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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 ½ 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

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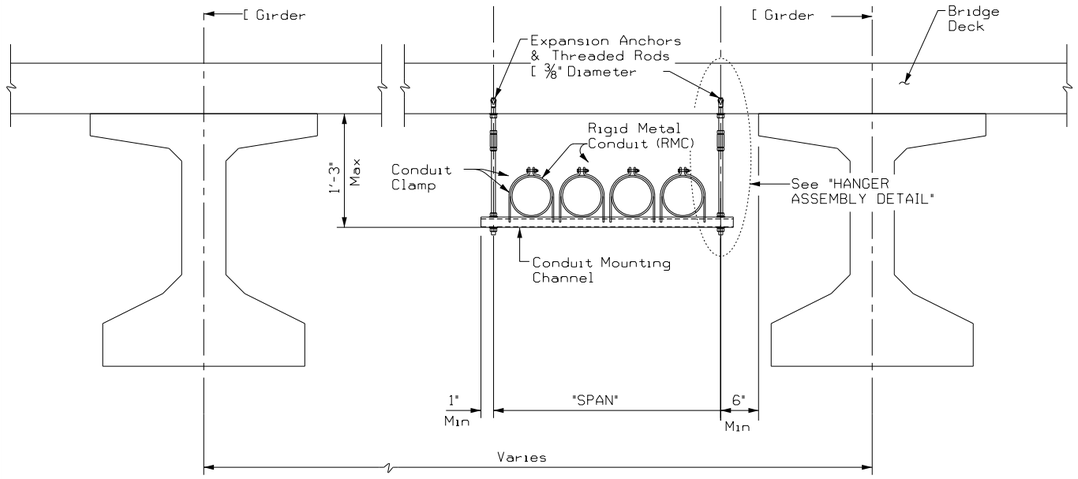
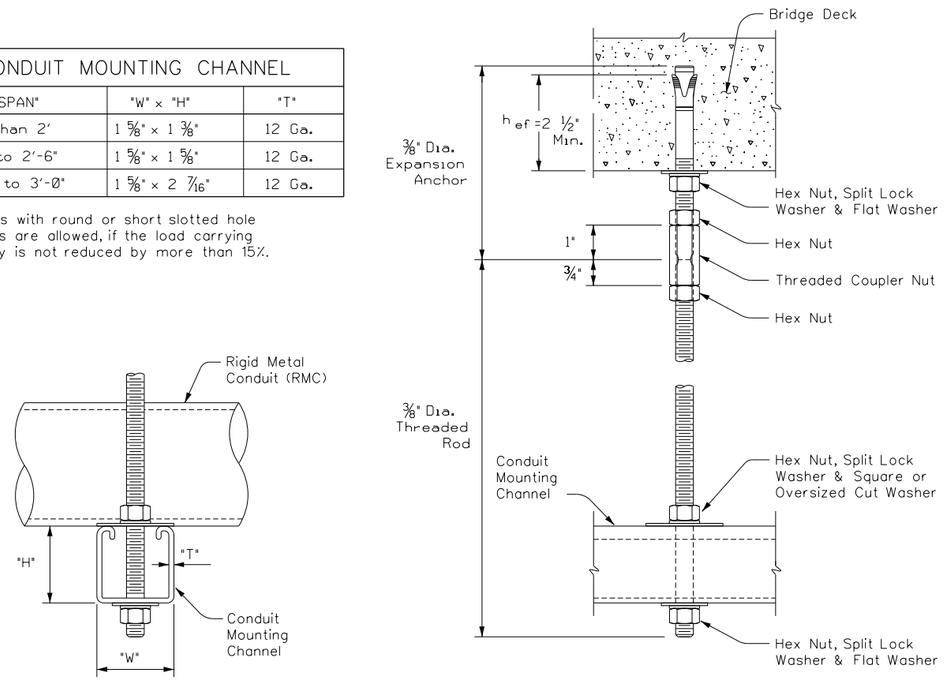


CONDUIT HANGING DETAIL

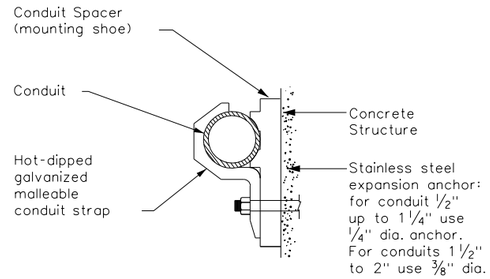
CONDUIT MOUNTING CHANNEL		
"SPAN"	"W" x "H"	"T"
less than 2'	1 5/8" x 1 3/8"	12 Ga.
2'-0" to 2'-6"	1 5/8" x 1 5/8"	12 Ga.
>2'-6" to 3'-0"	1 5/8" x 2 7/16"	12 Ga.

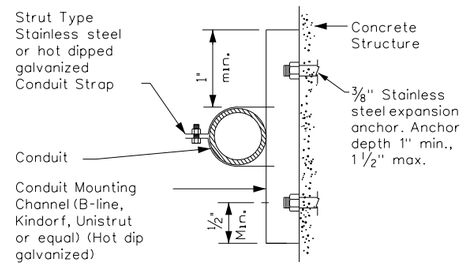
Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.



HANGER ASSEMBLY DETAIL

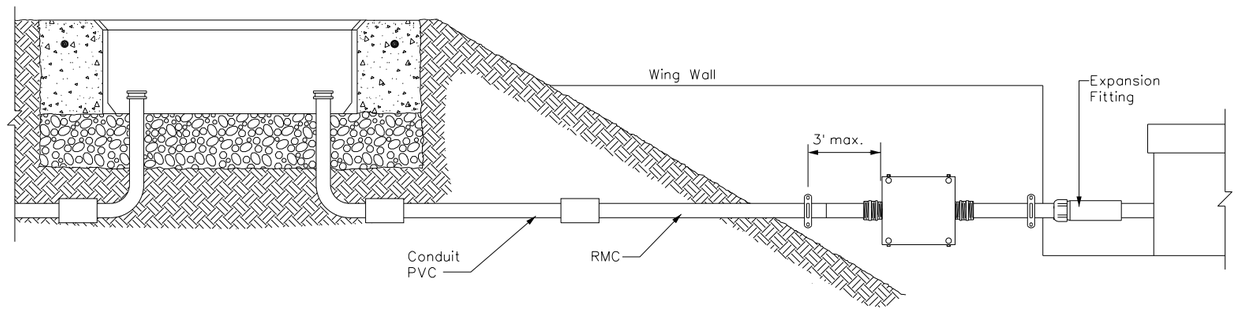
ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT





CONDUIT 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

1. Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation 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 031600 for Concrete Anchors.

2. 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.

3. 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.

4. 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.

5. Prior to hole drilling, use rebar locator to ensure clearing of existing deck strands or reinforcement. Install anchors to ensure a minimum effective embedment depth, $(h_{ef})_1$ as shown. Increase $(h_{ef})_2$ as needed to ensure sufficient thread length for proper torqueing and tightening of anchors.

6. Use anchors of minimum 1600 Lbs tensile capacity (minimum of steel, concrete breakout, and concrete pullout strengths as determined by ACI 318 Appendix D) at the required minimum embedment depth (h_{ef}). No lateral loads shall be introduced after conduit installation.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
CONDUIT SUPPORTS

ED(2)-14

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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.

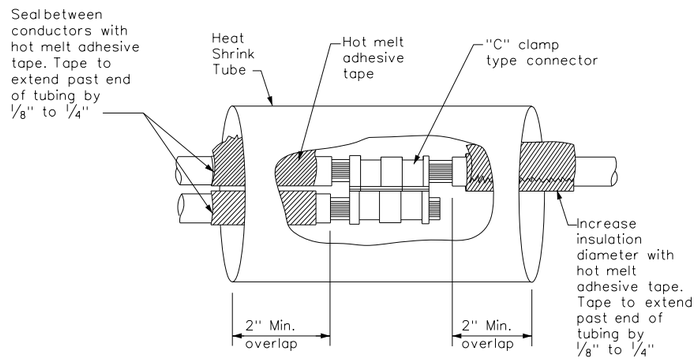
3. Install ground rods so the imprinted part number is at the upper end of the rod.

4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.

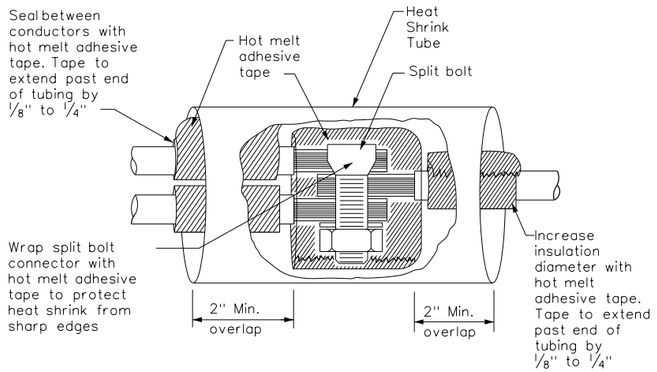
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

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.

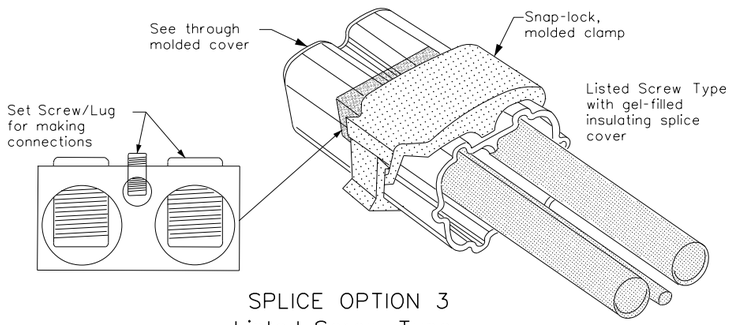
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

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Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

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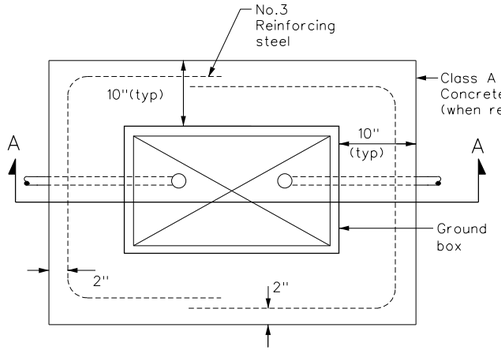
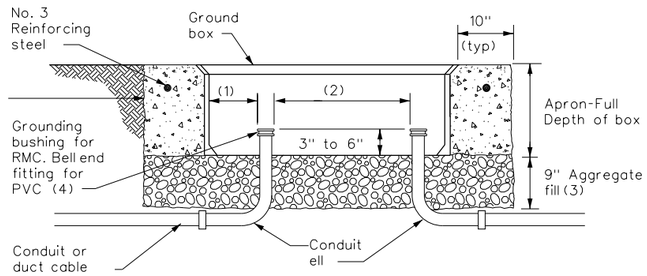


PLAN VIEW



SECTION A - A

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 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.

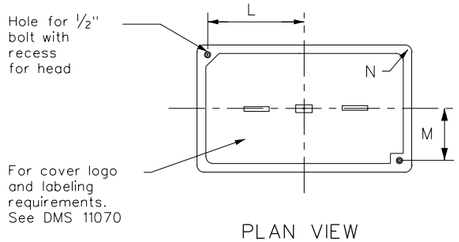
8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.

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.

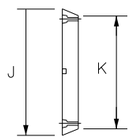
10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.

11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

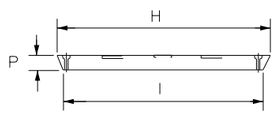
GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW



END



SIDE

GROUND BOX COVER

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS GROUND BOXES

ED(4)-14

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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 is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.

2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services,"DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.

3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.

4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid 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. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.

5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.

6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental 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 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.

9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.

10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.

11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed 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 MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing 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 used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.

14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.

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 bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

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 and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.

3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.

4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. 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. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

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

* ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

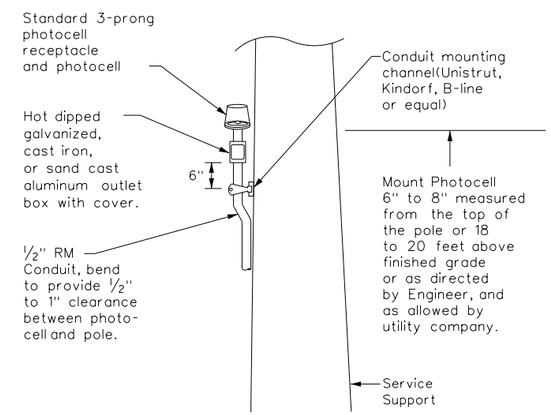
* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** 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

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

- Schematic Type
- Service Voltage V / V
- Disconnect Amp Rating
  000 indicates main lug only/
  Typically Type T
- (SS)= Safety Switch Ahead of Meter-Check with Utility
- (NS)= No safety Switch Ahead of Meter-Check with Utility
- Enclosure Type
  - GS= Galvanized steel("off the shelf")
  - SS= Stainless steel(Custom Enclosure)See MPL
  - AL= Aluminum (Custom Enclosure)See MPL
- Photocell Mounting Location
  - (E)= Inside Service/Enclosure Mounted
  - (T)= Top of pole
  - (L)= Luminaire mounted
  - (N)= None/No Photocell or Lighting Contactor Required
- Service Support Type
  - GC= Granite concrete
  - OC= Other concrete
  - TP= Timber pole
  - SP= Steel pole
  - SF= Steel frame
  - OT= Pole by others or paid for separately
  - EX= Existing pole
  - TS= Service on traffic signal pole
  - PS= Pedestal Service
- O= Overhead Service Feed from Utility
- U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

