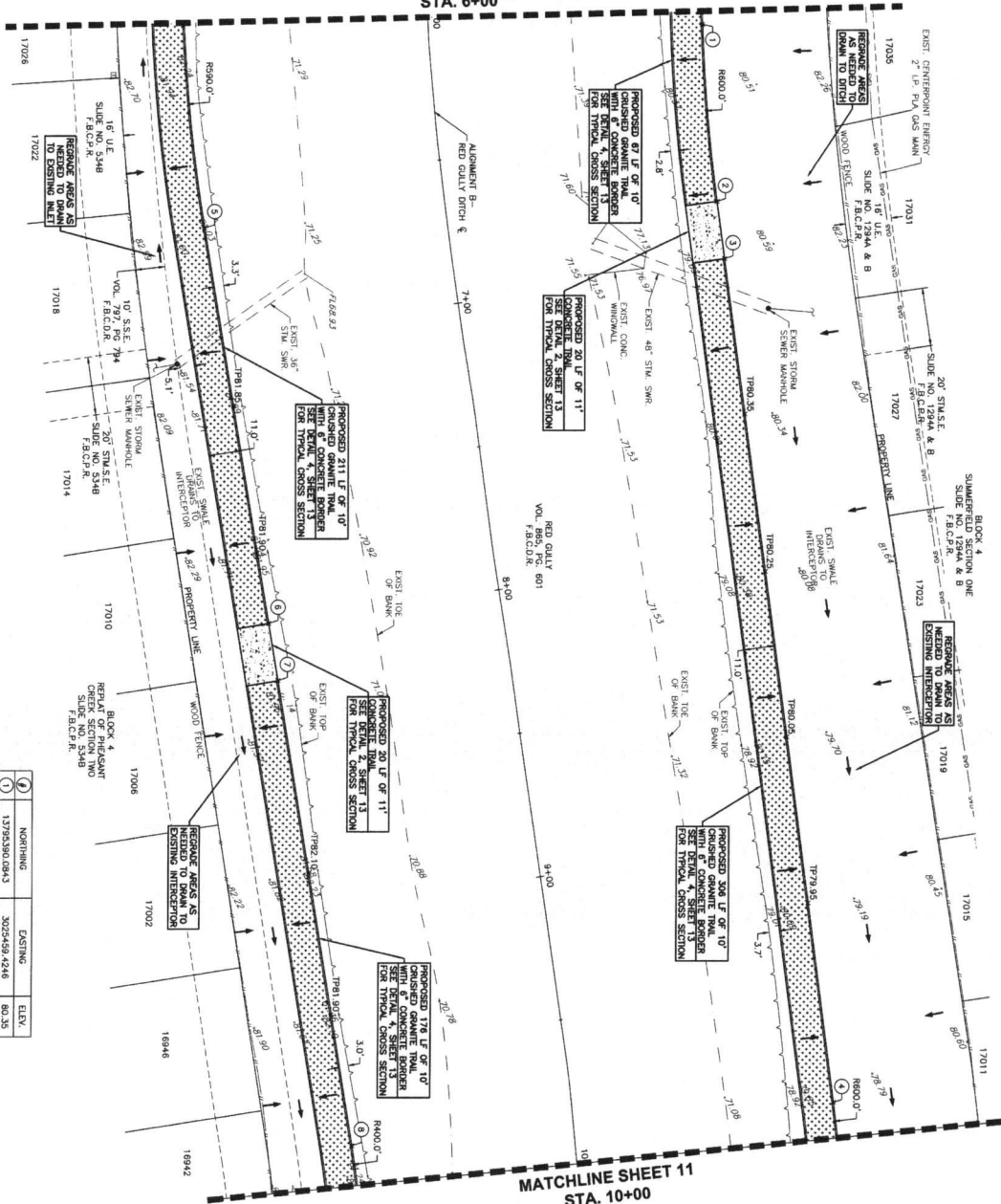
DATE: 5/1/17  
BY: *[Signature]*  
CHECKED BY: *[Signature]*

FOR THE COUNTY OF HARRIS, TEXAS  
E. J. Stevens  
Professional Engineer  
License No. 10288

FOR THE COUNTY OF HARRIS, TEXAS  
E. J. Stevens  
Professional Engineer  
License No. 10288

MATCHLINE SHEET 9

STA. 6+00



MATCHLINE SHEET 11  
STA. 10+00

NO.	NORTHING	EASTING	ELEV.
1	13795390.0943	3022449.4246	80.35
2	13795451.7874	3022453.3958	80.03
3	13795471.5854	3022458.4243	80.00
4	13795761.9884	3022408.7934	79.90
5	13795843.7533	3022429.8414	82.00
6	13795918.6728	3022460.3370	81.92
7	13795918.6728	3022460.3370	81.94
8	13795778.6707	3022572.8871	81.85

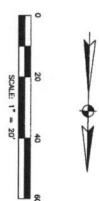
APPROVED: *[Signature]*  
DATE: 1/11/17



NOTES:

- ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE NOTED.
- EXISTING UTILITY LINE LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY ALL LINE SIZES, DEPTHS AND LOCATIONS PRIOR TO EXCAVATION.
- TOP OF EXISTING FOUNDATIONS ARE ONLY APPROXIMATE, AND CONTRACTOR SHALL FIELD VERIFY ALL FOUNDATION DEPTHS AND LOCATIONS PRIOR TO EXCAVATION.
- THE BOTTOM TRANSVERSE SLOPE (SIDEWALK CROSS SLOPE) IS TO BE MAINTAINED AS TO MEET ADA REQUIREMENTS.
- THE MAXIMUM RUNNING SLOPE IS 1:20 OR 5% AND MAXIMUM LENGTH SHALL NOT EXCEED 10 FEET.
- CONCRETE SIDEWALK SHALL HAVE EXPANSION JOINTS AT 40 FEET MAXIMUM SPACING.
- CONCRETE SHALL BE 28-DAY COMPRESSIVE STRENGTH CONCRETE.
- CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE ALONG DITCHES AND TO INTERCEPTOR STRUCTURES & PROTECT INLETS STRUCTURES DISTURBED SHALL BE RECONSTRUCTED IN THE SAME LOCATION AND SIZE AS PRE-CONSTRUCTION CONDITIONS.
- SURVEY BY CIVIL-SURVEY LAND SURVEYING, L.C. NOVEMBER 8, 2016. CONTRACTOR MAY REQUEST A COPY OF SURVEY FROM BUREAU.

**BENCHMARK:**  
CITY OF SODAR LAND REGIONAL CONTROL STATION 58R-14 (BEST) BEING A STAINLESS STEEL ROD IN SLEEVE WITH CAP BROOKS STREET APPROXIMATELY 40' SOUTH OF A LIGHT POLE AND APPROXIMATELY 25' NORTHEAST OF A POWER POLE. ELEVATION = 79.17' (NAVD 1988, 2001 ADJUSTMENT)



**LEGEND:**

	EXIST. ROW OR PROPERTY LINE
	EXIST. EXHAUST LINE
	EXIST. TOP OF BANK (TOB)
	EXIST. SMALLE CENTERLINE
	EXIST. CONCRETE SIDEWALK
	PROP. CONCRETE SIDEWALK
	EXIST. 6-INCH WIDE CONCRETE BORDER
	EXIST. ELEVATIONS
	PROP. TOP-OF-BANK/TOP-OF-PAVEMENT/TOP-OF-CURB/OUTLET
	RELOCATE SIGN IN PATH OF SIDEWALK DRAINAGE DIRECTION ARROW

**IGN** Loudonville, Ohio  
A T E C & S A V T COMPANY

2025 Bryant Drive  
Hudson, Ohio 43024-3720  
Tel: 713-666-0900 Fax: 713-266-7598

DATE: 1/11/17

PROJECT: ALIGNMENT B - STA. 6+00 TO 10+00

**Edwards & Kelcey**  
Professional Engineer  
License No. 15473

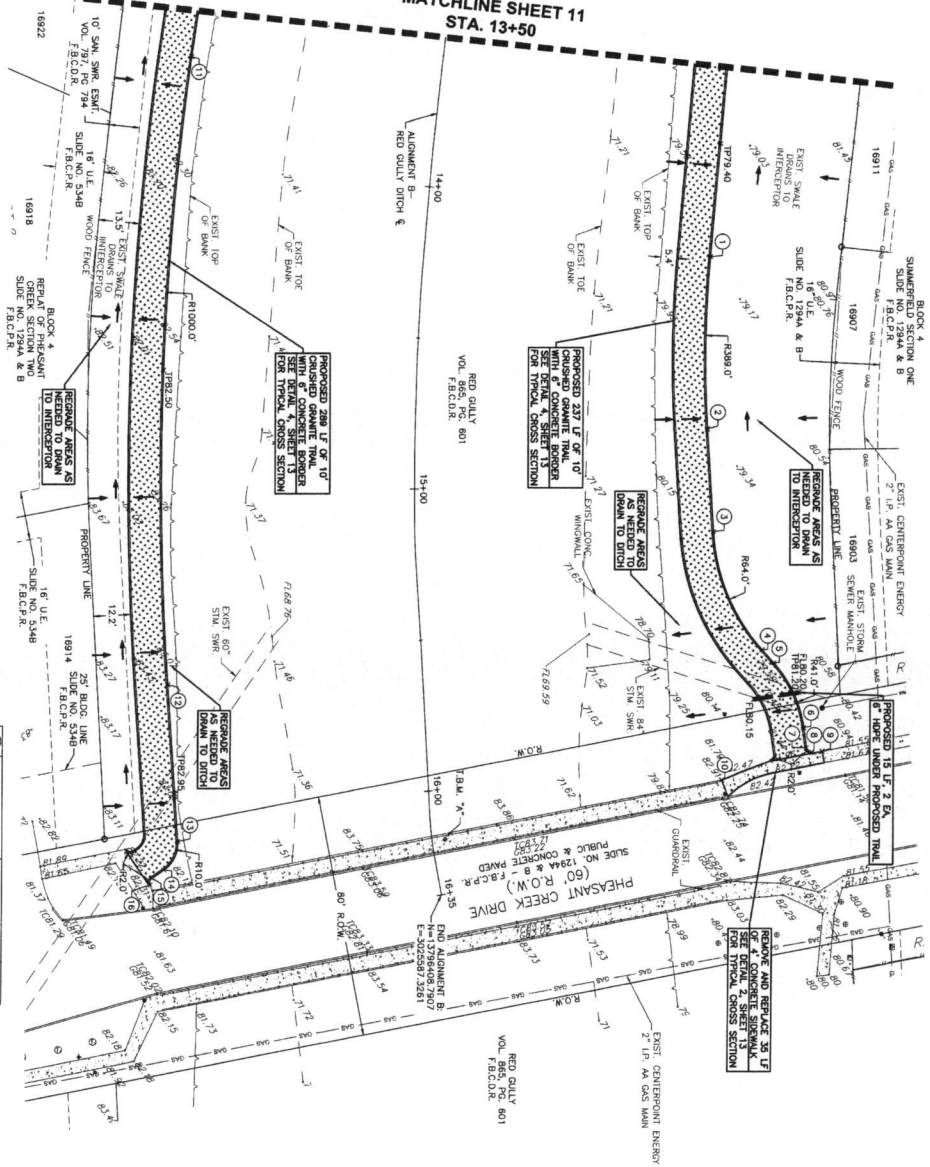
DATE: 1/11/17

PROJECT: ALIGNMENT B - STA. 6+00 TO 10+00

FILE NO.: FORT BEND COUNTY ALIGNMENT B - STA. 6+00 TO 10+00  
DRAWING SCALE: HORIZ. 1" = 20'  
VERT. N/A  
SHEET 10 OF 54



MATCHLINE SHEET 11  
STA. 13+50



**TEMPORARY BENCHMARK 'A'**  
BOX CUT IN THE CENTER OF A CONCRETE SIDEWALK ALONG THE  
SOUTH SIDE OF THE PROPERTY. THE BENCHMARK IS A 4\"/>

NO.	NORTHING	EASTING	ELEV.
1	13798212.8427	3025469.5140	79.60
2	13798268.9370	3025478.5378	79.75
3	13798202.8997	3025481.5191	79.95
4	13798343.8747	3025471.0714	80.90
5	13798348.8768	3025467.9246	81.00
6	13798371.3809	3025461.0988	81.45
7	13798378.1506	3025461.1080	81.70
8	13798378.8010	3025458.4341	81.72
9	13798380.0062	3025464.1450	81.68
10	13798384.5979	3025490.4271	82.91
11	13798122.3741	3025428.3973	82.20
12	13798326.7888	3025686.9791	83.00
13	13798378.6439	3025671.0172	82.55
14	13798387.3054	3025678.8708	82.45
15	13798388.4027	3025681.1980	82.35
16	13798381.5226	3025682.0709	82.29

APPROVED: *[Signature]*  
DATE: 6/21/17



FOR THE CITY OF FORT BEND COUNTY, TEXAS  
ENGINEER: *[Signature]*  
DATE: 6/21/17

- NOTES:**
1. ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE NOTED.
  2. EXISTING UTILITY LINE LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY ALL LINE SIZES, DEPTHS AND LOCATIONS PRIOR TO EXCAVATION.
  3. TOP OF PAVEMENT ELEVATIONS ARE ONLY APPROXIMATE AND MAY NEED TO BE ADJUSTED AS TO MEET PAVEMENT REQUIREMENTS.
  4. THE MAXIMUM TRANSVERSE SLOPE (SIDEWALK CROSS SLOPE) SHALL BE 1:12.
  5. THE MAXIMUM RUNNING SLOPE IS 1:20 (9% MAX) AND MAXIMUM LONGITUDINAL SLOPE FOR THE CONCRETE MAJOR IS 1:12 OR 8.33%.
  6. CONCRETE SIDEWALK SHALL HAVE EXPANSION JOINTS AT 40 FEET MAXIMUM AND CONTROL JOINTS AT 5 FEET MAXIMUM.
  7. CRUSSED GRANITE TRAIL SHALL HAVE 6 INCH WIRE CONCRETE FLEET WORKMAN AND CONTROL JOINTS AT 15-24 FEET MAXIMUM.
  8. CONTRACTOR TO REGRADE BACKSLOPE SWALE AND DITCH HIGH BANK AS NEEDED ALONG PROPOSED SWALE AND DITCH HIGH BANK AND OTHER OBJECTS IN THE GROUND THAT ARE IN THE PATH OF THE TRAIL TO MATCH TRAIL ELEVATION.
  9. THE CONTRACTOR SHALL RESTORE THE LANDSCAPE TO ITS ORIGINAL CONDITION AND REPLACE ANY PLANTS OR TREES THAT HAVE BEEN DISTURBED IN ANY CHANNEL OR CHANNEL ANY OBJECTS THAT HAS BEEN DISTURBED.
  10. THE CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE ALONG FROM EXISTING DRAINAGE STRUCTURES AND PROTECT INLETS FROM SEDIMENT DURING CONSTRUCTION AND OTHERS AND SHALL MAINTAIN POSITIVE DRAINAGE ALONG FROM EXISTING DRAINAGE STRUCTURES AND PROTECT INLETS FROM SEDIMENT DURING CONSTRUCTION.
  11. SURVEY BY CIVIL-SURVEY AND SURVEYING, L.C. NOVEMBER 8, 2016. CONTRACTOR MAY REQUEST A COPY OF SURVEY FROM ENGINEER.

**LEGEND:**

- EXIST. R.O.W. OR PROPERTY LINE
- EXIST. EASEMENT LINE
- EXIST. TOP OF BANK (TOB)
- EXIST. SWALE CENTERLINE
- EXIST. CONCRETE SIDEWALK
- PROP. CRUSSED GRANITE TRAIL WITH EXPANSION JOINTS
- PROP. TOP-OF-CURB/TOP-OF-PAVEMENT/PROP. POINTS. SEE TABLE THIS SHEET
- RECOGNIZE SIGN IN PATH OF SIDEWALK DRAINAGE DIRECTION ARROW

**BENCHMARK:**

CITY OF FORT BEND COUNTY GEODETIC CONTROL STATION SSR-14 (BEST) BUILT A STAINLESS STEEL ROD IN SLEEVE WITH CAP PROTECTS THE ROD FROM CORROSION. THE BENCHMARK IS APPROXIMATELY 35' NORTH-EAST OF A POWER POLE. ELEVATION = 79.17' (NAVD 1988, 2001 ADJUSTMENT)

0 20 40 60  
SCALE 1" = 20'

**IGN**  
Ludwood Andrews  
L.C. 11517  
L.C. 11517  
L.C. 11517

3015 Hempstead Drive  
Houston, Texas 77041-3720  
Tel: 713-266-6900 Fax: 713-266-7596

NOTICE:  
I, the undersigned, Matthew A. Smith, State of Texas License No. 11517, do hereby certify that I am a duly Licensed Professional Engineer in the State of Texas and that I am the Engineer of Record for the project described herein. I am not providing this certification for any other project or for any other purpose. My signature and seal are required for this certification to be valid. I am not providing this certification for any other project or for any other purpose.

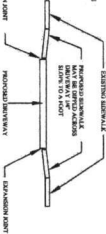
DATE: 6/21/17

FOR THE CITY OF FORT BEND COUNTY, TEXAS  
ENGINEER: *[Signature]*  
DATE: 6/21/17

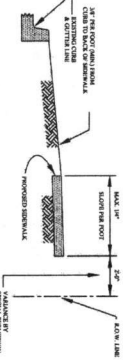
FILE NO.:  
DRAWING SCALE:  
HORIZ. 1" = 20'  
VERT. N/A  
SHEET 12 OF 54

WHEN A RESIDENTIAL SIDEWALK DRIVEWAY CURB OR OTHER IS CONSTRUCTED, THE DRIVEWAY SHALL BE CONSTRUCTED ON COUNTY HIGHWAY OR MAY BE BUILT WITH CONCRETE OR ASPHALT CURBED TYPE STREET, USE SECTION 416.04.01.

C. USE WHEN PROPOSED DRIVEWAY IS TO BE BUILT WITH EXISTING SIDEWALKS WITH EXCESSIVE GRADE



D. USE WHEN SIDEWALKS TO BE BUILT OTHER THAN DRIVEWAYS



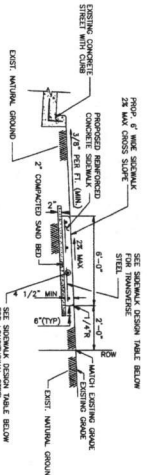
GENERAL NOTES:

1. APPROVED MATERIALS SHALL BE USED FOR ALL CONSTRUCTION. A LIST OF CURRENTLY APPROVED MATERIALS IS AVAILABLE FROM THE ENGINEER.

**SIDEWALKS & DRIVEWAYS ON CURB TYPE STREETS RESIDENTIAL AREA**  
**FORT BEND COUNTY ENGINEERING DEPARTMENT**

DESIGNED BY: L. HOOD  
 DATE: 2-1-94  
 CHECKED BY: L. HOOD  
 DATE: 2-1-94  
 PROJECT NO: FSC-0108

1 SIDEWALKS FOR RESIDENTIAL AREA  
 NOT TO SCALE

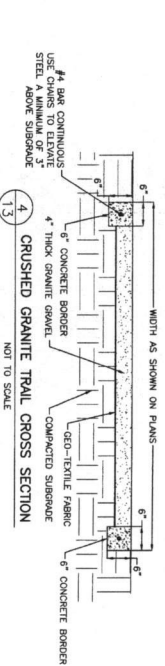


2 CONCRETE SIDEWALK DETAIL  
 NOT TO SCALE

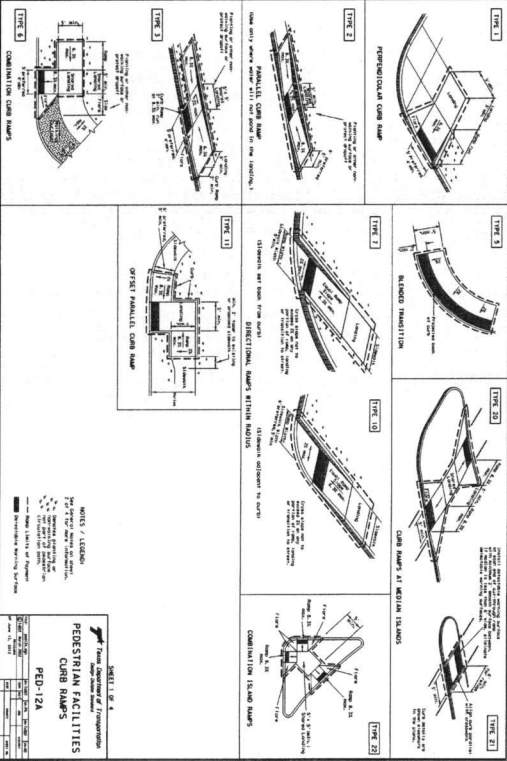
REINFORCING STEEL INFORMATION FOR 4" 1/2" THICK SIDEWALKS  
 EXPANSION JOINT SPACING = 40 FT  
 FC = 3000 PSI AND FY = 60,000 PSI

SIDEWALK THICKNESS (IN)	WIDTH (FT)	NUMBER OF BARS	CONCRETE STRENGTH (PSI)	END BAR SPACING (IN)	TRANSVERSE STEEL SPACING (IN)
4.5	4	3	18	3	16

3 SIDEWALK DESIGN TABLE  
 NOT TO SCALE



4 CRUSHED GRANITE TRAIL CROSS SECTION  
 NOT TO SCALE



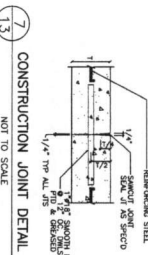
5 WHEELCHAIR RAMP DETAILS  
 NOT TO SCALE

NOTES:

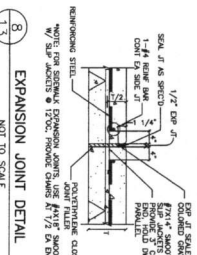
1. ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE NOTED.
2. EXISTING UTILITY LINE LOCATIONS ARE APPROPRIATE. CONTRACTOR SHALL FIELD VERIFY ALL LINE SIZES, DEPTHS AND LOCATIONS PRIOR TO EXCAVATION.
3. TOP OF PRECAST ELEVATIONS ARE ONLY APPROXIMATE AND MAY NEED TO BE ADJUSTED AS TO MEET ADA REQUIREMENTS.
4. THE MAXIMUM TRANSVERSE SLOPE (SIDEWALK CROSS SLOPE) IS 1:48 OR 2% WHEN CROSS SLOPE IS NOT SHOWN.
5. THE MAXIMUM RUNNING SLOPE FOR THE CONCRETE RAMP IS 1:12 OR 8.33%.
6. THE CONCRETE SIDEWALK SHALL BE MINIMUM CLASS 02. THE CONCRETE DRIVEWAY SHALL BE MINIMUM CLASS 03. FINISH AND EXPANSION JOINTS AT 40 FEET MAXIMUM AND 7" MINIMUM THICKNESS AT DRIVEWAYS WITH LIGHT BROOM FINISH, AND EXPANSION JOINTS AT 40 FEET MAXIMUM AND 7" MINIMUM THICKNESS AT DRIVEWAYS WITH LIGHT BROOM FINISH.
7. THRESHOLD SPACES SHALL SPREAD THE FULL WIDTH OF THE CURB RAMP AND SHALL ALSO HAVE A CENTER-TO-CENTER SPACING OF 1.6 INCHES MAXIMUM AND 2.4 INCHES MAXIMUM, MEASURED BETWEEN THE MOST ADVANCED EDGES ON A SQUARE GRID. EDGES SHALL BE 6 INCHES OFF FACE OF CURB.
8. DETERMINE WALKING SURFACES SHALL CONTRAST VISUALLY WITH ADJACENT WALKING SURFACES EITHER LIGHT-DARK, OR DARK-LIGHT.
9. CONTRACTOR SHALL TRIM TREES AND SHRUBS, AND REMOVE ANY FROM SIDEWALK AS TO MEET THE ADA REQUIREMENTS FOR PROTRUSION UNITS.
10. OUTSIDE FINISH SHALL BE OF WOOD OR METAL, OF A SECTION SATISFACTORY TO THE ENGINEER, STRONG, FREE OF TRAVEL CONTROL DANGER BODIES, VALUE AND LETTER BODIES, SHALL BE SECURELY STAKED TO LINE AND GRADE AND NOT MAINTAINED IN A TRAIL POSITION DURING THE DEPOSITING OF MATERIAL. SHALL BE OF SOLID DESIGN AS TO PROVIDE THE CURB REQUIRED AND SHALL BE RIGIDLY ATTACHED TO THE DRIVEWAY.
11. THE REINFORCING STEEL SHALL BE PLACED IN THE POSITION SHOWN BY THE DETAIL. CARE SHALL BE EXERCISED TO KEEP ALL STEEL FREE FROM RUST AND IN ITS PROPER LOCATION.
12. SIDEWALKS SHALL BE CONSTRUCTED IN SECTIONS OF THE LENGTH OF THE DRIVEWAY. THE DRIVEWAY SHALL BE REMOVED BY THE CONTRACTOR, LESS THAN 4 FEET LESS THAN THE DRIVEWAY. THE DRIVEWAY SHALL BE RECONSTRUCTED BY THE CONTRACTOR, LESS THAN 4 FEET LESS THAN THE DRIVEWAY. THE DRIVEWAY SHALL BE RECONSTRUCTED BY THE CONTRACTOR, LESS THAN 4 FEET LESS THAN THE DRIVEWAY.
13. WHERE THE SIDEWALKS ABUT A DRIVEWAY, CURB, INLET, OR DRIVEWAY, THE REINFORCING STEEL SHALL BE PLACED IN THE POSITION SHOWN BY THE DETAIL. CARE SHALL BE EXERCISED TO KEEP ALL STEEL FREE FROM RUST AND IN ITS PROPER LOCATION.
14. THE REINFORCING CONCRETE SIDEWALK SHALL BE PLACED ON A 4" THICK COMPACTED SAND AND 1/2" MINIMUM OF 2" THICK.
15. THE CONTRACTOR SHALL ADJUST ALL BODIES INCLUDING TRAVEL CONTROL DANGER BODIES, VALUE AND LETTER BODIES, THE FACE OF THE SIDEWALK OR TRAIL TO MATCH ELEVATION.
16. THE CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE ALONG DITCHES AND TO INTERCEPT STRUCTURES & PROTECT AND STRUCTURES DISTURBED SHALL BE RE-CONSTRUCTED IN THE ORIGINAL LOCATION AND SIZE AS PRE-CONSTRUCTION.
17. CONTRACTOR SHALL GRADE ADJACENT GROUND TO SIDEWALK OR TRAIL AS NECESSARY AND RE-GRADE AREAS AS SHOWN ON THE PLANS.
18. CONTRACTOR SHALL BE RESPONSIBLE FOR AND MAINTAIN POSITIVE DRAINAGE, LIGHTS, SIGNS, SHEDS, AND OTHER ADJACENT FACILITIES. CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL ADJACENT FACILITIES TO THE SIDEWALK OR TRAIL, INCLUDING THE PROTECTION OF ALL ADJACENT FACILITIES.
19. THE CONTRACTOR SHALL RESTORE THE LANDSCAPE TO ITS ORIGINAL CONDITION OR BETTER IN ALL AREAS DISTURBED BY THE SIDEWALK OR TRAIL. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL ADJACENT FACILITIES TO THE SIDEWALK OR TRAIL, INCLUDING THE PROTECTION OF ALL ADJACENT FACILITIES.

