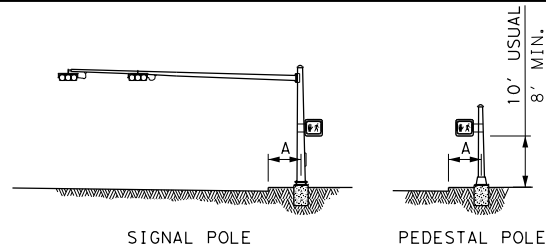


NOTES:

1. RELOCATE EXISTING SIGNAL POLE, SIGNAL HEADS, PUSH BUTTONS AND VIVDS CAMERA AS SHOWN ON THE PLAN. RELOCATE EXISTING PEDESTRIAN HEAD W2 AND PUSH BUTTON PB2 TO PROPOSED PEDESTAL POLE PP-1.
2. ALL OTHER EXISTING SIGNAL EQUIPMENTS ARE TO REMAIN UNLESS OTHERWISE NOTED ON THE PLAN.
3. REMOVE EXISTING SIGNAL HEADS AND INSTALL NEW SIGNAL HEADS FOR SH-1 & SH-6. CONNECT NEW SIGNAL HEADS TO EXISTING CABLES.
4. PROVIDE TO CITY OF SAN ANGELOS'S TRAFFIC OPERATIONS ONE (1) ECONOLITE COBALT CONTROLLER, ONE (1) 5.8 GHZ COMMUNICATION SYSTEM, A 5-PORT MIN. SWITCH, AND AN EDI MMU 16-LEIP SMARTMONITOR FOR INSTALLATION.



SIGNAL POLE LOCATION			
POLE	A	STATION	OFFSET
TS-4	4.5'	16+09.00	45.73' RT
TS-1		EXISTING	
TS-2		EXISTING	
TS-3		EXISTING	
PP-1	5'	16+15.89	53.31' RT

SIGNAL HEAD SCHEDULE



SIGNALS
SH-2
SH-3
SH-4
SH-5
SH-7
SH-8
(EXISTING)



PEDESTRIAN SIGNALS
W1, W4
(EXISTING)



SIGNALS
SH-1
SH-6
(PROPOSED)

FY = FLASHING YELLOW



SIGNALS
SH-9
SH-10
(RELOCATED)



PB1, PB4
(EXISTING)



PEDESTRIAN SIGNALS
W2, W3
(RELOCATED)



PB2
(RELOCATED)



PB3
(RELOCATED)

SUMMARY OF QUANTITIES

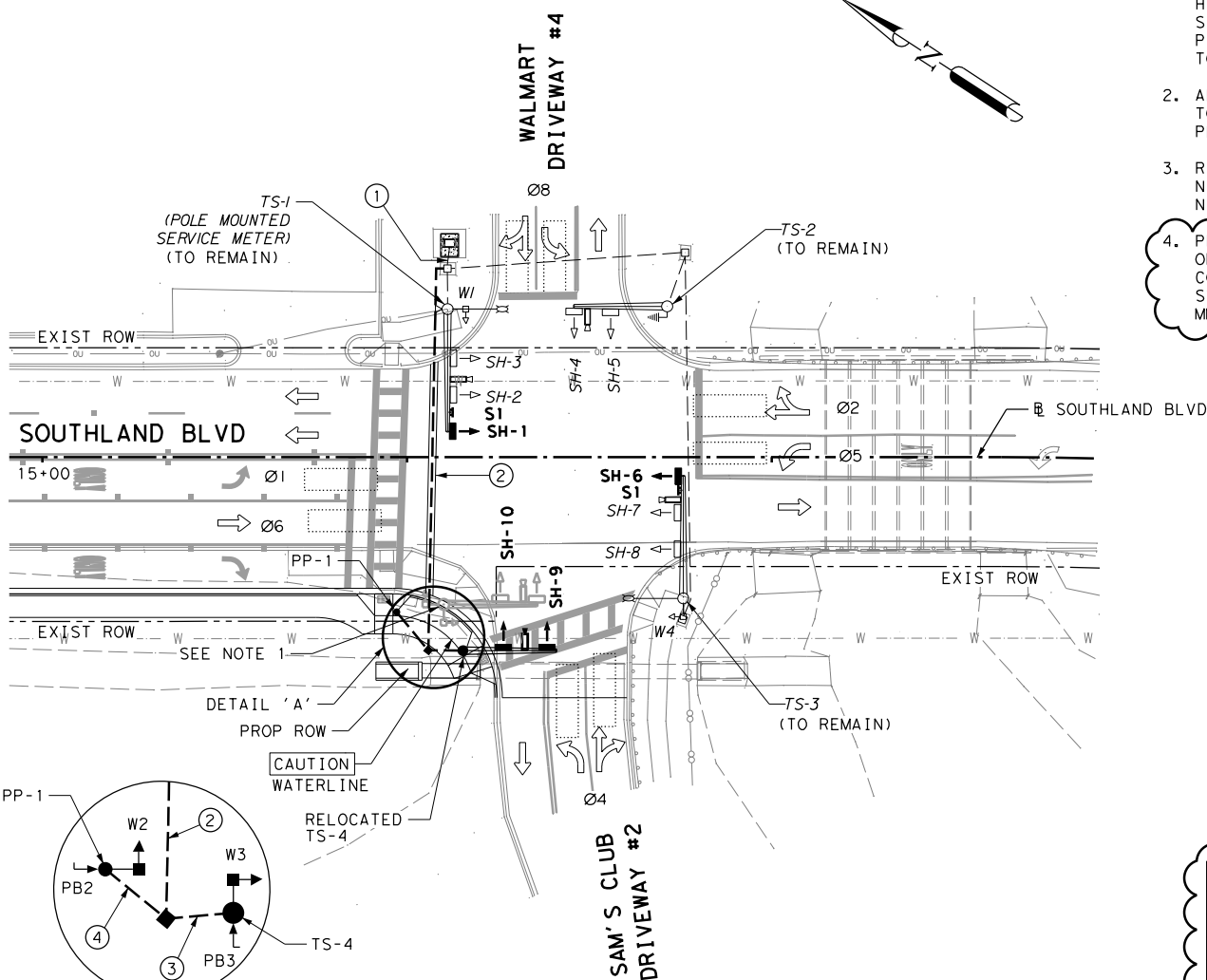
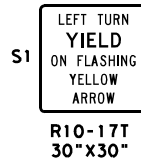
ITEM	CODE	DESCRIPTION	UNIT	QTY
*0416	6030	DRILL SHAFT (TRF SIG POLE) (24 IN)	LF	6
0416	6031	DRILL SHAFT (TRF SIG POLE) (30 IN)	LF	12
0618	6023	CONDT (PVC) (SCH 40) (2")	LF	14
0618	6029	CONDT (PVC) (SCH 40) (3")	LF	10
0618	6030	CONDT (PVC) (SCH 40) (3") (BORE)	LF	108
0620	6007	ELEC CONDR (NO.8) BARE	LF	140
0624	6010	GROUND BOX TY D (162922) W/APRON	EA	1
0680	6003	INSTALL HWY TRF SIG (SYSTEM)	EA	1
*		ECONOLITE COBALT ATC TRAFFIC CONTROLLER	EA	(1)
*		5.8 GHZ COMMUNICATION SYSTEM, UBIQUITI NBE-MT-19-5GHZ NANO BEAM 19dbi	EA	(1)
*		5-PORT SWITCH, UBIQUITI TS-5-POE	EA	(1)
*		EDI MMU 16-LEIP SMART MONITOR	EA	(1)
0684	6007	TRF SIG CBL (TY A) (12 AWG) (2 CONDR)	LF	30
0684	6010	TRF SIG CBL (TY A) (12 AWG) (5 CONDR)	LF	35
0684	6025	TRF SIG CBL (TY A) (12 AWG) (20 CONDR)	LF	130
0686	6282	RELOC TRF SG PL AM(S) SNGL MST ARM POLE	EA	1
0687	6001	PED POLE ASSEMBLY	EA	1
6002	6005	VIVDS COMMUNICATION CABLE (COAXIAL)	LF	130

* SUBSIDIARY TO OTHER ITEMS

SEQUENCE CHART

INTERVAL	PHASE 2&6			PHASE 1&5			PHASE 4&8			FLASHING OPERATIONS
	R/W	CLEAR 2&6	CLEAR TO ALL PHASES	R/W	CLEAR 1&5	CLEAR TO ALL PHASES	R/W	CLEAR 4&8	CLEAR TO ALL PHASES	
SH-2, SH-3	G	Y	R	R	R	R	R	R	R	R
SH-1	<FY	<Y	<R	<G	<Y	<R	<R	<R	<R	<R
SH-7, SH-8	G	Y	R	R	R	R	R	R	R	R
SH-6	<FY	<Y	<R	<G	<Y	<R	<R	<R	<R	<R
SH-4, SH-5	R	R	R	R	R	R	G	Y	R	R
SH-9, SH-10	R	R	R	R	R	R	G	Y	R	R