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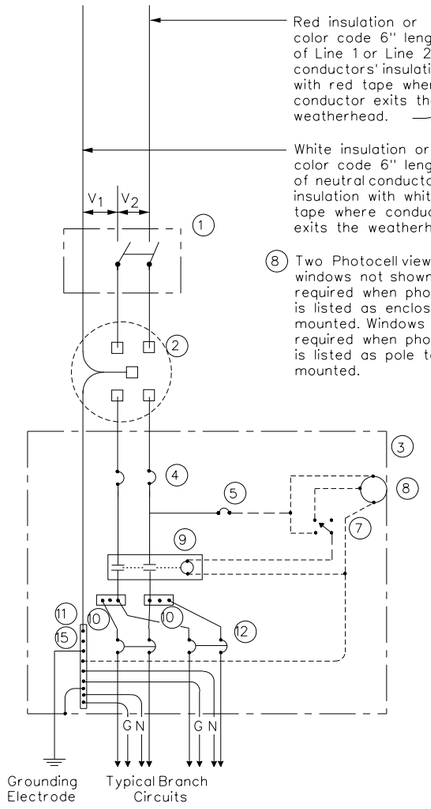
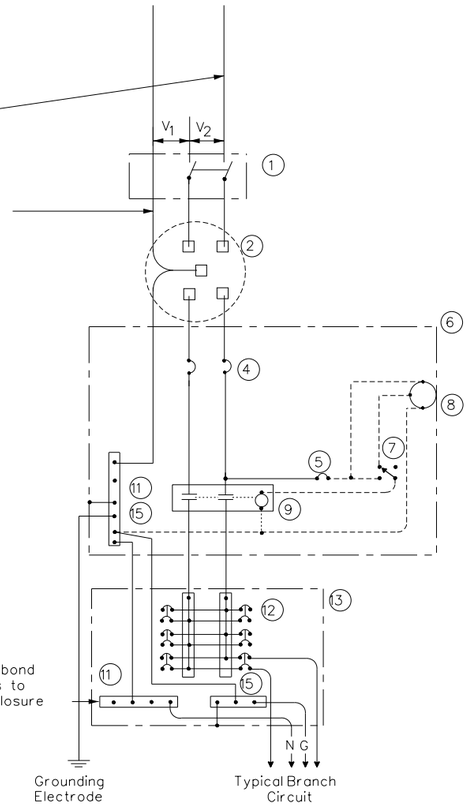
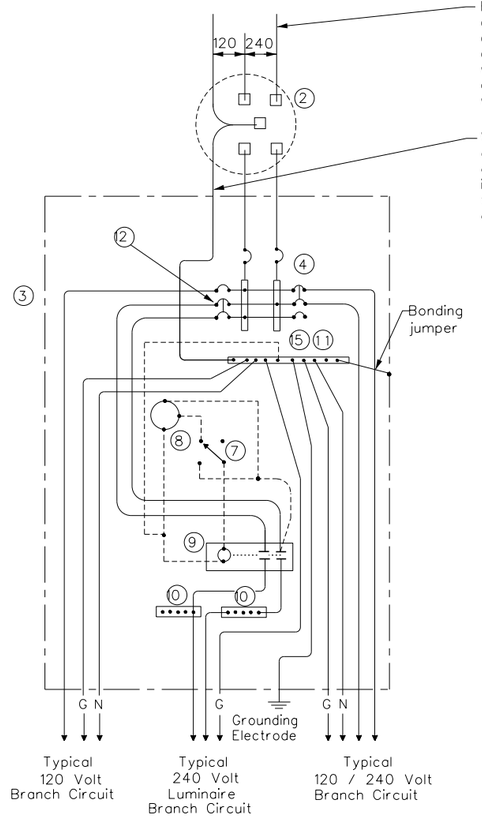


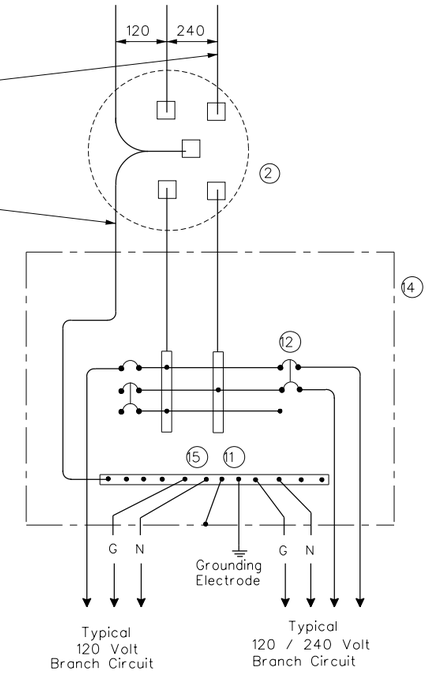
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



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



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

WIRING LEGEND	
———	Power Wiring
- - - - - - - - -	Control Wiring
——N——	Neutral Conductor
——G——	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

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SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 1/2 in. or 1 5/8 in. wide by 1 in. up to 3 3/4 in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.

2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.

3. Provide and install galvanized 3/4 in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized 3/4 in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 1/4 in. to 3 1/2 in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.

4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.

5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.

6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.

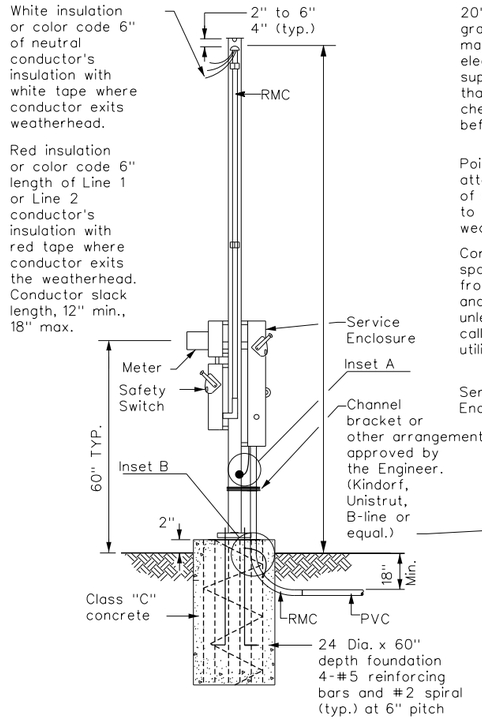
7. Drill and tap steel poles and frames for 1/2 in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.

8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.

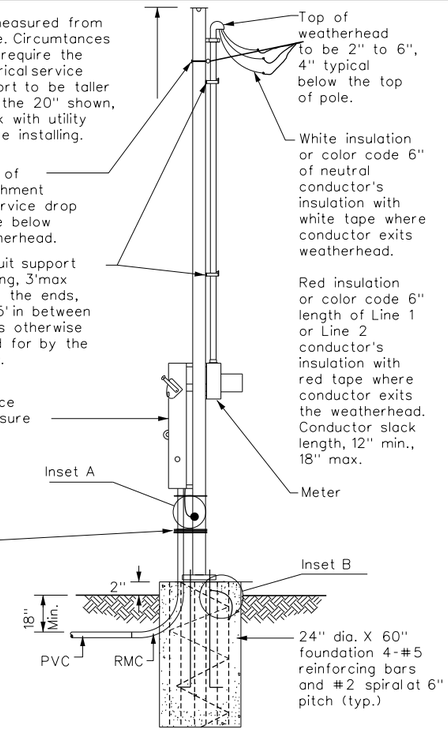
9. Provide 1/4" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.

11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

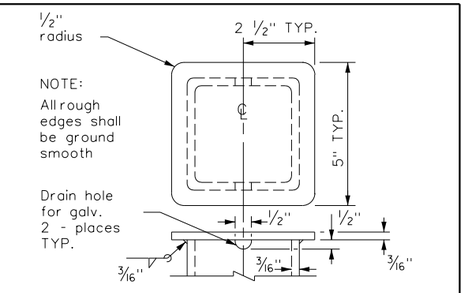


WITH SAFETY SWITCH

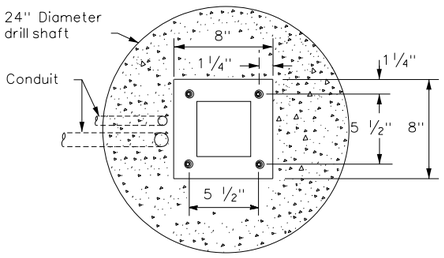


WITHOUT SAFETY SWITCH

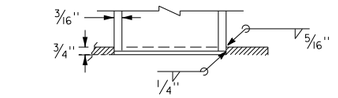
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



POLE TOP PLATE

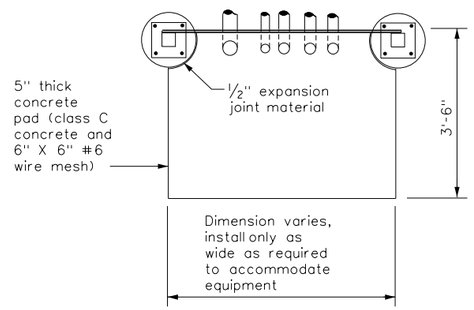


BASE PLATE DETAIL



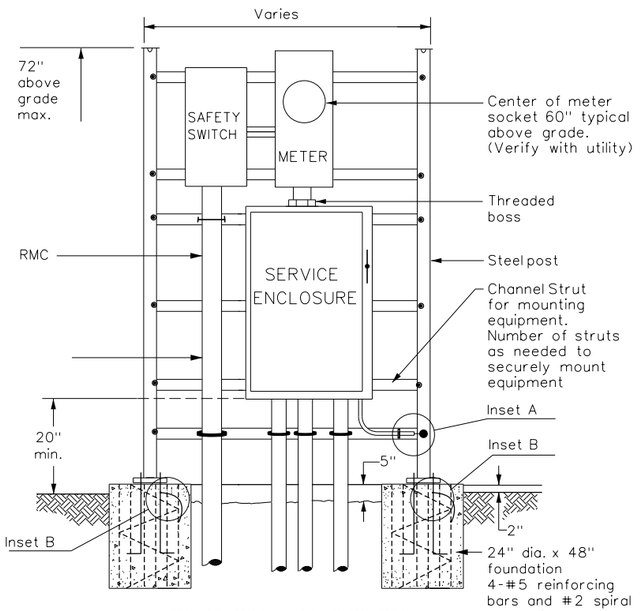
BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP

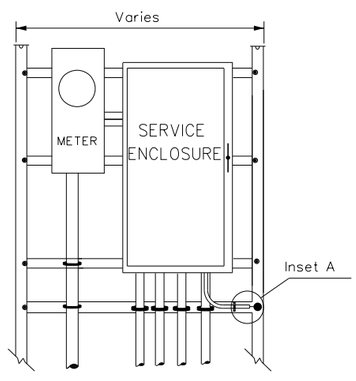


TOP VIEW

SERVICE SUPPORT TY SF (O) & SF (U)

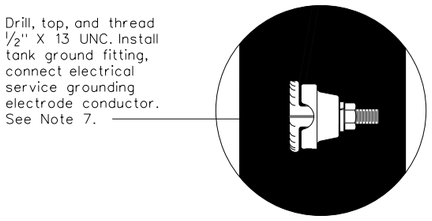


WITH SAFETY SWITCH
FRONT VIEW

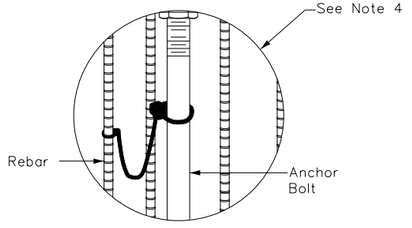


WITHOUT SAFETY SWITCH

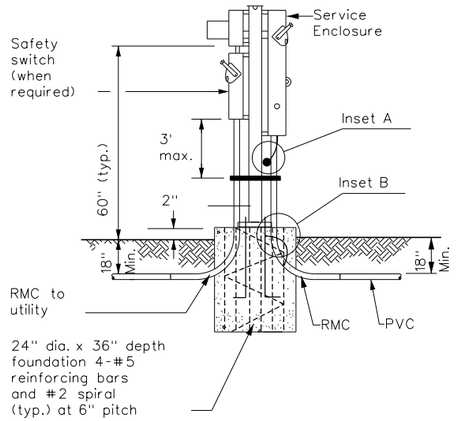
SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE



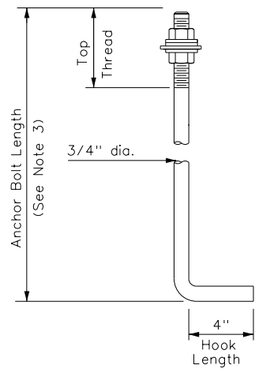
FRONT VIEW
INSET A



INSET B



WITH SAFETY SWITCH



HOOKED ANCHOR DETAIL

SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

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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 $\frac{1}{2}$ 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 $\frac{3}{4}$ 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".

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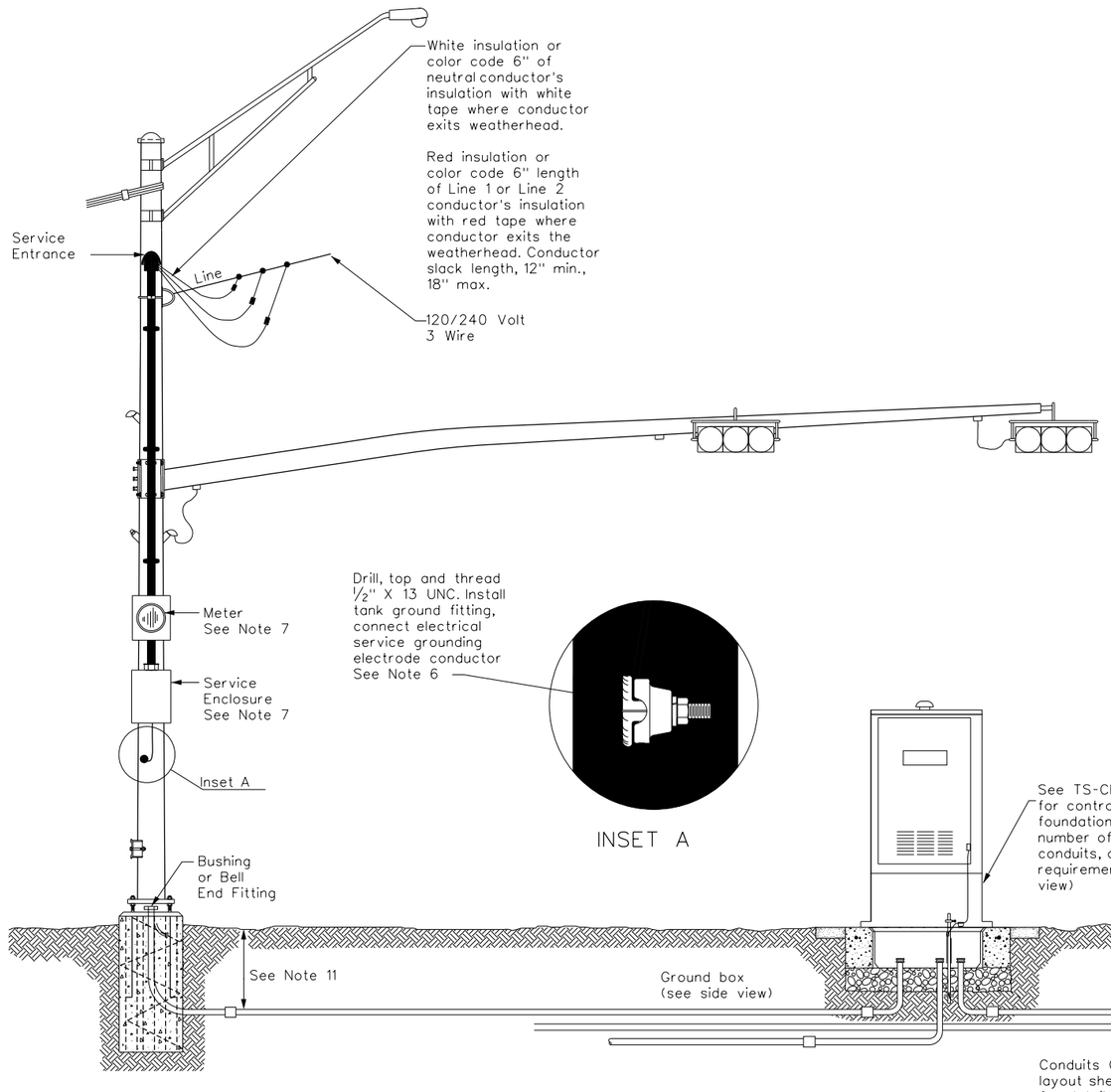
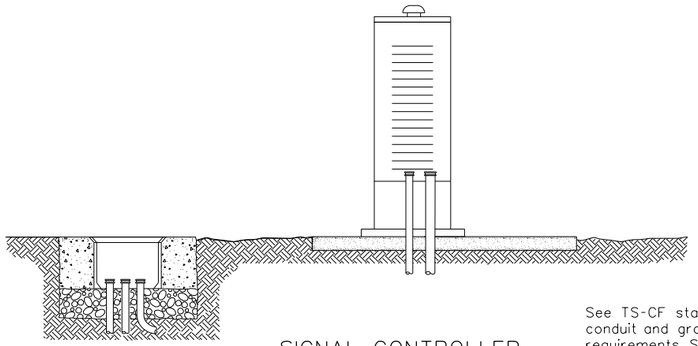