6 CONSTRUCTION NOTES FOR SIDEWALKS AND TRAILS  
 NOT TO SCALE

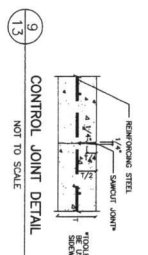
APPROVED: *[Signature]*  
 DATE: 12/1/17



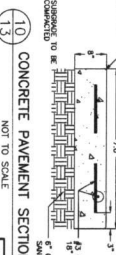
7 CONSTRUCTION JOINT DETAIL  
 NOT TO SCALE



8 EXPANSION JOINT DETAIL  
 NOT TO SCALE



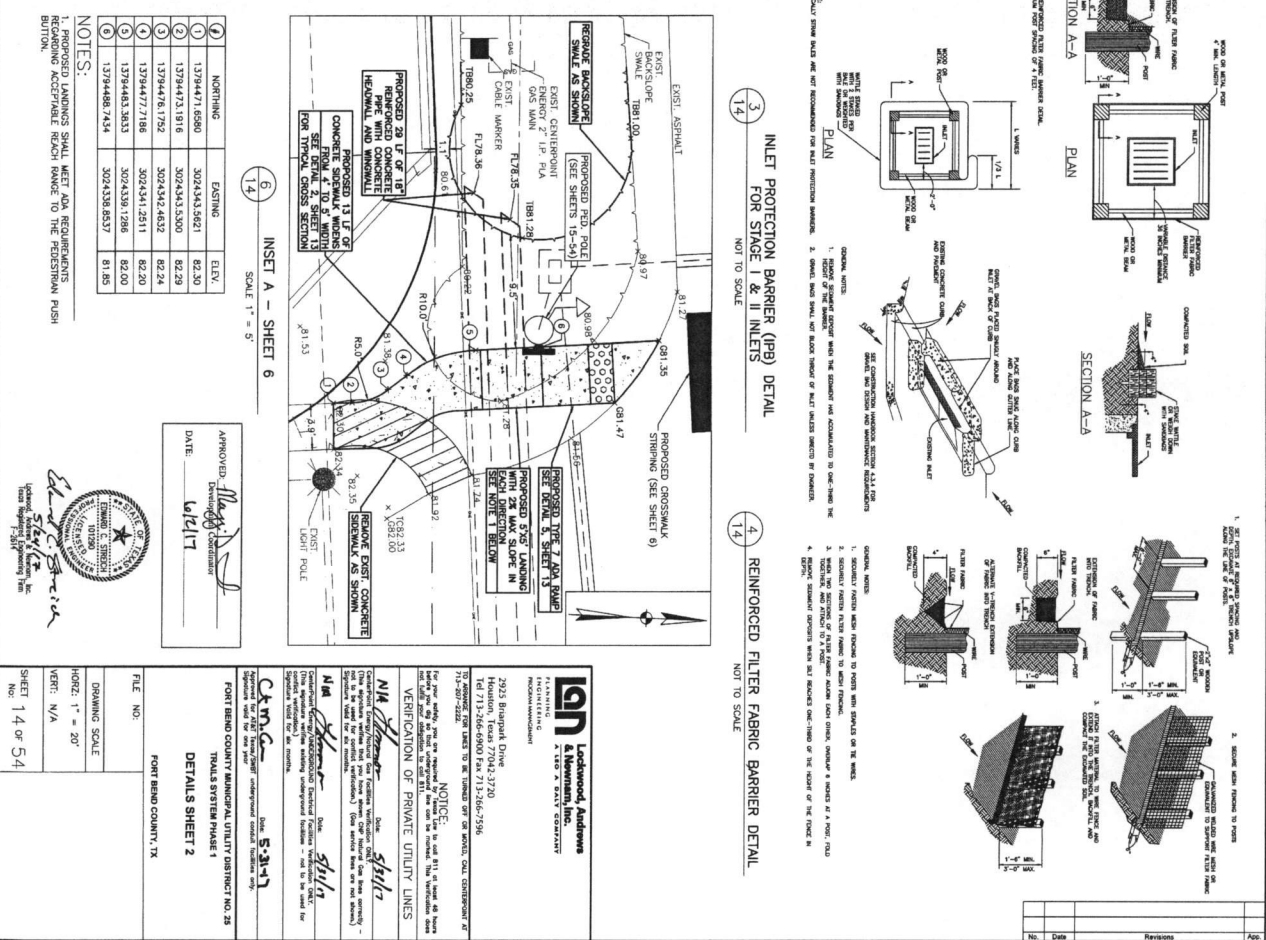
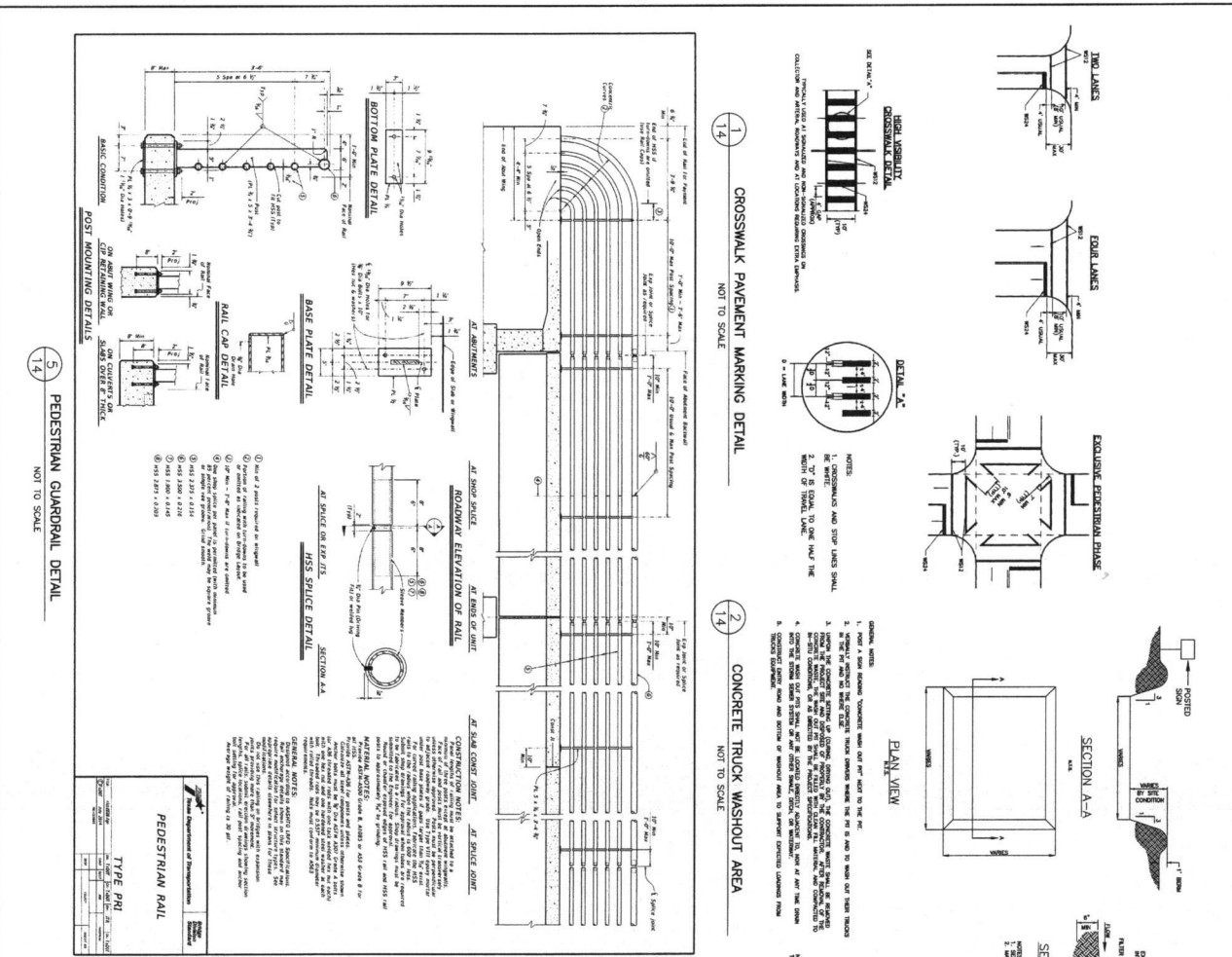
9 CONTROL JOINT DETAIL  
 NOT TO SCALE



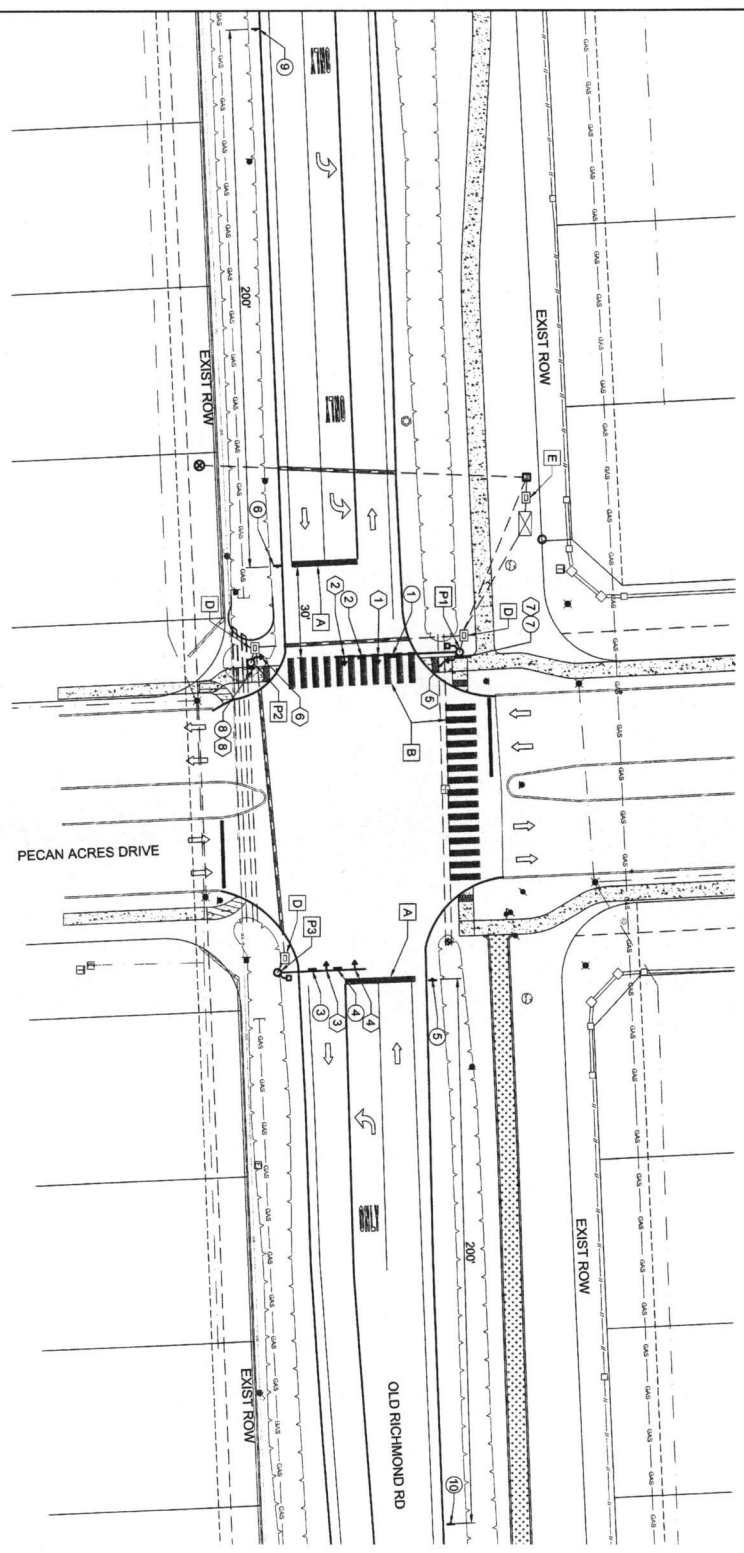
10 CONCRETE PAVEMENT SECTION  
 NOT TO SCALE

**Landmark**  
 Andrew  
 & Associates  
 ENGINEERS  
 2915 Bluffview Drive  
 Houston, Texas 77042-3720  
 Tel: 713-266-6900 Fax: 713-266-7596

FILE NO.	DRAWING SCALE	HORIZ. 1" = 20'	VERT. 1/4"	SHEET 13 OF 54
<p>FOR THE CITY OF FORT BEND COUNTY, TEXAS DISTRICT NO. 25                  TRAILS SYSTEM PHASE 1                  DETAILS SHEET 1</p>				



NOTE:  
 CONTRACTOR SHALL LOCATE/INSTALL PEDESTAL SERVICE AND CONTROLLER CABINET TO AVOID GAS LINE AND AWAY FROM LANDSCAPED ENTRY AREA AS PRACTICAL. ANY DISTURBED LANDSCAPING SHALL BE REPLACED IN KIND AT NO DIRECT PAY.



- ① ② ③ ④ HAWK SIGNAL HEAD
- ⑤ ⑥ COUNTDOWN CENTERLINE SIGNAL HEAD
- ⑦ ⑧ PEDESTRIAN PUSH BUTTON
- ① ③ S-1 \*
- ② ④ CROSSWALK STOP ON RED PROCEED ON FLASHING RED WHEN CLEAR R10-23(MOD) \*
- ⑤ ⑥ STOP HERE ON RED R10-BL
- ⑦ R10-3EL
- ⑧ R10-3ER
- ⑨ ⑩ S-1 \*
- ⑨ ⑩ AHEAD S-16-5P \*

\*FVG = FLUORESCENT YELLOW GREEN  
 \*FVG BACKGROUND  
 \*FVG BACKGROUND FOR CROSSWALK PORTION ONLY

- LEGEND:
- ① SIGN
  - ② SIGNAL POLE
  - ③ HAWK SIGNAL HEAD
  - ④ PEDESTRIAN SIGNAL HEAD
  - ⑤ PEDESTRIAN PUSH BUTTON
  - ⑥ 24" STOP BAR
  - ⑦ 24" CONTINENTAL CROSSWALK
  - ⑧ LUMINAIRE
  - ⑨ CONTROLLER CABINET
  - ⑩ PEDESTAL SERVICE
  - ⑪ JUNCTION BOX (TYPE D)
  - ⑫ JUNCTION BOX (TYPE E)
  - ⑬ EXIST CENTERPOINT PEDESTAL CONDUIT (TRENCHED)
  - ⑭ EXIST CENTERPOINT PEDESTAL CONDUIT (BORED)

Maggie  
 4/21/17

**IGN**  
 Lockwood, Andrews & Newnam, Inc.  
 A U.S. & CANADA COMPANY

2925 Blumhark Drive  
 Houston, Texas 77042-3720  
 Tel: 713-266-8900 Fax: 713-266-2986

FOR OFFICIAL USE ONLY  
 NOTICE: This drawing was prepared under contract for the State of Texas. It is the property of the State of Texas and shall remain the property of the State of Texas. It is loaned to the contractor for use on the project only. It is not to be retransmitted, copied, or otherwise used for any other purpose without the written consent of the State of Texas.

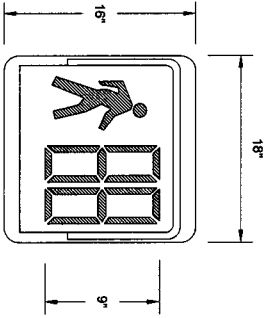
DATE: 5/24/17

PROJECT: FORT BEND COUNTY MUNICIPAL UTILITY DISTRICT NO. 28 TRAILS SYSTEM PHASE 1

SHEET: 15 OF 54

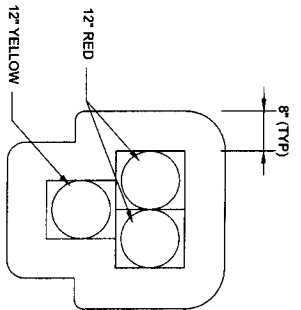
SIGNAL SEQUENCING OPERATION			
STEP	VEHICLE SIGNAL	PEDESTRIAN SIGNAL	SUGGESTED MIN. TIME (s)
1	DARK UNTIL ACTIVATED	SOLID HAND	-
2	FLASHING YELLOW UPON ACTIVATION	SOLID HAND	3
3	SOLID YELLOW/VEHICLE CLEARANCE	SOLID HAND	3
4	SOLID DOUBLE RED	PEDESTRIAN WALK INTERVAL	7
5	ALTERNATE FLASHING DOUBLE RED	FLASHING PEDESTRIAN CLEARANCE INTERVAL	20
6	DARK AGAIN UNTIL ACTIVATED NEXT ACTIVATION	SOLID HAND	4s *

- NOTE:
- IF THE HYBRID PEDESTRIAN TRAFFIC SIGNAL GOES INTO CONFLICT FLASH, THE PEDESTRIAN INDICATIONS SHALL GO DARK AND THE VEHICLE INDICATIONS SHALL FLASH YELLOW IN BOTH DIRECTIONS.
  - ADDITIONAL AFS COUNTDOWN SPEECH IS TO REMAIN OFF.
  - AFS PROGRAMMED SETTINGS SHALL BE IN CONFORMANCE WITH MUTUCD OPERATION REQUIREMENTS.

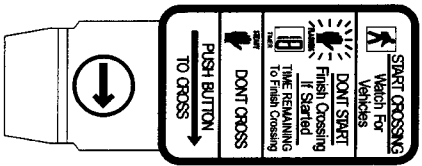


COUNTDOWN PEDESTRIAN SIGNAL

- NOTE:
- 2013 ITE TCDH RECOMMENDS 15 TO 45 SECONDS TO CLEAR CAR QUEUING.
  - MINIMUM BLANK-OUT TIME BETWEEN ACTIVATIONS CAN BE SHORTER DURING PEAK CROSSING TIMES.
  - EXAMPLE - SCHOOL ARRIVAL & DISMISSAL TIMES.
  - THIS CAN BE FIELD ADJUSTED BASED ON LOCAL CONDITIONS.

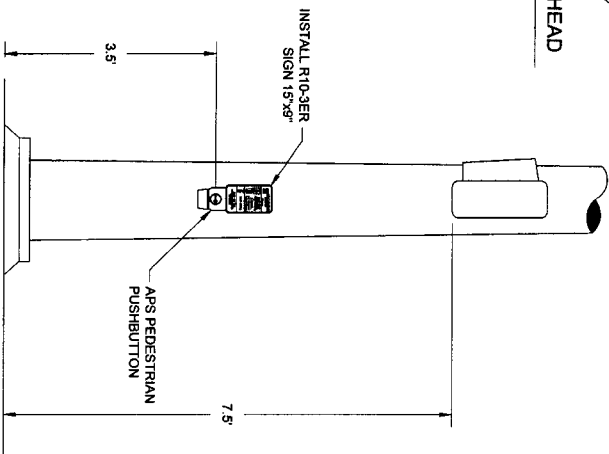


VEHICLE SIGNAL HEAD



APS PEDESTRIAN PUSHBUTTON

NOTES: ACCESSIBLE PEDESTRIAN SIGNAL (APS) UNITS (ITEM #689) ARE TO BE USED.



PEDESTRIAN HARDWARE SIGNAL POLE 2

NOTE: USE THE SAME PEDESTRIAN HARDWARE SIGNAL POLE 1 EXCEPT USE A R10-3EL SIGN.



John A. Hays  
5/24/17

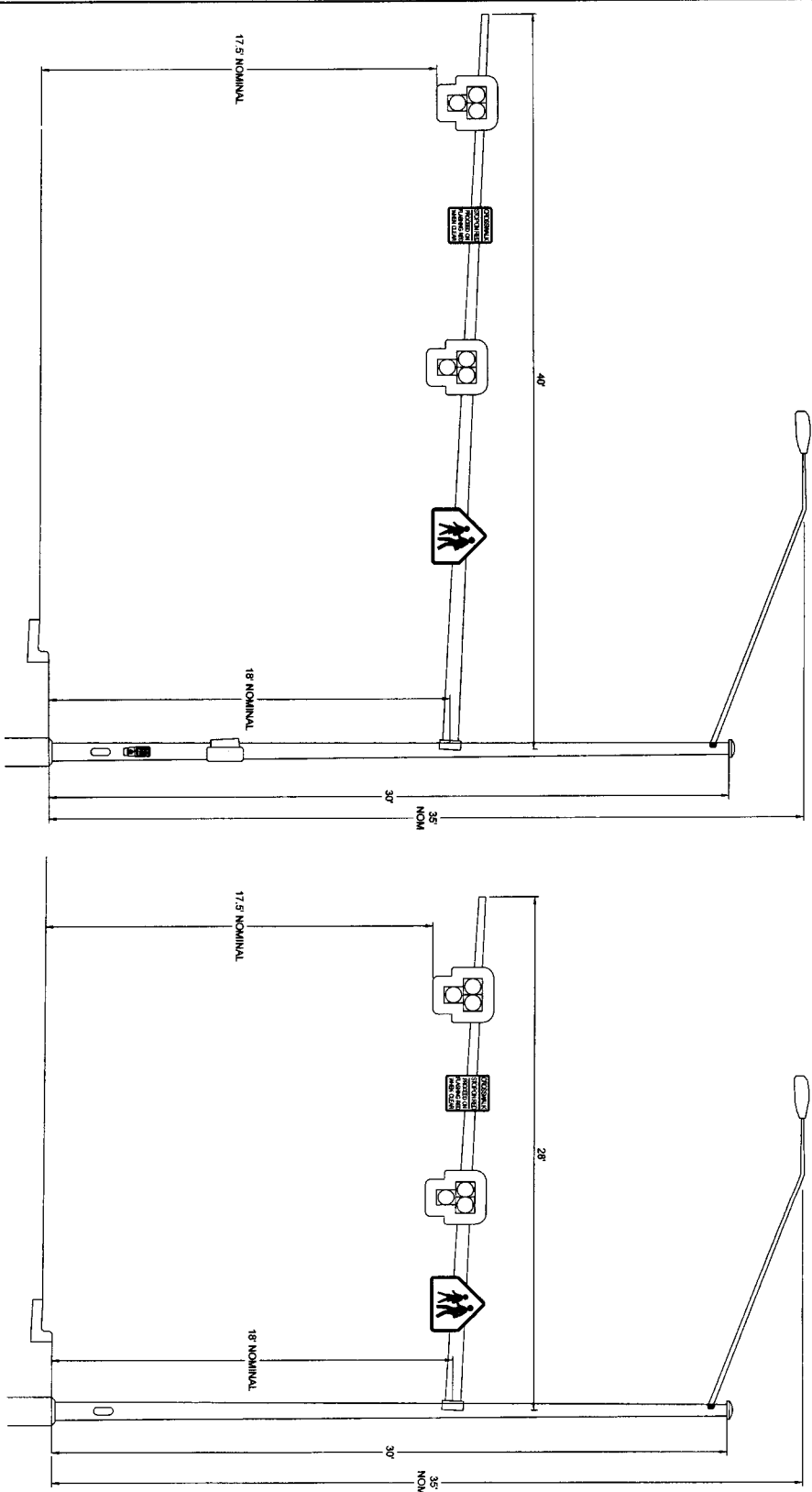
**gan**  
Landmark, Anderson  
& Associates, Inc.  
A TxDOT QUALIFIED CONSULTANT

2925 Sulphur Drive  
Houston, Texas 77043-3720  
Tel: 713-266-5000 Fax: 713-266-7356

NOTICE: It is the policy of Landmark, Anderson & Associates, Inc. to provide the best professional service to our clients. We are committed to the highest standards of integrity and ethics. We are committed to the highest standards of professional conduct. We are committed to the highest standards of customer service. We are committed to the highest standards of innovation. We are committed to the highest standards of excellence.

PROJECT: FORT BEND COUNTY MANUFACTURING UTILITY DISTRICT PHASE 1  
SHEET: 16 OF 54

DATE: 5/24/17  
DRAWING SCALE: NTS  
PROJECT: FORT BEND COUNTY, TX



- SIGNAL POLE ELEVATIONS**
- NOTES:
1. VEHICLE SIGNAL INDICATIONS, SIGNING DIMENSIONS AND LIGHT FIXTURE VEHICLE INDICATIONS AND SIGNING SHALL BE SHOWN ON SIGNAL POLES 1 AND 3.
  2. CENTER VEHICLE SIGNAL HEADS ON EACH APPROACHING LANE.
  3. USE TPOOT STANDARD MOUNTING BRACKETS (ASTRO BRAC) TO MOUNT HAWK SIGNAL HEADS ON MAST ARMS.

*Handwritten signature and date:* M. J. W. 5/24/17

**IGN**  
Landmark Engineering & Surveying, Inc.  
REGISTERED PROFESSIONAL ENGINEER  
No. 11424

3015 Blinnpark Drive  
Houston, Texas 77041-3720  
Tel: 713-266-6900 Fax: 713-266-7596

**NOTICE:**  
The undersigned hereby certifies that the information furnished herein is true and correct to the best of his knowledge and belief, and that he is a duly licensed Professional Engineer in the State of Texas.

**VERIFICATION OF PRIVATE UTILITY LINES**  
The undersigned hereby certifies that the information furnished herein is true and correct to the best of his knowledge and belief, and that he is a duly licensed Professional Engineer in the State of Texas.

**DATE:** 5/24/17

**PROJECT:** FORT BEND COUNTY MANAGERIAL UTILITY DISTRICT NO. 28 TRAILS SYSTEM PHASE 1

**SIGNAL POLE ELEVATIONS**

**FOOT BEND COUNTY, TX**

FILE NO.:  
DRAWING SCALE:  
DATE: NTS  
VERT: 17 of 54

*Handwritten signature:* John A. Harty  
5/24/17

No.	Date	Revision

SIGN NO.	DESCRIPTION	CODE	LOCATION	WIDTH (IN)	HEIGHT (IN)	AREA (SF)	FACING
1	PEDESTRIAN CROSSING SYMBOL	S1-1	P1				EAST
2	CROSSWALK STOP ON RED (CUSTOM)	R10-23(MOD)	P1				EAST
3	PEDESTRIAN CROSSING SYMBOL	S1-1	P3				WEST
4	CROSSWALK STOP ON RED (CUSTOM)	R10-23(MOD)	P3				WEST
5	STOP HERE ON RED	R10-8L					EAST
6	STOP HERE ON RED	R10-8L					WEST
7	ED PLaque FOR PEDESTRIAN SIGNALS	R10-3ER	P1				EAST
8	ED PLaque FOR PEDESTRIAN SIGNALS	R10-3ER	P2				EAST

**SIGN SUMMARY**

SIGNAL HEAD NO.	DESCRIPTION	POLE	LENS SIZE	MOUNTING TYPE	FACING
1	VEHICLE SIGNAL HEAD	1	12"	-	EAST
2	VEHICLE SIGNAL HEAD	1	12"	-	EAST
3	VEHICLE SIGNAL HEAD	3	12"	-	WEST
4	VEHICLE SIGNAL HEAD	3	12"	-	WEST
5	PEDESTRIAN SIGNAL HEAD	1	-	-	SOUTH
6	PEDESTRIAN SIGNAL HEAD	2	-	-	NORTH

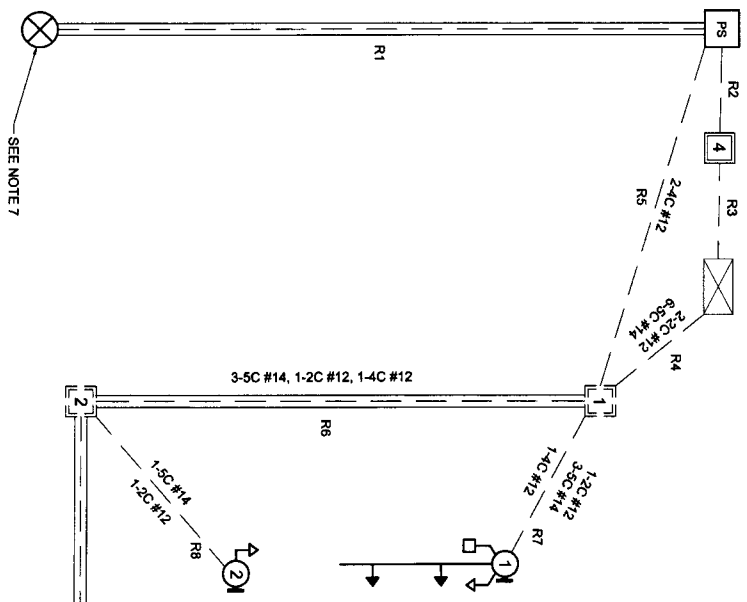
**SIGNAL HEAD SUMMARY**

SYMBOL	DESCRIPTION	WIDTH	LENGTH	COMMENTS
A	SOLID WHITE	24"	24"	STOP BARS (2 TOTAL)
B	SOLID WHITE	24"	116"	CONVENTIONAL CROSSWALK WITH SPACES BETWEEN BARS (26 BARS TOTAL)

**STRIPING SUMMARY**

LOCATION	SHAFT (TRF)	CONDIT	CONDIT	CONDIT	CONDIT	ELEC	ELEC	TRAY	GROUND	GROUND	ELC SRV TY	IN SIA RD	REFL PAV	REFL PAV
416	DRILL	CONDT	CONDT	CONDT	CONDT	ELEC	ELEC	CABLE	GROUND	GROUND	ELC SRV TY	IN SIA RD	REFL PAV	REFL PAV
602	SHAFT (TRF)	(PVC)(SCH	(PVC)(SCH	(PVC)(SCH	(PVC)(SCH	CONDR	CONDR	14	BOX TY D	BOX TY E	D 120/240	SRV SA &	WRK TY I	WRK TY II
603	(36 IN)	40)(17)	40)(17)	40)(17)	40)(17)	(NO B)	(NO B)	(12	(18822)WMA	(12231)WMA	(P94U)	(1) SA (T)	(W) 24"	(W) 24"
604	(36 IN)	(80/8)	(80/8)	(80/8)	(80/8)	INSULATED	INSULATED	(12	PRON	PRON		(1) SA (T)	(SLD)	(SLD)
605	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
606	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
607	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
608	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
609	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
610	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
611	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
612	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
613	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
614	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
615	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
616	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
617	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
618	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
619	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
620	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
621	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
622	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
623	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
624	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
625	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
626	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
627	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
628	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
629	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
630	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
631	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
632	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
633	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
634	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
635	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
636	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
637	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
638	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
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640	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
641	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
642	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
643	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
644	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
645	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
646	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
647	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
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652	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
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692	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
693	UF	UF	UF	UF	UF	UF	UF	UF	EA	EA	EA	EA	UF	UF
694	UF	UF	UF	UF</										

- NOTES:**
1. DRAWING DEPICTS CONDUCTORS REQUIRED TO OPERATE HAWK.
  2. 7C #14 CONDUCTORS MAY BE USED IN LIEU OF 5C #14 CONDUCTORS.
  3. 3/C #6 AWG WIRING FROM POWER SOURCE TO METER/DISCONNECT PEDESTAL BY SERVICE PROVIDER.
  4. 3' EXTRA LENGTH WAS GIVEN AS BUFFER FOR ALL THE CONDUIT RUNS.
  5. ACCESSIBLE PEDESTRIAN SIGNAL (APS) UNITS (ITEM #888) ARE TO BE USED.
  6. INCREASE ALL FOUNDATIONS WHERE CONDUIT LEAVES THE FOUNDATION.
  7. CONTRACTOR SHALL COIL 5' ADDITIONAL SERVICE WIRE AT THE UNDERGROUND ELECTRICAL PEDESTAL SHOWN FOR HOOK UP BY UTILITY PROVIDER. CONTRACTOR SHALL CONTACT CENTERPOINT ENERGY FOR ADDRESS SET UP AT 713-207-4460.
  8. LUMINAIRES SHALL BE LED TYPE (250W HPS EQUIVALENT).