SIGN DETAILS

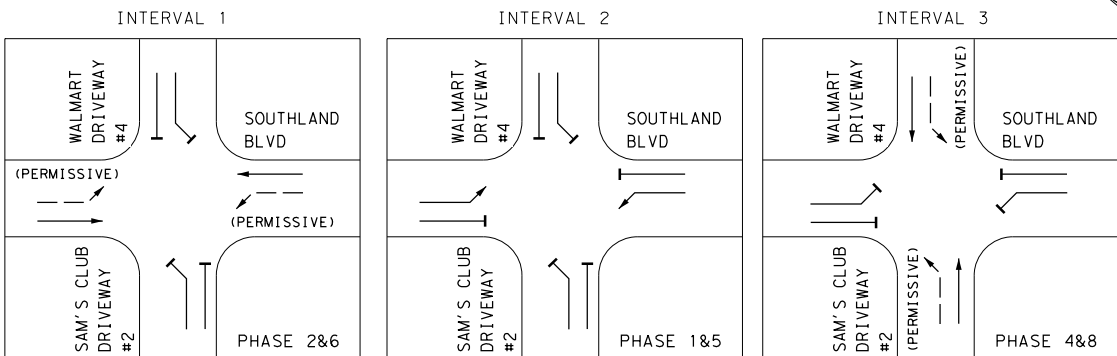


POLES TS-4 & PP-1
DETAIL 'A'
NTS

SUMMARY OF CONDUIT AND CABLES

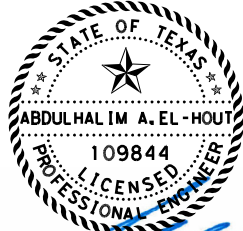
RUN NO	CONDUIT			LENGTH	GRND #8 AWG (BARE)	SIGNAL			VIVDS	
	TRENCH 2"	TRENCH 3"	BORE 3"			2/C #12 AWG	5/C #12 AWG	20/C #12 AWG	*3/C-#16	COAXIAL
1		EXIST		8'				1	1	1
2			1	108'	1			1	1	1
3		1		10'	1	1	1	1	1	1
4	1			14'	1	1	1			
TOTAL	14'	10'	108'		132'	24'	24'	126'	126'	126'

* SUBSIDIARY TO ITEM 6002



LEGEND

- EXIST SIGNAL POLE
- EXIST MAST ARM
- EXIST SIGNAL CONTROLLER
- ▽ EXIST METER AND DISCONNECT
- ◀ EXIST HORIZONTAL SIGNAL HEAD
- ⬇ EXIST PEDESTRIAN SIGNAL
- ⬆ EXIST PUSH BUTTON
- ⬇ EXIST LUMINAIRE WITH ARM
- ⬆ EXIST ANTENNA
- EXIST GROUND BOX
- ⬆ EXIST VIVDS CAMERA
- EXIST CONDUIT
- VIDEO DETECTION ZONE
- PROP PEDESTAL POLE
- RELOCATED SIGNAL POLE
- RELOCATED MAST ARM
- ◀ RELOCATED/NEW HORIZONTAL SIGNAL HEAD
- ⬆ RELOCATED PEDESTRIAN SIGNAL
- ⬆ RELOCATED PUSH BUTTON
- ⬆ RELOCATED VIVDS CAMERA
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- PROP GROUND BOX, TYPE D
- ⬆ TRAFFIC FLOW



1/11/2017
0' 25' 50'
SCALE: 1"=50'

LJA Engineering, Inc. LJA
FRN-F-1386



SOUTHLAND BOULEVARD
SIGNAL MODIFICATION
AT SAM'S/WAL-MART DRIVEWAY

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GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.
2. 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). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication 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.
3. 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.
4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.
5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.
6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.
2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.
3. 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 through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, 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"	16" 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"

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 within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.
5. Provide hot 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.
6. 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, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.
7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid 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.
9. 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 called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. 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.
10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.
2. 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 ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.
3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.
4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after 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.
5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."
6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.
7. 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.
8. 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 cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.
9. 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.
10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.
11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.
12. 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 on sheet ED(4).
13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.
14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.



Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
CONDUITS & NOTES

ED(1)-14

FILE: ed1-14.dgn	DWG:	CHK:	DWG:	CHK:
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS				SOUTHLAND
	DIST	COUNTY	SHEET NO.	
		TOM GREEN	49	

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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS) 11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.
2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.
3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.
4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.
2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.
3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.
4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.
5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.
6. Support conductors in illumination poles with a J-hook at the top of the pole.
7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.
8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.
9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.
10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.

11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.
2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.
3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.
4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.
5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

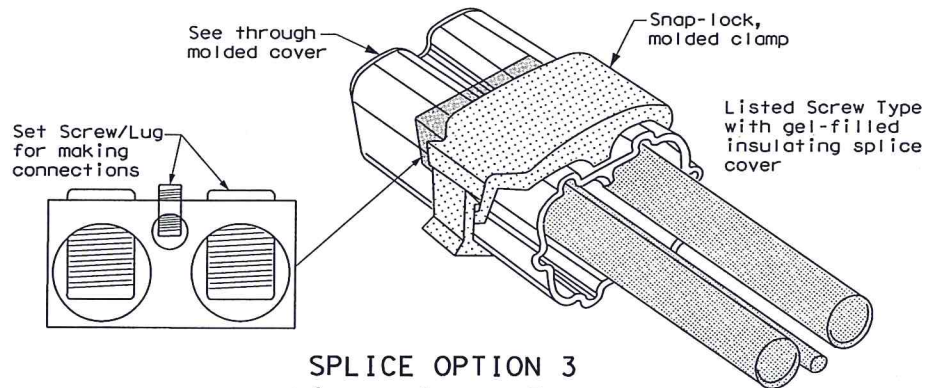
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

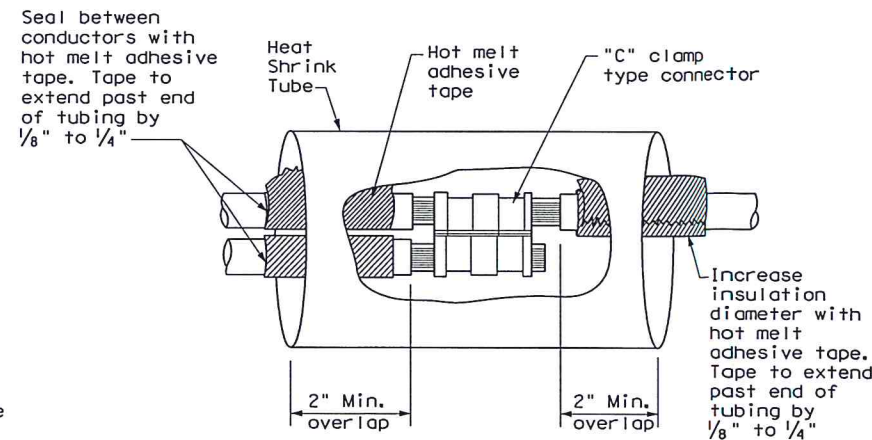
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

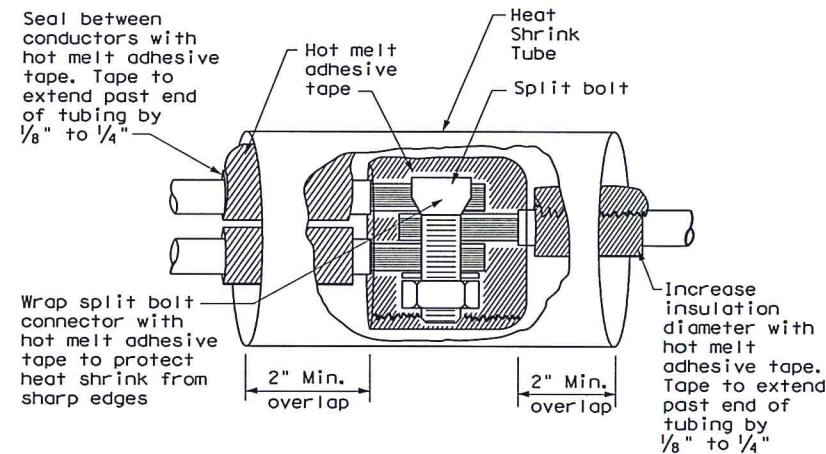
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.
2. Do not place ground rods in the same drilled hole as a timber pole.
3. Install ground rods so the imprinted part number is at the upper end of the rod.
4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.
6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 3
Listed Screw Type