SIGNAL POLE WITH SERVICE

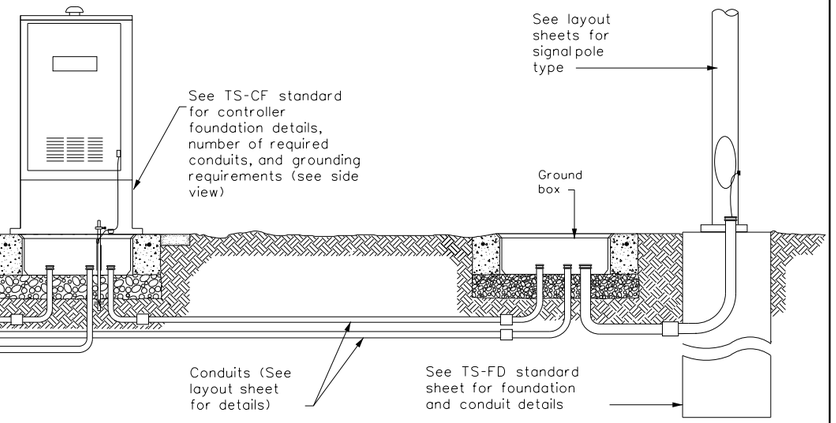
Type T electrical service mounted on signal pole shown as an example. See electrical details, layout sheets, and electrical service data chart for additional details.

INSET A



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.



SIGNAL CONTROLLER FRONT VIEW

SIGNAL POLE

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS

ED(8)-14

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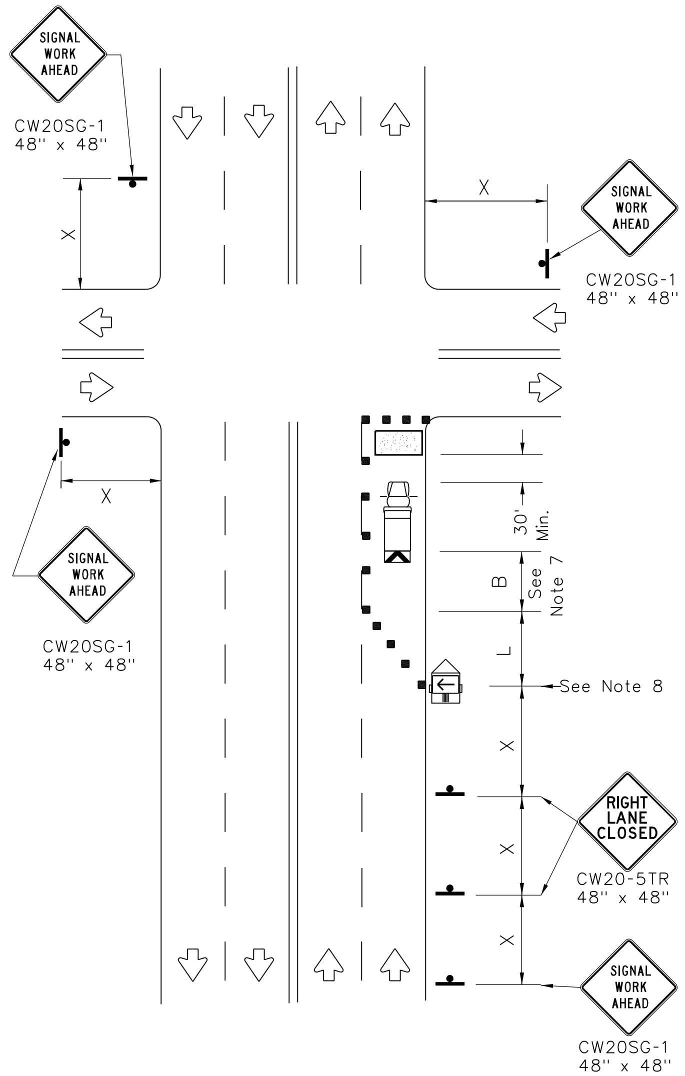
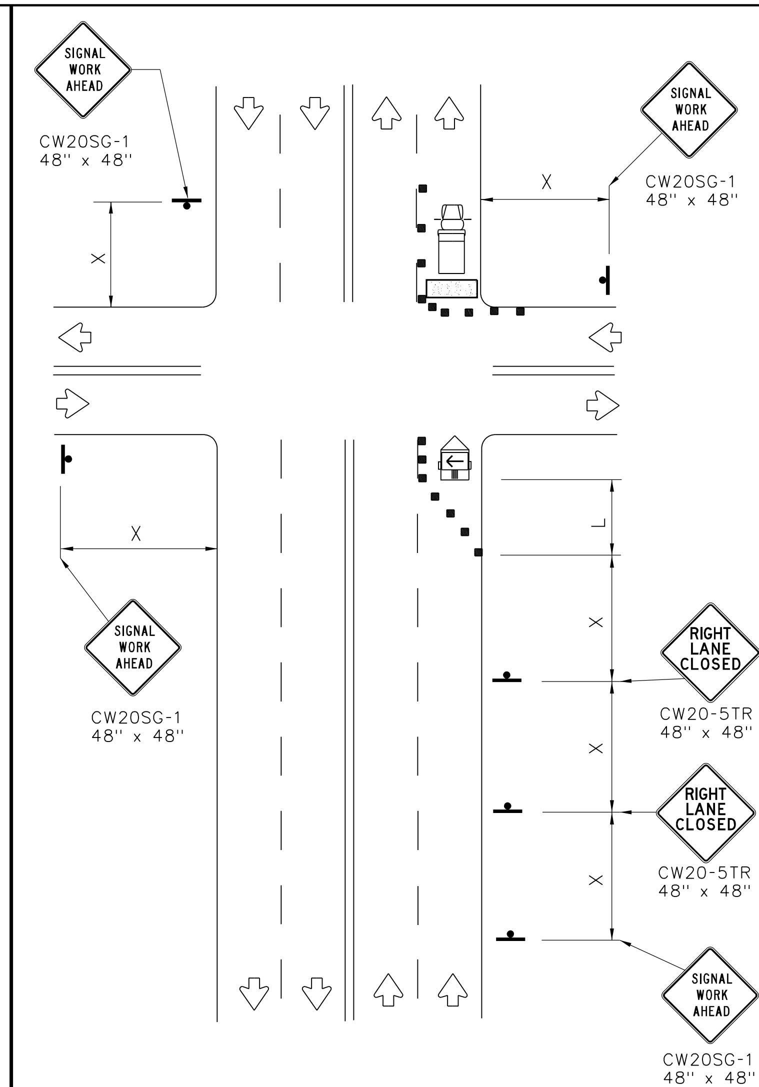
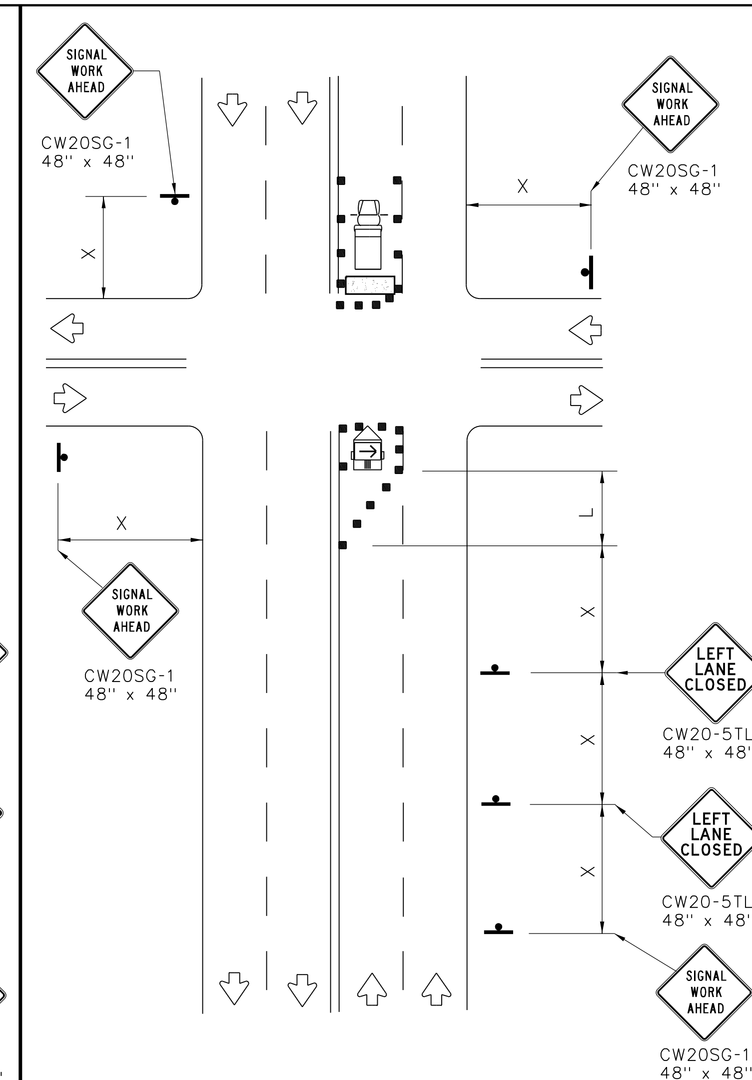


NEAR SIDE LANE CLOSURE
SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE RIGHT LANE CLOSURE
SHORT DURATION OR SHORT TERM STATIONARY



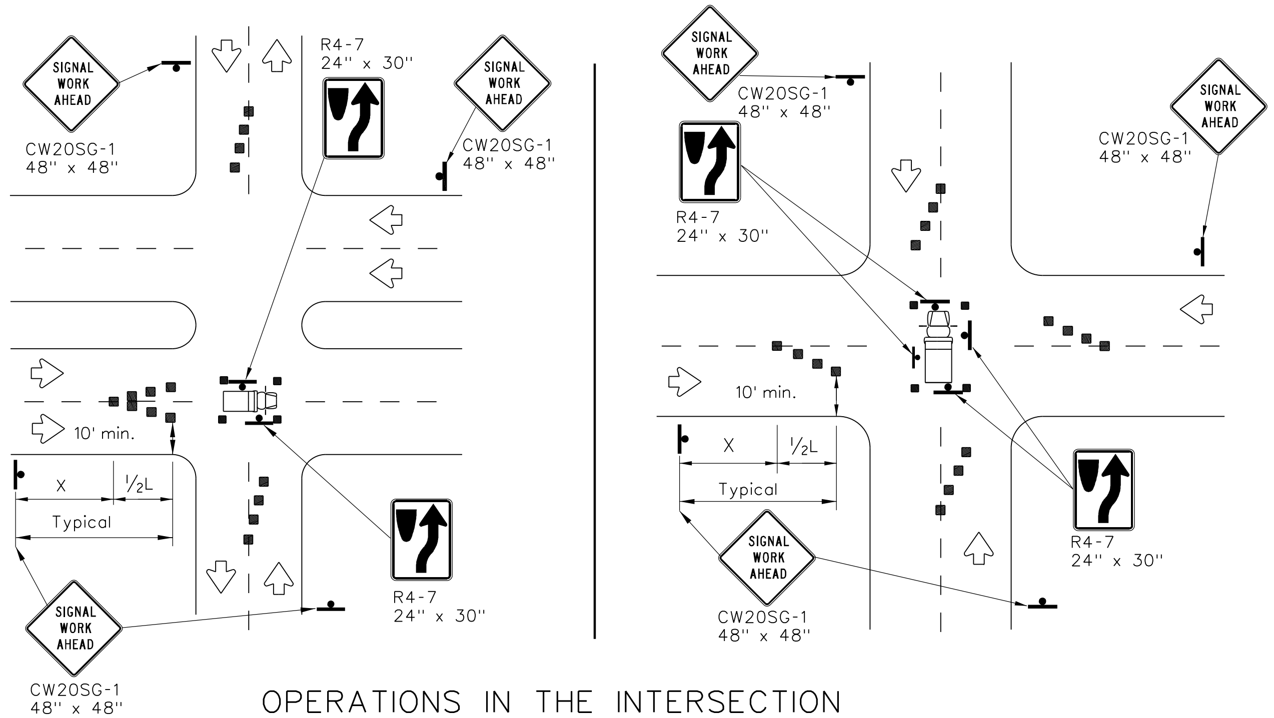
FAR SIDE LEFT LANE CLOSURE
SHORT DURATION OR SHORT TERM STATIONARY

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

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

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

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



OPERATIONS IN THE INTERSECTION
SHORT DURATION

GENERAL NOTES

1. The minimum size channelizing device is the 28" cone. 42" Two-piece cones, drums, vertical panels or barricades will be required when the device must be left unattended at night.
2. Obstructions or hazards at the work area shall 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 shall 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 signals, the signals may be placed in flashing red mode when approved by the engineer. If existing signals do not have power, All-Way Stop (R1-1 and R1-3P) 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 setup.
8. The arrow board at this location may be omitted for Short Duration work if the work vehicle has an arrow board in operation. As an option, the arrow board may be placed at the end of the taper in the closed lane if space is not available at the beginning of the taper.
9. Signs and devices for the NEAR SIDE LANE CLOSURE may be altered for a left lane closure by using a LEFT LANE CLOSED (CW20-5TL) and adding channelizing devices on the centerline to protect the work space from opposing traffic.