**CONDUIT AND CABLE**

RUN NO.	SIZE & INSTALLATION	LENGTH (FT)	1C #6 AWG XHHW	1C #6 AWG BARE	TRAY CABLE (4C #12)	5C #14 AWG	2C #12 AWG APS
1	3"-B	115	2	1			
2	2"-T	10	2	1			
3	2"-T	10	2	1			
4	4"-T	45		1	2	6	2
5	2"-T	60		1	1	3	1
6	3"-B	70		1	1	3	1
7	3"-T	10		1	1	1	1
8	3"-T	105		1	1	1	1
9	3"-B	105		1	1	2	2
10	3"-T	10		1	1	2	2
CABLE IN RUNS		-	270	330	315	750	180

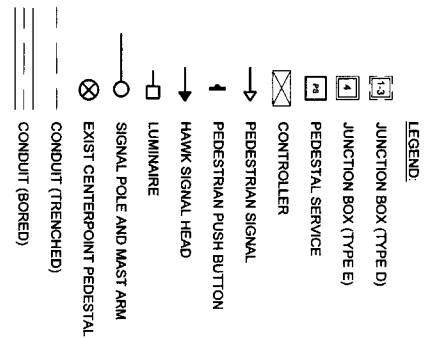
  

**CABLE QUANTITIES INSIDE POLES (LF) - INCL. IN TOTAL SIGNAL CABLE QTY**

POLE NO.	1C #6 AWG XHHW	1C #6 AWG BARE	TRAY CABLE (4C #12)	5C #14 AWG SIGNAL HEAD	2C #12 AWG APS PB
P1	-	-	40	110	5
P2	-	-	40	10	5
P3	-	-	80	95	-
TOTAL QTY INSIDE POLE		-	-	80	205
TOTAL SIGNAL CABLE		270	330	395	955

**ELECTRICAL SERVICES 2003 DATA SHEET**

ELEC. SERVICE NO.	SHEET NO.	ELECTRICAL SERVICE DESCRIPTION (SEE ED (4) & (5) - 03)	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN CKT. BRK. POLE/AMP	TWO-POLE CONTRACTOR AMPS	PANEL/BD/LOAD CENTER AMP RATING	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
1	-	ELC SERV. TY. D 1202240 080 (NSJALE/RSU)	1 1/2"	3#6	N/A	2P/60	N/A	100	A - SIGNAL	1P/50	40	5.5
										B - ILLUMINATION	2P/20	3



*John A. Hoby*  
5/24/17

*Mark A. Clevin*

**IGN** International Grounding & Bonding, Inc.  
3913 Baysport Drive, Houston, Texas 77042-3710  
Tel: 713-246-6900 Fax: 713-246-7396

**NOTICE:** CONTRACTOR SHALL VERIFY ALL CONDUIT RUNS AND SIGNAL HEADS ARE CORRECTLY INSTALLED AND WIRING IS AS SHOWN ON THIS DRAWING. CONTRACTOR SHALL VERIFY ALL FOUNDATIONS ARE AS SHOWN ON THIS DRAWING. CONTRACTOR SHALL VERIFY ALL CONDUIT RUNS ARE PROTECTED FROM DAMAGE BY OTHER TRADES. CONTRACTOR SHALL VERIFY ALL CONDUIT RUNS ARE PROTECTED FROM DAMAGE BY OTHER TRADES. CONTRACTOR SHALL VERIFY ALL CONDUIT RUNS ARE PROTECTED FROM DAMAGE BY OTHER TRADES.

**VERIFICATION OF PRIVATE UTILITY LINES:**

Contractor shall verify all utility lines are as shown on this drawing. Contractor shall verify all utility lines are as shown on this drawing. Contractor shall verify all utility lines are as shown on this drawing.

**VERIFICATION OF PUBLIC UTILITIES:**

Contractor shall verify all public utility lines are as shown on this drawing. Contractor shall verify all public utility lines are as shown on this drawing. Contractor shall verify all public utility lines are as shown on this drawing.

**VERIFICATION OF ALL OTHER UTILITIES:**

Contractor shall verify all other utility lines are as shown on this drawing. Contractor shall verify all other utility lines are as shown on this drawing. Contractor shall verify all other utility lines are as shown on this drawing.

**PROJECT:** FRONT BEARD COUNTY MUNICIPAL UTILITY DISTRICT NO. 25  
**TRIALS SYSTEM PHASE 1**

**SIGNAL WIRING DIAGRAM**

DATE: 5/24/17  
DRAWING SCALE: NTS  
SHEET: 19 OF 54

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**GENERAL NOTES FOR ALL ELECTRICAL WORK**

- The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.
- Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NHTLS such as Condon Standard Association (CSA), Intertek (listing Services NA Inc. or FM Approvals) can be considered equivalent (E) to NEMA listed devices, provided the manufacturer's listing is in accordance with the NEC. Provide a copy of the listing to the Engineer. Acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Fully fabricated or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.
- Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is 1/2" in. or less in diameter.
- Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ohmmeter, megohm meter (5000 volt DC), ground resistance cabinet within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.
- Handall grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conductors, including steel conduits, are grounded to the ground grid system. Provide bonding jumpers, and bonding jumpers or a subsidiary to the various bid items.
- When required by the Engineer, notify the Department in writing of materials from the Material/Producer List (MPL) intended for use on each project. Presubmit materials or No substitutions will be allowed for materials on this list.

**CONDUIT**

**A. MATERIALS**

- Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 1030, "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduit listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Conduit types according to the descriptive code or as shown on the plans. Do not substitute materials without the approval of the Engineer. Provide a copy of the listing to the Engineer. Acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Fully fabricated or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.
- Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans.
- Properly bond all metallic conduits.
- Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box size is given. Count the conductors as if all are of the larger size for situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
*1	10" x 10" x 4"	12" x 12" x 4"	6" x 16" x 4"
*2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
*4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
*6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
*8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

- Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit entries or on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.
- Provide not dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.
- Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting listed and approved for outdoor use. Provide a copy of the listing to the Engineer. Acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Fully fabricated or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.
- Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.
- Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only 90 degree, high tensile strength polyester fiber pultrude for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans, provide galvanized steel RMC elbows with a minimum of 1/2 in. of metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows RMC or PVC elbows are subsidiary to various bid items.
- When required provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC cable for in the plans. Ensure the substituted HDPE meets the requirements of Item 622. The HDPE conduit to PVC for RMC elbow when required of the bored RMC. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.
- Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or not dipped galvanized one-hole standard straps are allowed on the service riser conduit.

**B. CONSTRUCTION METHODS**

- Provide and install expansion joint conduit fittings on all structure-mounted conduits of 1/2" and larger. Provide expansion joint fittings on all continuous runs of galvanized steel RMC conduit, but not on PVC conduit. Provide expansion joint fittings on all expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for the amount of expansion to the Engineer upon request. Do not use LHM or LHM as a substitute for the required expansion conduit fittings.
- Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on DMS1030, "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Do not use LHM or LHM as a substitute for the required expansion conduit fittings.
- Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.
- Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or other the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.
- When opening conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When opening conduit in the sub-grade of existing roadways, backfill all trenches with cement-stabilized base as per requirements of Items 10 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "French Excavation Protection", and 403 "Temporary Special Storing."
- Provide and place warning tape approximately 10 in. above all-trenched conduit as per Item 618.
- During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.
- Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter light sealing hubs or not required.
- Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.
- Install a bonding jumper from each grounding bushing to the nearest ground rod grounding lug. Provide a copy of the listing to the Engineer. Acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Fully fabricated or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.
- Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail sheet ED(4).
- At all electrical services, install a 6 AWG solid copper grounding electrode conductor.
- Secure ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.
- File smooth the cut ends of all mounting strut and conduit. Before painting, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or as allowed under Item 445 "Coating") Do not paint impregnated galvanized material with paint on an alternative for materials required to be galvanized.

*M. J. L. L. L.*

**Texas Department of Transportation**

**Operations Standard**

**ELECTRICAL DETAILS**

**CONDUITS & NOTES**

**ED(1)-14**

REV. 11-2010

DATE: 11-2010

BY: [Signature]

CHECKED: [Signature]

DESIGNED: [Signature]

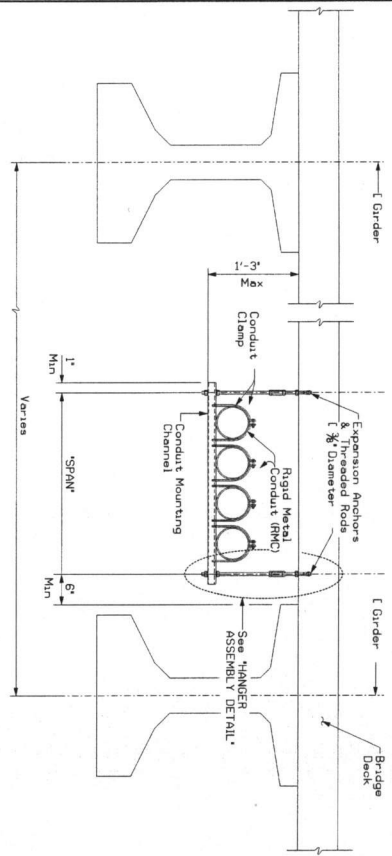
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SCALE: AS SHOWN

SHEET NO. 20

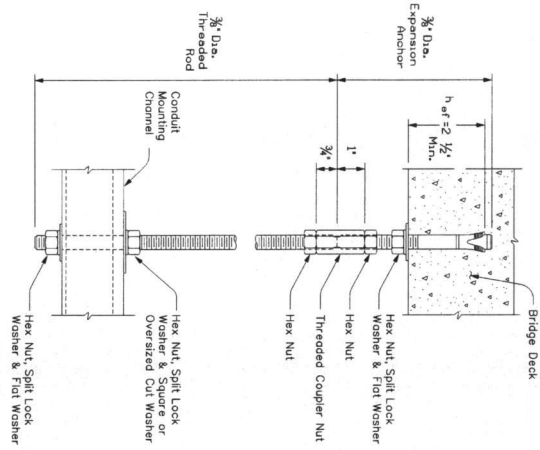
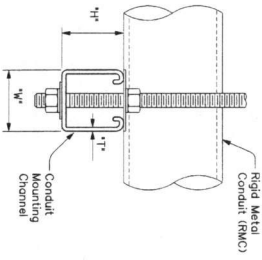
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DATE:  
FILE:



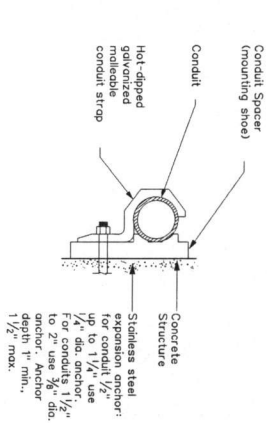
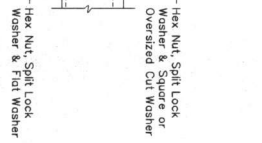
CONDUIT MOUNTING CHANNEL			
"SPAN"	"W" x "H"	"T"	
Less than 2'	1 3/8" x 1 3/8"	12 Ga.	
2'-0" to 2'-6"	1 3/8" x 1 3/8"	12 Ga.	
2'-6" to 3'-0"	1 3/8" x 2 3/8"	12 Ga.	

Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.

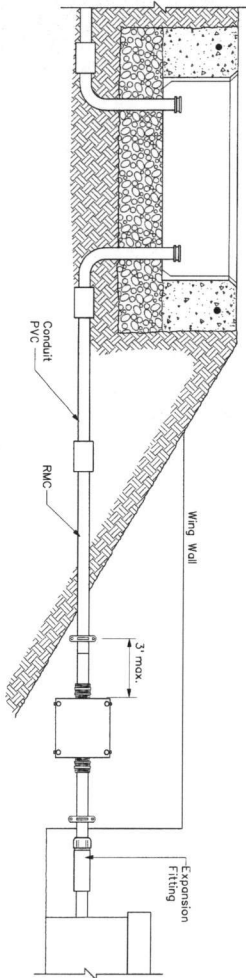
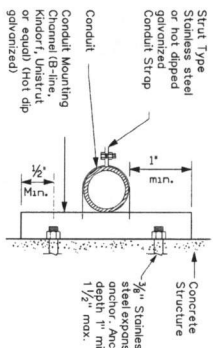


ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT

HANGER ASSEMBLY DETAIL



CONCRETE MOUNTING OPTIONS  
Attachment to concrete surfaces  
See ED(1)B.2



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

- Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council's ECR-ESR-2016 Service (ICC-ES). The chosen anchor product shall have a designated ICC-ES Evaluation Report number, and its approval status shall be maintained on the ICC-ES website under Division 03500 for Concrete Anchors.
- Unless otherwise approved by the Engineer, do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.
- Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environment, both the anchor body and expansion wedge shall be stainless steel.
- Install anchors as shown on the plans and in accordance with the anchor manufacturer's published installation instructions. Arrange a field demonstration test to evaluate the procedures and tools. The test shall be witnessed and approved by the Engineer prior to furnishing anchors on the structure.
- Prior to hole drilling, use rebar locator to ensure clearing of existing deck strands or reinforcement. Install anchors to ensure a minimum embedment depth. (e) If as shown, increase (e) as needed to ensure effective thread length for proper torquing and tightening of anchors.
- Use anchors of minimum 1600 Lbs tensile capacity (minimum of steel, concrete breakout, and concrete pullout strengths as determined by ACI 318 Appendix D) introduced after conduit installation.

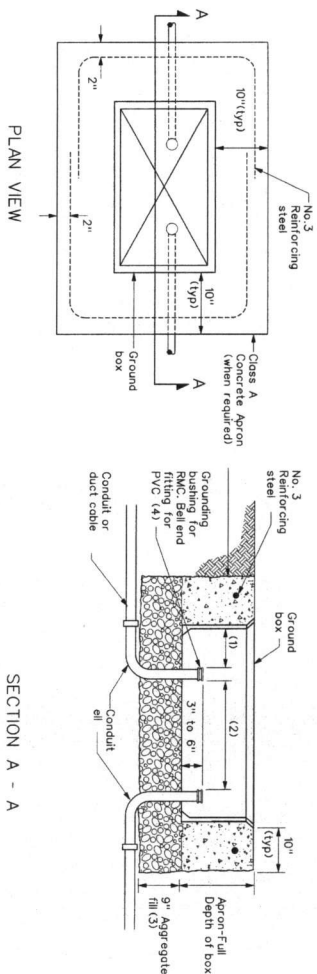
Michael Liblin

<p><b>ELECTRICAL DETAILS</b> <b>CONDUIT SUPPORTS</b></p>			
<p><b>ED(2)-14</b></p>			
FILE	042714.001	REV	1001
DATE	October 2014	JOB	1001
REVISIONS	CONTRACT	NO.	1001
SHEET	COUNT	NO.	21



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DATE:  
FILE:

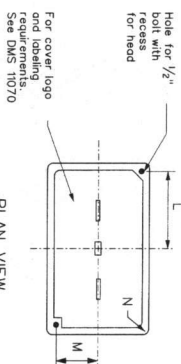


### APRON FOR GROUND BOX

- (1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.
- (2) Maintain sufficient space between conduits to allow for proper installation of bushing.
- (3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.
- (4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOX DIMENSIONS	
TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length x Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

GROUND BOX COVER DIMENSIONS										
TYPE	DIMENSIONS (INCHES)					DIMENSIONS (INCHES)				
	H	I	J	K	L	M	N	P		
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 7/8	1 3/8	2		
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2		



PLAN VIEW

END

SIDE

### GROUND BOX COVER

#### GROUND BOXES

##### A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes".
2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.
3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.

##### B. CONSTRUCTION METHODS

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 624 "Ground Boxes".
2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.
3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.
4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.
5. Cast concrete for the apron extends from finished grade to the top of the aggregate bed and is at least 9 inches deep, prior to setting the ground box inside ground box on top of aggregate.
6. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed and is at least 9 inches deep, prior to setting the ground box inside ground box on top of aggregate.
7. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.
8. Install all conduits and fill in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.
9. Temporarily seal all conduits in the ground box until conductors are installed.
10. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.
11. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.
12. When a Type B or D ground box is stocked to meet volume requirements, it is allowable to cut out an appropriately sized hole for conduit entry in the side wall of at least 18 inches below grade.
13. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items.
14. If metal covers are shown on the plans, with notes fully describing the work required.
15. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.
16. Bond metal ground box covers to the grounding conductor with a link ground Type Lug.



**Texas Department of Transportation**  
Traffic Operations Division Standard

## ELECTRICAL DETAILS

### GROUND BOXES

# ED(4)-14

DATE	04-14-14	BY	LADT	CHK	LADT
ISSUED	10/01/2014	REV	1/2007	REV	1/2007
PROJECT	408	NO. OF SHEETS	20	SHEET NO.	23

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**ELECTRICAL SERVICES NOTES**

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material manufacturers Laboratories (UL) listed. Circuit breaker standards and branch circuit breaker assembly shown on the Electrical Single Line Diagram is justification for rejection. Where manufacturers provide workloads and quantities as a customer's trade product, furnish these to the State.
2. Provide electrical services in accordance with Electrical Details standard sheets, Department of Transportation (DOTS) 1080, "Electrical Services," DMS 1083, "Electrical Services - Type A," DMS 1084, "Electrical Services - Type B," DMS 1085, "Electrical Services - Pedestal (PS)," and Item 628, "Electrical Services" of the Standard Specifications. Provide electrical service Types A, C, and D, as listed in the Standard Specifications. Provide electrical service equipment with illumination and Electrical Supplies, Item 628. Provide other service types as detailed on the plans.
3. Provide all work, materials, services, and any incidents needed to install a complete electrical enclosure as specified in the plans.
4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. The utility company to provide power to the location or point for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Contact the utility provider for determining costs and requirements, and coordinate the work as approved.
5. The enclosure manufacturer will provide Master Lock, Type 2, with brass handles and key #2195 for electrical enclosures. Enclosures must be provided with Master Lock #2195 Type 2 with brass handles for "off the shelf" enclosures. Master Lock #2195 Keys and locks become property of the State. Enclosures otherwise approved do not energize electrical service equipment until locks are installed.
6. Enclosures with external disconnects that de-energize equipment inside the enclosure shall be provided for the disconnecting of equipment from the incident contact as required by the NEC.
7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.
8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 8 American Wire Gauge (AWG) and larger for continuous duty. Provide continuous duty jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with red tops of colored tape when identifying conductors. Ensure each service conductor is properly grounded. The lengths of the conductors outside the weatherhead shall be 12 inches minimum, 18 inches maximum, or as required by utility.
9. All electrical service conductors and conductors attached to the electrical service, including the riser or the elbow below ground or one subsiding to the electrical service, for an underground utility feed, all service conductors and conductors after the elbow, including service conductors and conductors for the utility pole riser when furnished by the contractor, shall be galvanized.
10. Provide rigid metal conduit (RMC) for all conductors on service, except for the 1/2" in. PVC conduit containing the electrical service grounding electrode. RMC shall be galvanized steel, or stainless steel. RMC shall be installed in a trench or conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of conduit specified on the plans. RMC shall be installed in a trench and schedule of grounding building on the RMC where it terminates in the service enclosure.
11. Use of knockout flexible metal conduit (LFMC) is allowed between the meter and LFMC. The same size as service entrance conduit. LFMC must not exceed 3 feet in length. Stop LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be stoppped. Each end of LFMC must have a grounding bushing or be secured to the enclosure. LFMC shall be installed in a trench and schedule of conduit required on alternate conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.
12. Ensure all mounting hardware and installation details of services conform to utility company specifications.
13. For all electrical service enclosures listed under Item 628 on the MFL, the UL 508 enclosure manufacturer will prepare and submit a schematic wiring unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart on the enclosure. The laminated plan sheet shall be placed on the enclosure with the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed on the enclosure in a document pocket. Reduce all drawings to a minimum of 8 1/2" x 11" in plan sheets to fit in the enclosure. The laminated plan sheets are to be placed on the enclosure. The laminated plan sheets are to be placed on the enclosure. The laminated plan sheets are to be placed on the enclosure.
14. When providing a "VOT The Shell" Type D or Type I service, provide laminated plan sheets on alternate conductors, and permit bonding jumpers to grounding wires. The laminated plan sheets are to be placed on the enclosure. The laminated plan sheets are to be placed on the enclosure. The laminated plan sheets are to be placed on the enclosure.
15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding jumpers on alternate conductors, and permit bonding jumpers to grounding wires. The laminated plan sheets are to be placed on the enclosure. The laminated plan sheets are to be placed on the enclosure. The laminated plan sheets are to be placed on the enclosure.

**SERVICE ASSEMBLY ENCLOSURE**

1. Provide threaded hub for all conduit entries into the top of enclosure.
2. Type galvanized steel (GS) enclosures may be used for Type C panelboards. Provide a photoelectric control for lighting. Provide GS enclosures in accordance with DMS 1080, 1082, 1083, and 1084.
3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 1080, 1081, 1082, 1083, and 1084. Do not point stainless steel.
4. Provide pedestal service (PS) enclosures in accordance with ED9 and DMS 1080 and 1085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

**MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS**

1. Field drill flange-mounted remote operator handle. If needed, to ensure handle is lockable in both the "On" and "Off" positions.
2. Where the utility company provides a transformer larger than 50 KVA, verify the utility company provides a transformer larger than 50 KVA breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

**PHOTOELECTRIC CONTROL**

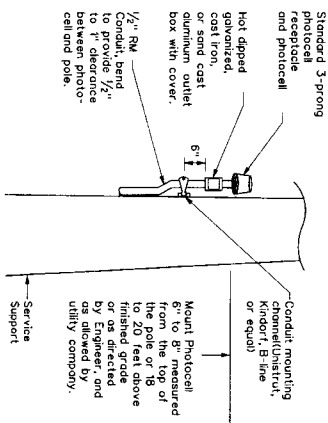
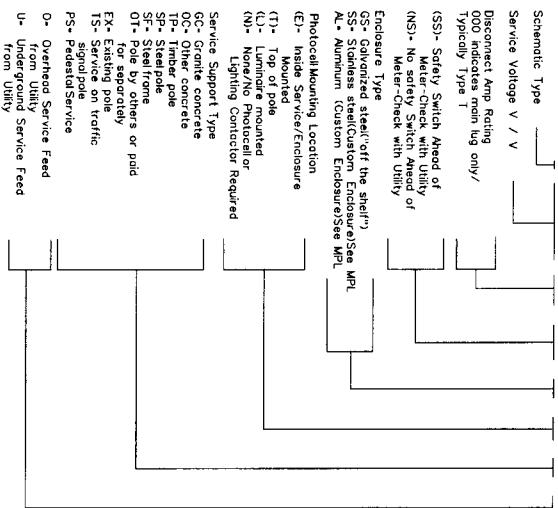
1. Provide photocells listed on the MFL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practice Mount Top of pole photocells as shown on Top Mounted Photoelectric Detail.

**ELECTRICAL SERVICE DATA**

Elec. Serv. ID	Plan Sheet	Electrical Service Description	Service Conduit Size	Service Conductors No./Size	Safety Switch Amps	Mon. Pwr./Amps	Two-Pole Loadcenter Amp Rating	Branch Circuit ID	Branch Pwr./Amps	Branch Circuit Amps	Branch KVA Load
SB 183	299	ELC SRV TY A 240/480 100(SS)AL(ELSR(U))	2"	3/*2	100	2P/0/0	100	Lighting NS Underpass	2P/40	26	28.1
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(CT)SGO	1 1/4"	3/*6	N/A	2P/60	100	Sig. Controller Luminaire CCTV	1P/30	9	5.3
2nd & Main	58	ELC SRV TY T 120/240 000(NS)SS(M)SP(O)	1 1/4"	3/*6	N/A	N/A	70	Fishing Beacon 2	1P/20	4	1.0

\* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans. \*\* Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National Electrical Code.

**EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE**



**TOP MOUNTED PHOTOCELL**

Install conduit stop maximum 3 feet above mounting spacing between struts supporting conduit.

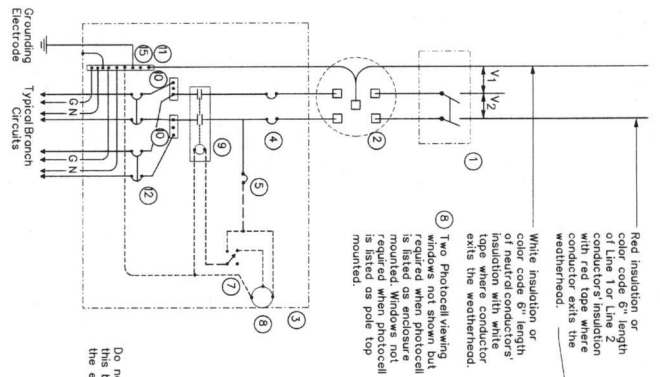
**Texas Department of Transportation**  
**Traffic Operations Division**  
**Standard**

**ELECTRICAL DETAILS**  
**SERVICE NOTES & DATA**  
**ED(5)-14**

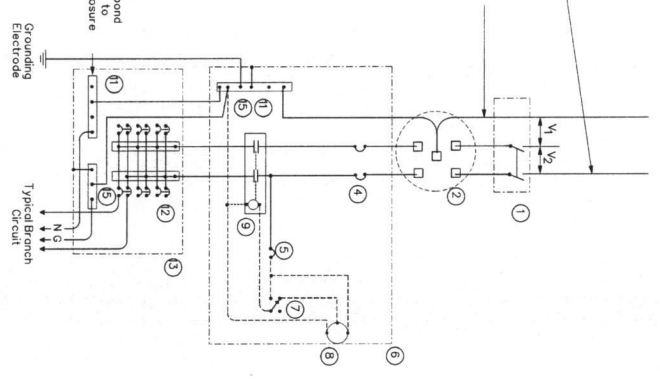
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REVISED	01-20-2010	BY	SCET	CHK	LADT
NO.	001	QUANTITY		SHEET NO.	21

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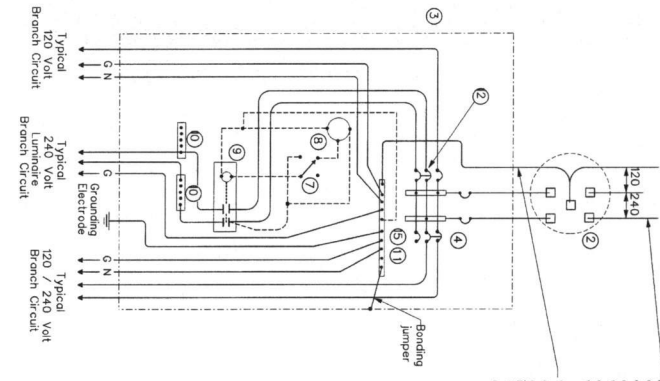
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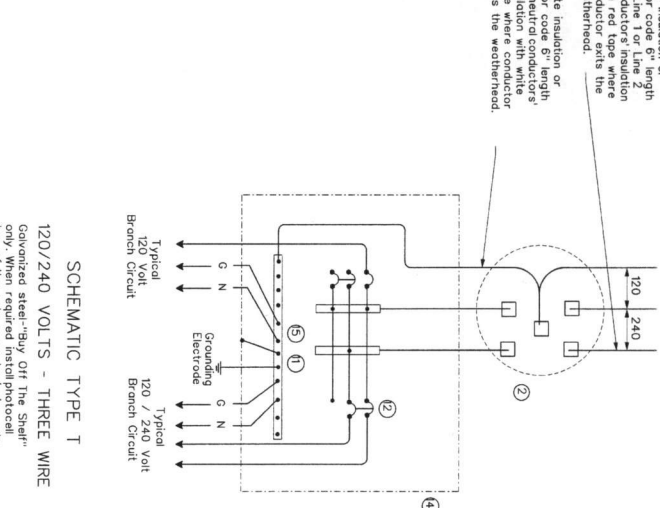
SCHEMATIC TYPE A  
THREE WIRE



SCHEMATIC TYPE C  
THREE WIRE



SCHEMATIC TYPE D - CUSTOM  
120/240 VOLTS - THREE WIRE



SCHEMATIC TYPE T  
120/240 VOLTS - THREE WIRE

**WIRING LEGEND**

—	Power Wiring
—	Control Wiring
—	Neutral Conductor
—	Equipment grounding conductor—always required

**SCHEMATIC LEGEND**

1	Safety Switch (when required)
2	Meter (when required—verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure—mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

Texas Department of Transportation  
Traffic Operations Division  
Standard

**ELECTRICAL DETAILS  
SERVICE ENCLOSURE  
AND NOTES**

ED(6)-14

REV	DATE	BY	CHKD	APP'D
1	10/01/14	10/01/14	10/01/14	10/01/14

11/28/14  
11/21/17



**TRAFFIC SIGNAL NOTES**

1. Do not pass luminaire conductors through the signal-controller cabinet.
2. Include an equipment grounding conductor in all conduits throughout the electrical system. Bond all exposed metal parts to the grounding conductor.
3. Provide roadway luminaires, when required, in accordance with the material and construction sections of Item 610, "Roadway Illumination Assemblies," except for performance testing of luminaires. Test luminaires for proper operation as a part of the associated traffic signal system test.
4. If internally illuminated street name signs are approved for use, bond anchor bolts to rebar cage in two locations using #3 bars or #6 AWG stranded copper conductors. Use listed mechanical connectors rated for embedment in concrete. See TxDOT standard TS-FD for further details.
5. Drill and top signal poles for 1/2" in. X 13 UNC tank ground fitting.
6. Provide and install tank ground fitting 4 in. to 6 in. directly below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Drill and top signal poles for 1/2" in. X 13 UNC tank ground fitting. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. See Inset A detail for further information. Size service entrance conduit and bronze circuit conduit as shown in the plans.
7. Mount electrical service enclosure and meter to signalpole with stainless steel bands. Ensure bands are a minimum width of 3/4" in. Secure enclosures to bands using two-bolt brackets. Install brackets near top and bottom of enclosure, install properly sized stainless steel washers on each bolt. Bands should be installed on top properly sized stand off strips to signalpole for attaching conduit.
8. Conduct pull tests and insulation resistance tests on all illumination and power conductors as required in Item 620, "Electrical Conductors" and EDC(3), on traffic signalcables after termination.
9. Lock all enclosures and bolt down all ground box covers before applying power to the signal installation.
10. Terminate conduits entering the top of enclosures with a conduit-sealing hub or threaded boss such as meter hub. Install a grounding bushing on all metal conduits not connected to conduit-sealing hub or threaded boss. Bond the grounding bushing to the ground bus with a bonding jumper. Seal all conduits with a sealant with duct seal or expanding foam. Do not use silicone to seal conduit ends.
11. For all conduits, ensure the burial depth is a minimum of 18". Ensure the minimum burial depth for conduit placed under a roadway is 24".