SPLICE OPTION 1
Compression Type

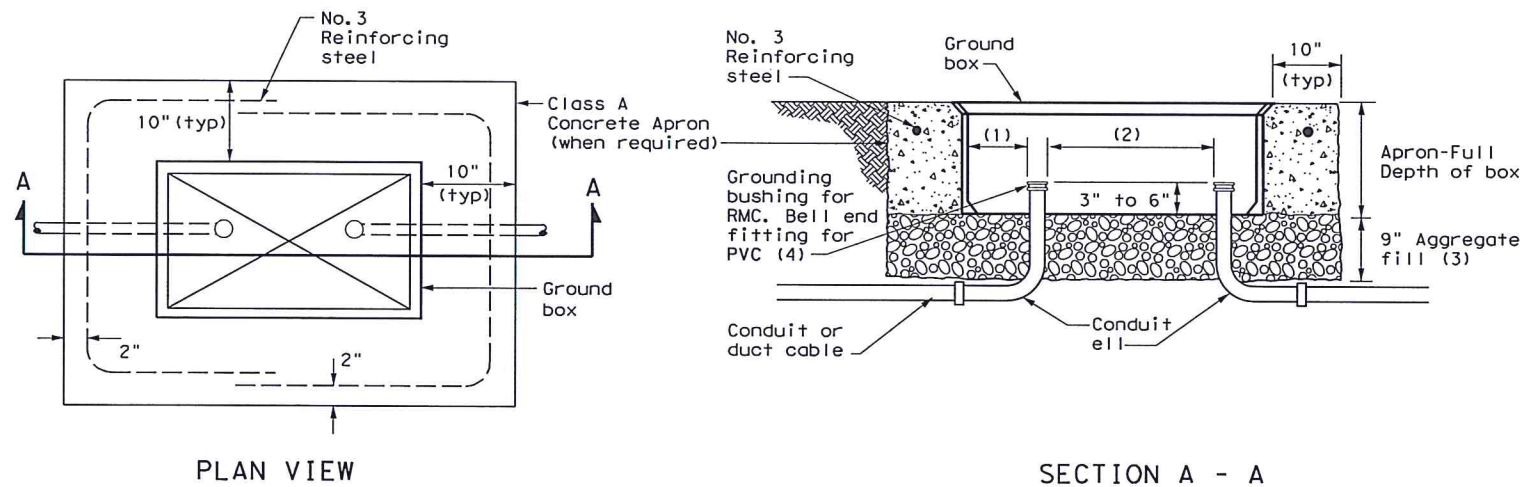


SPLICE OPTION 2
Split Bolt Type

		Traffic Operations Division Standard	
ELECTRICAL DETAILS CONDUCTORS			
ED(3) - 14			
FILE: ed3-14.dgn	DN: TxDOT	CK: TxDOT	DN: TxDOT
© TxDOT October 2014	CONT	SECT	JOB
REVISIONS		HIGHWAY	
DIST		COUNTY	SHEET NO.
		TOM GREEN	50

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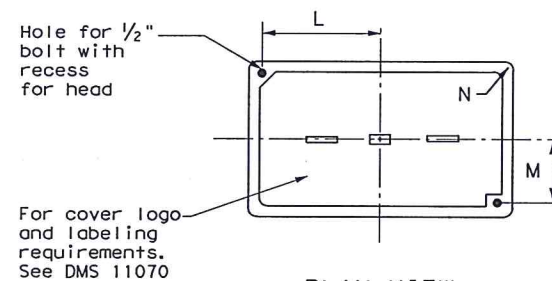


APRON FOR GROUND BOX

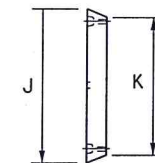
- (1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.
- (2) Maintain sufficient space between conduits to allow for proper installation of bushings.
- (3) Place 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

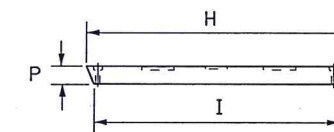
GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



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.
4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

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 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.
2. 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 under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.
3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.
4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.
5. Temporarily seal all conduits in the ground box until conductors are installed.
6. 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.
7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.
8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.
9. 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. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.
10. 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.
11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

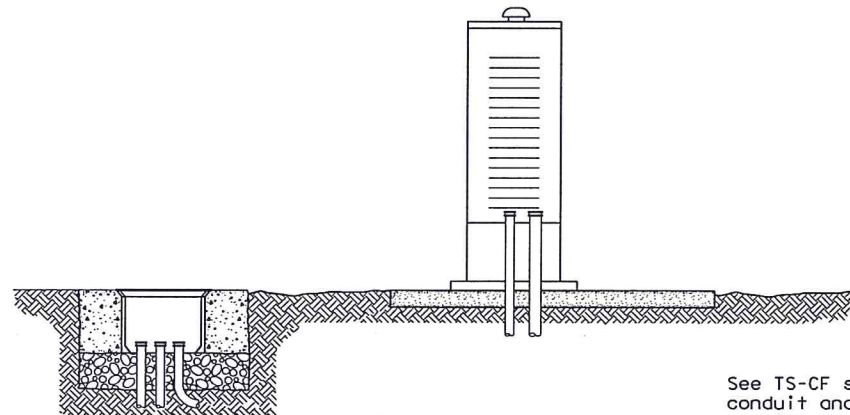
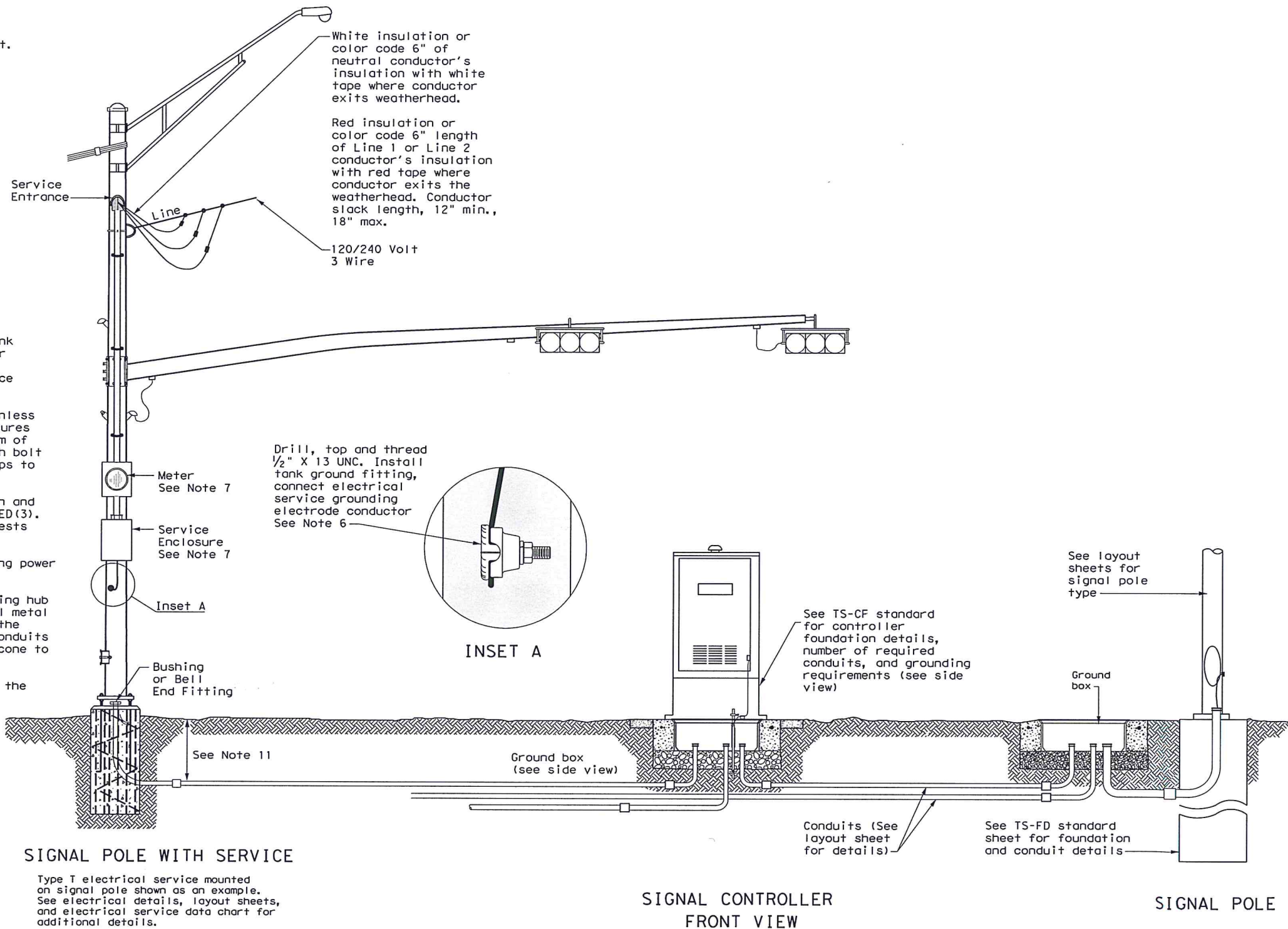
		Traffic Operations Division Standard	
ELECTRICAL DETAILS GROUND BOXES			
ED(4) - 14			
FILE: ed4-14.dgn	DN: TxDOT	CK: TxDOT	DN: TxDOT
© TxDOT October 2014	CONT	SECT	JOB
REVISIONS		SOUTHLAND	
DIST	COUNTY	SHEET NO.	
	TOM GREEN	51	

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DATE: Sep. 23, 2016 11:07:07 AM
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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 installed roadway 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, ground the fixture to the pole with a 12 AWG green XHHW conductor.
5. 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.
6. Drill and tap signal poles for 1/2 in. X 13 UNC tank ground fitting. 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. Connect the electrical service grounding electrode conductor to the 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 branch circuit conduit as shown in the plans.
7. Mount electrical service enclosure and meter to signal pole 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 each enclosure. Install properly sized stainless steel washers on each bolt in the enclosure. Band or drill and tap properly sized stand-off straps to signal pole 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 ED(3). To prevent electronics damage, do not conduct insulation resistance tests on traffic signal cables 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 entering enclosures 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 locations and any additional conduits that are required.



Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS

TYPICAL TRAFFIC SIGNAL

SYSTEM DETAILS

ED(8) - 14

FILE: ed8-14.dgn	DN: TxDOT	CK: TxDOT	DN: TxDOT	CK: TxDOT
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS				SOUTHLAND
	DIST	COUNTY		SHEET NO.
		TOM GREEN		52

DATE: Sep. 23, 2016 11:08:56 AM
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FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (††)					
		FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	32'	48'		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'	32' X 32'		
			36' X 36'		
			40' X 36'		
			44' X 28'	44' X 36'	
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		24' X 24'		
			28' X 28'		
			32' X 24'	32' X 32'	
				36' X 36'	
				40' x24'	40' X 36'
					44' x 36'

36-A can support a single 36' ...

1/4" thk. min.
Circular Steel
Top Template

Heavy Hex
Nut (Typ)

2 Flat Washers
per Anchor Bolt

Anchor Bolt Length
(See Table)

Galvanize Length
= Top Thread
plus 6" Min.

Top Thread

Type 1

Type 2

$R=d$

Bottom Thread

Thickness =
 $d/4$ (inch) min.

1 1/2" Min

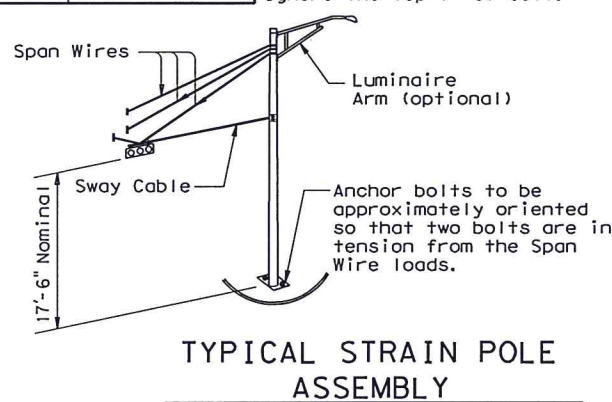
Circular Steel Bottom Template
(Omit bottom template
for FDN 24-A)

2 Sides
(Typ)

HOOKED ANCHOR
(TYPE 1)

NUT ANCHOR
(TYPE 2)

ANCHOR BOLT ASSEMBLY

[illegible]

ANCHOR BOLT & TEMPLATE SIZES						
BOLT DIA IN.	⑦ BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R ₂	R ₁
¾"	1'-6"	3"	—	12 ¾"	7 ⅞"	5 ⅝"
1 ½"	3'-4"	6"	4"	17"	10"	7"
1 ¾"	3'-10"	7"	4 ½"	19"	11 ¼"	7 ¾"
2"	4'-3"	8"	5"	21"	12 ½"	8 ½"
2 ¼"	4'-9"	9"	5 ½"	23"	13 ¾"	9 ¼"

Conduit

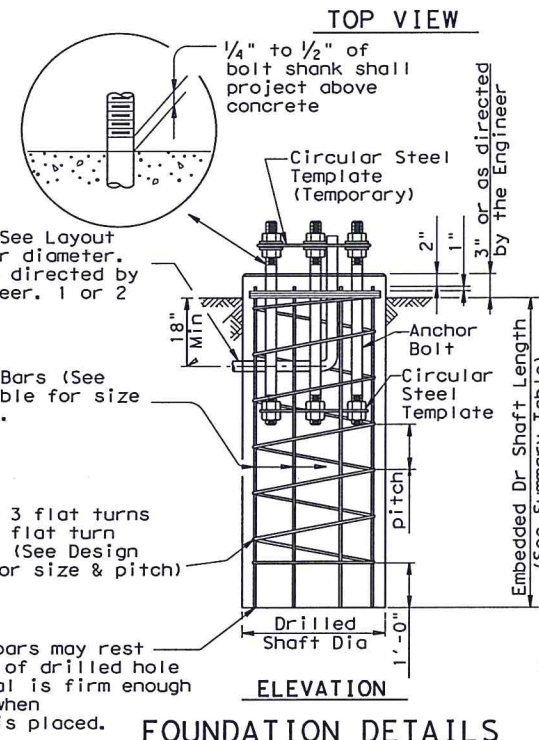
Steel Template with holes $\frac{1}{16}$ " greater than bolt diameter

Bond anchor bolts to rebar cage, two locations using #3 bar or #6 copper jumper. Mechanical connectors shall be UL Listed for concrete encasement.

Spiral

Vertical Bars

Bolt Circle Diameter



GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.

Reinforcing steel shall conform to Item 440, "Reinforcing Steel".

Concrete shall be Class "C".

Threads for anchor bolts and nuts shall be rolled or cut threads of 8UN series up to 2" in diameter or UNC series for all sizes. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.

Anchor bolts that are larger than 1" in diameter shall conform to "alloy steel" or "medium-strength mild steel" per Item 449, "Anchor Bolts". Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Galvanize a minimum of the top end thread length plus 6" for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing".

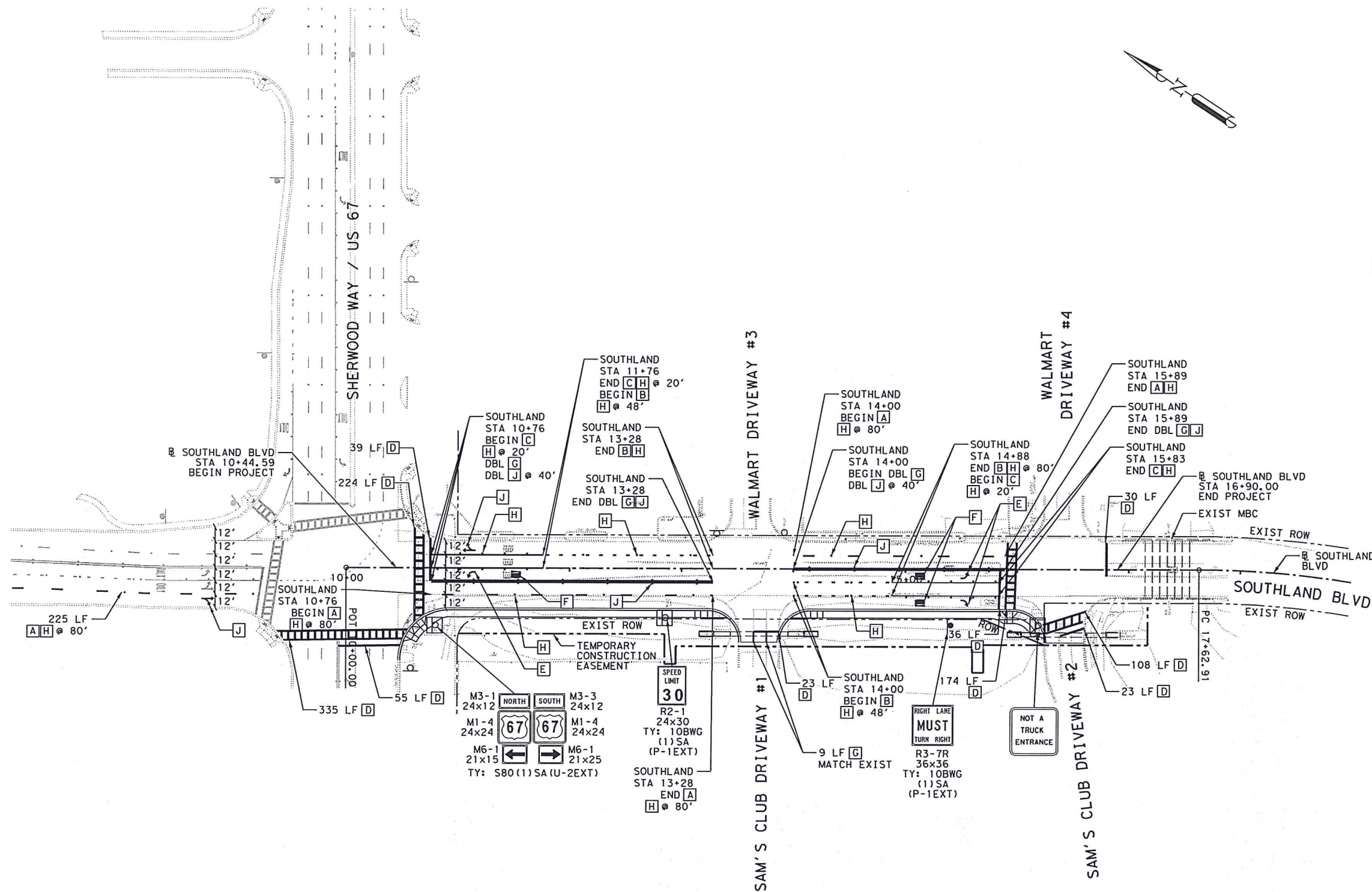
Templates and embedded nuts need not be galvanized. Lubricate and tighten anchor bolts when erecting the structure in accordance with Item 449, "Anchor Bolts".