SHEET 1 OF 2

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

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REVISIONS
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4-98 3-03
DIST | COUNTY | SHEET NO.
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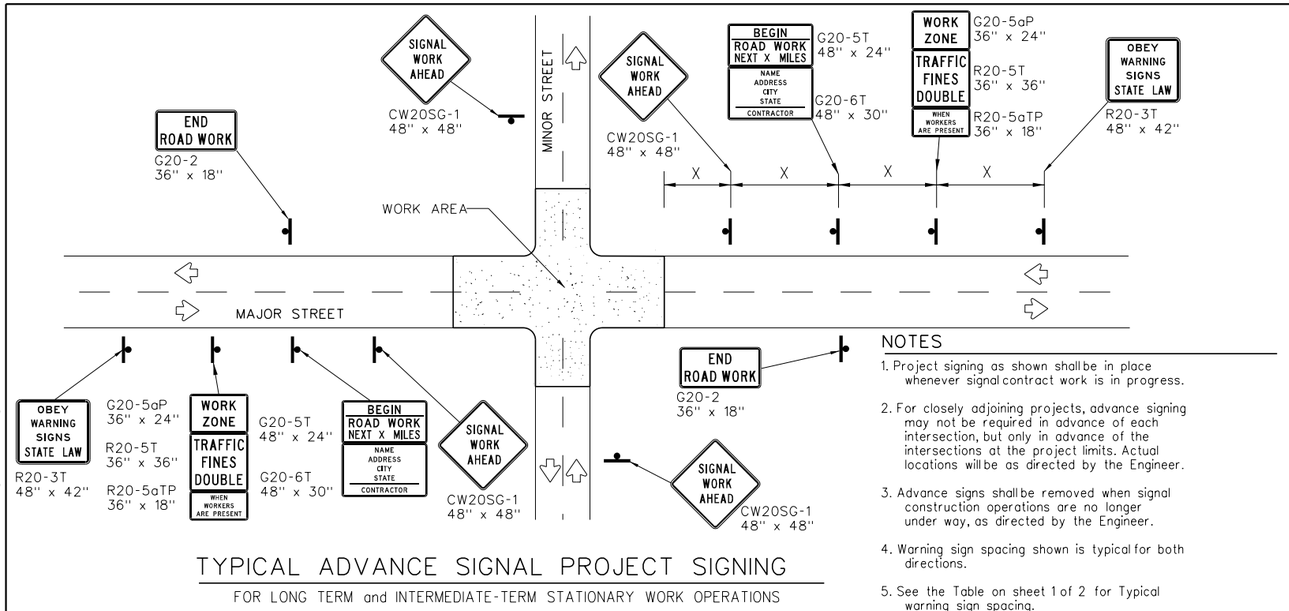


TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

1. Project signing as shown shall be in place whenever signal contract work is in progress.
2. For closely adjoining projects, advance signing may not be required in advance of each intersection, but only in advance of the intersections at the project limits. Actual locations will be as directed by the Engineer.
3. Advance signs shall be removed when signal construction operations are no longer under way, as directed by the Engineer.
4. Warning sign spacing shown is typical for both directions.
5. See the Table on sheet 1 of 2 for Typical warning sign spacing.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Signs shall be installed and maintained in a straight and plumb condition.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. Nails shall NOT be used to attach signs to any support.
5. All signs shall be installed in accordance with the plans or as directed by the Engineer.
6. The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
7. The Contractor shall furnish sign supports and substrates listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD), installed as per the manufacturer's recommendations.
8. Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
9. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1".
10. Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

DURATION OF WORK

1. Work zone durations are defined in Part 6, Section 6G.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

1. Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
2. Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
3. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night without damaging the sign sheeting. Burlap, or heavy materials such as plywood or aluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the requirements of the DMS and color usage table shown on this sheet.

SIGN SUPPORT WEIGHTS

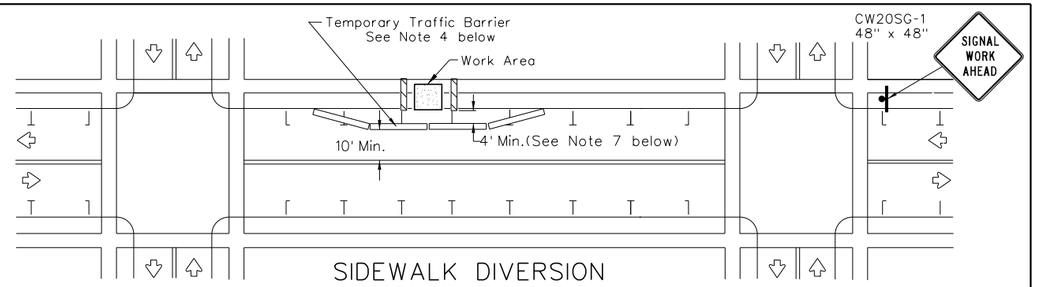
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support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

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

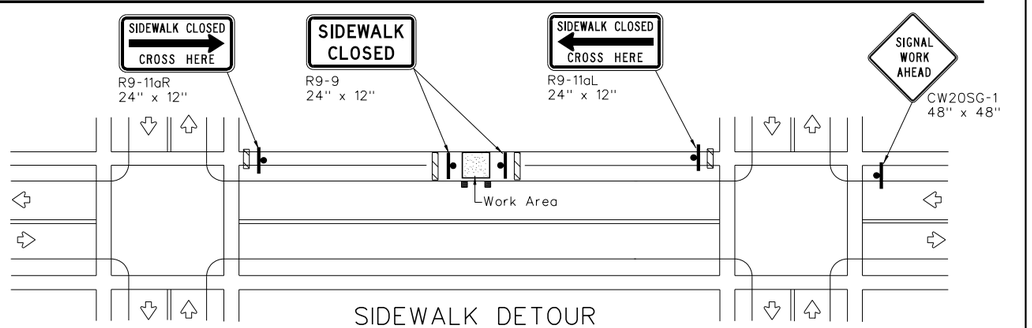
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B_{FL} OR TYPE C_{FL} SHEETING
WHITE	BACKGROUND	TYPE A SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

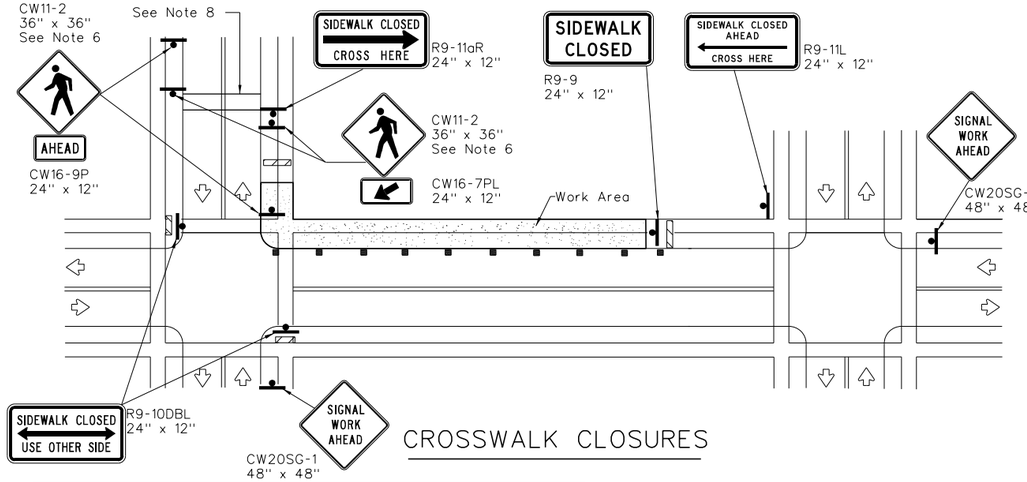
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

1. Holes, trenches or other hazards shall be adequately protected by covering, delineating or surrounding the hazard with orange plastic pedestrian fencing or longitudinal channelizing devices, or as directed by the Engineer.
2. "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
3. R9 series signs shown may be placed on supports detailed on the BC standards or CWZTCD list, or when fabricated from approved lightweight plastic substrates, they may be mounted on top of a plastic drum at or near the location shown.
4. For speeds less than 45 mph longitudinal channelizing devices may be used instead of traffic barriers when approved by the Engineer. Attenuation of blunt ends and installation of water filled devices shall be as per BC(9) and manufacturer's recommendations.
5. Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
6. Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
7. The width of existing sidewalk should be maintained if practical.
8. Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
9. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

SHEET 2 OF 2

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

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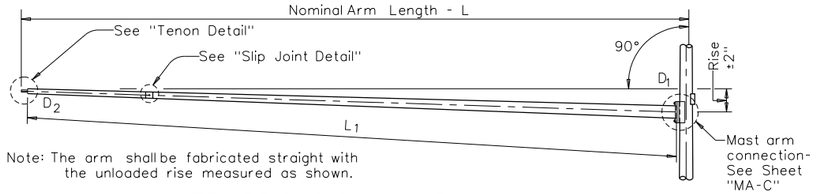
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	10.5	7.8	7.1	6.3	.179	11.5	8.5	7.7	6.8	.179	30-A
24	11.0	8.3	7.6	6.8	.179	12.0	9.0	8.2	7.3	.179	30-A
28	11.5	8.8	8.1	7.3	.179	12.5	9.5	8.7	7.8	.179	30-A
32	12.5	9.8	9.1	8.3	.179	12.0	9.0	8.2	7.3	.239	30-A
36	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
40	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
44	12.5	9.8	9.1	8.3	.239	14.0	11.0	10.2	9.3	.239	36-A
48	13.0	10.3	9.6	8.8	.239	15.0	12.0	11.2	10.3	.239	36-A

Arm Length	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	① thk	Rise	L_1	D_1	② D_2	① thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	6.5	3.8	.179	1'-9"	19.1	7.0	3.5	.179	1'-8"
24	23.1	7.5	4.3	.179	1'-10"	23.1	7.5	3.5	.179	1'-9"
28	27.1	8.0	4.2	.179	1'-11"	27.1	8.0	3.5	.179	1'-10"
32	31.0	9.0	4.7	.179	2'-1"	31.0	9.0	3.5	.179	2'-0"
36	35.0	9.5	4.6	.179	2'-4"	35.0	10.0	3.5	.179	2'-1"
40	39.0	9.5	4.1	.239	2'-8"	39.0	9.5	3.5	.239	2'-3"
44	43.0	10.0	4.1	.239	2'-11"	43.0	10.0	3.5	.239	2'-6"
48	47.0	10.5	4.1	.239	3'-4"	47.0	11.0	3.5	.239	2'-9"

D_B = Pole Base O.D.
D_{19} = Pole Top O.D. with no Luminaire and no ILSN
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L = Nominal Arm Length

① Thickness shown are minimums, thicker materials may be used.

② D_2 may be increased by up to 1" for polygonal arms.



Note: The arm shall be fabricated straight with the unloaded rise measured as shown.

TRAFFIC SIGNAL ARM

(Fixed Mount)

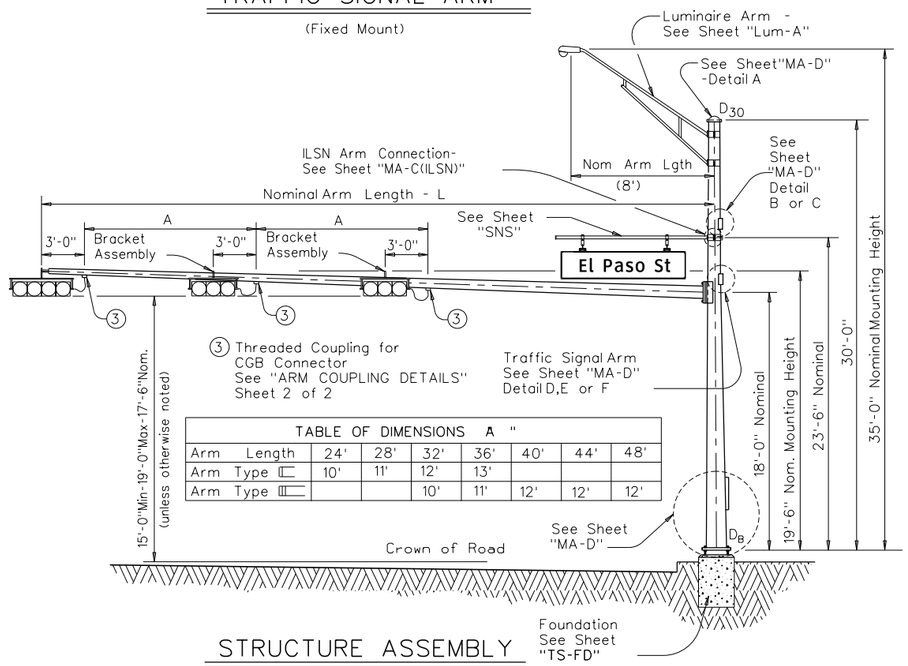


TABLE OF DIMENSIONS A "							
Arm Length	24'	28'	32'	36'	40'	44'	48'
Arm Type ⊏	10'	11'	12'	13'			
Arm Type ⊏⊏			10'	11'	12'	12'	12'

STRUCTURE ASSEMBLY

SHIPPING PARTS LIST

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.

Nominal Arm Length	30' Poles With Luminaire		24' Poles With ILSN		19' Poles With No Luminaire and No ILSN	
	Above hardware plus: One (or two if ILSN attached) small hand hole, clamp-on simplex		Above hardware plus one small hand hole		See note above	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20L-80		20S-80		20-80	
24	24L-80		24S-80		24-80	
28	28L-80		28S-80	1	28-80	
32	32L-80	1	32S-80	3	32-80	
36	36L-80	2	36S-80		36-80	
40	40L-80	1	40S-80		40-80	
44	44L-80		44S-80		44-80	
48	48L-80		48S-80		48-80	

Traffic Signal Arms (1 per Pole) Ship each arm with the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	1 CGB connector		1 Bracket Assembly and 2 CGB Connectors		2 Bracket Assemblies and 3 CGB Connectors	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-80					
24	24I-80		24II-80			
28	28I-80		28II-80	1		
32			32II-80	4	32III-80	
36			36II-80	2	36III-80	
40					40III-80	1
44					44III-80	
48					48III-80	

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	4

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 ½"	3'-4"	2
1 ¾"	3'-10"	6

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

SHEET 1 OF 2

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(80 MPH WIND ZONE)

SMA-80(1)-12

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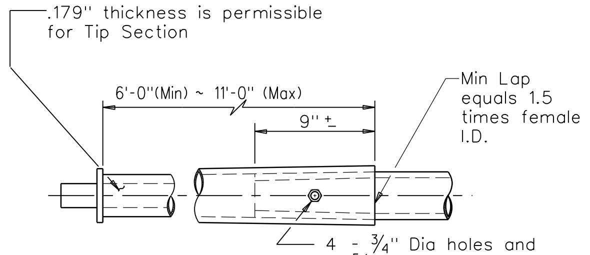
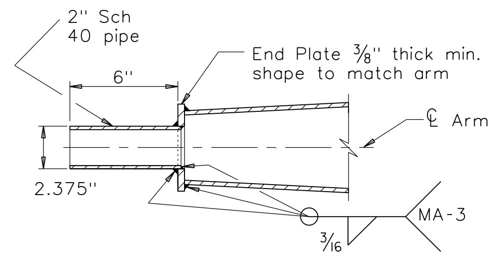


Note: A slip joint is permissible for arms 40' and greater in length. The slip joint shall be made in the shop, but may be match marked and shipped disassembled.