**SIGNAL CONTROLLER  
SIDE VIEW**

See TS-CF standard for conduit and grounding requirements. See layout sheets for ground box and conduit details. See additional conduits that are required.

**SIGNAL POLE WITH SERVICE**

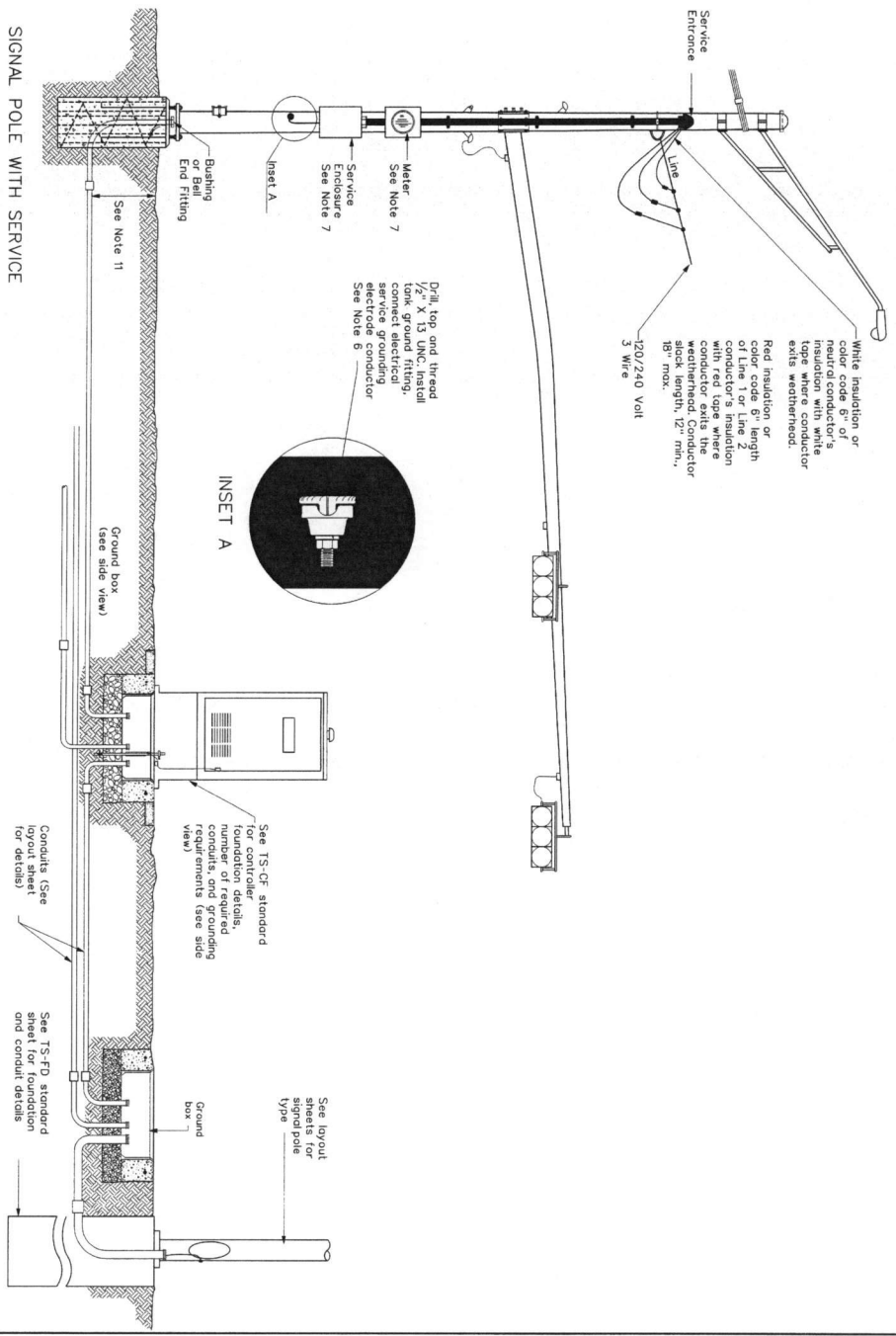
Type I electrical service mounted on signalpole shown as an example. See electrical details, layout sheets, and electrical service data chart for additional details.

**SIGNAL CONTROLLER  
FRONT VIEW**

Conduits (See layout sheet for details)

See TS-FD standard sheet for foundation and conduit details

**SIGNAL POLE**



DATE:  
FILE:

**ELECTRICAL DETAILS  
TYPICAL TRAFFIC SIGNAL  
SYSTEM DETAILS**

**ED(8)-14**

DATE	08/14/97	REV	1.001	BY	1.001	CHK	1.001
DATE	02/08/2014	REV	1.002	BY	200	CHK	1.003
DATE		REV		BY		CHK	
DATE		REV		BY		CHK	

Traffic Operations Division Standard

Texas Department of Transportation

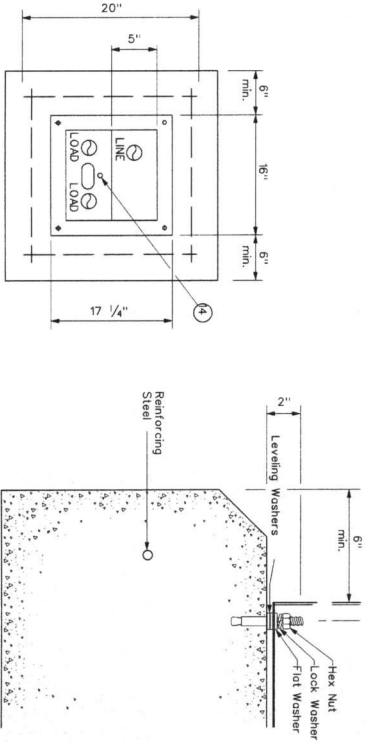
*Missy D. Litch*

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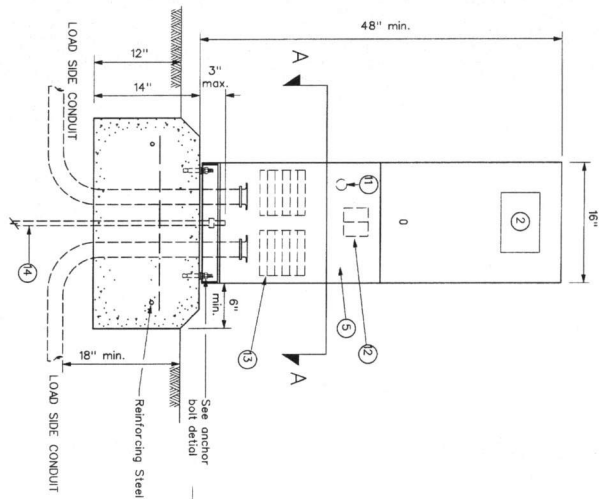
**PEDESTAL SERVICE NOTES**

1. Manufacture pedestal electrical services in accordance with Departmental Material Specifications (DMS) 1080 "Electrical Services," 1085 "Electrical Services-Pedestal (PS)" and Item 628 "Electrical Services." Provide pedestal electrical services as listed on the Material Producers list (MPL) on the Department's web site under "Roadway Illumination and Electrical Supplies," Item 628. Ensure all mounting hardware and installation details of services meet utility company specifications. Contact the local utility company for approval of pedestal details prior to installing the electrical pedestal service. Submit any changes required by the utility company prior to manufacturing the pedestal enclosure.
2. When a meter socket is required, provide a socket with a minimum 100 amp rating that complies with local utility requirements.
3. Provide Class A or C concrete for pedestal service foundations in accordance with Item 420, "Concrete Substructures," except that concrete will not be paid for directly but is considered subsidiary to Item 628.
4. Provide #4 reinforcing steel for foundations in accordance with Item 440, "Reinforcement for Concrete."
5. Install 1/2 in. x 2 1/8 in. minimum length concrete single expansion type anchors for mounting pedestal enclosure to foundation. Anchor location to match mounting holes in each corner of enclosure. Secure each of the four corners of the pedestal enclosure to foundation with expansion anchors. In addition, install a stainless steel machine thread bolt, a properly sized locknut and a flat washer.
6. Finish top of concrete foundation in a neat and workmanlike manner. If leveling washers are used, ensure no more than 1/8 in. gap at any corner. Do not exceed a maximum dip or rise in the foundation of 1/8 in. per foot. When properly installed, ensure the top of the service enclosure is level front to back and side to side within 1/4 in. Repair rocking or movement of the service enclosure at no additional cost to the department.
7. Do not use liquidtight flexible metal conduit (LFMC) on pedestal type services.
8. Ensure all elbows in the foundation are sized as per utility provider's conduit requirements for underground conduit and feeders. PVC extensions may be installed provided the ends of the extension conduits are more than 2 in. below the top of the concrete foundation. Where extension conduits are metal, grounding bushings must be installed with a bonding jumper properly terminated.

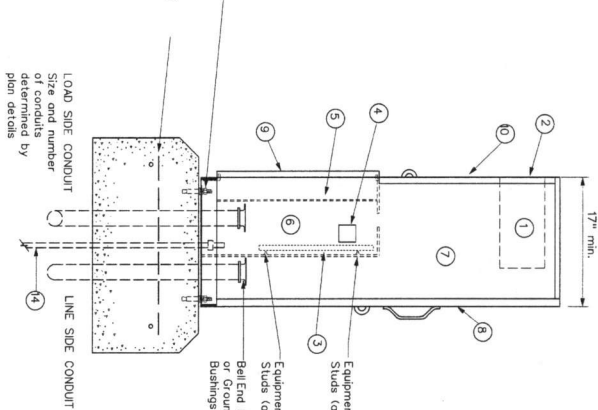


SECTION A-A

ANCHOR BOLT DETAIL



FRONT VIEW



SIDE VIEW

TYPE C shown, TYPE A similar except that TYPE A shall have individual circuit breakers (CB) mounted on an equipment mounting panel. CB handles shall protrude through hinged deadfront trim.

**LEGEND**

1	Meter Socket, (when required)
2	Meter Socket Window, (when required)
3	Equipment Mounting Panel
4	Photo Electric Control Window, (when required)
5	Hinged Deadfront Trim
6	Load Side Conduit Trim
7	Line Side Conduit Area
8	Utility Access Door, with handle
9	Pedestal Door
10	Hinged Meter Access
11	Control Station (H-O-A Switch)
12	Main Disconnect
13	Branch Circuit Breakers
14	Copper Clad Ground Rod - 5/8" x 10'

**ELECTRICAL DETAILS**  
**ELECTRICAL SERVICE SUPPORT**  
**PEDESTAL SERVICE TYPE PS**

**ED(9)-14**

**Texas Department of Transportation**

**Traffic Operations Division**  
**Standard**

DATE	4-24-14	REV	1.001	REV	1.001	REV	1.001	REV	1.001
BY	DLH	CHKD	DLH	APP	DLH	DESIGN	DLH	DRWN	DLH
PROJECT	14001	DESCRIPTION	REVISIONS	DATE	BY	CHKD	APP	DESIGN	DRWN
NO.	28								

MAGG 6/21/17

DATE:  
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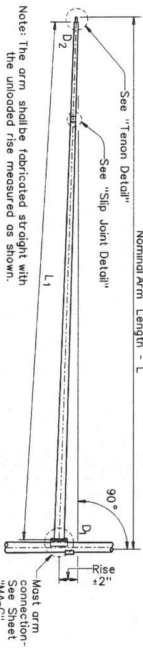
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DATE:  
FILE:

Arm Length	ROUND POLES				POLYGONAL POLES				Foundation Type
	D <sub>g</sub>	D <sub>24</sub>	D <sub>30</sub>	D <sub>thk</sub>	D <sub>g</sub>	D <sub>24</sub>	D <sub>30</sub>	D <sub>thk</sub>	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	
20	12.0	9.3	8.6	7.8	12.5	9.5	8.7	7.8	.239
24	12.0	9.3	8.6	7.8	12.0	9.0	8.3	7.5	.239
28	12.0	9.3	8.6	7.8	13.5	10.5	9.7	8.8	.239
32	13.0	10.3	9.6	8.8	14.0	11.0	10.2	9.3	.239
36	13.5	10.8	10.1	9.3	15.0	12.0	11.2	10.3	.239
40	14.0	11.3	10.6	9.8	16.0	13.0	12.2	11.3	.239
44	14.5	11.8	11.1	10.3	16.5	13.5	12.7	11.8	.239

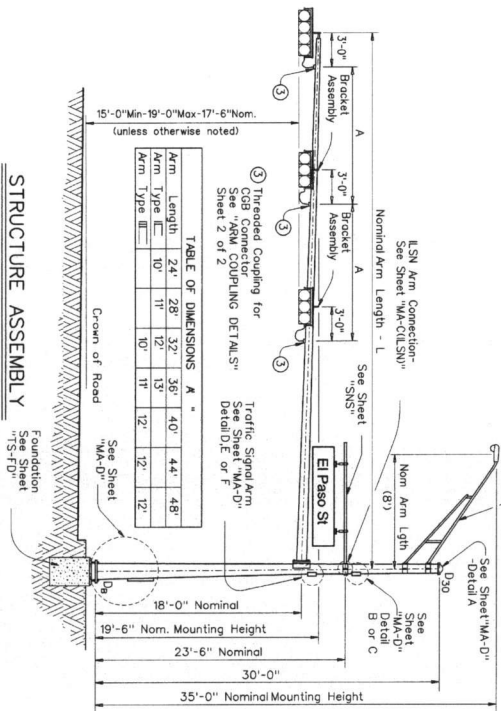
Arm Length	ROUND ARMS				POLYGONAL ARMS			
	L <sub>1</sub>	D <sub>1</sub>	D <sub>2</sub>	D <sub>thk</sub>	L <sub>1</sub>	D <sub>1</sub>	D <sub>2</sub>	D <sub>thk</sub>
ft.	in.	in.	in.	in.	ft.	in.	in.	in.
20	19.1	8.0	5.3	1.79	19.1	8.0	3.5	.179
24	23.1	9.0	5.8	1.79	23.1	9.0	3.5	.179
28	27.1	9.5	5.7	1.79	27.1	10.0	3.5	.179
32	31.0	9.5	5.2	2.39	31.0	9.5	3.5	.239
36	35.0	10.0	5.1	2.39	35.0	10.0	3.5	.239
40	39.0	10.5	5.1	2.39	39.0	11.0	3.5	.239
44	43.0	11.0	5.1	2.39	43.0	11.5	4.0	.239

- D<sub>g</sub> = Pole Base O.D.
- D<sub>24</sub> = Pole Top O.D. with no luminaire
- D<sub>30</sub> = Pole Top O.D. with LSN
- D<sub>thk</sub> = Pole thickness with no luminaire
- D<sub>thk</sub> = Pole thickness with LSN
- D<sub>1</sub> = Nominal Arm Length
- D<sub>2</sub> = Arm End O.D.
- D<sub>2</sub> = Arm End O.D. with no luminaire
- D<sub>2</sub> = Arm End O.D. with LSN
- L<sub>1</sub> = Nominal Arm Length
- L<sub>1</sub> = Nominal Arm Length



**TRAFFIC SIGNAL ARM**

(Fixed Mount)



**SHIPPING PARTS LIST**

Item	Description	Quantity	Designation	Quantity	Designation
1	Ship each pole with the following attached: enlarged hand hole, pole cap, fixed-arm connection bolts and washers and any additional hardware listed in the table.				
2	30' Poles With Luminaire		24 Pole With LSN		19' Poles With No Luminaire and No LSN
3	Above hardware plus: One (or two if LSN attached) small hand hole, clamp-on simplex		Above hardware plus one small hand hole		See note above
4	20L-100	1	205-100	1	20-100
5	24L-100	1	245-100	1	24-100
6	28L-100	1	285-100	1	28-100
7	32L-100	1	325-100	1	32-100
8	36L-100	1	365-100	1	36-100
9	40L-100	1	405-100	1	40-100
10	44L-100	1	445-100	1	44-100

Item	Description	Quantity	Designation	Quantity	Designation
11	Traffic Signal Arms (1 per pole)		Type I Arm (1 Signal)		Type II Arm (2 Signals)
12	1 COB connector		1 Bracket Assembly and 2 COB Connectors		2 Bracket Assemblies and 3 COB Connectors
13	20L-100	1	24 H-100	1	32 H-100
14	24L-100	1	28 H-100	1	36 H-100
15	28L-100	1	32 H-100	1	40 H-100
16	32L-100	1	36 H-100	1	44 H-100
17	36L-100	1	40 H-100	1	44 H-100
18	40L-100	1	44 H-100	1	44 H-100
19	44L-100	1	44 H-100	1	44 H-100

Item	Description	Quantity	Designation	Quantity	Designation
20	Luminaire Arms (1 per 30' pole)				
21	Nominal Arm Length		2		
22	8' Arm				
23	7' Arm				
24	6' Arm				

Item	Description	Quantity	Designation	Quantity	Designation
25	Anchor Bolt Assemblies (1 per pole)				
26	Anchor Bolt Diameter				
27	Anchor Bolt Length				
28	1 1/2"				
29	1 3/4"				
30	4'-3"				

John A. Haly 5/24/17  
 THESE TABLES WERE COMPLETED UNDER MY SUPERVISION



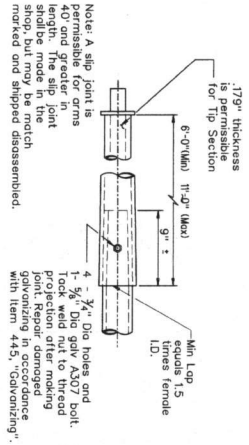
LOUISIANA PROFESSIONAL ENGINEER REGISTRATION NO. 2814

TEXAS Department of Transportation  
 Traffic Operations Division  
**TRAFFIC SIGNAL SUPPORT STRUCTURES**  
**SINGLE MAST ARM ASSEMBLY**  
 (100 MPH WIND ZONE)  
 SMA-100(1)-12

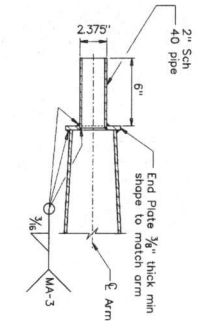
SHEET 1 OF 2

DATE: 5/24/17  
 FILE: 12/117

DATE:  
FILE:



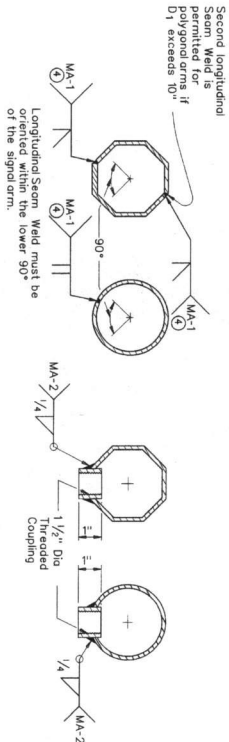
SLIP JOINT DETAIL



TENON DETAIL

Stainless steel bolts (or cables) and cast bracket as in "Astro-Brac" 1 1/2" Dia Threaded Coupling

BRACKET ASSEMBLY



ARM WELD DETAIL

ARM COUPLING DETAILS

**VIBRATION WARNING**

Most Arms of SMA and DMA structures and clamping Arms of LMA structures of approximately 40 ft or longer are subject to harmonic vertical vibrations in light wind conditions due to the aeroelastic characteristics of a few of the myriads of possible combinations of the following signal numbers, arm, such as signs and connection arm wind distribution and arm pole structure.

Such vibrations may cause fatigue damage to the structure and may lead to galloping in moderate wind that when wind is blowing toward the pole. The public tests have indicated the probability of unacceptable harmonic vibration and/or galloping is rather high. Windspatters attached to backplates are not required for improved visibility they should not be applied to the signal heads or if they must be applied, they should be vented so a first and responsive measure to mitigate vibrations.

The traffic signal mast arms shall be visually inspected in 5 to 20 mph wind conditions after installation of signal heads and any attachment equipment. If excessive upward or downward movements with a total excursion (maximum upward excursion to maximum downward excursion) of more than approximately 8" are observed at the arm tip, a damping plate shall be fitted to the arm. See "Damping Pole Mounting Details" on standard sheet, MA-DP-10.

This visual inspection shall be repeated after each modification of the structure that could affect its aeroelastic response. Excessive vibrations shall not be allowed to continue for more than two days.

**GENERAL NOTES:**

Design conforms to 1994 ASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signs and Interim Specifications thereto. Design Wind Speed equals 100 mph plus a 1.3 gust factor.

Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a total arm load of 1000 lbs. The specified luminaire load applied at the end of the luminaire arm and the specified street name sign load applied at the end of the street name sign shall be applied at a horizontal wind load on an effective projected area of 1.6 sq ft. The specified internally lighted street name sign load applied 4.5 ft from the centerline of the pole equals 85 lbs vertical dead load plus 180 lbs horizontal wind load. The specified traffic signal arm load applied at the end of the traffic signal arm equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft (octad area times drag coefficient).

See Standard Sheet "MA-D" for pole details, "MA-C" for traffic signal arm connection details, "MA-G (LISN)" for internally lighted connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details. See "MA-C" for material specifications.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld materials, fabrication tolerances, and shipping practices shall be the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing", after fabrication. Deviation from the details and dimensions shown herein require submission of shop drawings for review and approval. Item 441, "Steel Structures", alternate designs are not acceptable.

SHEET 2 OF 2

*Handwritten signature and date*

**Texas Department of Transportation**  
Traffic Operations Division

**TRAFFIC SIGNAL  
SUPPORT STRUCTURES  
SINGLE MAST ARM ASSEMBLY  
(100 MPH WIND ZONE)**

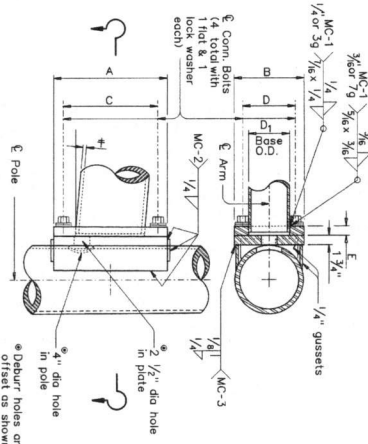
**SMA-100(2)-12**

DATE	REV	BY	CHK	APP
10/01/17	1	ML	ML	ML

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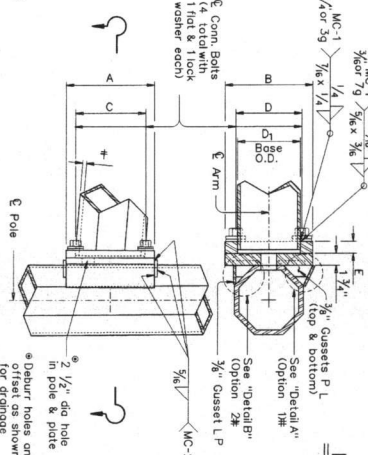
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D <sub>1</sub>	#	In.	In.	In.	In.	In.	In.
6.5	.179	12	9	9	6	1 3/4	1
7.5	.179	13	9	10	6	1 3/4	1
8.0	.179	14	10	11	7	2	1 1/4
9.0	.179	16	11	13	8	2	1 1/4
9.5	.179	17	12	14	9	2	1 1/4
10.0	.239	18	12	15	9	2	1 1/4
10.5	.239	18	13	15	10	3	1 1/2
11.0	.239	18	13	15	10	3	1 1/2



FIXED MOUNT DETAIL 1

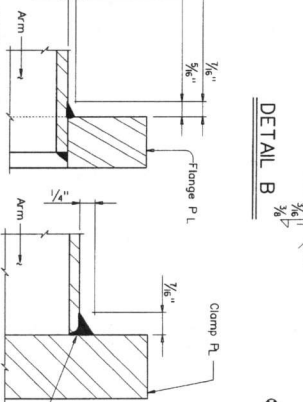
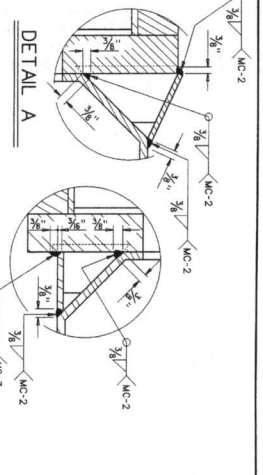
ARM SIZE		A	F	No.	Dia	No.	Dia
D <sub>1</sub>	#	In.	In.	Co.	In.	Co.	In.
6.5	.179	12	6	4	1	2	3/8
7.5	.179	14	8	4	1	2	3/8
8.0	.179	14	8	4	1	2	3/8
9.0	.179	16	10	4	1	2	3/8
9.5	.179	16	10	4	1	2	3/8
10.0	.239	18	12	4	1 1/4	3	3/8
10.5	.239	18	12	4	1 1/4	3	3/8
11.0	.239	18	12	4	1 1/4	3	3/8

ARM SIZE		A	B	C	D	E	CONN. BOLT DIA.
D <sub>1</sub>	#	In.	In.	In.	In.	In.	In.
7.0	.179	11	8	8	8	1 3/4	1 1/4
7.5	.179	11	8	8	8	1 3/4	1 1/4
8.0	.179	11	8	8	8	1 3/4	1 1/4
9.0	.179	13	10	10	10	2	1 1/4
9.5	.239	13	10	10	10	2	1 1/4
10.0	.239	14	11	11	11	2	1 1/4
10.5	.239	14	11	11	11	3	1 1/2
11.0	.239	14	11	11	11	3	1 1/2



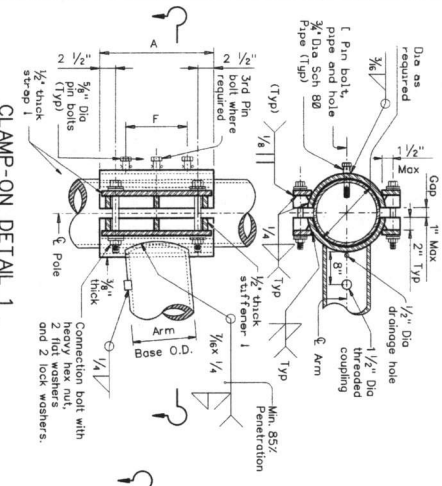
FIXED MOUNT DETAIL 2

ARM SIZE		A	F	T	No.	Dia	No.	Dia
D <sub>1</sub>	#	In.	In.	In.	Co.	In.	Co.	In.
7.0	.179	12	6	3 1/4	4	1 1/4	2	3/8
7.5	.179	14	8	3 1/4	4	1 1/4	2	3/8
8.0	.179	14	8	3 1/4	4	1 1/4	2	3/8
9.0	.179	16	10	3 1/4	4	1 1/4	2	3/8
9.5	.179	16	10	3 1/4	4	1 1/4	2	3/8
10.0	.239	18	12	3 1/4	4	1 1/4	2	3/8
10.5	.239	18	12	3 1/4	4	1 1/4	2	3/8
11.0	.239	18	12	3 1/4	4	1 1/4	2	3/8

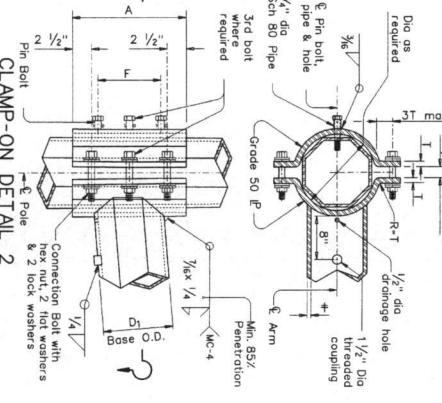


ARM BASE WELD DETAILS

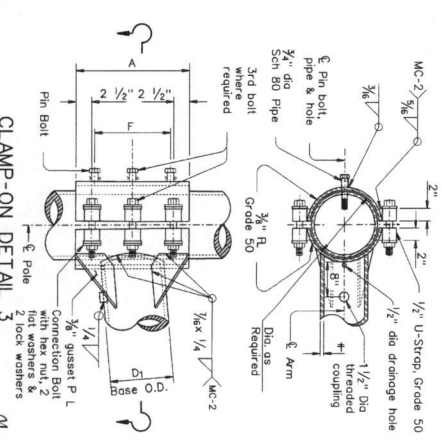
ARM SIZE		A	F	No.	Dia	No.	Dia
D <sub>1</sub>	#	In.	In.	Co.	In.	Co.	In.
6.5	.179	12	6	4	1	2	3/8
7.0	.179	14	8	4	1	2	3/8
7.5	.179	14	8	4	1	2	3/8
8.0	.179	16	10	4	1	2	3/8
9.0	.179	16	10	4	1	2	3/8
9.5	.179	16	10	4	1	2	3/8
10.0	.239	18	12	4	1 1/4	3	3/8
10.5	.239	18	12	4	1 1/4	3	3/8
11.0	.239	18	12	4	1 1/4	3	3/8



CLAMP-ON DETAIL 1



CLAMP-ON DETAIL 2



CLAMP-ON DETAIL 3

MATERIALS	
Round Shirts or Polygonal Shirts	ASTM A595 Gr. A, A598, A608 HSLAS-F, Gr. 50 Class 2, or A611 HSLAS-F Gr. 50 Class 2, A572 Gr. 50
Pipes	ASTM A36, A588, or A572 Gr. 50
Connection Bolt	ASTM A325 or A449, except where noted
Pin Bolt	ASTM A325
Pipe	ASTM A53 Gr. B, A601, A608 HSLAS-F Gr. 50, A611 HSLAS-F Gr. 50
Misc. Hardware	Galvanized steel or stainless steel or as noted

GENERAL NOTES:

Clamp-on details are used for the second arm on dual-arm assemblies. A Maximum 1 1/2" wide vertical slotted hole shall be provided for drainage during installation. The hole shall be 1/2" from the top and bottom edges of the arm and shall be no longer than the arm diameter minus 1".