Sep. 23, 2016

LEGEND

- [A] REFL PAV MRK TY I (W) 4" (BRK) (100MIL)
- [B] REFL PAV MRK TY I (W) 8" (DOT) (100MIL)
- [C] REFL PAV MRK TY I (W) 8" (SLD) (100MIL)
- [D] REFL PAV MRK TY I (W) 24" (SLD) (100MIL)
- [E] REFL PAV MRK TY I (W) (ARROW) (100MIL)
- [F] REFL PAV MRK TY I (W) (WORD) (100MIL)
- [G] REFL PAV MRK TY I (Y) 4" (SLD) (100MIL)
- [H] REFL PAV MRK TY I-C
- [J] REFL PAV MRKR TY II-A-A
- Ⓟ EXISTING SIGN TO REMAIN
- Ⓢ EXISTING SIGN TO RELOCATE
- Ⓣ PROPOSED SMALL SIGN



09/23/2016

0' 25' 50' 100'

SCALE: 1"=100'

REV. NO.	DATE	DESCRIPTION	BY

FRN - F-1386

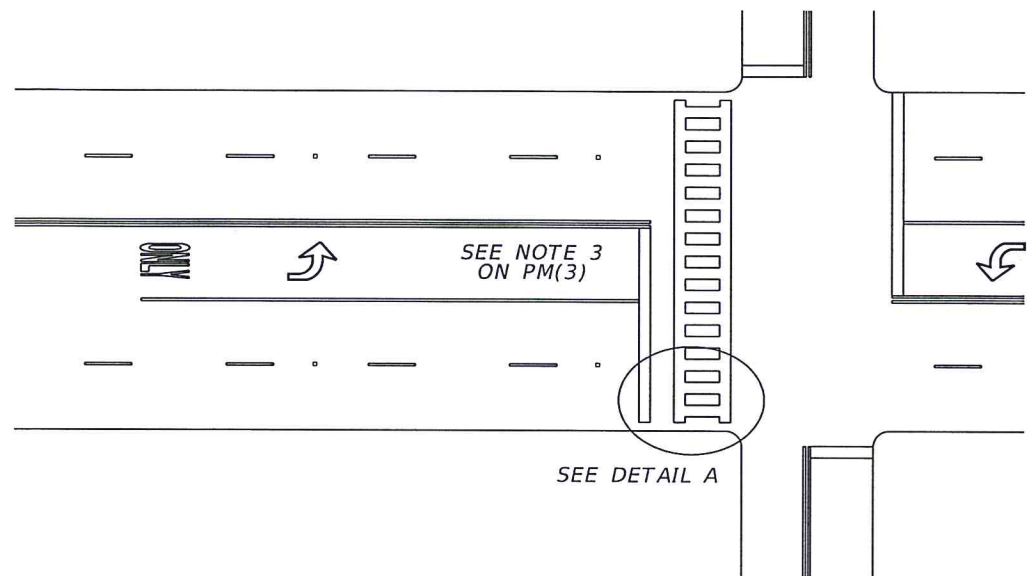
**SOUTHLAND BOULEVARD
SIGNING AND PAVEMENT
MARKING LAYOUT**

SHEET 1 OF 1

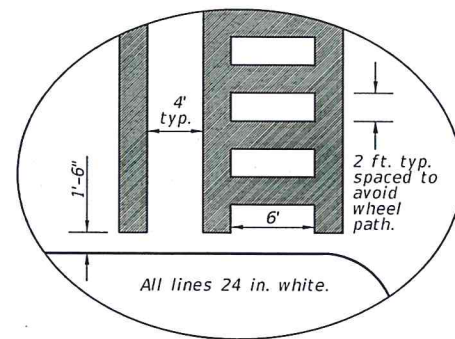
54

NOTES:

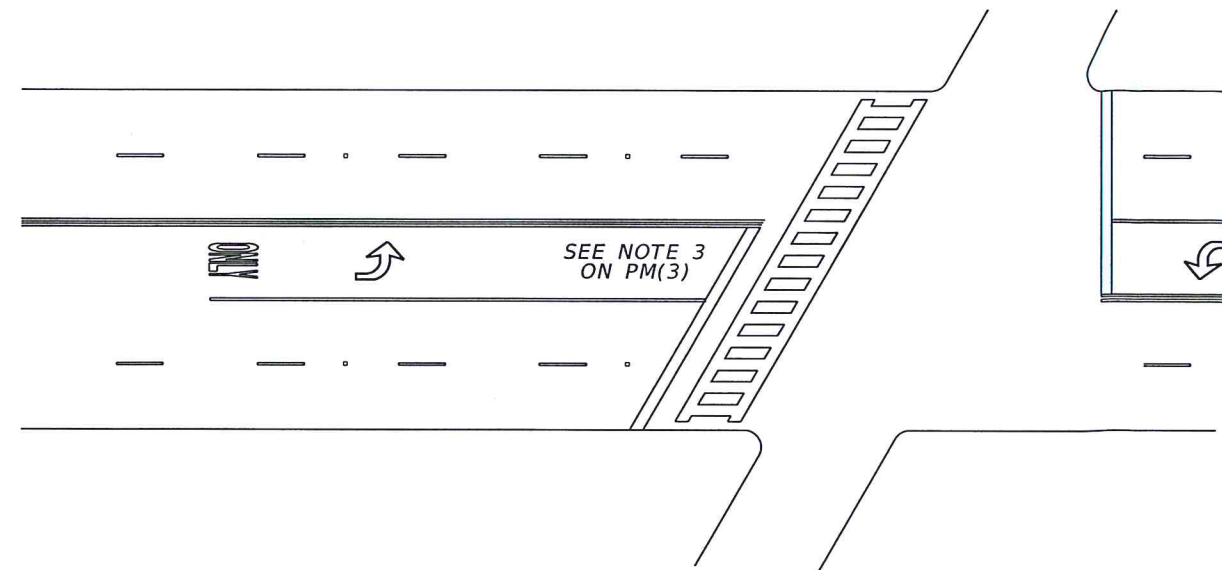
- FOR ITEM "B" REFER TO TXDOT STANDARD PM(3)-12.
- REFER TO PVMT MARK DETAIL SHEETS
- EXISTING SIGNS SHALL REMAIN IN PLACE UNLESS NOTED OTHERWISE ON REMOVAL OR SIGNING AND MARKING SHEET.



TYPICAL INTERSECTION
WITH PERPENDICULAR CROSSWALK

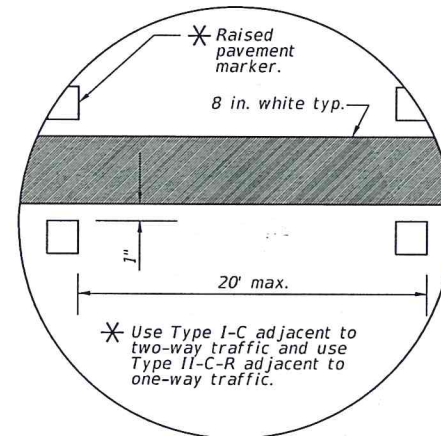


DETAIL A
The Engineer will approve final
placement of stop bar and crosswalk.



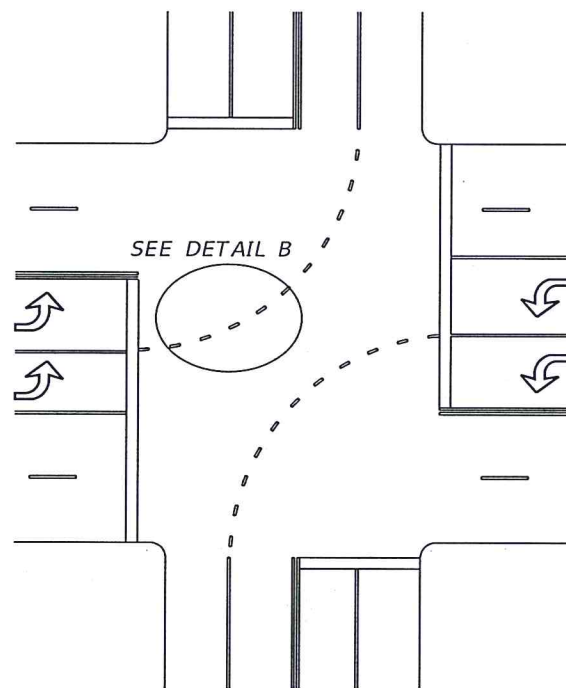
TYPICAL INTERSECTION
WITH SKEWED CROSSWALK

NOTE: WHERE IN CONFLICT, DETAILS ON THIS SHEET SHALL
SUPERCEDE THE PAVEMENT MARKING STANDARD SHEETS.