SLIP JOINT DETAIL



TENON DETAIL

VIBRATION WARNING

Mast Arms of SMA and DMA structures and clamp-on 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, weights and positions; existence/solidity of backplates; presence of additional attachments to the arm, such as signs and cameras; arm-wind orientation; and arm-pole stiffness.

Such vibrations may cause fatigue damage to the structure and may lead to galloping in moderate wind conditions which may further damage the structure and alarm the public. Tests have indicated that when wind is blowing toward the back side of signal heads having un-vented backplates attached the probability of unacceptable harmonic vibration and/or galloping is rather high.

If 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 as a first and inexpensive 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 attachments, including any required backpates. If vertical 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 Plate Mounting Details" on standard sheet, MA-DPD-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.

Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 1/2" Dia Threaded Coupling.

BRACKET ASSEMBLY

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor.

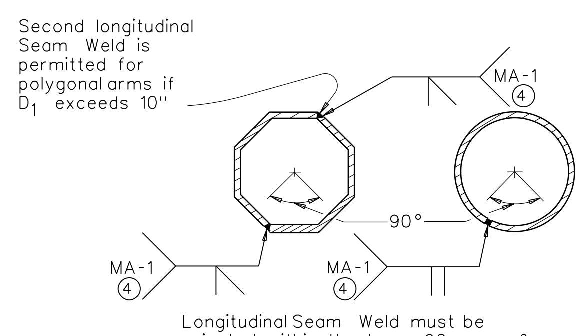
Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 60 lbs vertical dead load plus the horizontal wind load on an effective 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 horizontal wind load on an effective projected area of 11.5 sq ft. The specified signal 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 (actual area times drag coefficient).

See Standard Sheet "MA-D" for pole details, "MA-C" for traffic signal arm connection details, "MA-C (ILSN)" for internally lighted street name sign arm connection details, "LUM-A" for luminaire arm and 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 procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

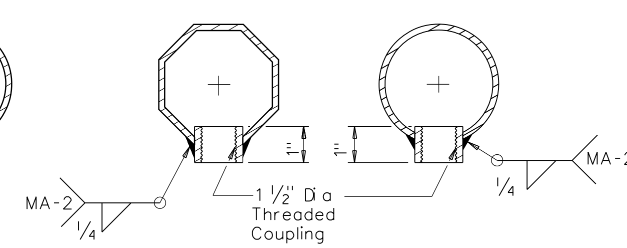
Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing", after fabrication.

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.



ARM WELD DETAIL

④ 60% Min. penetration 100% penetration within 6" of circumferential base welds.



ARM COUPLING DETAILS

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES
SINGLE MAST ARM ASSEMBLY
(80 MPH WIND ZONE)
SMA-80(2)-12

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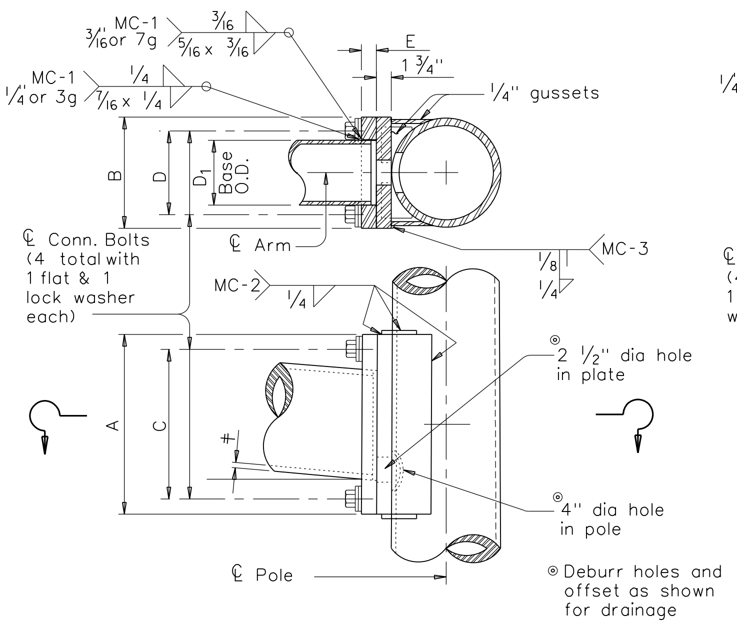
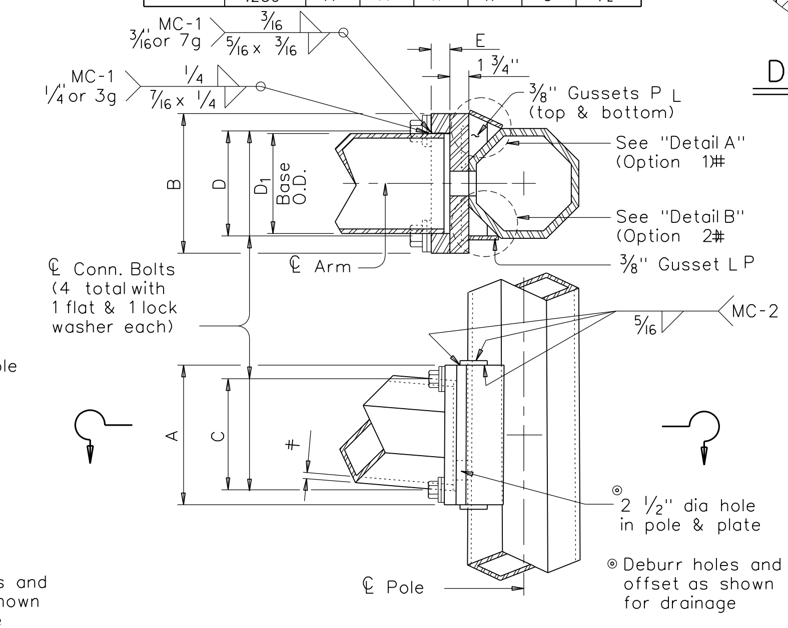
ARM SIZE D_1	ARM SIZE ǂ	A	B	C	D	E	CONN BOLT DIA
in.	in.	in.	in.	in.	in.	in.	in.
6.5	.179	12	9	9	6	1 3/4	1
7.5	.179	13	9	10	6	1 3/4	1
8.0	.179	14	10	11	7	2	1 1/4
9.0	.179	16	11	13	8	2	1 1/4
9.5	.179	17	12	14	9	2	1 1/4
9.5	.239	18	12	15	9	2	1 1/4
10.0	.239	18	12	15	9	2	1 1/4
10.5	.239	18	13	15	10	3	1 1/2
11.0	.239	18	13	15	10	3	1 1/2

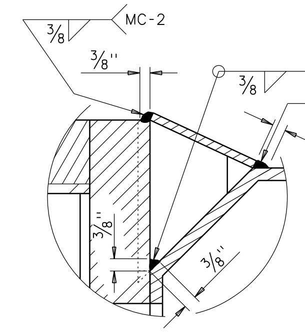


FIXED MOUNT DETAIL 1

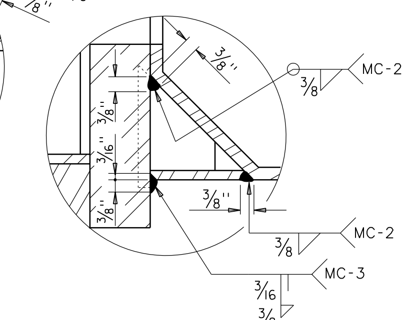
ARM SIZE D_1	ARM SIZE ǂ	A	B	C	D	E	CONN BOLT DIA
in.	in.	in.	in.	in.	in.	in.	in.
7.0	.179	11	11	8	8	1 3/4	1 1/4
7.5	.179	11	11	8	8	1 3/4	1 1/4
8.0	.179	11	11	8	8	2	1 1/4
9.0	.179	13	13	10	10	2	1 1/4
10.0	.179	13	13	10	10	2	1 1/4
9.5	.239	13	13	10	10	2	1 1/4
10.0	.239	14	14	11	11	2	1 1/2
11.0	.239	14	14	11	11	3	1 1/2
11.5	.239	14	14	11	11	3	1 1/2



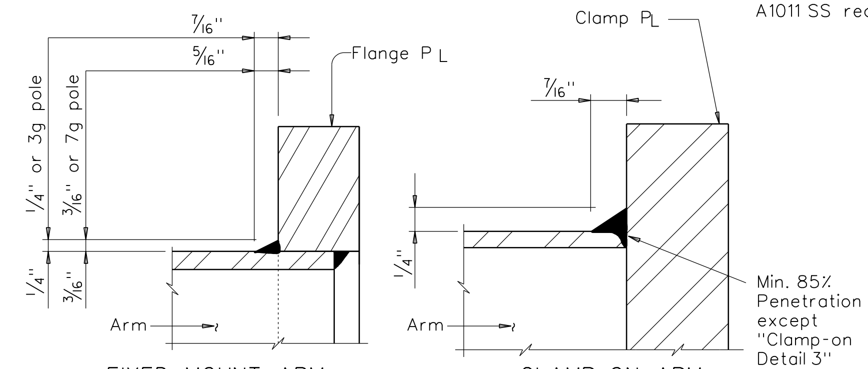
FIXED MOUNT DETAIL 2



DETAIL A



DETAIL B



FIXED MOUNT ARM

CLAMP-ON ARM

ARM BASE WELD DETAILS

MATERIALS	
Round Shafts or Polygonal Shafts ①	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 ②
Plates ①	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325 or A449, except where noted
Pin Bolts	ASTM A325
Pipe ①	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Misc. Hardware	Galvanized steel or stainless steel or as noted

① ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

② ASTM A1011 SS Gr.50 material shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

GENERAL NOTES:

Clamp-on details are used for the second arm on dual mast arm assemblies. A Maximum 1 1/2" wide vertical slotted hole shall be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1"

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

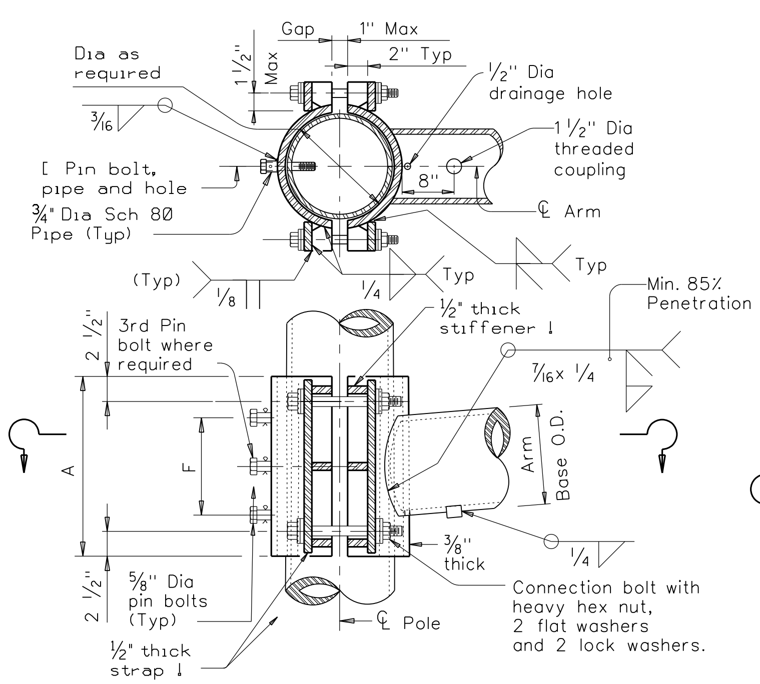
Where duplicate parts occur on a detail, welds shown for one part shall apply to all similar parts on the detail.

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

NOTE:

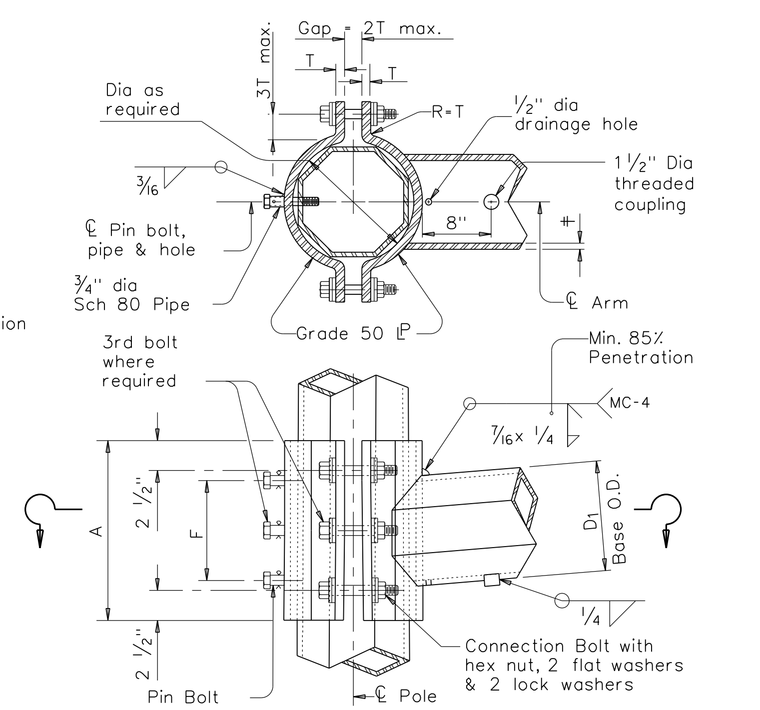
Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and 3/4" dia pipe shall have 3/16" dia holes for a 1/8" dia galvanized cotter pin. Back clamp plate shall be furnished with a 3/4" dia hole for each pin bolt. An 11/16" dia hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

ARM SIZE D_1	ARM SIZE ǂ	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	4	1 1/4	3	5/8
9.5	.239	18	12	4	1 1/4	3	5/8
10.0	.239	18	12	4	1 1/4	3	5/8