Fixed mount details are used for single arm assemblies and for the first arm on dual-arm assemblies.

Where duplicate parts occur on a detail, welds shown for one part shall apply to all other parts on the detail.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces.

NOTE:

Pin bolts shall be A325 with threads excluded from the grip zone. Pin bolt and 3/4" dia pipe shall be galvanized or galvanized in place. A 3/4" dia hole for each pin bolt. An 1 1/2" dia hole for each pin bolt shall be drilled through the pole by the fabricator.

Texas Department of Transportation  
Traffic Operations Division

STANDARD ASSEMBLY  
FOR TRAFFIC SIGNAL  
SUPPORT STRUCTURES  
MAST ARM CONNECTIONS

MA-C-12

1/10/11 August 1995

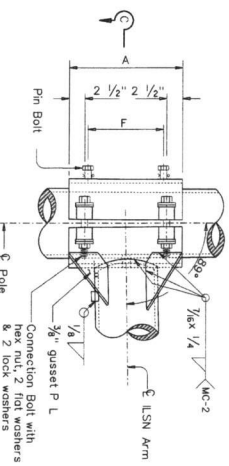
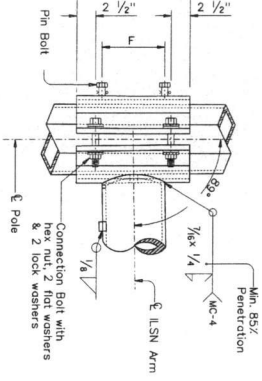
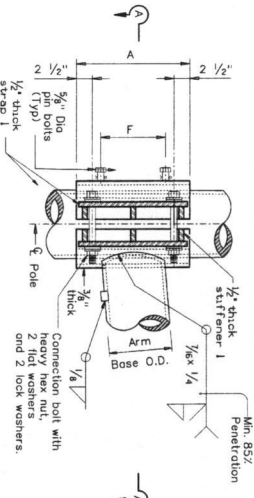
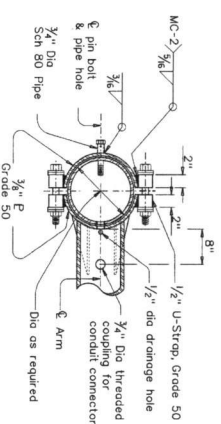
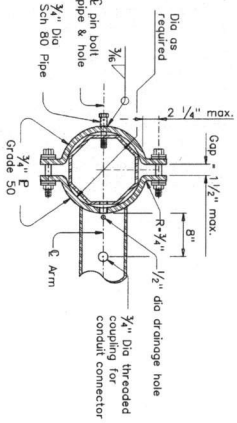
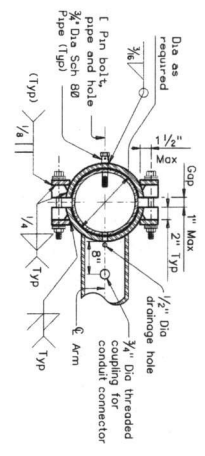
REV	DATE	BY	CHK	APP
1	08/11/95	...	...	...
2	08/11/95	...	...	...

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DATE:  
FILE:

**TABLE OF DIMENSIONS**  
for LSN Support 2 Arm Clamp-on

LSN ARM SIZE	CONN. BOLTS		PIN BOLTS	
	A	F	No.	Dia.
3 in. dia Schedule 40 Pipe	10	4	4	1/4
				2
				3/8



**GENERAL NOTES:**

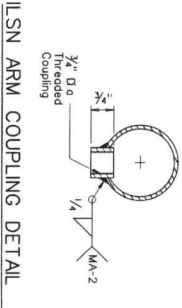
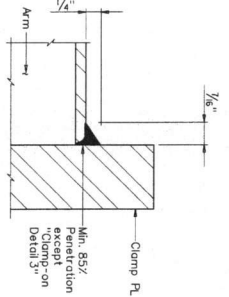
Clamp-on details shall be used for LSN support arm assemblies. A 1 1/2" inch diameter hole shall be cut in the front clamp plate for wiring access. A note on the drawing shall specify the size of the hole. The hole shall be deburred after arm is oriented. Debur both holes.

Where duplicate parts occur on a detail, welds shown (except shop supply) to all similar parts on the details.

Pin bolts are required to prevent rotation of clamp on arms under design wind forces.

NOTE:  
Pin bolts shall be A325, with threads excluded from the shear plane. Pin bolt and 3/4" dia pipe shall have 3/8" dia holes for a 1/2" dia galvanized coating pin. Back clamp plate shall be 1/2" dia galvanized steel. All other parts shall be field drilled through for each pin bolt orientation have been approved by the Engineer.

**ARM BASE WELD DETAILS**



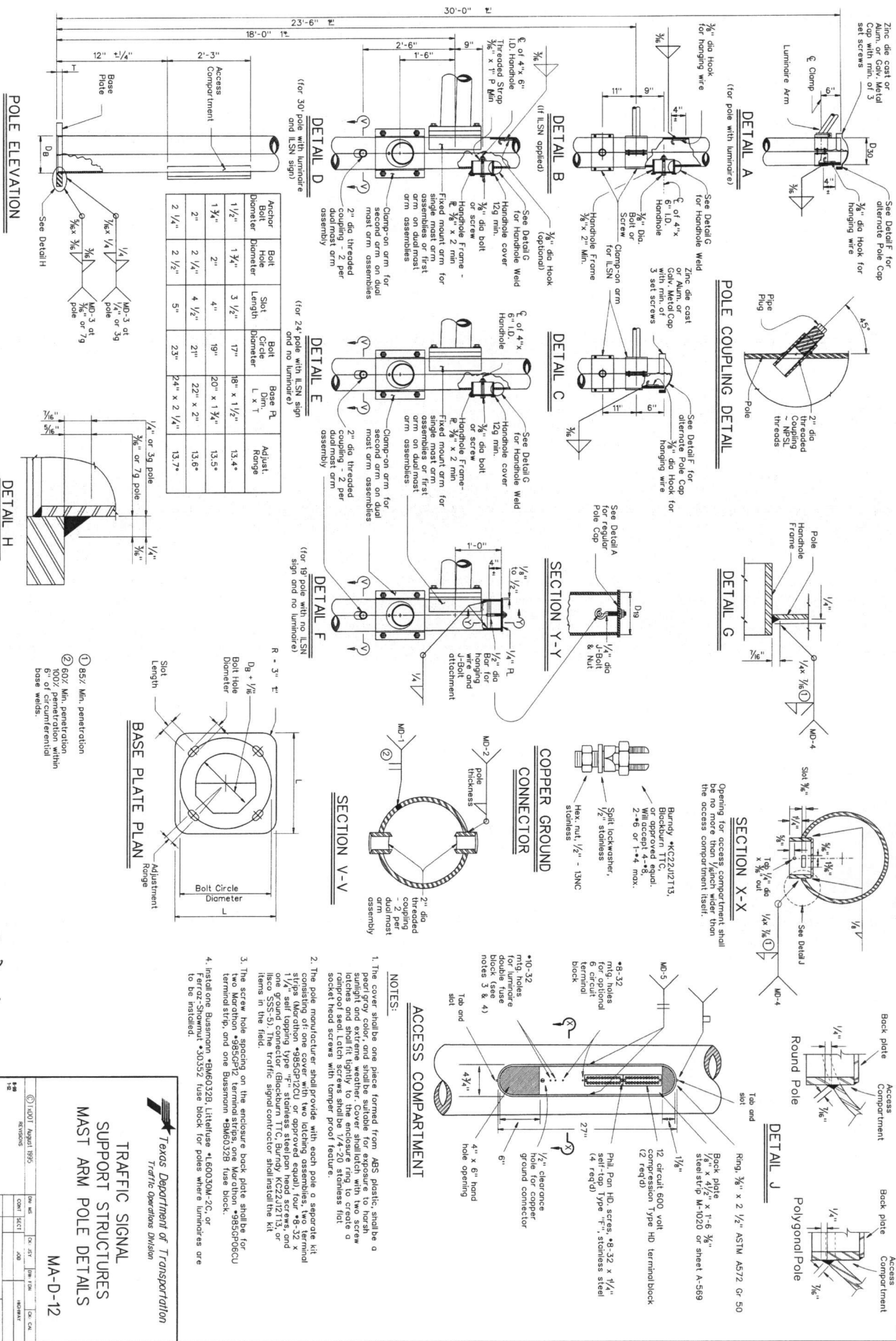
*Morgan*  
11/17

**Texas Department of Transportation**  
Traffic Operations Division  
**STANDARD ASSEMBLY**  
FOR TRAFFIC SIGNAL  
SUPPORT STRUCTURES  
MAST-ARM CONNECTIONS  
MA-C(ILSN)-12

REV	DATE	BY	CHKD	APP'D
1	08/17/17	MS	MS	MS

17888

DATE:  
FILE:



1857  
12/17

Texas Department of Transportation  
Traffic Operations Division

TRAFFIC SIGNAL  
SUPPORT STRUCTURES  
MAST ARM POLE DETAILS

MA-D-12

© TxDOT August 1995

REV	DATE	BY	CHK	APP
001	08/95	...	...	...
002	...	...	...	...
003	...	...	...	...

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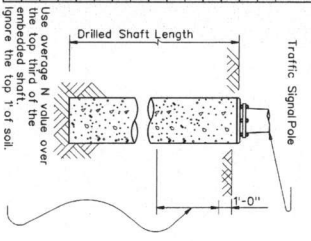
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FILE: \$FILES\$

**FOUNDATION DESIGN TABLE**

FDN TYPE	DRILLED SHAFT DIA	VERT BARS	Spiral	EMBEDDED LENGTH-ft	SHAFT PERIMETER	ANCHOR DIA	ANCHOR TYPE	FOUNDATION DESIGN	TYPICAL APPLICATION
24-A	24"	4-#5	#2 at 12"	5.7	5.3	4.0	1	1	Pedestal pole, pedestal mounted controller
30-A	30"	8-#9	#3 at 6"	11.3	8.0	5.5	17"	2	Mast arm assembly. (See Selection Table)
36-A	36"	10-#9	#3 at 6"	13.2	12.0	9.4	1 3/4"	5	Mast arm assembly with or without luminaire.
36-B	36"	12-#9	#3 at 6"	15.2	13.6	10.4	2"	7	Mast arm assembly. (See Selection Table)
42-A	42"	14-#9	#3 at 6"	17.4	15.6	11.9	2 1/4"	9	Strain pole taller than 30' & strain pole with mast arm.

**FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS UL SN SUPPORT ASSEMBLIES (ft)**

MAX SINGLE ARM LENGTH	FDN 30-A			FDN 36-A			FDN 36-B			FDN 42-A		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	MAX SINGLE ARM LENGTH	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	MAX SINGLE ARM LENGTH	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	MAX SINGLE ARM LENGTH	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	MAX SINGLE ARM LENGTH	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	MAX SINGLE ARM LENGTH	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	
24' X 24'	28' X 28'	32' X 32'	32' X 32'	36' X 36'	40' X 36'	44' X 36'	44' X 36'	48'	48'	48'	48'	
28' X 28'	32' X 32'	36' X 36'	40' X 36'	44' X 36'	48'	48'	48'	48'	48'	48'	48'	
32' X 32'	36' X 36'	40' X 36'	44' X 36'	48'	48'	48'	48'	48'	48'	48'	48'	
36' X 36'	40' X 36'	44' X 36'	48'	48'	48'	48'	48'	48'	48'	48'	48'	
40' X 36'	44' X 36'	48'	48'	48'	48'	48'	48'	48'	48'	48'	48'	
44' X 36'	48'	48'	48'	48'	48'	48'	48'	48'	48'	48'	48'	
48'	48'	48'	48'	48'	48'	48'	48'	48'	48'	48'	48'	



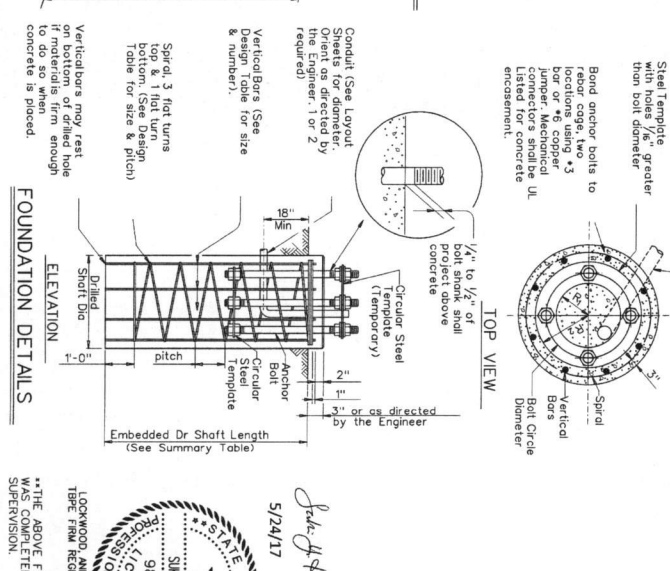
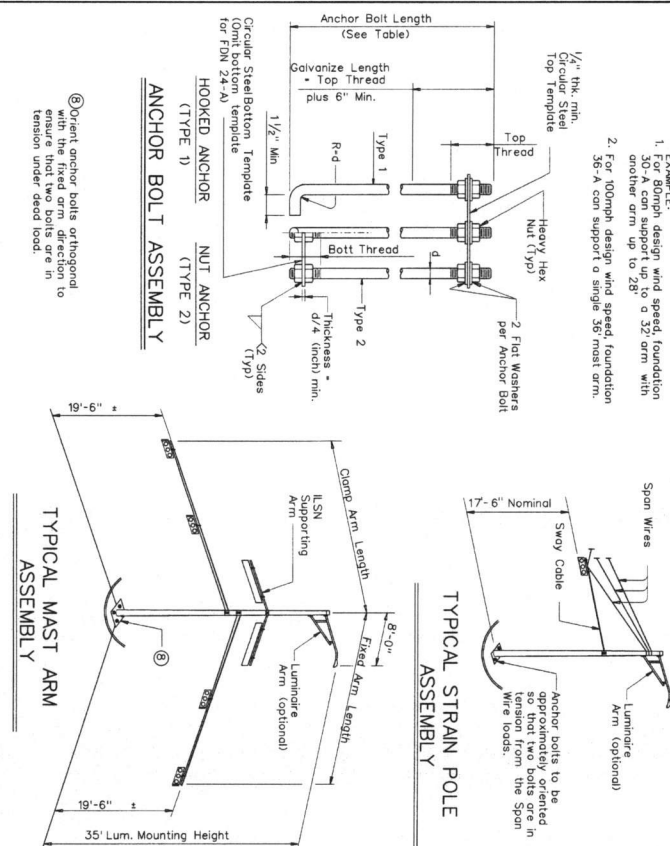
**ANCHOR BOLT & TEMPLATE SIZES**

ANCHOR BOLT & TEMPLATE SIZES	BOLE DIA	BOLE LENGTH	TOP THREAD	BOTTOM THREAD	BOLE CIRCLE	R2	R1
1	3/4"	1'-6"	3"	3"	12 3/4"	7 1/4"	5 3/4"
2	1 1/2"	3'-4"	6"	4"	17"	10"	7"
3	2"	3'-10"	7"	4 1/2"	19"	11 1/4"	7 3/4"
4	2 1/4"	4'-3"	8"	5"	21"	12 1/2"	8 1/2"
5	3"	4'-9"	9"	5 1/2"	23"	13 3/4"	9 1/4"

- NOTES:
- Anchor bolt design develops the foundation capacity given under Foundation Design Loads.
  - Foundation Design Loads are the allowable moments and shears at the base of the structure.
  - Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.
  - Field Penetration readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.
  - If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.
  - Decimal lengths in Design Table are to allow interpolation for other penetration values found to nearest foot for entry into Summary Table.
  - Min dimensions given, longer bolts are acceptable.

**\*\*FOUNDATION SUMMARY TABLE**

LOCATION IDENTIFICATION	AVG. BLOW COUNT	NO. FOUNDATIONS	DRILLED SHAFT LENGTH (FEET)
P1	10	36-B	1
P3	10	36-A	1
			13
			15
			13
			15



LOCKWOOD, ANDREWS & NEWMAN  
TRAFFIC SIGNAL RESTORATION NO. 2614  
THE ABOVE FOUNDATION TABLE WAS COMPLETED UNDER MY SUPERVISION.

STATE OF TEXAS  
SILVY HAWKINS  
PROFESSIONAL ENGINEER  
LICENSED NO. 98748

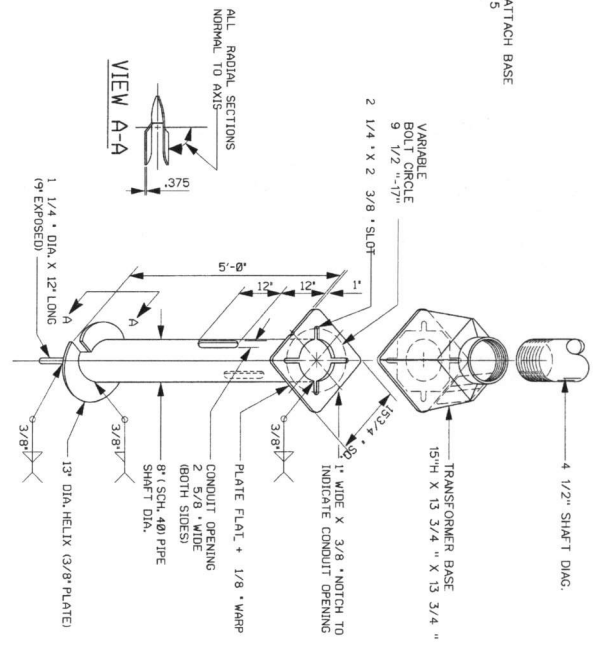
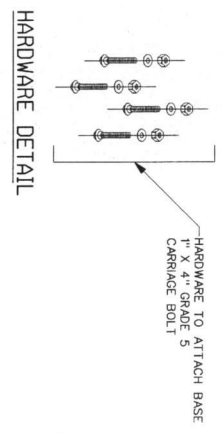
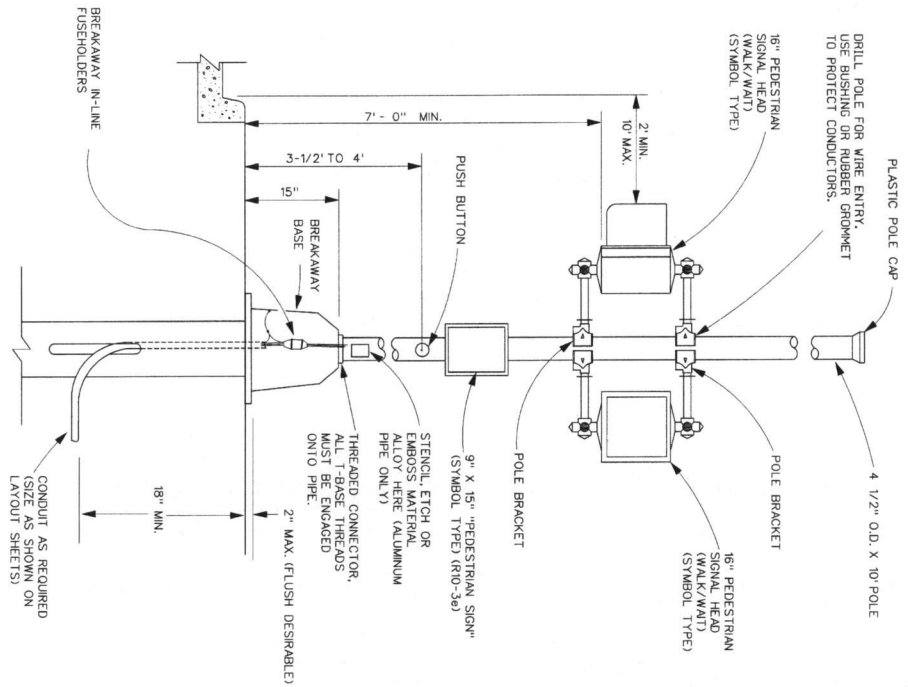
5/24/17

TS-FD-12

Texas Department of Transportation  
Traffic Signal Division

TRAFFIC SIGNAL POLE FOUNDATION

DATE: \$DATE\$ STIMES  
FILE: \$FILES\$



SCREW ANCHOR FOUNDATION DETAIL

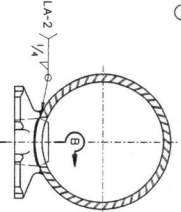
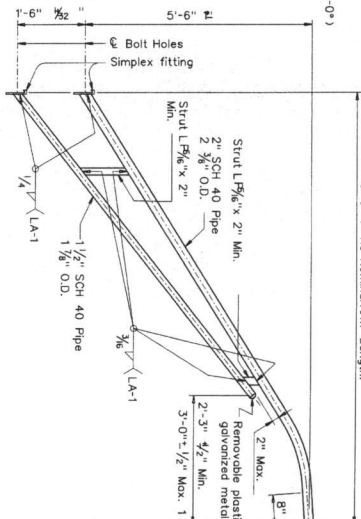
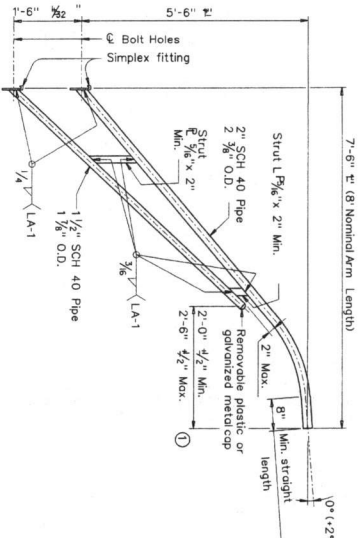
**NOTE:**  
SEE STANDARD (RFBA - 13) FOR NOTES AND NON - FUSED BREAKAWAY ELECTRICAL CONNECTOR DETAILS

*M. J. D.*  
4/21/17

<p>SIGNAL DETAILS/STANDARDS CONSTRUCTION DETAILS FOR POLE MOUNTED PEDESTRIAN SIGNALS</p>	
FILE	CD/PMPs
1A007 2007	
REV. NO.	6
DATE	01/14
BY	
CHECKED	
DATE	
SCALE	
SHEET	35

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DATE:  
FILE:



8-FOOT LUMINAIRE ARM

10-FOOT LUMINAIRE ARM

DIRECT ATTACHMENT DETAIL

- Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length should have the same dimensions within specified tolerances.
- Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.
- AS76 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.
- ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but should not have less elongation than the grade indicated.

GENERAL NOTES:

1/2" Dia. A307 Bolts  
2 at 5" c-c each side  
4 bolts & 4 lock washers per clamp

1/2" Dia. A307 Bolts  
2 at 5" c-c each side  
4 bolts & 4 lock washers per clamp

CLAMP ATTACHMENT DETAIL NO.1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO.2 (HALF SECTION)

3/4" Dia. x 1" Sch 80 Pipe  
Clamp E 3/8" x 5" AS72 GR 50  
LA-2 1/4" x 1/4" x 1/4" (LA-2)

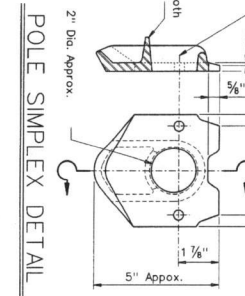
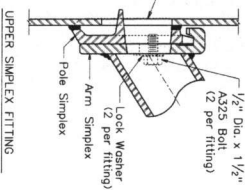
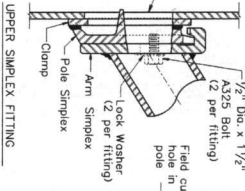
3/4" Dia. x 1" Sch 80 Pipe  
Clamp E 3/8" x 5" AS72 GR 50  
LA-3 3/8" x 1/4" x 1/4" (LA-3)

CLAMP ATTACHMENT DETAIL NO.3 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO.4 (HALF SECTION)

3/4" Dia. x 1" Sch 80 Pipe  
Clamp E 3/8" x 5" AS72 GR 50  
LA-2 1/4" x 1/4" x 1/4" (LA-2)

3/4" Dia. x 1" Sch 80 Pipe  
Clamp E 3/8" x 5" AS72 GR 50  
LA-3 3/8" x 1/4" x 1/4" (LA-3)



Each pole simplex fitting shall be supplied with the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When attaching the simplex to the pole, the simplex shall be attached to the pole with the simplex assembly secured to the pole at the location shown on the plans.

If clamp assemblies are ordered without poles, the fabricator shall ship one upper and one lower clamp assembly together in a single package including all nuts and washers required for the clamps and simplex fittings.

SECTION A-A LOWER SIMPLEX FITTING

SECTION B-B LOWER SIMPLEX FITTING

ARM SIMPLEX DETAIL

11/21/12

Texas Department of Transportation  
Traffic Operations Division  
STANDARD ASSEMBLY  
DRAWINGS FOR LUMINAIRE  
SUPPORT STRUCTURES  
ARM DETAILS  
LUM-A-12

DATE: 10/07 August 1995  
REVISED: 12

NO.	DATE	BY	CHKD	APPD	REVISION
001					

129







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### SIGN SUPPORT DESCRIPTIVE CODES

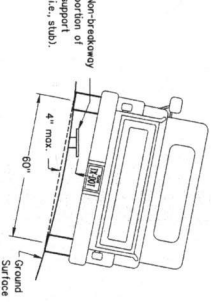
### REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT

### SIGN LOCATION

### T-INTERSECTION

Post Type  
 FRP - Fiberglass Reinforced Plastic Pipe (see SMD(GEN))  
 TW - Thin-Walled Tubing (see SMD(TW))  
 10BWC - 10 BWC Tubing (see SMD(SL-P-1) to (SMD(SL-P-3))  
 S80 - Schedule 80 Pipe (see SMD(SL-P-1) to (SMD(SL-P-3))  
 Number of Posts (1 or 2)

Anchor Type  
 UA - Universal Anchor - Concrete (see SMD(GEN) and (TWT))  
 UB - Bolted Universal Anchor - Steel (see SMD(GEN) and (TWT))  
 WA - Wedge Anchor Steel - (see SMD(TW))  
 WP - Wedge Anchor Plastic - (see SMD(TW))  
 SA - Spigone - Concrete (see SMD(SL-P-1) to (SMD(SL-P-3))  
 SB - Spigone - Bolted Down (see SMD(SL-P-1) to (SMD(SL-P-3))  
 Sign Mounting Designation  
 P - Preload - "Plain" (see SMD(SL-P-1) to (SMD(SL-P-3)), (TWT), (FRP))  
 T - Preload - "T" (see SMD(SL-P-1) to (SMD(SL-P-3)), (TWT))  
 U - Preload - "U" (see SMD(SL-P-1) to (SMD(SL-P-3))  
 E - REQUIRED T - Number of Extensions (see SMD(SL-P-1) to (SMD(SL-P-3))  
 BM - Extended Wind Beam (see SMD(SL-P-1) to (SMD(SL-P-3))  
 WC - 1/2" x 1/4" Wing Channel (see SMD(SL-P-1) to (SMD(SL-P-3))  
 EXL - Extended Aluminum Sign Panels (see SMD(SL-P-3))



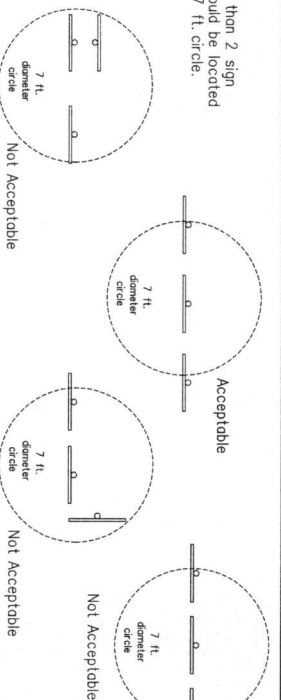
To avoid vehicle undercarriage snagging, any substantial remainder of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-degree (60°) spread angle between wheelpaths.