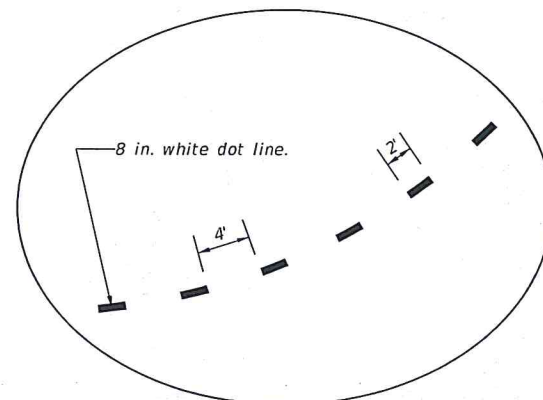


DETAIL C

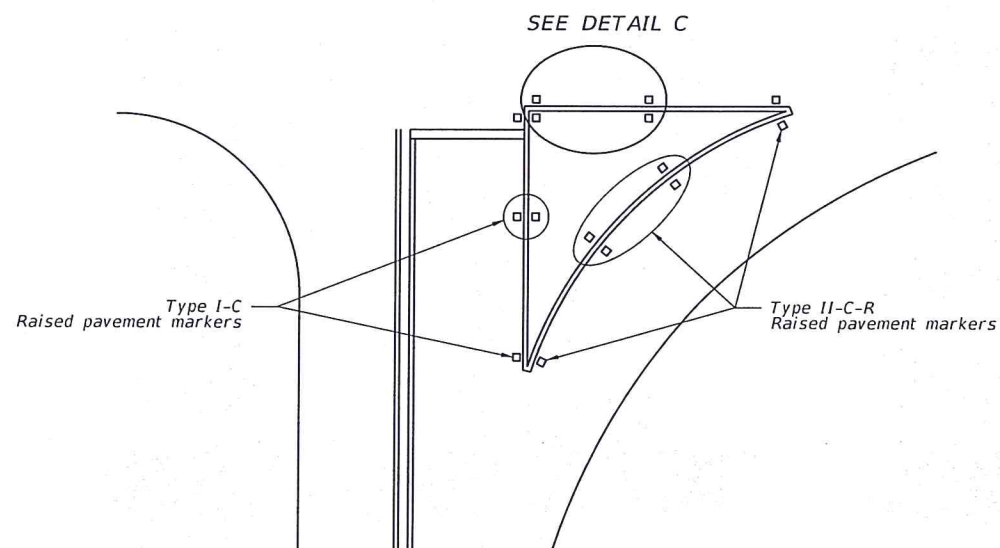
PROJECT QUANTITIES OF WORDS AND ARROWS					
ONE WAY	LEFT TURN	RIGHT TURN	STRAIGHT	U-TURN	
3	2	1	0	0	
STRAIGHT	LEFT TURN	RIGHT TURN	U-TURN	STRAIGHT	
0	0	2	0	0	



TYPICAL INTERSECTION
WITH "CAT TRACKS"



DETAIL B




TYPICAL INTERSECTION
WITH UNCURBED
CHANNELIZING ISLAND



09/23/2016

REV. NO.	DATE	DESCRIPTION	BY

LJA Engineering, Inc.
FRN - F-1386


THE CITY OF SAN ANGELO
TEXAS

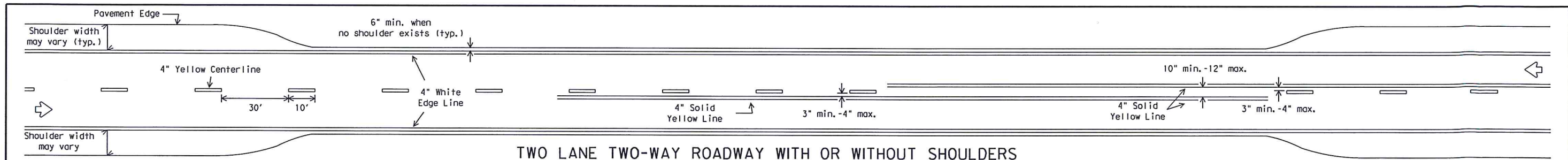
SOUTHLAND BOULEVARD
PAVEMENT MARKING DETAILS

SHEET 1 OF 1

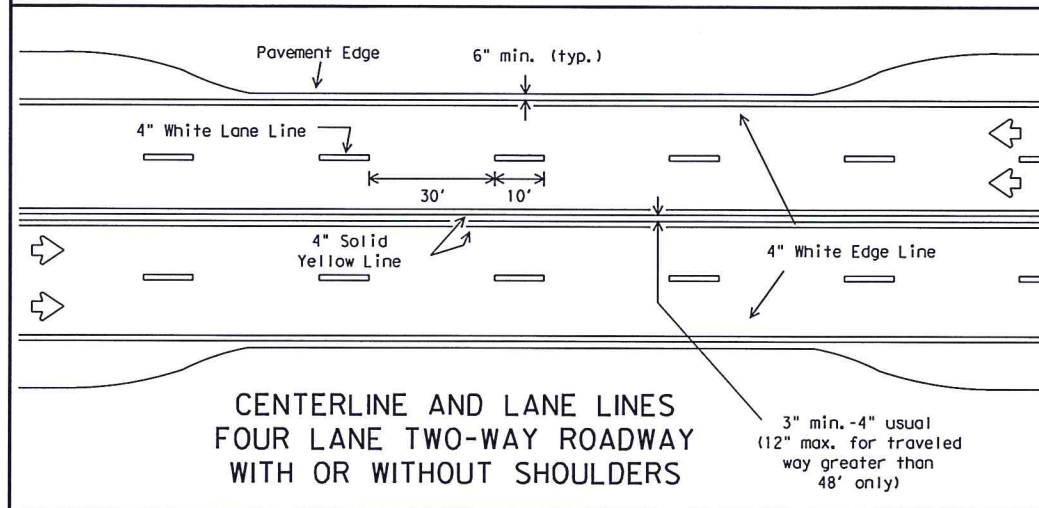
SHEET NO. 55

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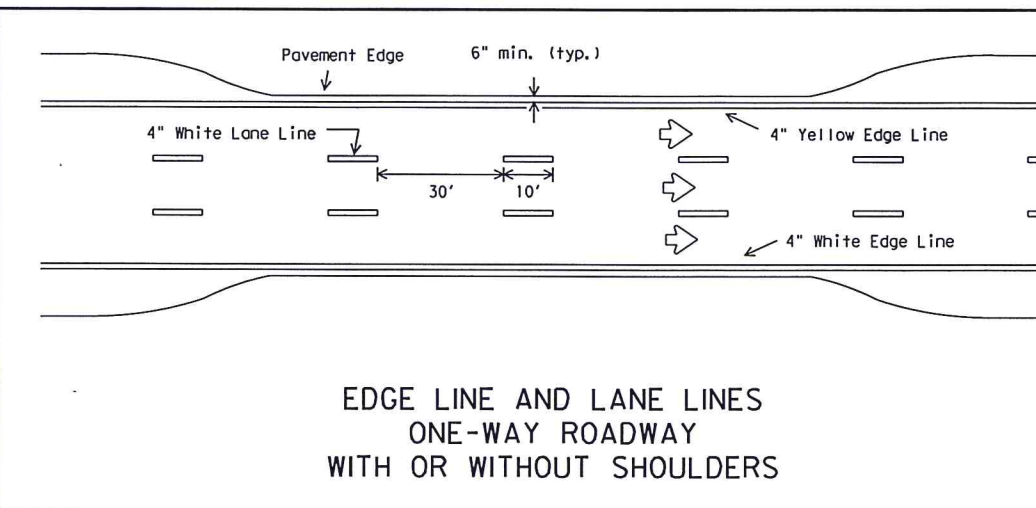
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FILE: T:\2357\1601\CADD\SHEETS\05-Markings\Standards\PM1-12.dgn