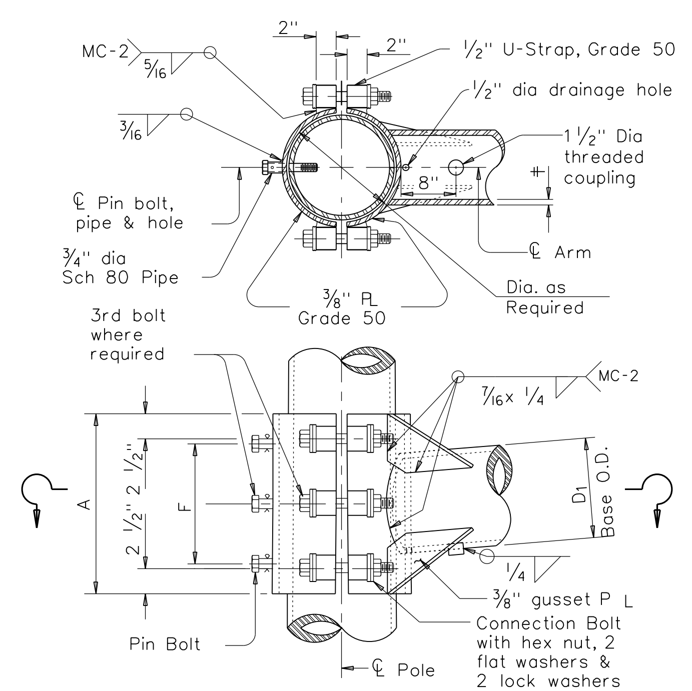
CLAMP-ON DETAIL 1

ARM SIZE D_1	ARM SIZE ǂ	A	F	T	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	in.	ea.	in.	ea.	in.
7.0	.179	12	6	3/4	4	3/4	2	5/8
7.5	.179	14	8	3/4	4	3/4	2	5/8
8.0	.179	14	8	3/4	4	3/4	2	5/8
9.0	.179	16	10	7/8	4	1	2	5/8
10.0	.179	18	10	7/8	4	1	2	5/8
9.5	.239	18	10	1	6	1	3	5/8
10.0	.239	18	10	1	6	1	3	5/8



CLAMP-ON DETAIL 2

ARM SIZE D_1	ARM SIZE ǂ	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	6	1	3	5/8
9.5	.239	18	12	6	1	3	5/8
10.0	.239	18	12	6	1	3	5/8



CLAMP-ON DETAIL 3

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY FOR TRAFFIC SIGNAL SUPPORT STRUCTURES

MAST ARM CONNECTIONS

MA-C-12

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MicroStation V8 User: 02235 Office: Fort Worth $ACCOUNT$ Date: Jan. 12, 2017 - 03:54:09 PM
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Office: Fort Worth $ACCOUNT$ Date: Jan. 12, 2017 - 03:54:09 PM User: 02235 File: N:\IF\Drawings\TXDOT Details\Phase I Txdot Details\Traffic Signal Details\mac.dgn

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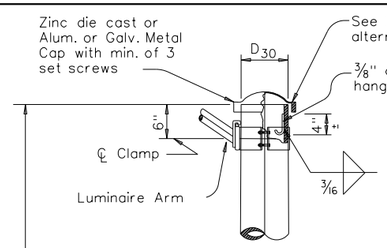
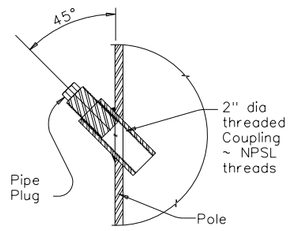
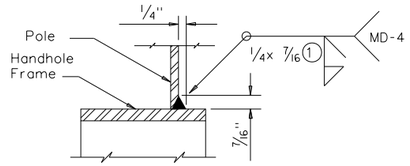


DETAIL A

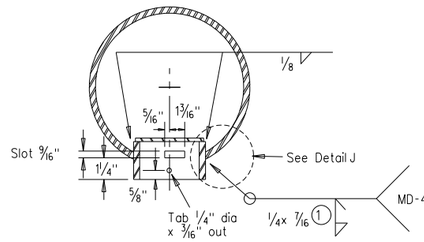
(for pole with luminaire)



POLE COUPLING DETAIL

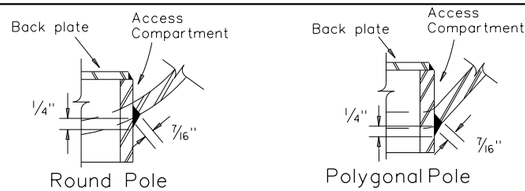


DETAIL G

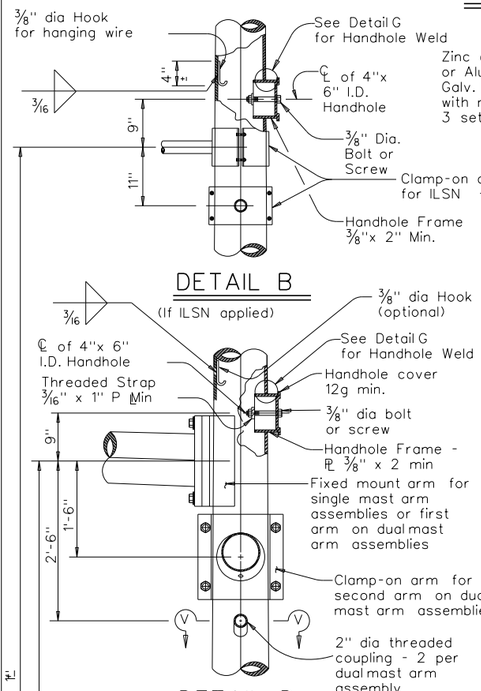


SECTION X-X

Opening for access compartment shall be no more than 1/16inch wider than the access compartment itself.

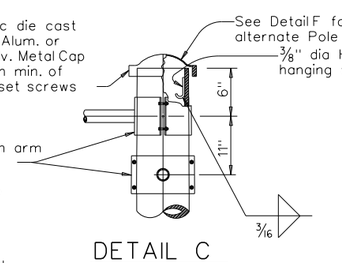


DETAIL J

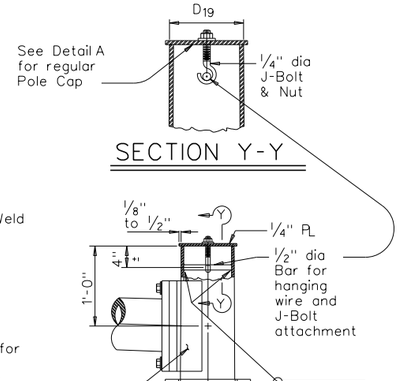


DETAIL B

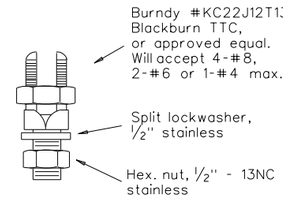
(If ILSN applied)



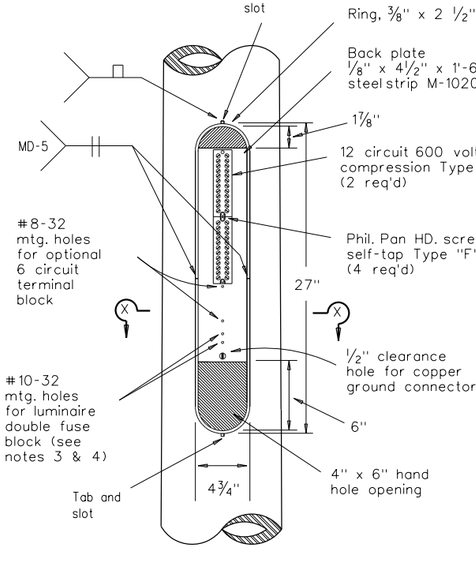
DETAIL C



SECTION Y-Y



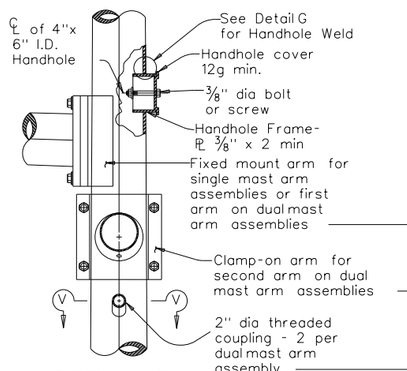
COPPER GROUND CONNECTOR



ACCESS COMPARTMENT

DETAIL D

(for 30' pole with luminaire and ILSN sign)

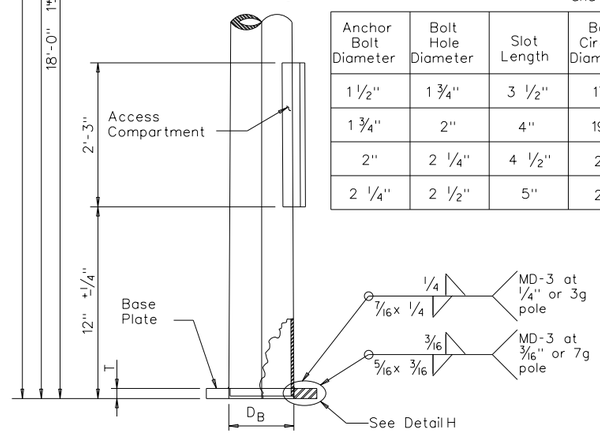


DETAIL E

(for 24' pole with ILSN sign and no luminaire)

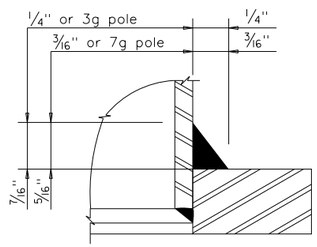
DETAIL F

(for 19' pole with no ILSN sign and no luminaire)

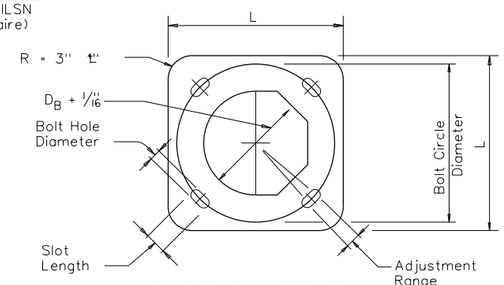


POLE ELEVATION

Anchor Bolt Diameter	Bolt Hole Diameter	Slot Length	Bolt Circle Diameter	Base PL Dim. L x T	Adjust. Range
1 1/2"	1 3/4"	3 1/2"	17"	18" x 1 1/2"	13.4°
1 3/4"	2"	4"	19"	20" x 1 3/4"	13.5°
2"	2 1/4"	4 1/2"	21"	22" x 2"	13.6°
2 1/4"	2 1/2"	5"	23"	24" x 2 1/4"	13.7°



DETAIL H



BASE PLATE PLAN

(1) 85% Min. penetration

(2) 60% Min. penetration 100% pemetration within 6" of circumferential base welds.

NOTES:

1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.

2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.

3. The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.

4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES MAST ARM POLE DETAILS

MA-D-12

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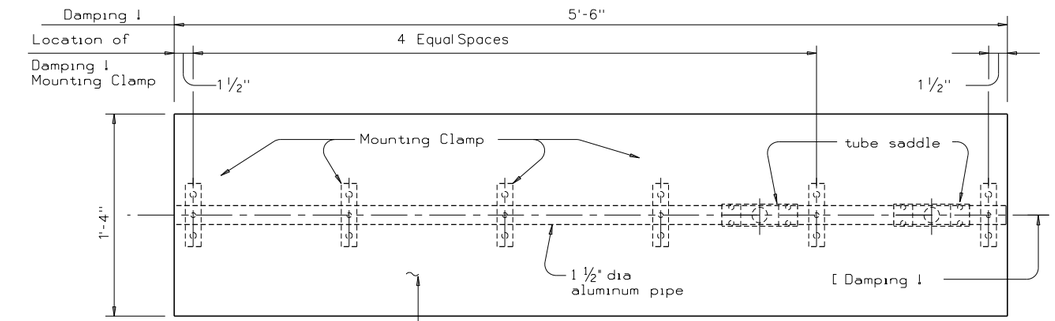
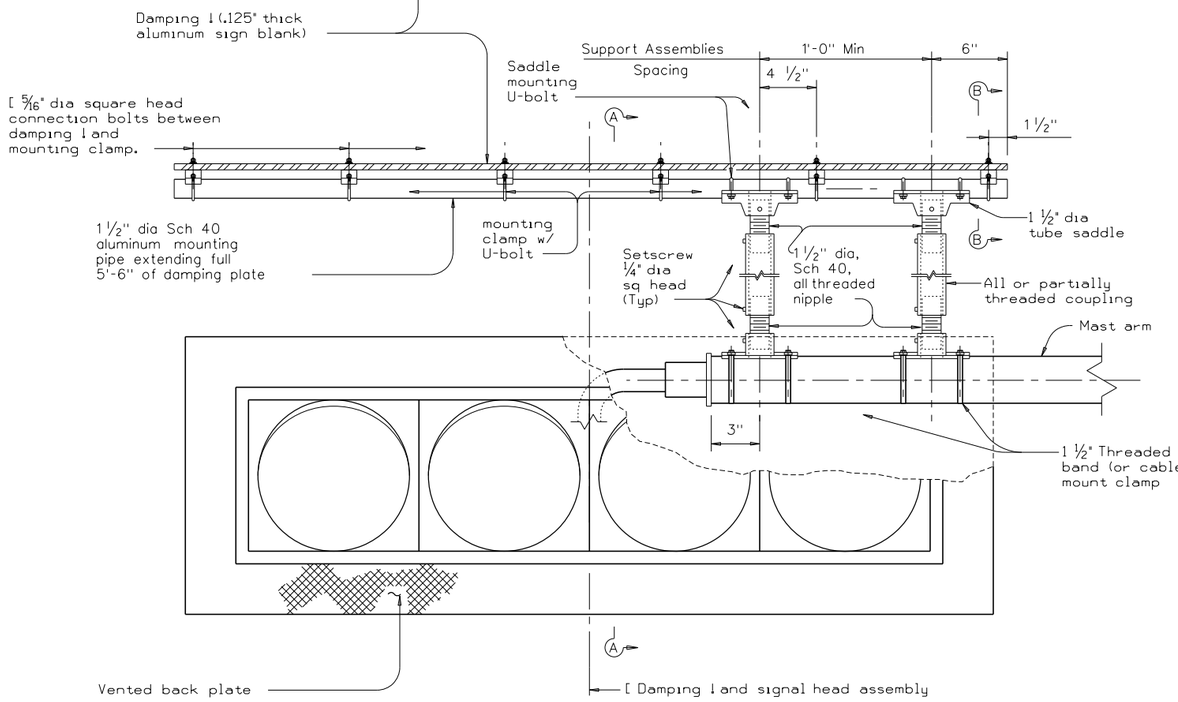
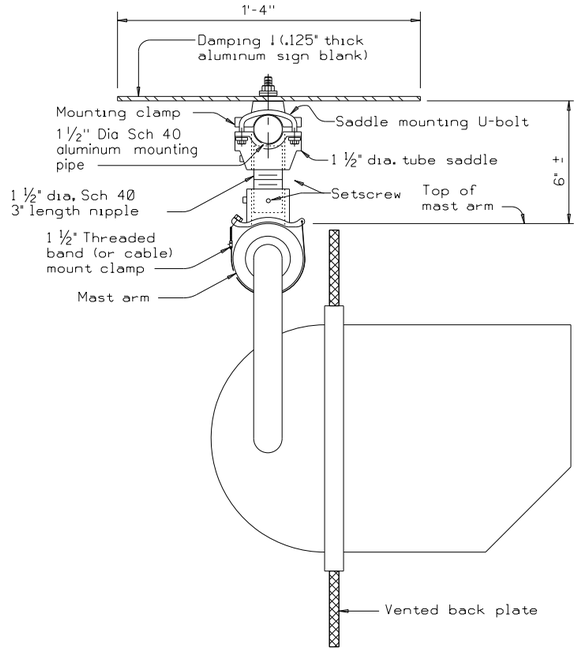


PLAN



ELEVATION



SECTION A-A

(Showing standard placement of signal head)
(Mounting clamp U-bolt is not shown for clarity)

SECTION A-A

(Showing alternate placement of signal head)
(Mounting clamp U-bolt is not shown for clarity)

GENERAL NOTES:

In accordance with the findings of TxDOT sponsored research, the installation of a damping plate in accordance with the details shown here at the end of signal mast arms of SMA and DMA standard structures reduces excessive harmonic vertical vibration, and thus fatigue damage. Any deviation from these details may reduce the effectiveness of this damping device.