When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travelway.

When the shoulder is greater than 6 ft. in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

When this sign is needed at the end of a two-lane, two-way road, the sign must be placed in the line with the centerline of the roadway. Place as close to ROW as practical.

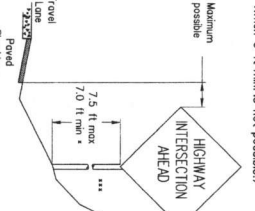
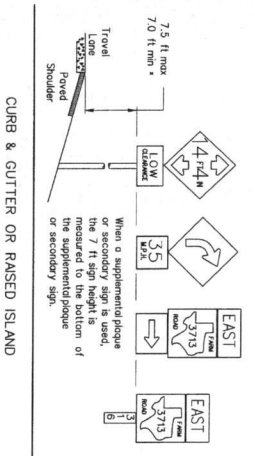
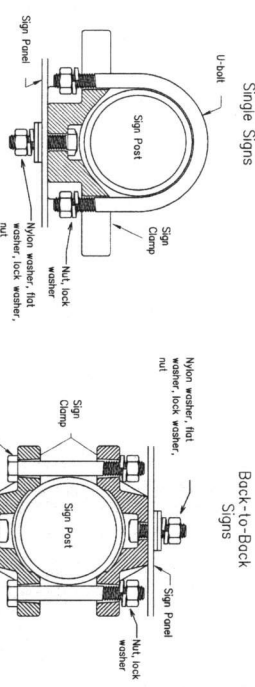
NO MORE THAN 2 SIGN POSTS SHOULD BE LOCATED WITHIN A 7 FT. CIRCLE.



### TYPICAL SIGN ATTACHMENT DETAIL

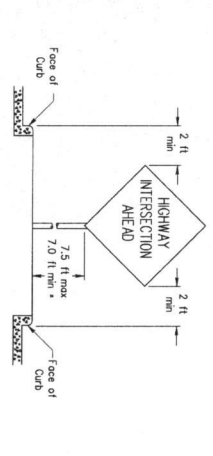
### SIGNS WITH PLAQUES

### RESTRICTED RIGHT-OF-WAY



Bolts used to mount sign posts to the clamp are 3/8" diameter and 1 1/2" long. The nuts are 3/8" diameter and 1 1/2" long. The flat washer, lock washer, and nut are 1 inch in diameter.

Pipe Diameter	Specific Clamp	Universal Clamp
2 1/2" nominal	3" or 3 1/2"	3 1/2" or 4"
3" nominal	3 1/2" or 4"	4 1/2"



Right-of-way restrictions may be created by a curb, a raised island, a narrow island, or other factors.

Signs shall be mounted using the following condition that results in the greatest sign elevation:  
 (1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travelway or  
 (2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.  
 The minimum values may be increased when directed by the Engineer.  
 See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Spigone System components and Wedge Anchor System components.  
 The website address is:  
<http://www.txdot.gov/publications/traffic.htm>

DATE: FILE:

**Texas Department of Transportation**  
 Traffic Operations Division

**SIGN MOUNTING DETAILS**  
**SMALL ROADSIDE SIGNS**  
**GENERAL NOTES & DETAILS**

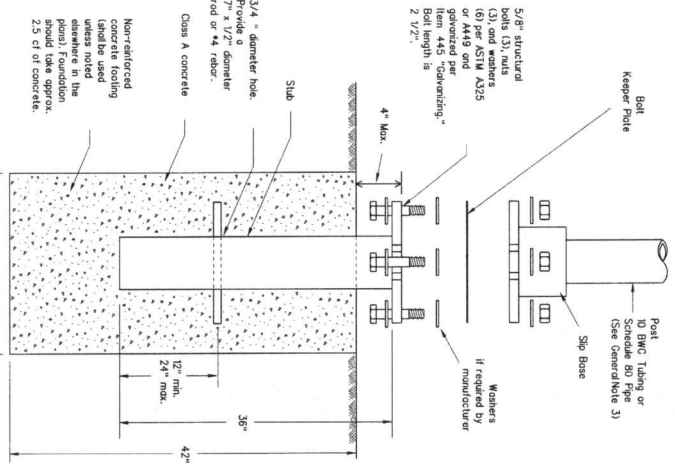
**SMD(GEN)-08**

9-08	REVISED	DATE	BY	REASON
9-08	REVISED	DATE	BY	REASON
9-08	REVISED	DATE	BY	REASON

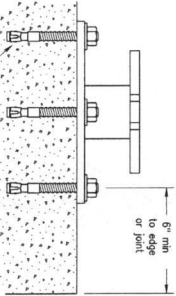
# TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS

**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](http://www.txdot.gov/business/producer_list.htm) The devices shall be installed per manufacturer's recommendations. Installation procedures shall be provided to the Engineer by Contractor.



## CONCRETE ANCHOR



5/8" diameter Concrete Anchor - 8 pieces (embed a minimum of 5 1/2" and torque to min. of 50 ft-lbs). Anchor may be expansion or adhesive type.

SM RD SSM ASSM TY XXXXX(S)BK-XXXX

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### GENERAL NOTES

- 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.
- Material used as post with this system shall conform to the following specifications:
  - 30 0194 - Tubing (2.575" outside diameter)
  - Seamless or electric-resistance welded steel tubing or pipe
  - Steel shall be HS/LS Or 55 per ASTM A501 or ASTM A508
  - Other steels may be used if they meet the following:
    - 25,000 Pst/minimum yield strength
    - 75,000 Pst/minimum tensile strength
    - 202 minimum elongation in 2"
- Wall thickness (uncoated) shall be within the range of 0.127" to 0.138"
  - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
  - Galvanization per ASTM A253 or ASTM A553 52B. For pre-coated steel tubing (ASTM A653), recoat Schedule 80 Pipe (2.875" outside diameter)
  - 0.275" nominal wall thickness
- Steel tubing per ASTM A500 or 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:
    - 62,000 Pst/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"
- See the Traffic Operations Division website for detailed drawings of sign clips and Texas Universal Triangular Slipbase System components. The website address is: <http://www.txdot.gov/publications/traffic.htm>
- Sign supports shall not be spaced except where shown. Sign support posts shall not be spaced ASSEMBLY PROCEDURE

### Foundation

- 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.
- Foundation may be prepared by hand or by using a motor-driven concrete mixer. For embedment less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
- 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 ensure good contact between the concrete and stub.
- Place the slip base stub into the hole. The stub shall be between 2 to 3 inches above the ground.
- The triangular slipbase system is multi-directional and is designed to release when struck from any direction.

### Support

- Support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the roadway (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 roadway. The cut shall be plumb and straight.
- Attach sign to support using connections shown. When multiple signs are installed on the same support, a minimum clearance between each sign is maintained. See SMD(S)LP-21 for clearances based on sign types.

*Michael Wain*

Texas Department of Transportation  
Traffic Operations Division

**SIGN MOUNTING DETAILS  
SMALL ROADSIDE SIGNS  
TRIANGULAR SLIPBASE SYSTEM**

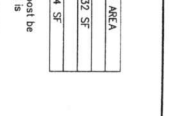
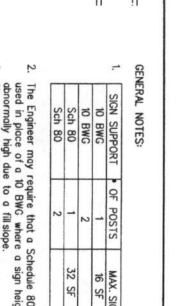
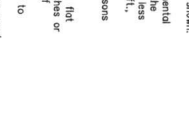
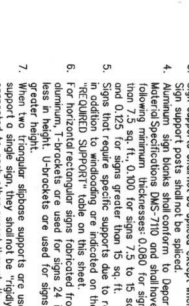
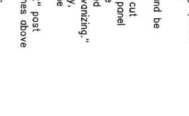
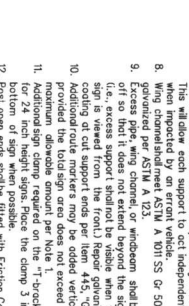
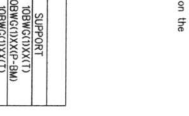
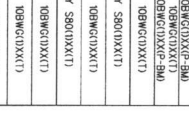
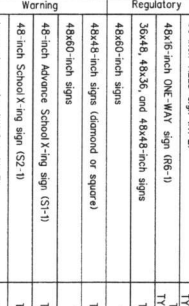
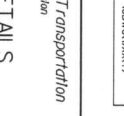
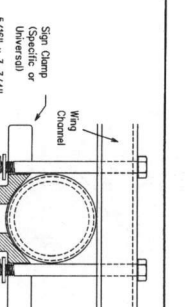
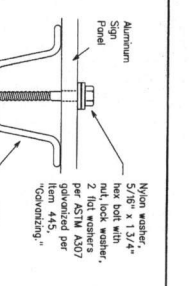
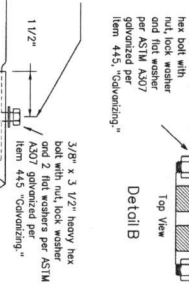
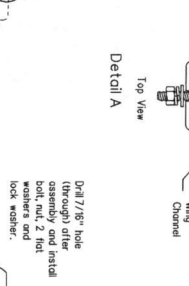
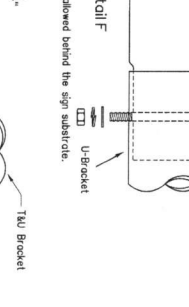
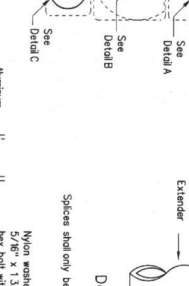
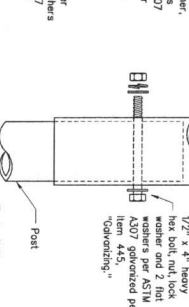
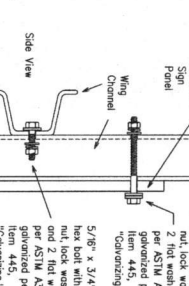
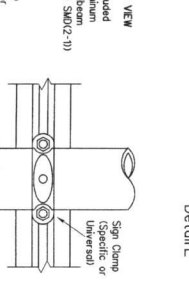
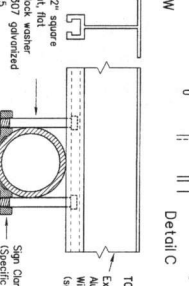
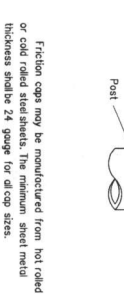
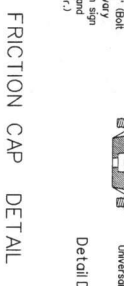
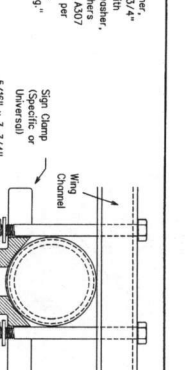
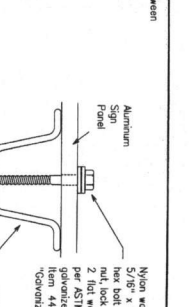
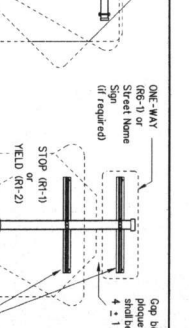
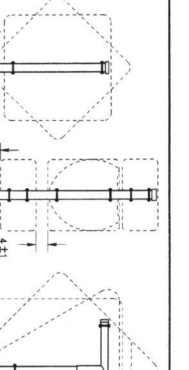
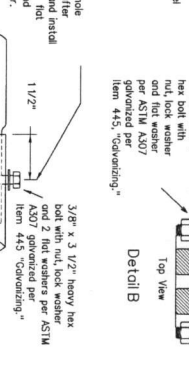
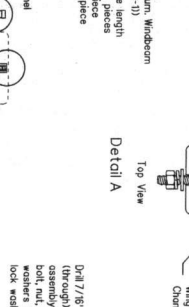
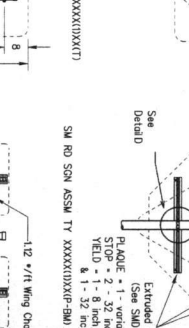
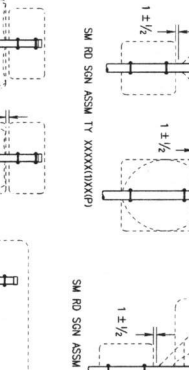
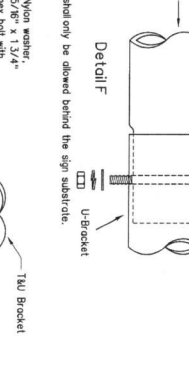
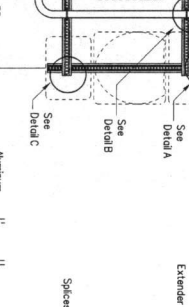
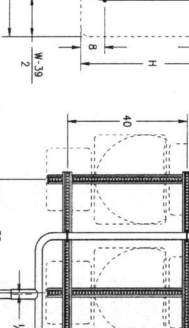
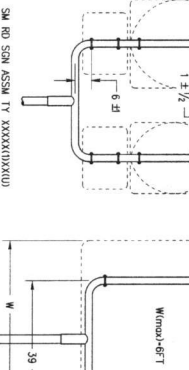
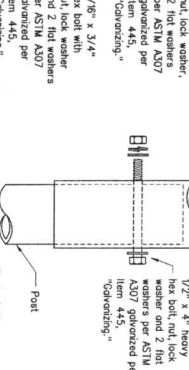
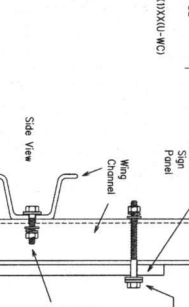
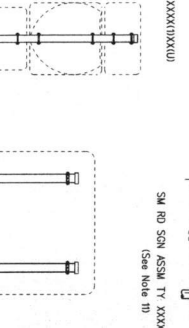
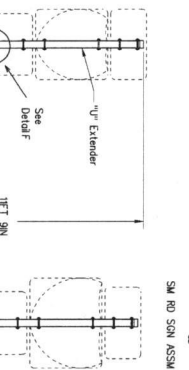
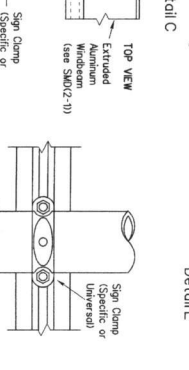
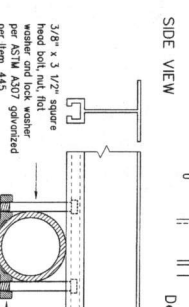
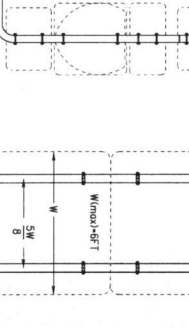
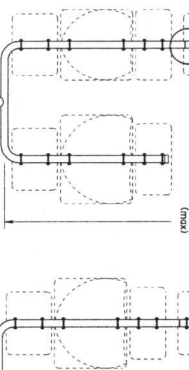
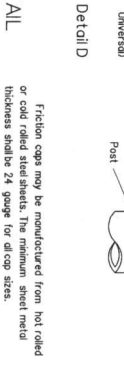
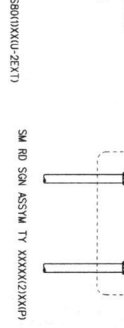
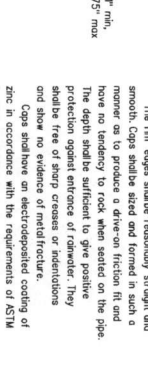
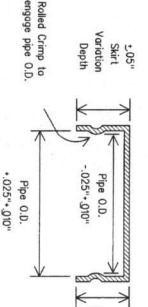
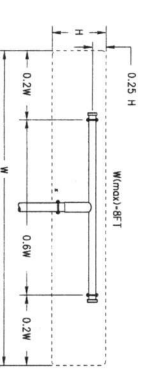
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DATE: FILE:



**FRICION CAP DETAIL**

2.05" Skirt  
Variation Depth  
Pipe O.D.  
-0.05" - 0.10"  
1" min.  
1.75" max.  
Pipe O.D.  
+0.05" - 0.10"

Fricion caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum steel metal thickness shall be 24 gauge for all cap sizes. The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner that they will fit snugly over the pipe. How no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rodents. They shall be free of sharp creases or indentations and show no evidence of manufacturing. Caps shall have an electro-deposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

**REQUIRED SUPPORT**

Sign Description	Support
48-inch STOP sign (R1-1)	TY DBMGC10X11
60-inch YIELD sign (R1-2)	TY DBMGC10X12
48x48-inch ONE-WAY sign (R8-1)	TY DBMGC10X12
48x48-inch signs (diamond or square)	TY DBMGC10X11
36x48, 48x36, and 48x48-inch signs	TY DBMGC10X11
48x60-inch signs	TY SB010X11
48-inch Advance Speed X-ing sign (S1-1)	TY DBMGC10X11
48-inch School X-ing sign (S2-1)	TY DBMGC10X11
Large Arrow sign (W1-6 & W1-7)	TY DBMGC10X11

**GENERAL NOTES**

1. SIGN SUPPORT \* OF POSTS. MAX. SIGN AREA  

NO BWC	1	16 SF	32 SF
SM RD	2	32 SF	64 SF
2. The Engineer may require that a Schedule 80 post be used in place of a 60 BWC where a sign height is 80 feet or greater.
3. Sign supports shall not be fabricated except where shown. Sign support posts shall not be spliced.
4. Aluminum sign bolts shall conform to Departmental Specification MS-7110 and shall have a tensile strength of 7.5 sq. ft., 0.300 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Sign post requires specific supports due to reasons indicated in "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from 101 aluminum, supports are used for signs 24 inches or greater height. For vertical rectangular signs, supports are used for signs 61 inches or greater height.
7. When two triangular sign supports are used to support a sign, they shall not be directly opposite each other.
8. When supported by an erect vehicle, the sign shall be supported to cut independently.
9. Excess pipe, wing channel, or endbeam shall be cut off so that it does not extend beyond the sign panel.
10. Additional route markers may be added vertically.
11. Additional route markers may be added vertically.
12. Sign blanks shall be the size and shapes shown on the plans.

**SM RD SQN ASSM TY XXXXX(U)X(K)U**

1/2" x 4" heavy hex bolt, nut, lock washer per ASTM A307 galvanized per "Coating"

5/8" x 3/4" hex bolt, nut, lock washer per ASTM A307 galvanized per "Coating"

2 Hot washers per ASTM A307 galvanized per "Coating"

3/8" x 1/2" heavy hex bolt, nut, lock washer per ASTM A307 galvanized per "Coating"

1/2" x 4" heavy hex bolt, nut, lock washer per ASTM A307 galvanized per "Coating"

3/8" x 1/2" heavy hex bolt, nut, lock washer per ASTM A307 galvanized per "Coating"

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**SM RD SQN ASSM TY XXXXX(U)X(K)U**

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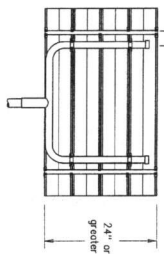
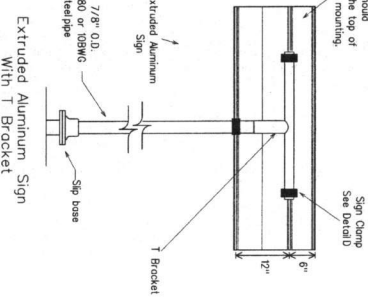
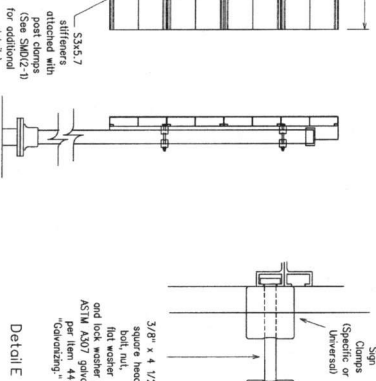
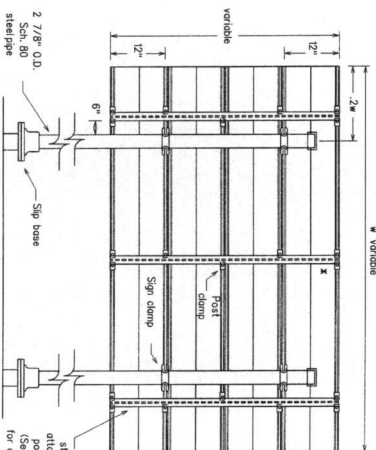
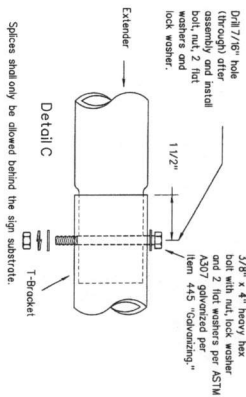
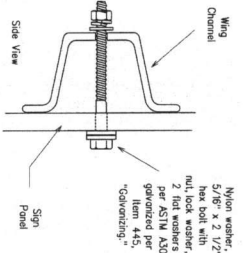
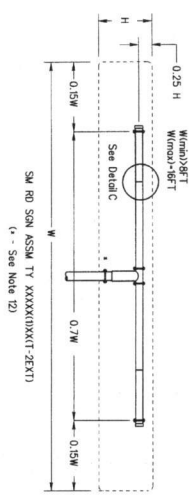
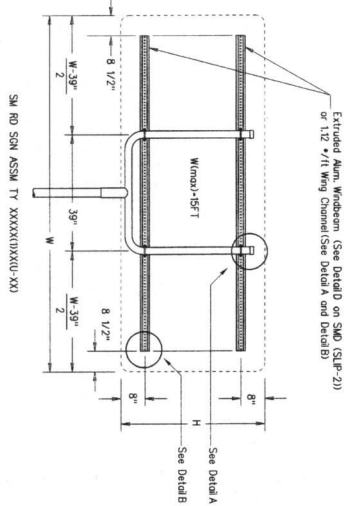
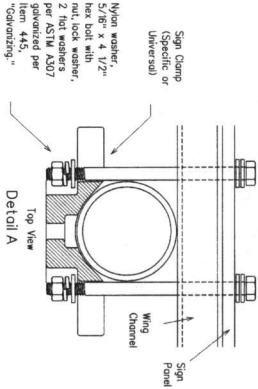
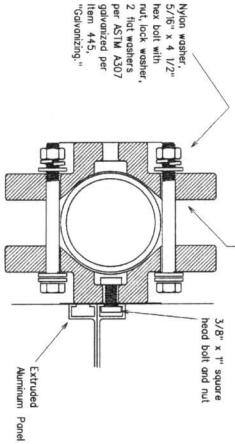
1/2" x 4" heavy hex bolt, nut, lock washer per ASTM A307 galvanized per "Coating"

3/8" x 1/2" heavy hex bolt, nut, lock washer per ASTM A307 galvanized per "Coating"

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DATE: FILE:

EXTRUDED ALUMINUM SIGN WITH T BRACKET



Handwritten signature and date: *W. J. Lutz* 12/17

GENERAL NOTES:

1. SIGN SUPPORT \* OF POSTS MAX SIGN AREA
2. The Engineer may require that a Schedule 80 post be used in place of a 90 BWC where a sign height is used in place of a sign height is
3. Sign support posts shall not be spliced.
4. Aluminum sign bolts shall conform to Departmental following minimum thickness: 0.080 for bolts less than 7.5 sq. ft., 0.100 for 7.5 sq. ft. to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft. For additional requirements see specifications on the "REINFORCED SUPPORT" notes on this sheet.
5. For horizontal/rectangular signs fabricated from flat less in height, U-brackets are used for signs 6' or greater height.
6. When two triangular supports are used to connected to each other, except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
7. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel.
8. Sign bolts shall be installed in the center of the sign panel.
9. Sign bolts shall be installed in the center of the sign panel.
10. Sign bolts shall be installed in the center of the sign panel.
11. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible with Friction Caps.
12. Post open ends shall be filled with Friction Caps.

REQUIRED SUPPORT

Warning	Regulatory	SUPPORT
48-inch sign (R1-1)	48x48-inch signs (diamond or square)	TY DBMGC(D)X(KT)
60-inch sign (R1-2)	48x48-inch signs (rectangle)	TY DBMGC(D)X(P-BM)
48x48-inch sign (R1-2)	48-inch Advance School X-ing sign (S1-1)	TY DBMGC(D)X(P-BM)
48x48-inch sign (R1-2)	48-inch School X-ing sign (S2-1)	TY DBMGC(D)X(KT)
48x48-inch sign (R1-2)	Large Arrow sign (W1-6 & W1-7)	TY DBMGC(D)X(KT)

Texas Department of Transportation  
Traffic Operations Division

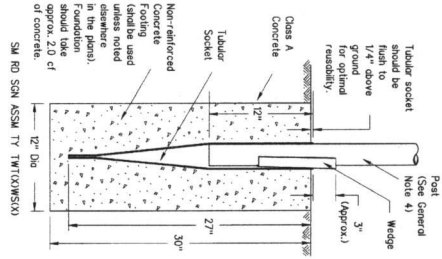
**SIGN MOUNTING DETAILS  
SMALL ROADSIDE SIGNS  
TRIANGULAR SLIPBASE SYSTEM**

SMD/SLIP-3j-08

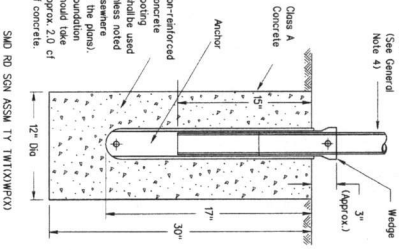
9-08

12/17

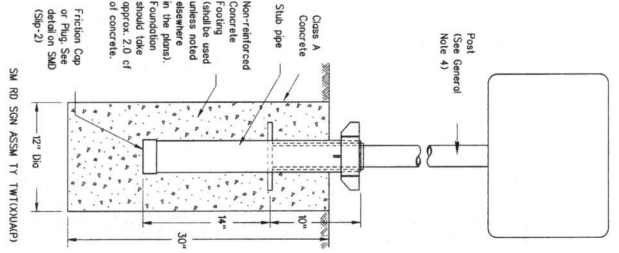
### Wedge Anchor Steel System



### Wedge Anchor High Density Polyethylene (HDPE) System

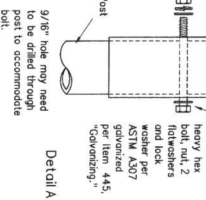
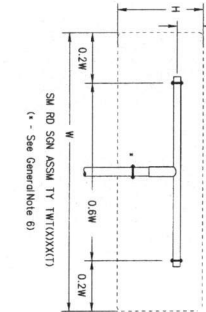
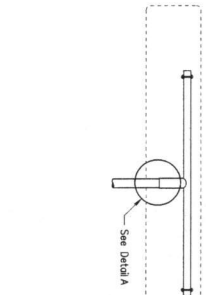


### Universal Anchor System with Thin-Walled Tubing Post



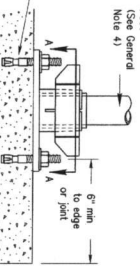
Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt-Down Universal Anchor System. The insert should be approx. 10\"/>

### Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post

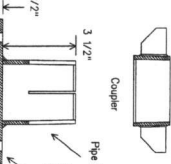
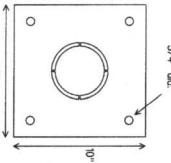


NOTE  
The devices shown include per manufacturer's recommendations. Installation procedures should be provided to the Engineer by Contractor.

Concrete anchor consists of 5/8\"/>



Concrete anchor consists of 5/8\"/>



#### GENERAL NOTES:

- The Wedge Anchor System and the Universal Anchor System with the walling post shall be installed in accordance with the manufacturer's instructions.
- The Wedge Anchor System and the Universal Anchor System with the walling post shall be installed in accordance with the manufacturer's instructions.
- Except for posts (1) 96\"/>

- Material used on posts with the system shall conform to the following specifications:
  - 13 96\"/>

- Other steel may be used if they meet the following:
  - 55,000 Psi minimum yield strength
  - 70,000 Psi minimum tensile strength
  - 38\"/>

- Additional sign clamps shall be used on the 12\"/>

- Sign supports shall not be spaced except where shown; sign support posts shall not be spaced.