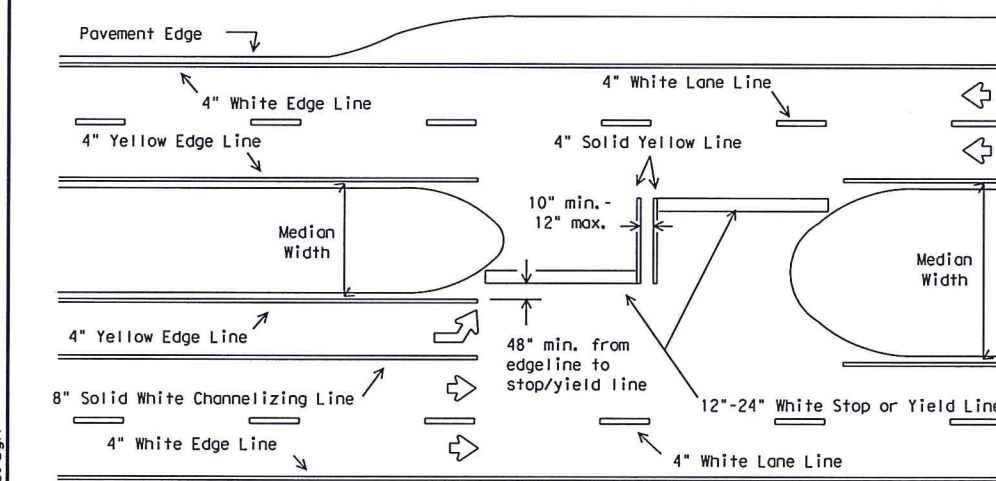
TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS

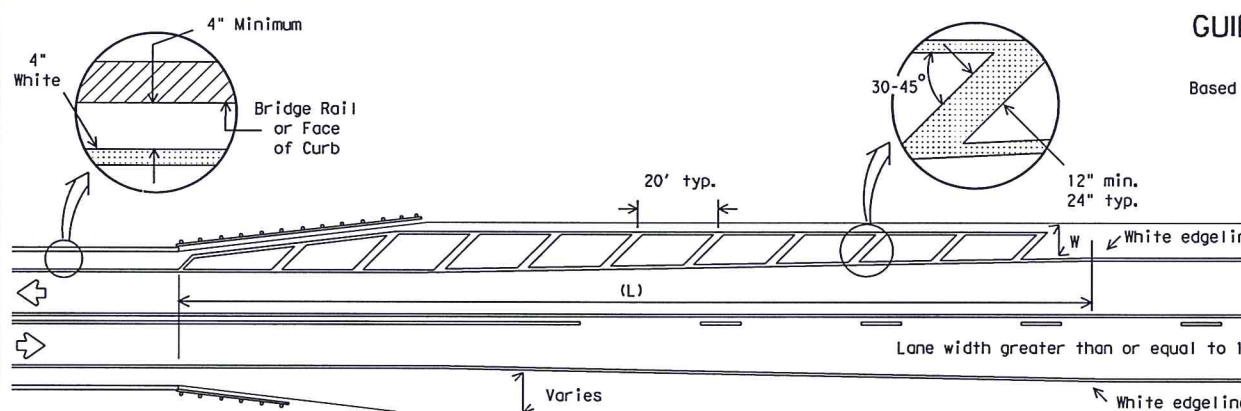


EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



All medians shall be field measured to determine the location of necessary striping. Stop/Yield bars and centerlines shall be placed when the median width is greater than 30 ft. The median width is defined as the area between two roadways of a divided highway measured from edge of traveled way to edge of traveled way. The median excludes turn lanes. The median width might be different between intersections, interchanges and of opposite approaches of the same intersection. The narrow median width will be the controlling width to determine if markings are required.

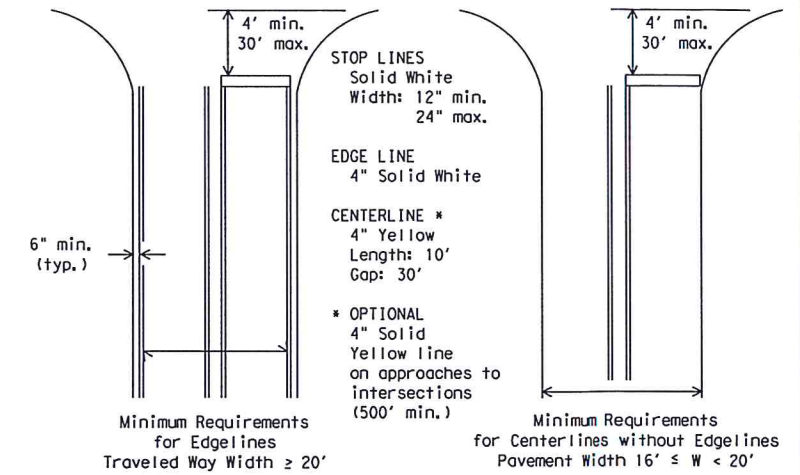
FOUR LANE DIVIDED ROADWAY INTERSECTIONS



NOTES:

- No-passing zone on bridge approach is optional but if used, it shall be a minimum 500 feet long.
- For crosshatching length (L) see Table 1.
- The width of the offset (W) and the required crosshatching width is the full shoulder width in advance of the bridge.
- The crosshatching is not required if delineators or barrier reflectors are used along the structure.
- For guard fence details, refer elsewhere in the plans.

ROADWAYS WITH REDUCED SHOULDER
WIDTHS ACROSS BRIDGE OR CULVERT



GUIDE FOR PLACEMENT OF STOP LINES,
EDGE LINE & CENTERLINE
Based on Traveled Way and Pavement Widths for Undivided Highways

TABLE 1 - TYPICAL LENGTH (L)

Posted Speed *	Formula
≤ 40	$L = \frac{WS^2}{60}$
≥ 45	$L = WS$

* 85th Percentile Speed may be used on roads where traffic speeds normally exceed the posted speed limit. Crosshatching length should be rounded up to nearest 5 foot increment.

L=Length of Crosshatching (FT.) W=Width of Offset (FT.) S=Posted Speed (MPH)

EXAMPLES:

An 8 foot shoulder in advance of a bridge reduces to 4 feet on a 70 MPH roadway. The length of the crosshatching should be:
 $L = 8 \times 70 = 560$ ft.
A 4 foot shoulder in advance of a bridge reduces to 2 feet on a 40 MPH roadway. The length of the crosshatching should be:
 $L = 4(40)^2 / 60 = 106.67$ ft, rounded to 110 ft.

Texas Department of Transportation
Traffic Operations Division

TYPICAL STANDARD
PAVEMENT MARKINGS

PM(1)-12

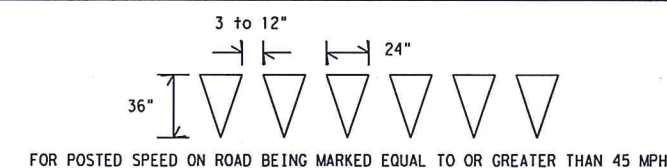
GENERAL NOTES

- Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should typically be placed a minimum of 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.
- The traveled way includes only that portion of the roadway used for vehicular travel and not the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to inside of edgeline of a two lane roadway.

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
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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



FOR POSTED SPEED ON ROAD BEING MARKED EQUAL TO OR GREATER THAN 45 MPH



FOR POSTED SPEED ON ROAD BEING MARKED EQUAL TO OR LESS THAN 40 MPH

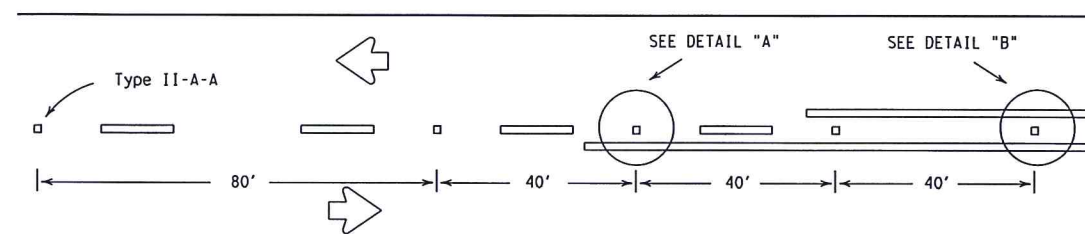
YIELD LINES

REVISIONS	DN: TxDOT	CK: TxDOT	DM: TxDOT	CK: TxDOT
8-95 2-12	CONT	SECT	JOB	HIGHWAY
5-00				SOUTHLAND
8-00	DIST	COUNTY	SHEET NO.	
3-03		TOM GREEN	56	

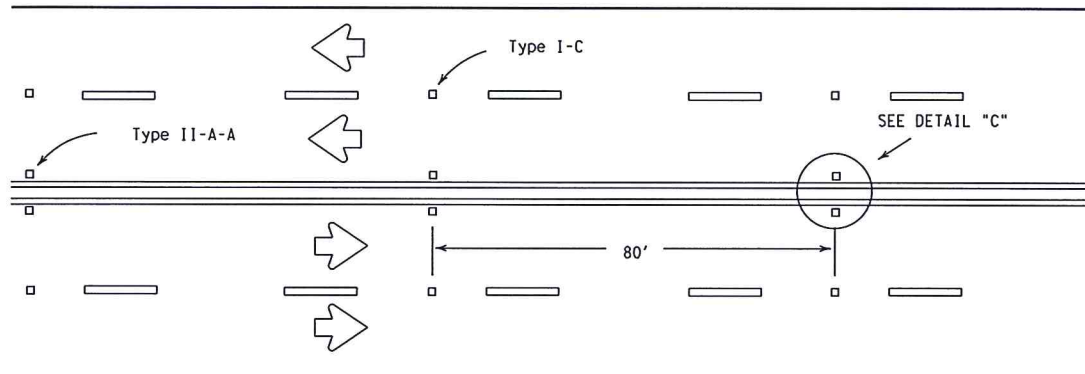
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REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