Aluminum sign blank for damping plate shall conform to Departmental Material Specifications DMS-7110. Materials for mast arm mounting clamp and tube saddle shall be aluminum castings or aluminum alloys as in accordance with manufacturers' stipulations. Mounting pipe, pipe nipple and coupling shall be aluminum alloy 6061-T6 or 6063-T6. Damping plate mounting clamp and u-bolt assemblies shall conform to Standard sheet SMD(GEN)-08. U-bolts for saddle mounting shall have a minimum yield strength of 36 ksi.

Damping plate shall be mounted horizontally. Position centerline of damping plate to align with centerline of signal head assembly. Vertical clearance between signal head (with or without backing plate) and bottom of damping plate shall be maintained as shown. The attachments shown here are examples only, other supporting details which meet both alignment and vertical clearance requirements are also acceptable.

Unless stipulated by the manufacturers, all steel parts shall be galvanized finish in accordance with Standard Specification Item 445, "Galvanizing".

Contractor shall verify applicable field dimensions before the installation.

SECTION B-B

(Showing damping plate attachment)

DAMPING PLATE MOUNTING DETAILS

(Showing alternate placement of signal head)

(1) Recommended supporting assemblies to achieve required height			
Height required	One nipple each length	Two nipples each length plus	One coupling each length
6"-6 3/4"	3"	-	-
7"-8 1/2"	4"	-	-
9"-10 1/2"	6"	-	-
11"-15 1/2"	-	4"	5"
16"-24"	-	6"	10"

Texas Department of Transportation
Traffic Operations Division

MAST ARM DAMPING PLATE DETAILS

MA-DPD-12

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FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL: VERT BARS	REINFORCING STEEL: SPIRAL & PITCH	EMBEDDED DRILLED SHAFT LENGTH-ft ④,⑤,⑥ TEXAS CONE PENETROMETER N blows/ft: 10	15	40	ANCHOR BOLT DESIGN ①: ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	FOUNDATION DESIGN LOAD ②: MOMENT K-ft	SHEAR Kips	TYPICAL APPLICATION
24-A	24"	4- #5	#2 at 12"	6	5.3	4.5	3/4"	36	12 3/4"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	12	10.3	8.0	1 1/2"	55	17"	2	87	3	Mast arm assembly. (see Selection Table)
36-A	36"	10- #9	#3 at 6"	14	12.0	9.4	1 3/4"	55	19"	2	131	5	Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire.
36-B	36"	12- #9	#3 at 6"	16	13.6	10.4	2"	55	21"	2	190	7	Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm
42-A	42"	14- #9	#3 at 6"	18	15.6	11.9	2 1/4"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

NOTES:

① Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

② Foundation Design Loads are the allowable moments and shears at the base of the structure.

③ Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

④ Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

⑤ If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

⑥ Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

FOUNDATION SUMMARY TABLE ③

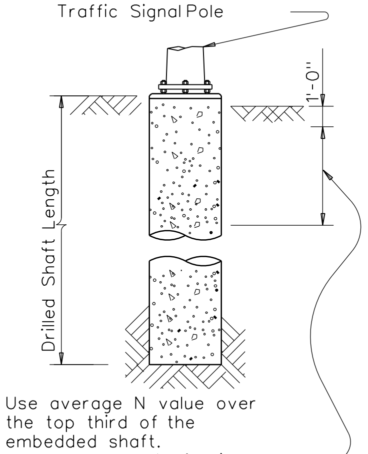
LOCATION IDENTIFICATION	AVG. N BLOW /ft.	FDN TYPE	NO. EA	DRILLED SHAFT LENGTH (FEET) ⑥ 24-A	30-A	36-A	36-B	42-A
RIO CONCHO/BELL								
T-1,2,4,5,7,8,10,11	10	24-A	8	6				
T-6	10	30-A	1		12			
T-3,9,12	10	36-A	3			14		
HARRIS/BELL								
T-1,3,4,6,8	10	24-A	5	6				
T-2,5,7,9	10	36-A	4			14		
TOTAL DRILLED SHAFT LENGTHS				78	12	98		

FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)

		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'

EXAMPLE:

1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.

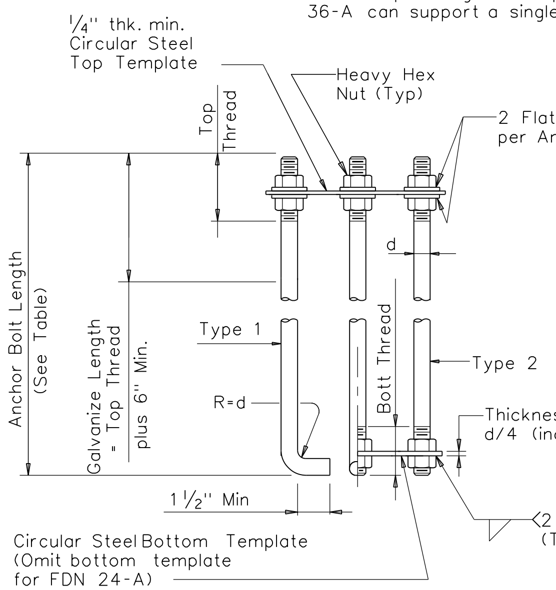


Use average N value over the top third of the embedded shaft. Ignore the top 1' of soil.

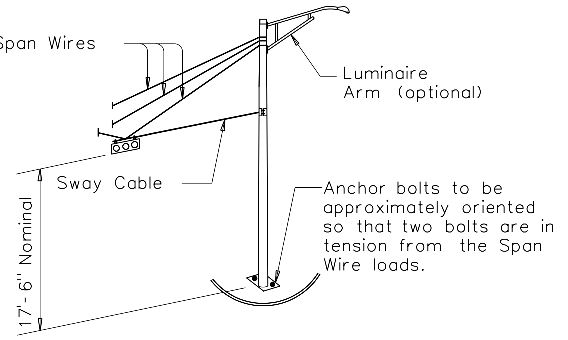
ANCHOR BOLT & TEMPLATE SIZES

BOLT DIA IN.	⑦ BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	R1
3/4"	1'-6"	3"	—	12 3/4"	7 1/8"	5 5/8"
1 1/2"	3'-4"	6"	4"	17"	10"	7"
1 3/4"	3'-10"	7"	4 1/2"	19"	11 1/4"	7 3/4"
2"	4'-3"	8"	5"	21"	12 1/2"	8 1/2"
2 1/4"	4'-9"	9"	5 1/2"	23"	13 3/4"	9 1/4"

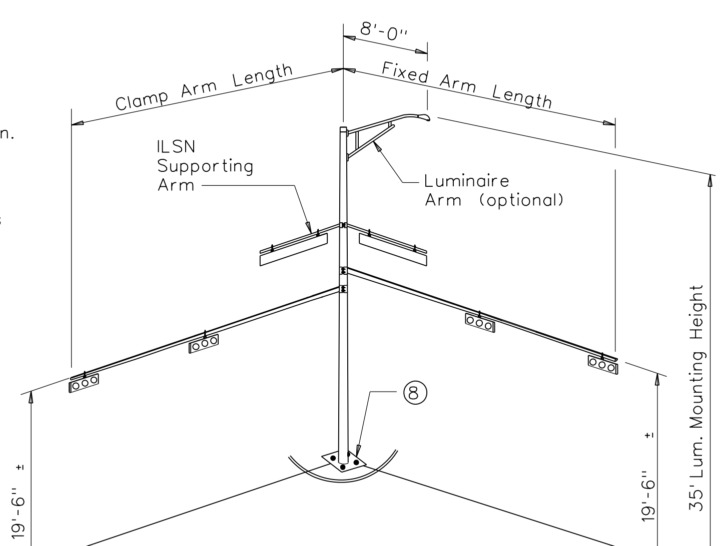
⑦ Min dimensions given, longer bolts are acceptable.



ANCHOR BOLT ASSEMBLY

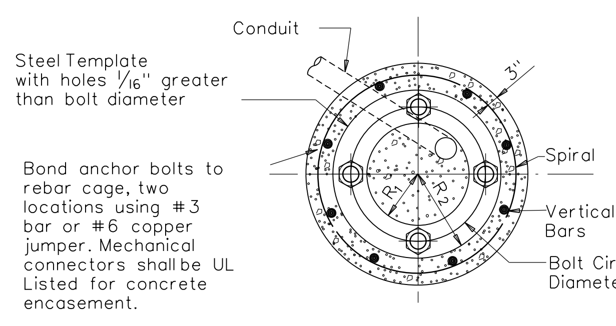


TYPICAL STRAIN POLE ASSEMBLY

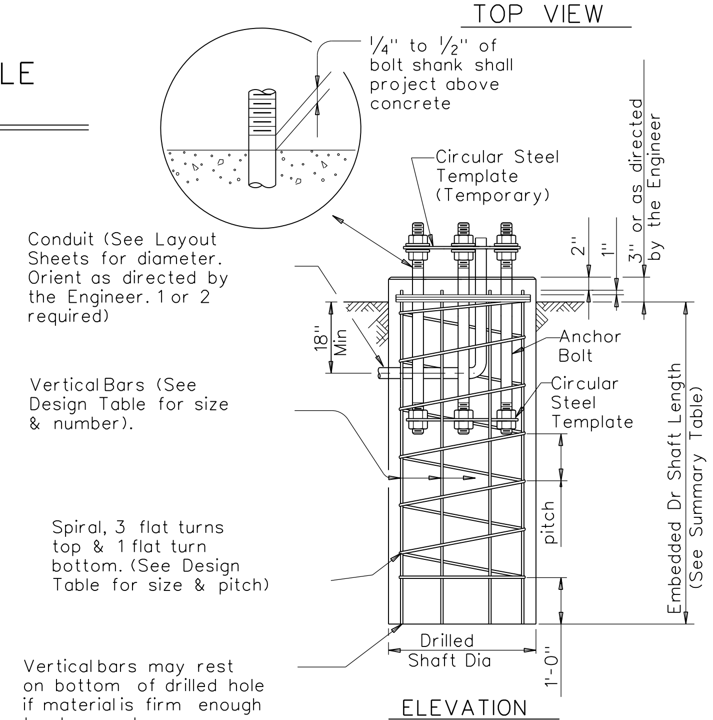


⑧ Orient anchor bolts orthogonal with the fixed arm direction to ensure that two bolts are in tension under dead load.

TYPICAL MAST ARM ASSEMBLY



TOP VIEW



ELEVATION

FOUNDATION DETAILS

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".

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Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-12

©TxDOT August 1995	DN: MS	CK: JSY	DW: MAO/MMF	CK: JSY/TEB
REVISIONS 5-96 11-99 1-12	CONT SECT	JOB	HIGHWAY	
	DIST	COUNTY	SHEET NO.	

DATE:
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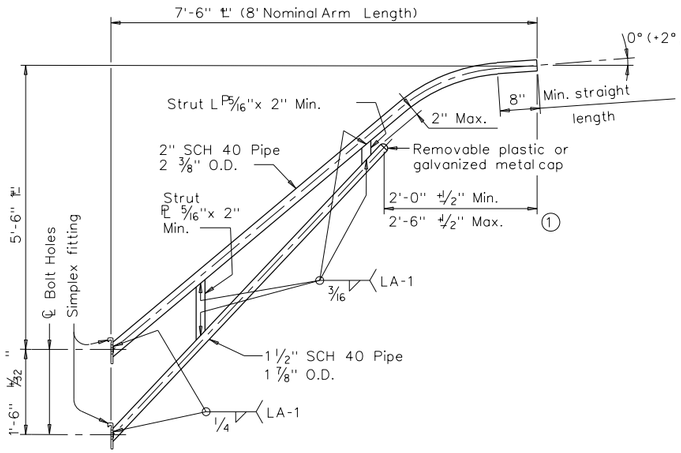
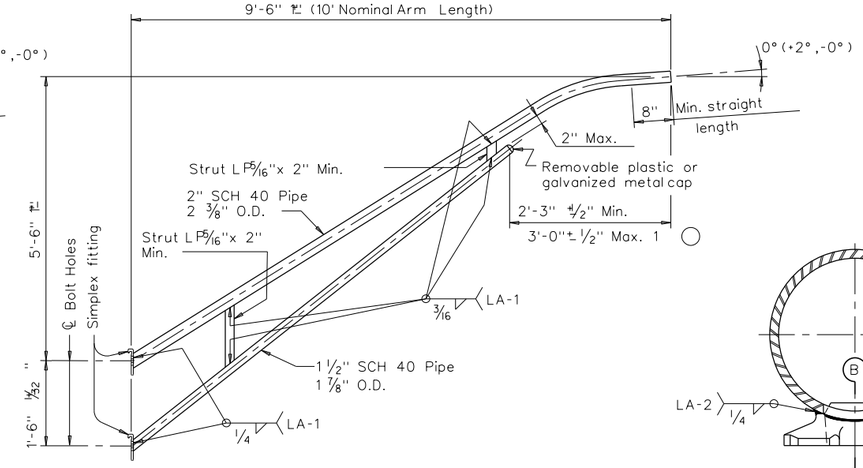
MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr.65-35 or A148 Gr.80-50, A576 Gr.1021 3 ◯, or A36 (Arm only)
Arm Pipes	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50 4 ◯ or A1011 HSLAS-F Gr.50 4 ◯
Arm Strut Plates 2 ◯	ASTM A36, A572 Gr.50 4 ◯ or A588
Misc.	ASTM designations as noted



8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM

DIRECT ATTACHMENT DETAIL

1. Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.
2. Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.
3. A576 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.
4. ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. Design Wind Speed equals 90 mph plus a 1.3 gust factor. Arms are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq. ft.