- See the Traffic Operations Division website for detailed drawings of sign clamps <http://www.txdot.gov/traffic/signs/signs.htm>


- WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18\"/>
2. If the foundation hole is not in solid rock, the foundation shall be a minimum depth of 18\"/>
3. Insert the wedge into the socket to secure post. This will occur approximately 1/4\"/>
4. Place the socket. Allow a minimum 4\"/>
5. Attach the sign to the sign post.
6. Insert the sign post into the socket to secure post. This will occur approximately 1/4\"/>
7. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18\"/>
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

#### UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18\"/>
2. If the foundation hole is not in solid rock, the foundation shall be a minimum depth of 18\"/>
3. Insert the wedge into the socket to secure post. This will occur approximately 1/4\"/>
4. Place the socket. Allow a minimum 4\"/>
5. Attach the sign to the sign post.
6. Insert the sign post into the socket to secure post. This will occur approximately 1/4\"/>
7. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18\"/>
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

1/12/17

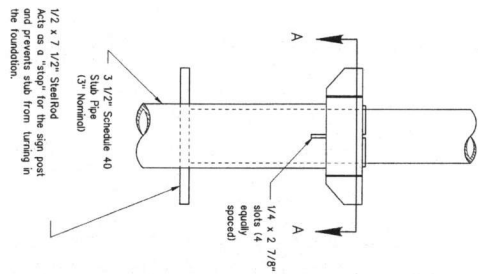
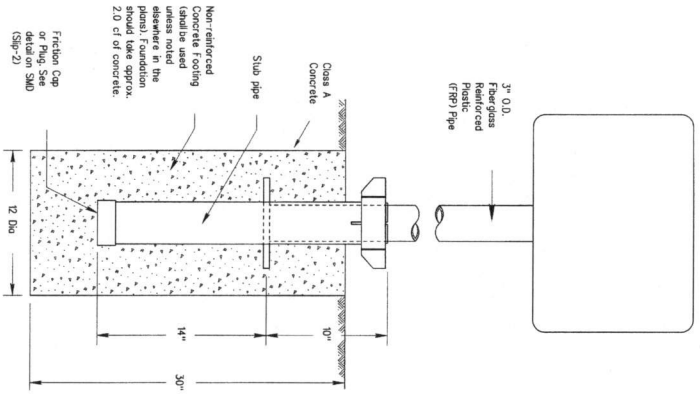
  
**Texas Department of Transportation**  
 Traffic Operations Division

**SIGN MOUNTING DETAILS**  
**SMALL ROADSIDE SIGNS**  
**WEDGE & UNIVERSAL ANCHOR**  
**WITH THIN WALL TUBING POST**  
**SMD(TWT)-08**

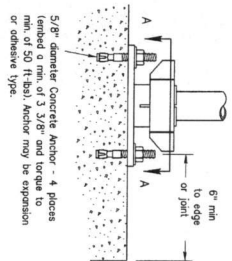
9-08	13001 July 2002	1001	1001
REV	DATE	BY	CHK

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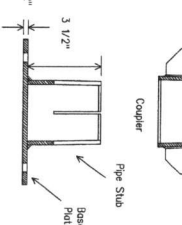
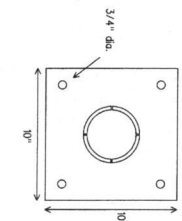
## Universal Anchor System with Fiberglass Reinforced Plastic (FRP) Post



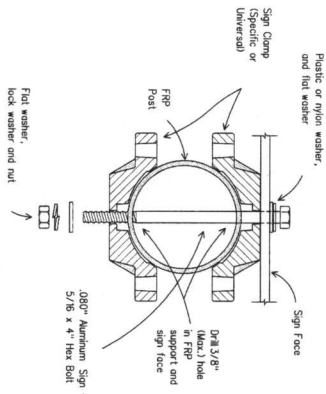
Concrete anchor consists of 5/8" diameter stud bolt with 1/2" nut and 3/4" washer. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Coatings." Top of bolt shall extend at least 1/2" above top of concrete with a 3/8" minimum, embedded steelhead minimum adhesive length and shear of 2450 and 1025 psi, respectively. Adhesive type anchors shall have stud bolts installed with adhesive in accordance with the manufacturer's recommendations. Adhesive anchors may be loaded after epoxy cure time per the manufacturer's recommendations.



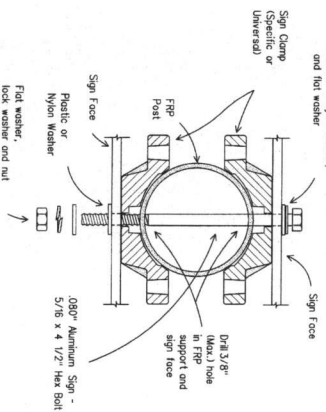
### BOLT-DOWN DETAILS



### Typical Sign Mounting Detail for FRP Support with Single Sign



### Typical Sign Mounting Detail for FRP Support with Back-to-Back Signs



#### GENERAL NOTES:

- FRP sign supports for a single type sign support may be used for signs up to and including 16 square feet. Dual post installation may be used for signs up to and including 32 square feet. Dual post installation may be used for signs up to and including 64 square feet.
- All nuts, bolts and washers shall be galvanized per Item 445, "Coatings."
- See the Traffic Operations Division website for detailed drawings of sign clamps. The website address is: <http://www.txdot.gov/publications/traffic.htm>

#### FRP POST REQUIREMENTS

- Materials shall conform to the requirements of Departmental Material Specification DMS-414b and will be finished in a yellow or gray color as specified elsewhere in the plans. 0.25% - 0.03% - 0.02%
- FRP post supports are prequalified by the Traffic Operations Division. Prequalification procedures are obtained by writing: Texas Department of Transportation, Traffic Operations Division, 333 East 11th Street, Austin, Texas 78701-2483.


#### UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURES

- Sign foundation hole: Where solid rock is encountered at ground level, the hole shall be drilled into the rock. If the rock is fractured, the hole shall be drilled below ground level. The foundation shall extend in the rock a minimum depth of 36" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 36". Any material removed from the socket/stub shall be removed from the site and the clearance requirements given on SMD(GSN) must be followed. The surface of the socket/stub must remain free of concrete or other debris.
- The Engineer may permit bolches of concrete less than 2 cubic yards to be placed with 0.5 cubic yards, hand mixing in a suitable container may be used. The concrete shall be placed in a suitable container and shall be placed in the hole. The concrete shall be placed in the hole and shall be compacted. Cut base post from bottom and ensure a minimum of 36" embedment in solid rock.
- Level and pour the base post with coupler using a torqued level and let concrete set a minimum of 4 days, unless otherwise directed by Engineer.
- Attach sign to FRP post.
- Attach sign to FRP post.
- Insert sign post into base post. Lower until the post comes to rest on the steel rod.
- Use hammer to ensure the coupler is firmly seated. Top of coupler should be flush with top of base post in most instances.
- Check that there is no twist. If loose, increase the tightening of coupler.

#### BOLT DOWN SIGN SUPPORT

- Position base plate with coupler on existing concrete.
- Drill holes into concrete and insert the 5/8" diameter bolts with wedges, anchors, and tighten nuts.
- Attach sign to FRP post.
- Insert bottom of sign post into pipe stub.
- Use hammer to ensure the coupler is firmly seated. Top of coupler should be flush with top of base post in most instances.
- Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

Maggie A. Calvert



**Texas Department of Transportation**  
Traffic Operations Division

**SIGN MOUNTING DETAILS  
SMALL ROADSIDE SIGNS  
UNIVERSAL ANCHOR SYSTEM  
WITH FRP POST**

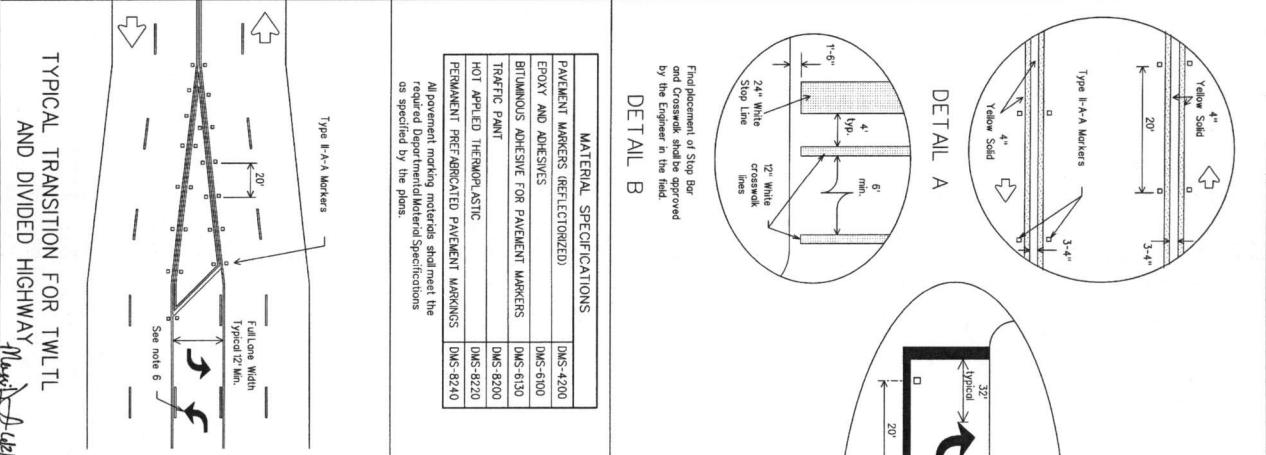
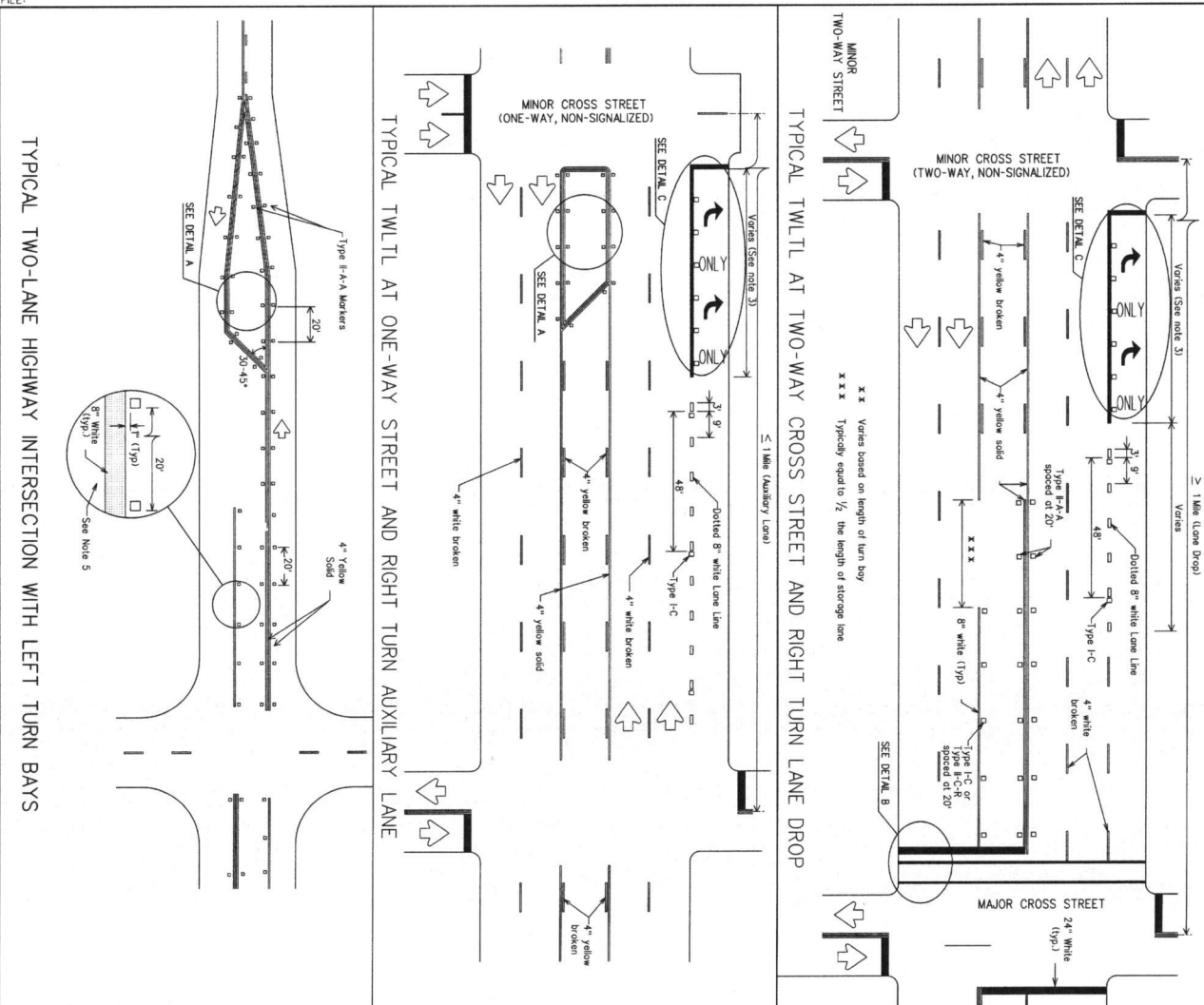
**SMD(FRP)-08**

9-08	REV. 11/01	REV. 11/01	REV. 11/01
DESIGN	CHECK	APPROVE	SHEET NO.
			45

DATE:  
FILE:

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DATE:  
FILE:



**MATERIAL SPECIFICATIONS**

PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PREPARED PREFABRICATED PAVEMENT MARKERS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.

Placement of Stop Bar and crosswalk shall be approved by the Engineer in the field.

**GENERAL NOTES**

- Refer elsewhere in plans for additional pavement and details.
- Line use word and arrow markings shall be used to indicate mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for Sign Change for two-lane highway are shown in the Standard Highway Signs Manual.
- When lane and word and arrow markings are used, the word and arrow markings shall be used in the lane use word and arrow marking is used near the upstream end of the full-width turn lane.
- Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used.
- Revised pavement marker Type I-C with undrilled highways, flush medians and two-way left turn lanes, divided highways and raised medians.
- A two-way left-turn (TWL) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a intersection or deceleration turn bay is not required unless stated elsewhere in the plans.

**PAVEMENT MARKINGS FOR TWO-WAY LEFT TURN LANES DIVIDED HIGHWAYS AND RURAL LEFT TURN BAYS**

PM(3)-12

Texas Department of Transportation  
Traffic Operations Division

DATE	BY	CHKD	APP'D	DATE	BY	CHKD	APP'D
5-90	5-90	5-90	5-90	5-90	5-90	5-90	5-90
2-92	2-92	2-92	2-92	2-92	2-92	2-92	2-92
2-90	2-90	2-90	2-90	2-90	2-90	2-90	2-90

PROJECT NO. 46

SHEET NO. 46

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DATE:  
FILE:

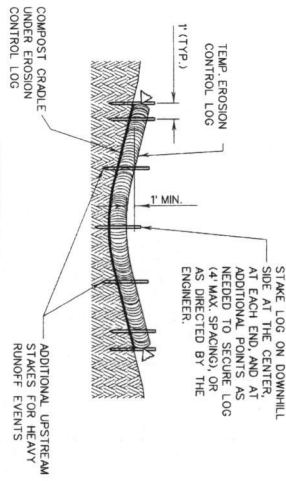
- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSI — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL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

LEGEND



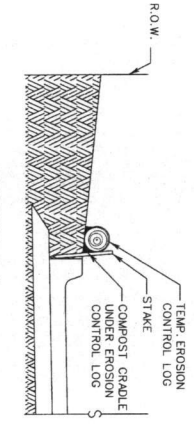
EROSION CONTROL LOG DAM

SECTION A-A



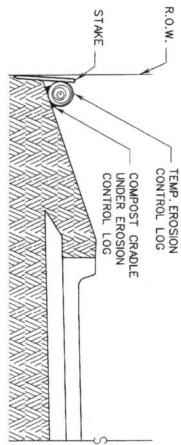
EROSION CONTROL LOG AT BACK OF CURB

SECTION B-B

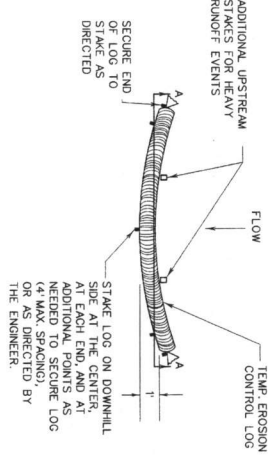


EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

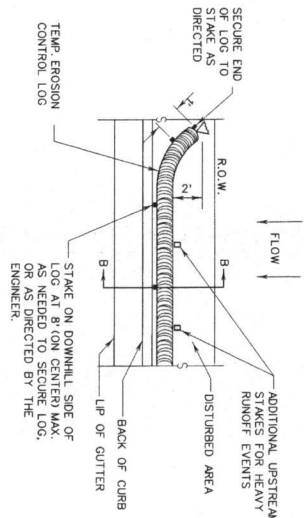
SECTION C-C



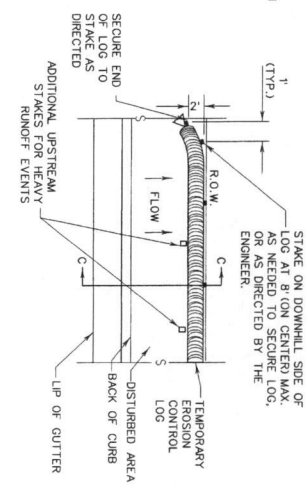
PLAN VIEW



PLAN VIEW

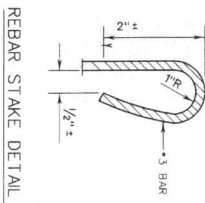


PLAN VIEW



GENERAL NOTES:

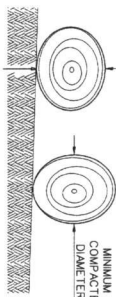
1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE SPECIFIED, USE BIODEGRADABLE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



**SEDIMENT BASIN & TRAP USAGE GUIDELINES**  
An erosion controlling sediment trap may be used to filter sediment out of runoff draining from an unconsolidated area.  
**Log Traps:** The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Controllogs should be placed in the following locations:  
1. Immediately preceding ditch inlets or drop inlets  
2. Just before the drainage enters a water course  
3. Just before the drainage leaves the right of way  
4. Just before the drainage flows from the construction limits where drainage flows away from the project.  
5. Just before the drainage flows into a ditch or stream.  
The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

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



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

SHEET 1 OF 3

**TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES**  
**EROSION CONTROL LOG**

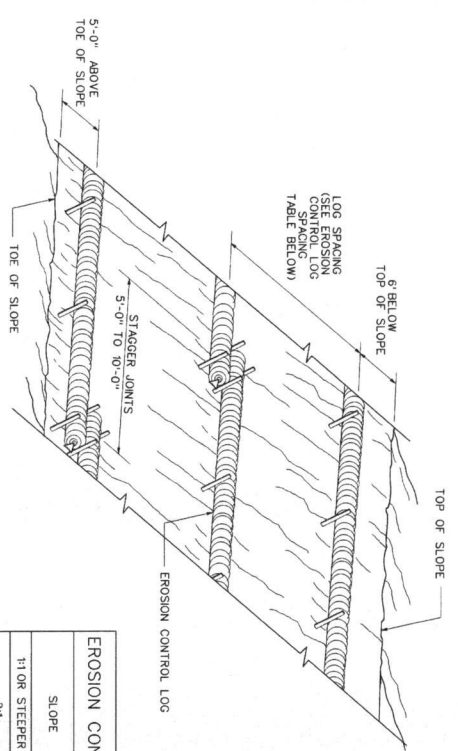
EC(9) - 16

Design Standard

FILE: EC(9) - 16	DATE: JUL 1, 2016	BY: [Signature]	SCALE: AS SHOWN
PROJECT: [Blank]	CONTRACT: [Blank]	SHEET NO: [Blank]	TOTAL SHEETS: [Blank]

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DATE:  
FILE:

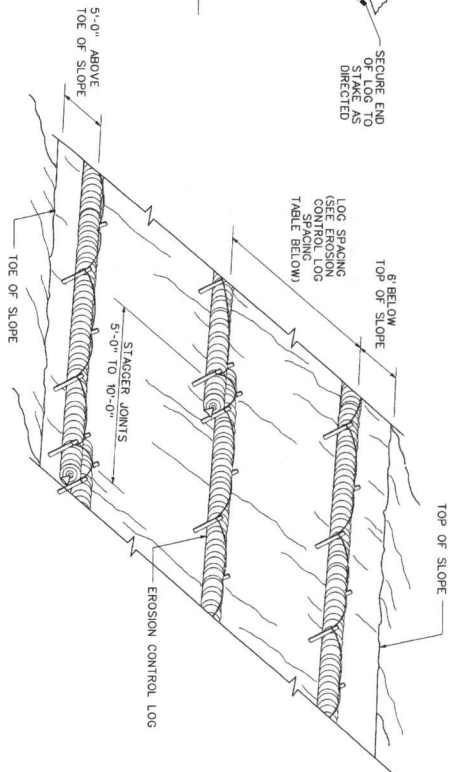
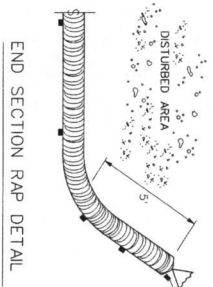


EROSION CONTROL LOGS ON SLOPES  
STAKE AND TRENCHING ANCHORING

CL-SST

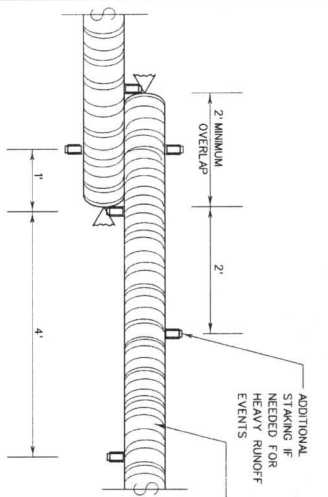
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

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



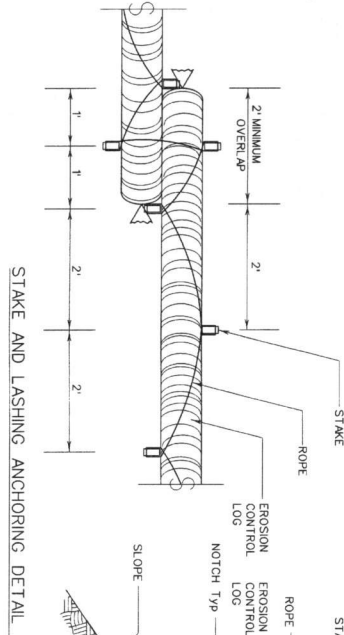
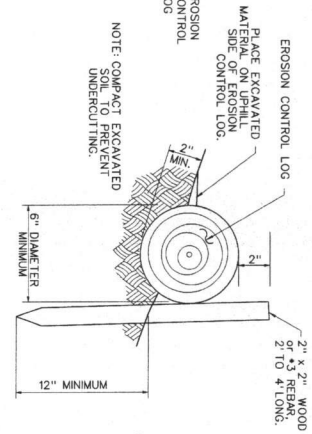
EROSION CONTROL LOGS ON SLOPES  
STAKE AND LASHING ANCHORING

CL-SSL



STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

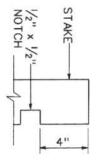


STAKE AND LASHING ANCHORING DETAIL

CL-SSL

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

STAKE NOTCH DETAIL



1/2" x 1/2"

SHEET 2 OF 3

Texas Department of Transportation

Design Standard

**TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES**

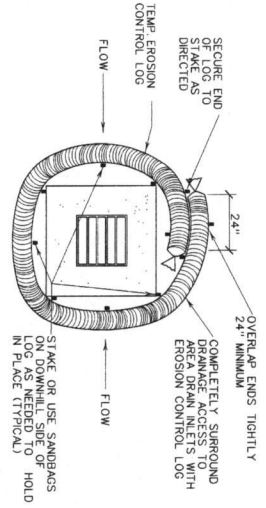
**EROSION CONTROL LOG**

**EC(9) -16**

FILE: EC16	REV: 02/16	DATE: 02/16	BY: JLB	CHECK: JLB	SCALE: AS SHOWN
PROJECT: JULE '2016	SECTION: 208	DATE: 02/16	BY: JLB	CHECK: JLB	SCALE: AS SHOWN
NO. 1	NO. 2	NO. 3	NO. 4	NO. 5	NO. 6
NO. 7	NO. 8	NO. 9	NO. 10	NO. 11	NO. 12
NO. 13	NO. 14	NO. 15	NO. 16	NO. 17	NO. 18
NO. 19	NO. 20	NO. 21	NO. 22	NO. 23	NO. 24
NO. 25	NO. 26	NO. 27	NO. 28	NO. 29	NO. 30
NO. 31	NO. 32	NO. 33	NO. 34	NO. 35	NO. 36
NO. 37	NO. 38	NO. 39	NO. 40	NO. 41	NO. 42
NO. 43	NO. 44	NO. 45	NO. 46	NO. 47	NO. 48

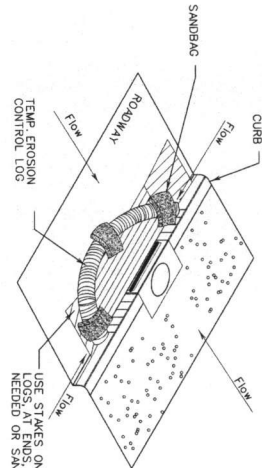
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DATE:  
FILE:



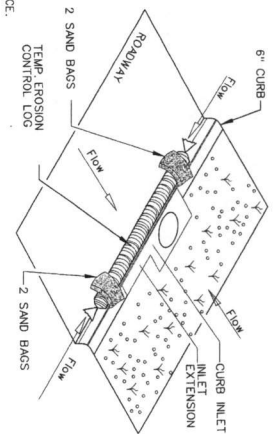
EROSION CONTROL LOG AT DROP INLET

CL-DI



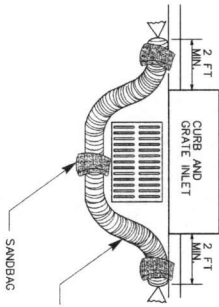
EROSION CONTROL LOG AT CURB INLET

CL-CI



EROSION CONTROL LOG AT CURB INLET

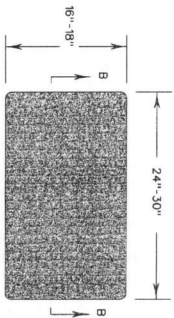
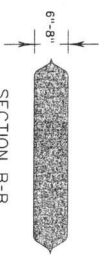
CL-CI



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

NOTE:  
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPED E TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.