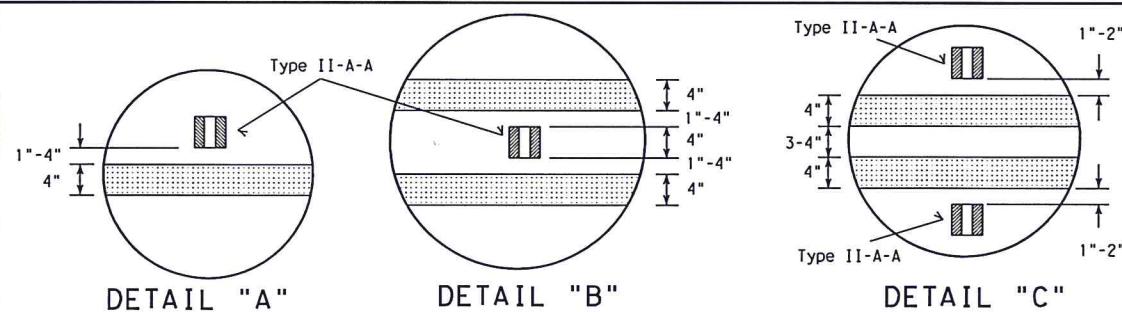


CENTERLINE FOR ALL TWO LANE ROADWAYS



CENTERLINE & LANE LINES
FOR FOUR LANE TWO-WAY HIGHWAYS

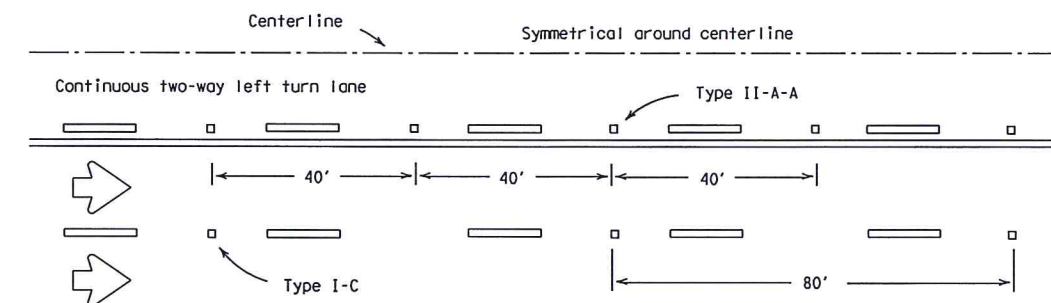
Raised pavement marker Type I-C, clear face toward normal traffic, shall be placed on 80-foot centers.



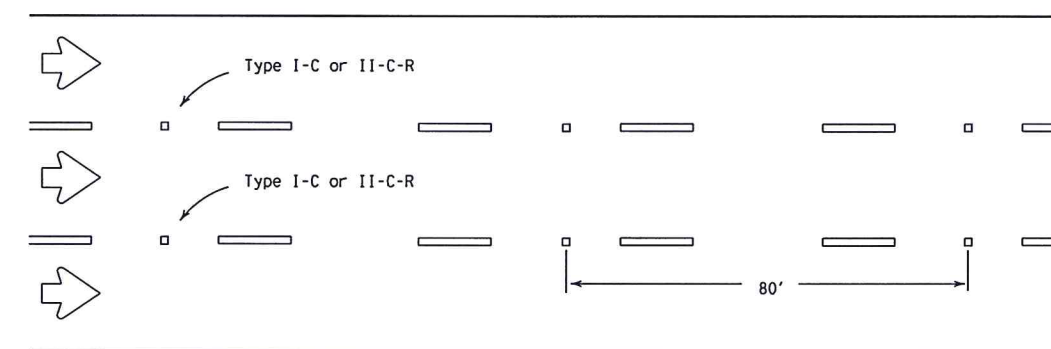
DETAIL "A"

DETAIL "B"

DETAIL "C"

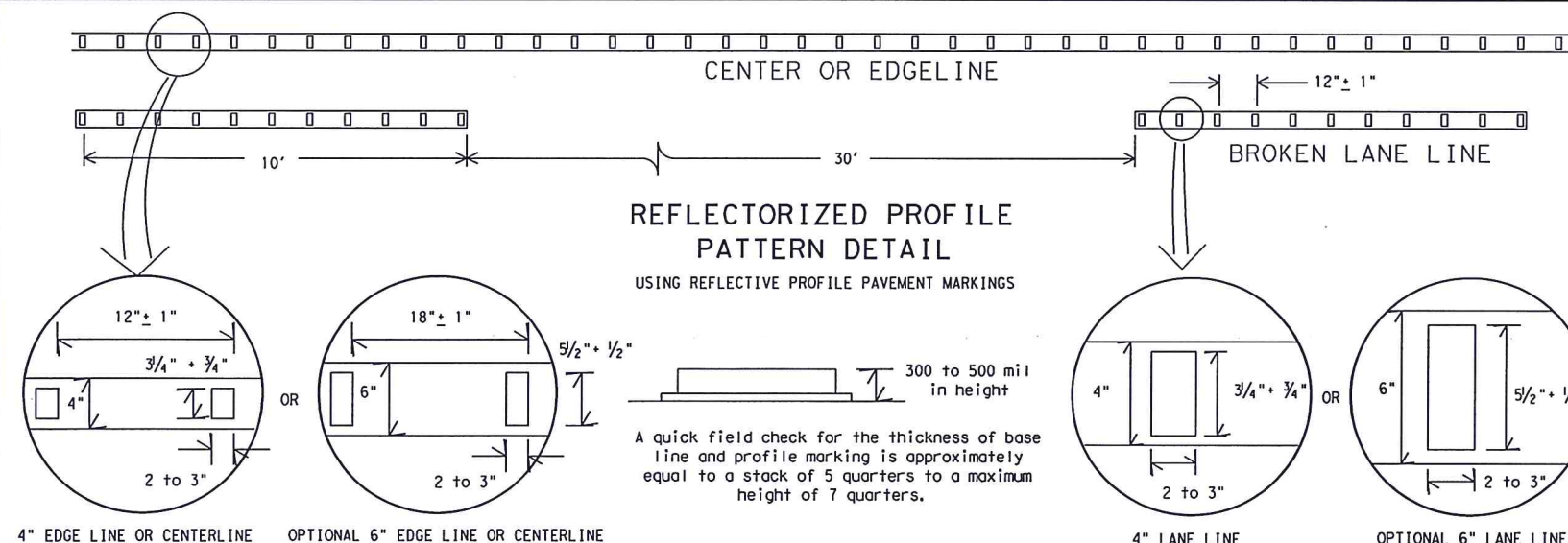


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.



REFLECTORIZED PROFILE
PATTERN DETAIL

USING REFLECTORIZED PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTE:

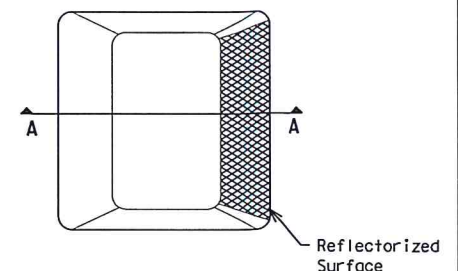
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

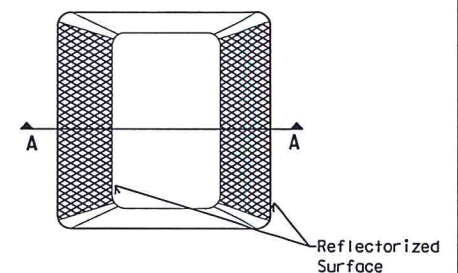
- All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
- On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

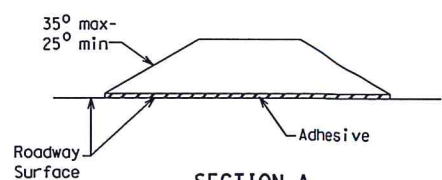
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation
Traffic Operations Division

POSITION GUIDANCE USING RAISED MARKERS REFLECTORIZED PROFILE MARKINGS

PM(2) - 12

© TxDOT April 1977		DN: TxDOT	CK: TxDOT	DN: TxDOT	CK: TxDOT
REVISIONS		CONT	SECT	JOB	HIGHWAY
4-92	2-10				
5-00	2-12				
8-00		DIST	COUNTY		SHEET NO.
2-08			TOM GREEN		57