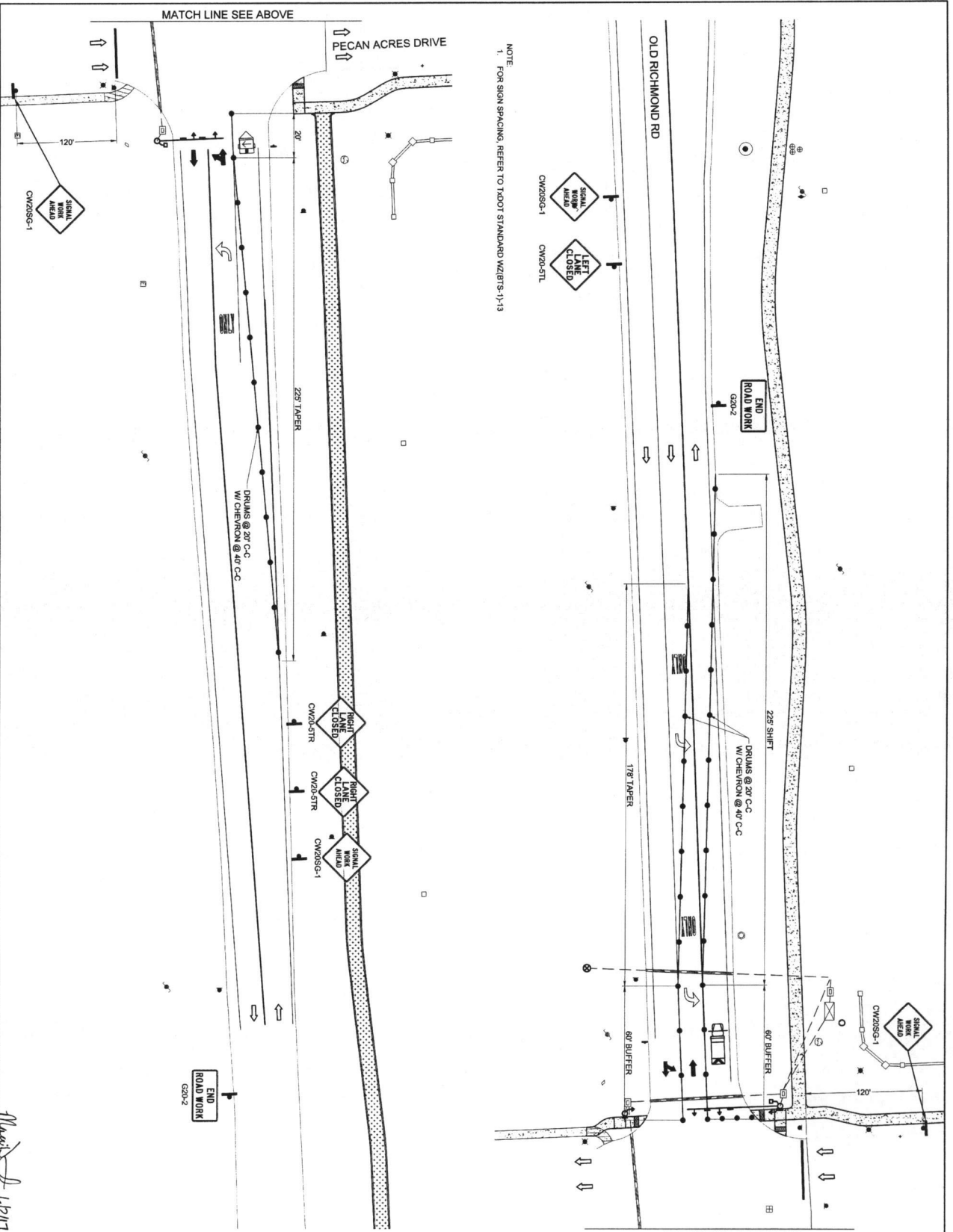


SANDBAG DETAIL

SHEET 3 OF 3

<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG</b>			
<b>EC(9) -16</b>			
FILE: EC916	DATE: JULY 2016	REV: 1	DATE: 07/17/17
PROJECT: 130071	SECTION: 206	COUNTY: 49	SHEET NO: 49





NOTE:  
1. FOR SIGN SPACING, REFER TO TPOOT STANDARD WZ/RTS-1-13

- LEGEND:
- TYPE 3 BARRICADE
  - TRAFFIC CONTROL SIGN
  - CHANNELIZING DEVICE
  - PROP TRAFFIC FLOW
  - EXIST TRAFFIC FLOW
  - FLAGGER
  - FLASHING ARROW BOARD

*John G. Hilly*  
5/24/17



2935 Blumhark Drive  
Houston, Texas 77042-3720  
Tel 713-266-6900 Fax 713-266-7586  
713-266-5298 Lines to be removed or work, ONLY DISPOSITION AT THE DISCRETION OF THE CLIENT.  
NOTICE: This drawing is the property of IAN Engineering and shall remain confidential. It is to be used for the project and site only. It is not to be used for any other project or site without the written consent of IAN Engineering.

**IAN Engineering**  
INCORPORATED  
Lodges Road  
Tomball, Texas 77375  
TEL 713-266-6900 FAX 713-266-7586

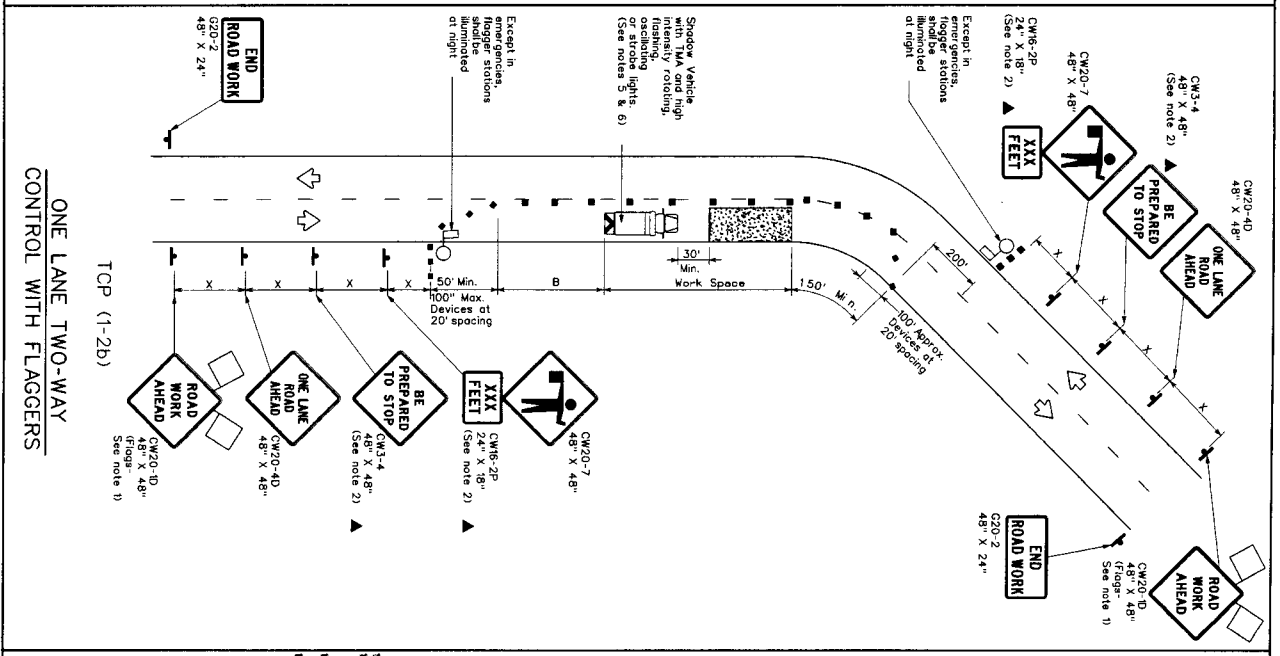
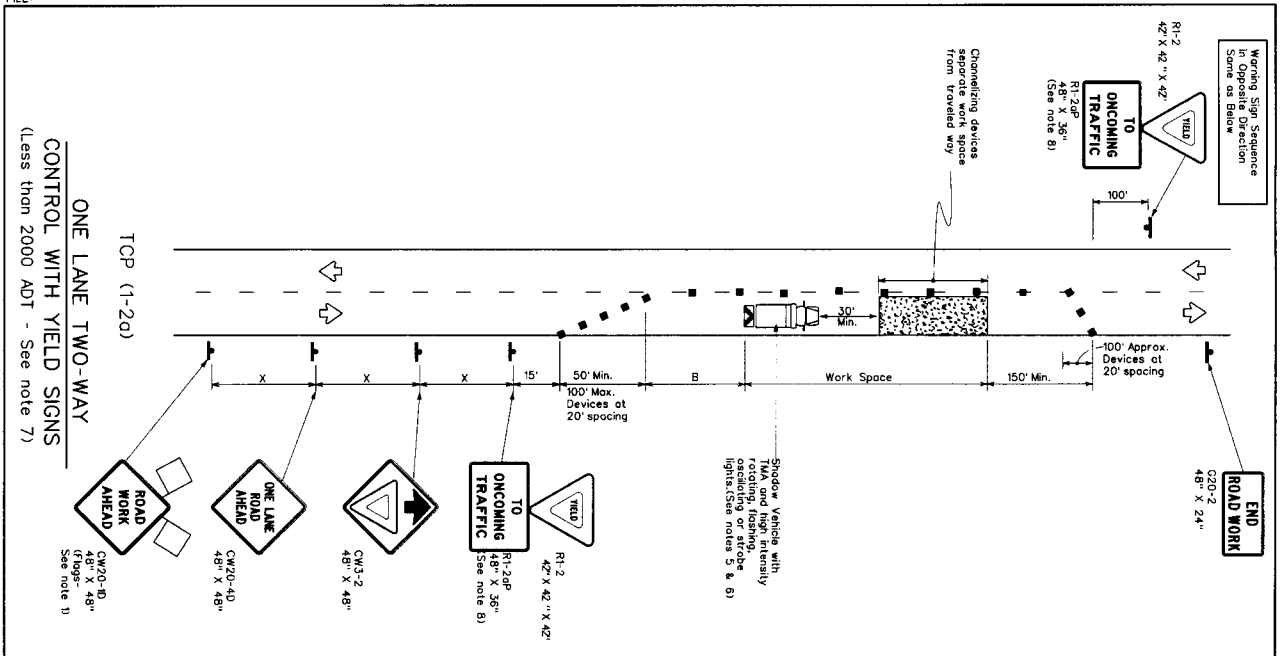
Approved for: N/A  
Checked by: N/A  
Date: N/A

FOR TARRANT COUNTY MUNICIPAL UTILITY DISTRICT NO. 25  
TRAILS SYSTEM PHASE 1  
TCP PHASE 2  
FORT BEND COUNTY, TX

DRAWING SCALE  
HORIZ: 1"=20'  
VERT: N/A

FILE NO:  
SHEET 51 OF 54

DATE:  
FILE:



**LEGEND**

Heavy Work Vehicle	Truck Mounted Attenuator (TMA)	Portable Changeable Message Sign (CMS)	Flagger
Trailer Mounted Attenuator (TMA)	Truck Mounted Attenuator (TMA)	Message Sign (CMS)	Flagger
Sign	Message Sign (CMS)	Message Sign (CMS)	Flagger

**GENERAL NOTES**

- Flags attached to signs where shown are REQUIRED.
- All traffic control devices illustrated except those denoted with the word "OPTIONAL" are REQUIRED unless otherwise stated elsewhere in the plans or for routine maintenance work, when approved by the Engineer.
- The "ROAD WORK AHEAD" sign shall be placed 300 feet in advance of the work zone.
- Sign spacing may be increased or an additional "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or "ELD" sign is less than 1500 feet.
- A Snowplow Vehicle with a TMA should be used whenever it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance of the traffic control in any way. Type 3 Barricades or other channelling devices may be substituted for the Snowplow Vehicle and TMA.
- Additional Snowplow Vehicles with TMAs may be positioned off the paved surface next to those shown in order to protect wider work spaces.
- TCP (1-20)
- "ELD" sign/traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work spaces should be no longer than one half city block. In rural areas on roadways with less than 2000 ADT, work spaces should be no longer than 400 feet.
- "ELD" sign with "ROAD WORK AHEAD" sign shall be placed on a support structure at 750 feet minimum mounting height.
- TCP (1-2b)
- Flaggers should use two-way radios or other methods of communication to control traffic.
- Length of work space should be based on the ability of flaggers to communicate.
- If all lanes are closed, a horizontal or vertical curve, the buffer distance should be the same as that shown in the diagram.
- Stopping sign distance to the flagger and a queue of stopped vehicles (see table above).
- Channelling devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
- Flaggers should use 24" STOP/SLOW paddles to control traffic. Paddles should be tilted to emergency situations.

**TYPICAL USAGE**

MOBILE	SHORT STATIONARY	SPEED TRAIL INTERMEDIATE	LONG TERM STATIONARY
✓	✓	✓	✓

**TABLE 1: Suggested Spacing of Traffic Control Devices**

Ported Speed (mi/h)	Minimum Spacing of Traffic Control Devices (ft)	Suggested Minimum Spacing of Traffic Control Devices (ft)	Minimum Sign Spacing (ft)	Suggested Maximum Spacing (ft)
30	100	100	120	200
35	150	150	180	300
40	205	225	245	420
45	265	295	320	505
50	330	360	390	600
55	400	440	480	720
60	480	528	576	864
65	570	630	684	1026
70	675	742.5	810	1215
75	795	877.5	954	1440

**GENERAL NOTES:**

- x Conventional Roads Only.
- xxx Taper lengths have been rounded off.
- L-Length of Taper (FT) W-Width of Offset (FT) S-Spacing (Feet/ft)

**TRAFFIC CONTROL PLAN**  
ONE-LANE TWO-WAY  
TRAFFIC CONTROL  
TCP(1-2)-12

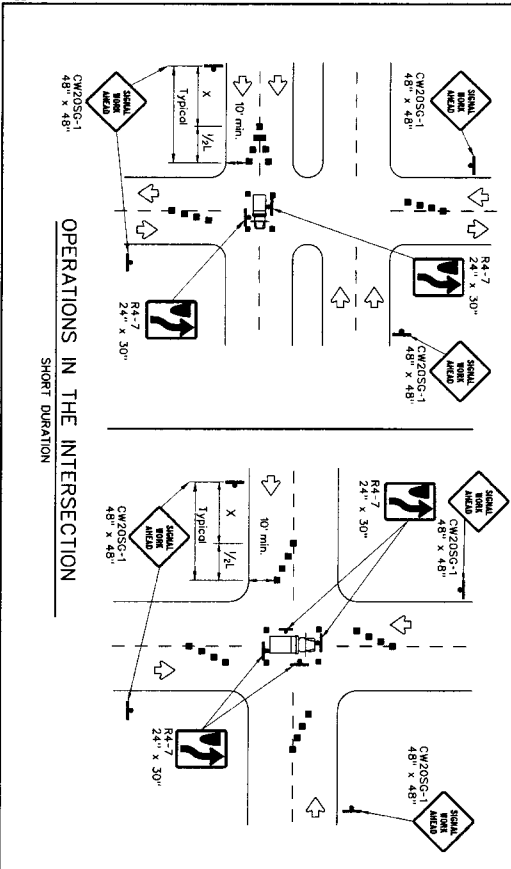
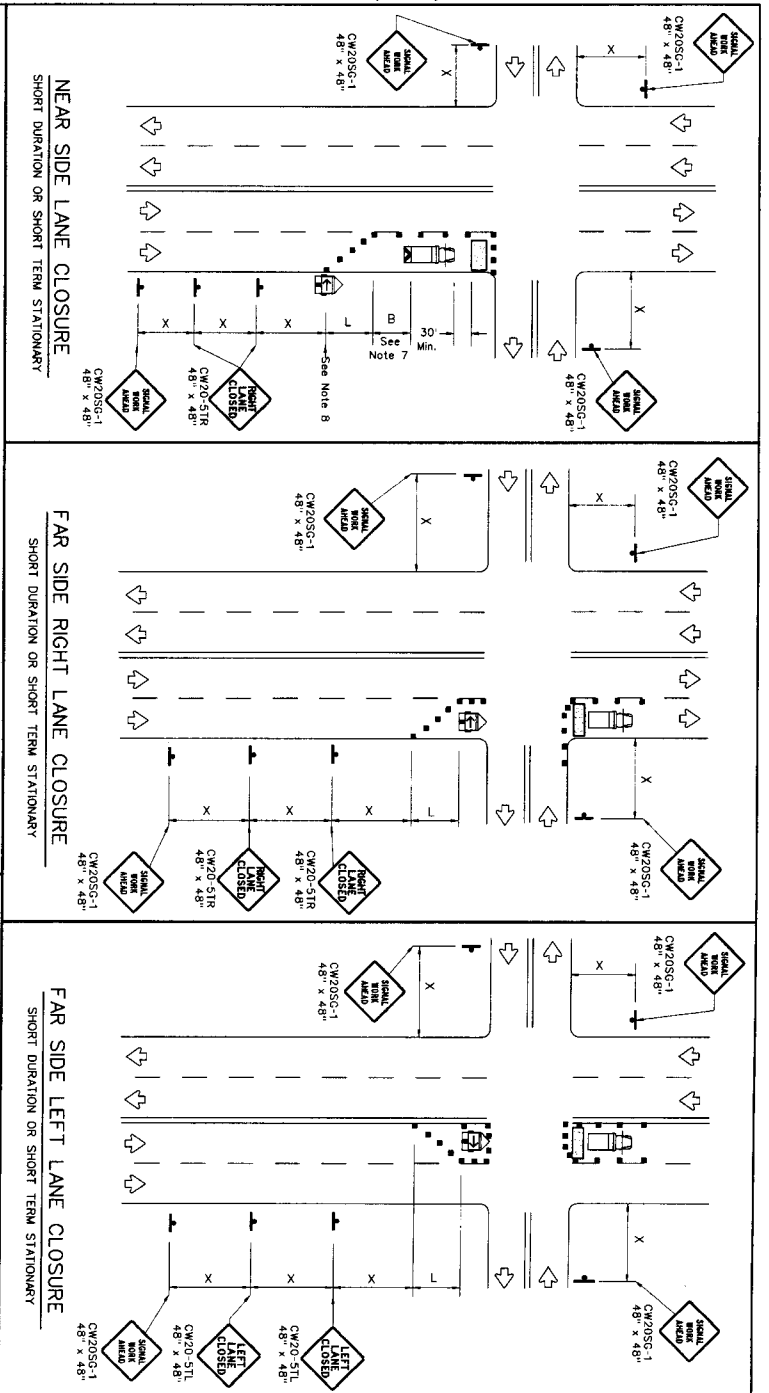
For construction or maintenance contract work, specific project requirements for sign and message signs should be found in the project GENERAL NOTES for item 502. Signs and message signs and traffic handling.

Texas Department of Transportation  
Traffic Operations Division

DATE: 4-26-12  
DRAWN: 2-12  
CHECKED: 2-14  
DESIGNED: 1-27  
SCALE: 1/8" = 1'-0"  
SHEET NO: 52

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DATE:  
FILE:



**GENERAL NOTES**

1. The minimum size channelizing device is the 28" cone, 42". Two-piece devices are preferred. Barricades will be required when the device must be left unattended at night.
2. Obstructions or hazards at the work area should be clearly marked and delineated at all times.
3. Flaggers and Flagger Symbol (CW20-7) signs may be required according to field conditions.
4. Vehicles parked in roadway should be equipped with at least two high intensity rotating, flashing, oscillating or strobe type lights.
5. High level warning devices (flag trees) may be used at corners of the vehicle.
6. When work operations are performed on existing signs, the signs may be placed in flashing red mode when approved by the engineer. If existing signs do not have power, All-Way Stop (R1-1) and R1-3F signs may be implemented when approved by the engineer.
7. For Short-Term Stationary work the buffer space "B" from the above table should be used if field conditions permit. For Short Duration (less than 1 hour) any buffer space provided will enhance the safety of the stop.
8. The arrow board at this location may be omitted for Short Duration work, if the work vehicle has an arrow board at the end of the taper in the closed lane. If space is not available at the beginning of the taper, signs and devices for the NEAR SIDE LANE CLOSURE may be placed for a left lane closure by using a LEFT LANE CLOSED (CW20-51L) and adding channelizing devices on the centerline to protect the work space from opposing traffic.

WZ/BTS

**LEGEND**

████████	Type 3 Barricade	■	Channelizing Devices
▣	Heavy Work Vehicle	▣	Truck Mounted Attenuation (TMA)
▣	Trailer Mounted Flashing Arrow Board	▣	Portable Channelized Message Sign (PCMS)
▣	Sign	↔	Traffic Flow
▣	Flag	▣	Flagger

Posted Speed	Formula	Minimum Taper Length	Suggested Maximum Spacing of Devices	Minimum Sign Spacing	Suggested Sign Spacing
30	150'	180'	30'	120'	90'
35	150'	205'	35'	120'	120'
40	150'	265'	40'	120'	155'
45	150'	450'	45'	120'	195'
50	150'	550'	50'	100'	240'
55	150'	605'	55'	110'	295'
60	150'	660'	60'	120'	350'
65	150'	715'	65'	130'	410'
70	150'	770'	70'	140'	475'
75	150'	825'	75'	150'	540'

\* Conventional Roads Only  
\* Taper lengths have been rounded off.  
\* L-length of Taper (T) = W-width of Offset (T) S-Posted Speed (MPH)

WORKERS IN BUCKET TRUCKS SHALL NOT WORK ABOVE OPEN LANES OF TRAFFIC.

**Texas Department of Transportation**

**TRAFFIC SIGNAL WORK TYPICAL SIGNAL DETAILS**

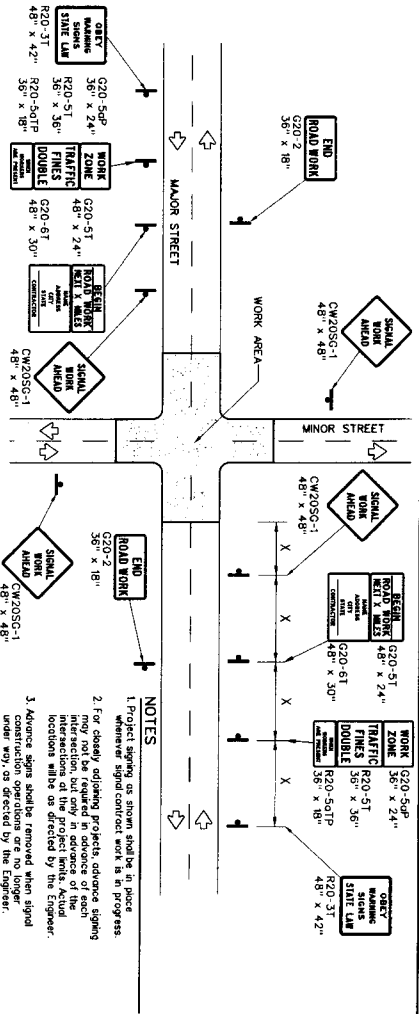
WZ(BTS)-1-13

SHEET 1 OF 2

DATE: 08/21/09  
DRAWN BY: WZ/BTS  
CHECKED BY: WZ/BTS  
SCALE: AS SHOWN  
SHEET NO. 53

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DATE: FILE:



**TYPICAL ADVANCE SIGNAL PROJECT SIGNING**  
FOR LONG TERM AND INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

**GENERAL NOTES FOR WORK ZONE SIGNS**

- Signs shall be installed and maintained in a straight and plumb condition.
- Wooden sign posts shall be painted white.
- Barricades shall NOT be used on sign supports.
- Holes shall NOT be used to attach signs to any support.
- All signs shall be installed in accordance with the plans or as directed by the Engineer.
- The Contractor shall furnish sign supports and substrates listed in the Standard Highway Sign Designs for Texas (SHSD). The Contractor shall furnish sign supports and substrates listed in the Standard Highway Sign Designs for Texas (SHSD). The Contractor shall furnish sign supports and substrates listed in the Standard Highway Sign Designs for Texas (SHSD).
- Temporary signs that have damaged or cracked substrates and/or supports shall be replaced as directed by the Engineer.
- Identification markings may be shown only on the back of the sign substrate. The mounting height of letters and/or company logos used for identification shall be 1".
- Damaged wood posts shall be replaced splicing wood posts within the allowed.

**DURATION OF WORK**

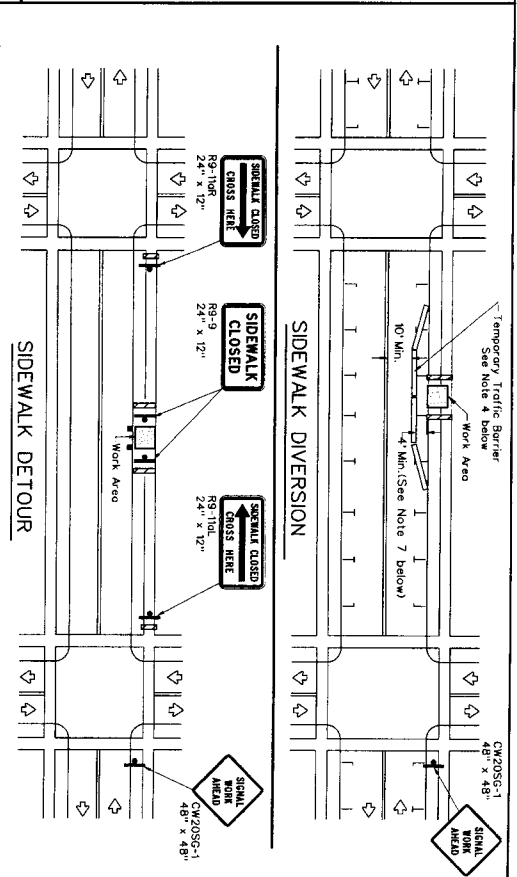
- Work zone duration are defined in Part 6, Section 6C.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).
- Tasks duration on Uniform Traffic Control Devices (TMUTCD).

**SIGN MOUNTING HEIGHT**

- Sign height of Long-Term/Intermediate-Term warning signs shall be as shown on Figure 6B-1 of the TMUTCD.
- Sign height of Short-Term/Short Duration warning signs shall be as shown on Figure 6B-2 of the TMUTCD.
- Regulatory signs shall be mounted at least 7 feet, but not more than 8 feet, above the power surface regardless of work duration.

**REMOVING OR COVERING**

- When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
- When signs are covered, the material used shall be opaque, such as black plastic, and maintain their original position under automatic headlights at night without damaging the sign sheeting or the sign face. Signs shall be covered with a material that is used to cover signs.
- Dual type or other adhesive material shall NOT be affixed to a sign face.
- Signs and other aids shall be removed and holes back filled upon completion of the work.



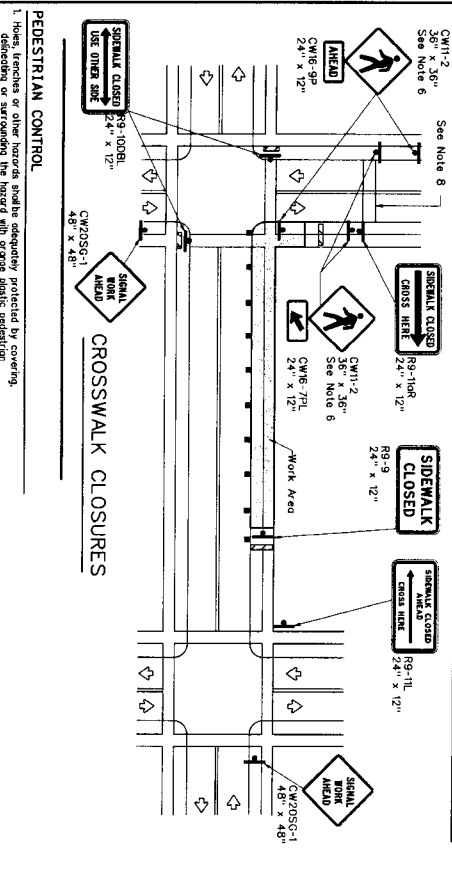
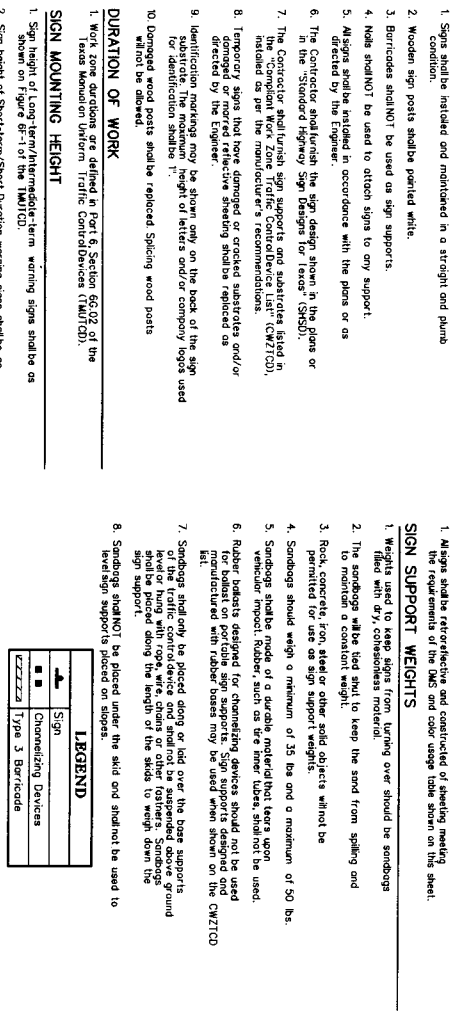
**REFLECTIVE SHEETING**

- Make signs retro-reflective and constructed of sheeting meeting the requirements of the size and color usage table shown on this sheet.
- Sign support WEIGHTS

  - Weights used to keep signs from turning over should be sandbags filled with dry, chain-stainless material.
  - The sandbags shall be tied shut to keep the sand from spilling and to maintain a constant weight.
  - Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
  - Sandbags shall 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 the inner tubes, shall not be used.
  - Rubber blocks designed for cheneviere devices should not be used for sign support. Sign supports designed for use with cheneviere devices may be used when shown on the CWZTCO list.
  - Sandbags shall only be placed atop or laid over the base supports of the traffic control device and shall not be suspended above the sign support.
  - Sandbags shall NOT be placed under the sign and shall not be used to level sign supports on slopes.

**NOTES**

- Project signing as shown shall be in place whenever signal control work is in progress.
- For clearly defining projects, advance signing may not be required in advance of each intersection, but only in advance of the locations where advance signing is required as directed by the Engineer.
- Advance signs shall be removed when signal under way, as directed by the Engineer.
- Warning sign spacing shown is typical for both directions.
- See the Table on sheet 1 of 2 for Typical Warning Sign Spacing.



**DEPARTMENTAL MATERIAL SPECIFICATIONS**

SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B <sub>1</sub> OR TYPE C <sub>1</sub> SHEETING
WHITE	BACKGROUND	TYPE A SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCO) describes pre-qualified products and their sources and may be found at the following web address:  
[http://www.txdot.gov/txdot\\_library/publications/construction.htm](http://www.txdot.gov/txdot_library/publications/construction.htm)

**TRAFFIC SIGNAL WORK BARRICADES AND SIGNS**

WZ(BTS-2)-13

2-98 8-99 7-13

4-98 3-13

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TEXAS DEPARTMENT OF TRANSPORTATION

TRAFFIC OPERATIONS STANDARD

SHEET 2 OF 2