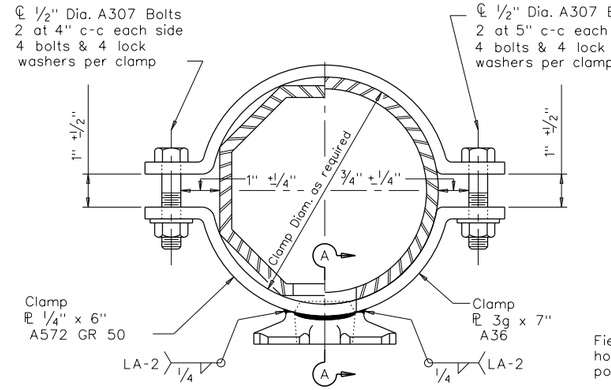
Materials and fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absense of specified Fabricaton tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing".

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

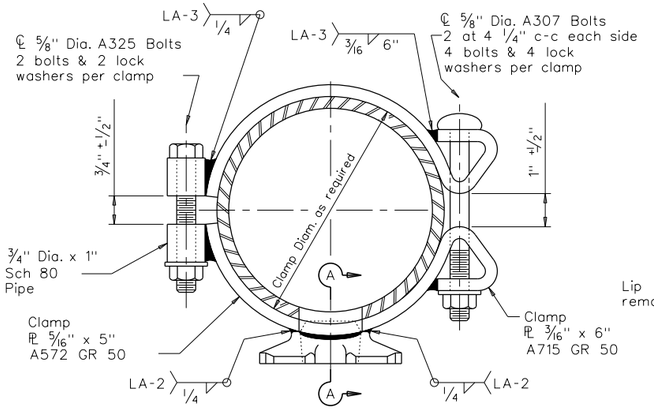
Each pole simplex fitting shall be supplied with 2 ASTM A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the Fabricator shall ship the clamp assembly securely attached 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.



CLAMP ATTACHMENT DETAIL NO.1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO.2 (HALF SECTION)



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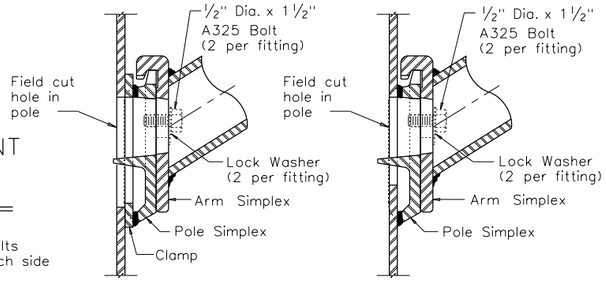
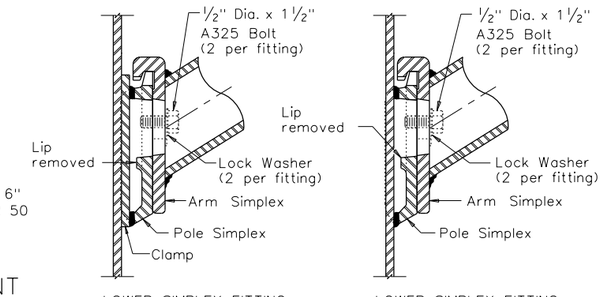


UPPER SIMPLEX FITTING

UPPER SIMPLEX FITTING

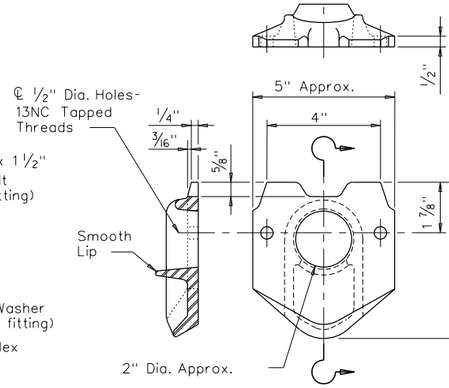


LOWER SIMPLEX FITTING

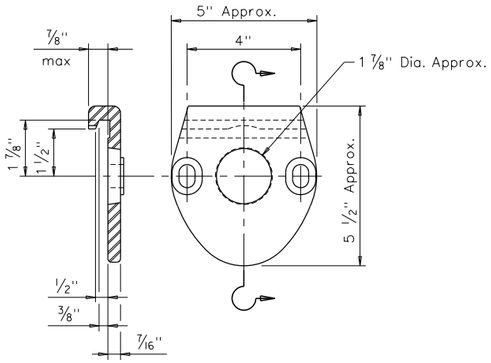
SECTON A-A

LOWER SIMPLEX FITTING

SECTON B-B



POLE SIMPLEX DETAIL



ARM SIMPLEX DETAIL

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES

ARM DETAILS

LUM-A-12

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DN: LEH	CK: JSY	DW: LTT	CK: TEB
CONT	SECT	JOB	HIGHWAY
DIST	COUNTY		SHEET NO.

REVISIONS
5-96
1-99
1-12

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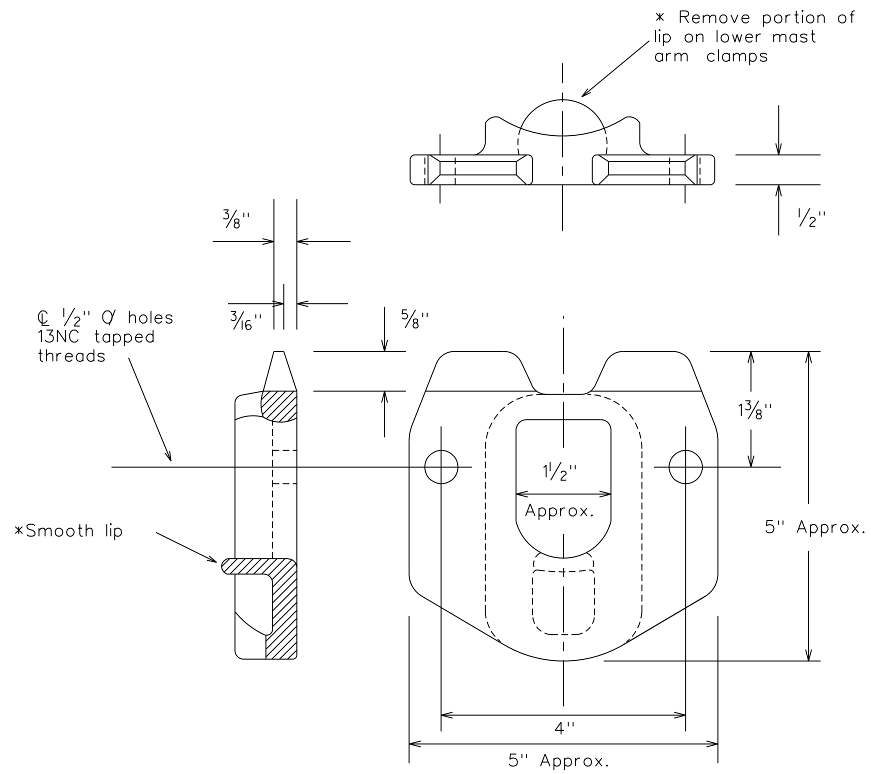


POLE SIMPLEX DETAILS

OTHER MATERIALS:

1. Pole simplex shall be ASTM A27 GR65-35 or A148 GR80-50 or A576 GR1021. ASTM A576 must be suitable for forging and also meet minimum tensile of 65ksi, minimum yield of 35ksi, and a minimum elongation of 22 percent in 2 inches.

2. Welded tabs and backplates shall be ASTM A-36 steel or better.

3. Nylon insert locknuts shall conform to ASTM A563.

GENERAL NOTES:

1. Materials and fabrication shall be in accordance with Standard Sheet "MA-C" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

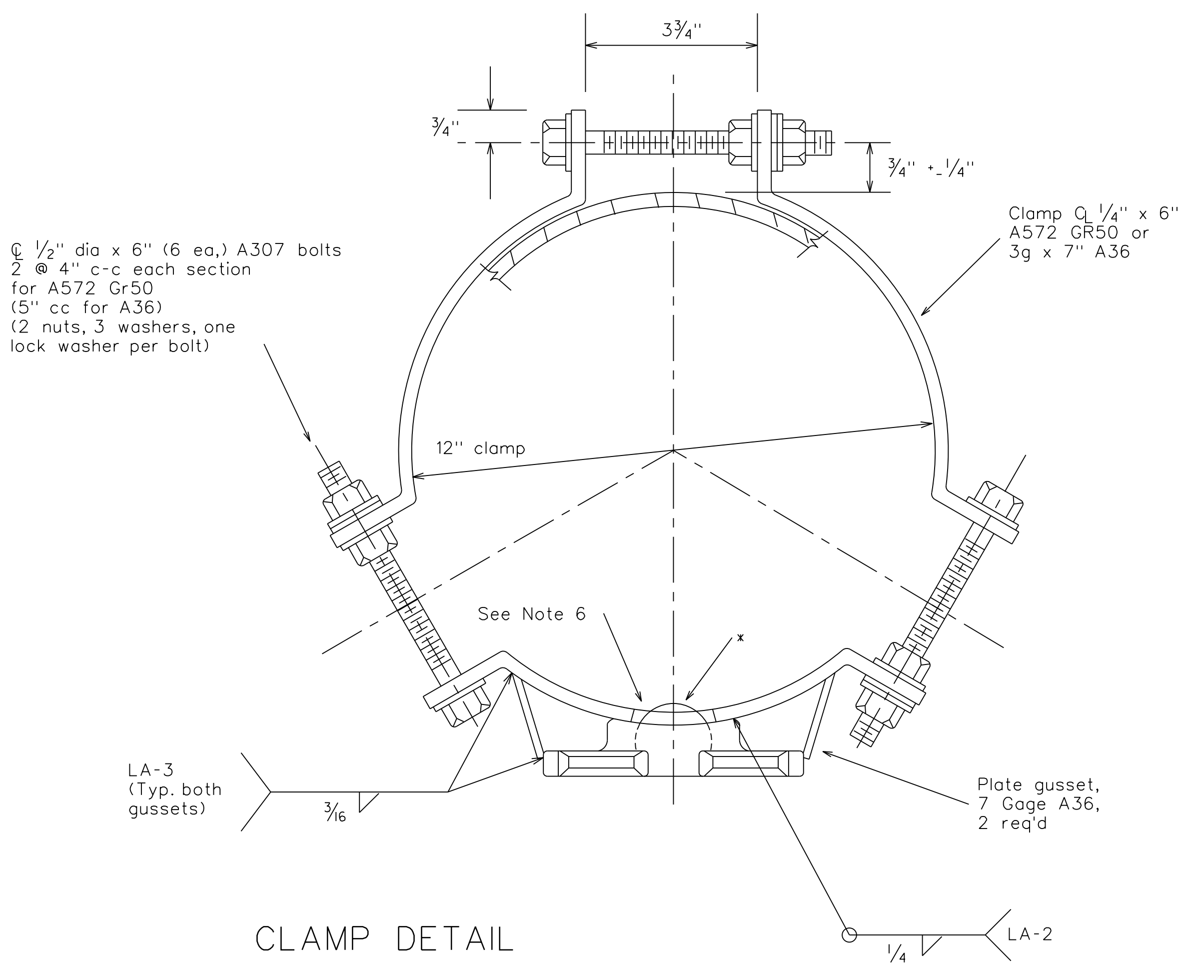
2. All parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing". The throat of the Simplex shall be made free of all rough or sharp edges resulting from the galvanizing process.

3. Each simplex fitting shall be supplied with 2 ASTM A325 bolts, ½in. X 1½in. and 2 lock washers. The bolts and lock washers shall be secured to the clamp with the other hardware items. The Fabricator shall ship clamp assembly together in a single package, including all bolts, nuts, and washers required for the clamp and simplex fitting.

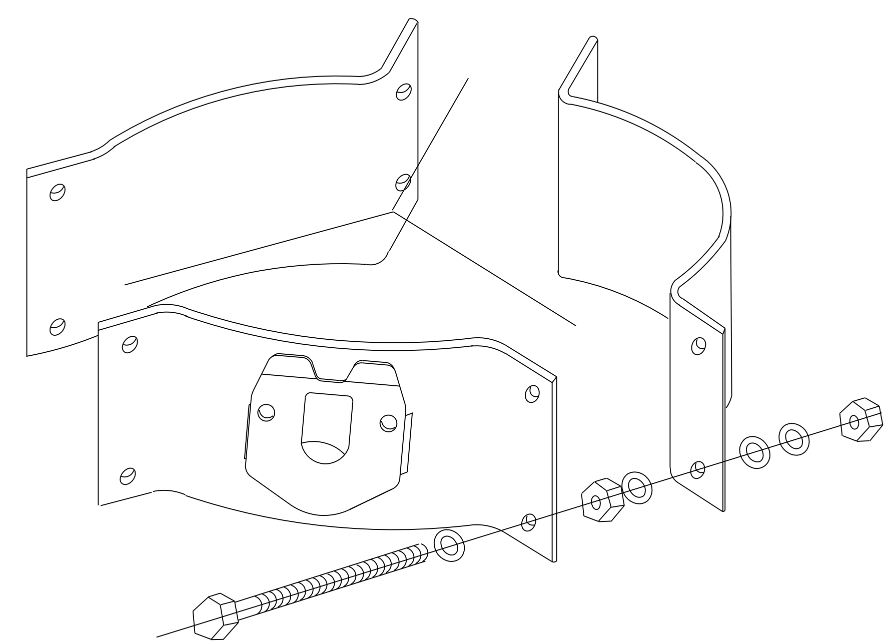
4. Design conforms to 1994 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals" and interim revisions thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor. Clamps are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq.ft., 12 ft. maximum arm length.

5. Each assembly shall consist of one upper piece simplex fitting having a smooth lip and one lower piece simplex fitting with the lip removed.

6. Approximately 2 in. diameter hole in upper mast arm clamp.



CLAMP DETAIL



PROJECTION

For 8.9 - 12 inch diameter Signal Poles
(Two req'd for each mast arm)

Texas Department of Transportation
Traffic Operations Division

CLAMP ON
FITTING ASSEMBLY FOR
LUMINAIRE MAST ARM

CFA-12

©TxDOT	DN: KAB	CK: RES	DW: FDN	CK: CAL
REVISIONS	CONT	SECT	JOB	HIGHWAY
11-99 1-12				
	DIST	COUNTY		SHEET NO.
				130

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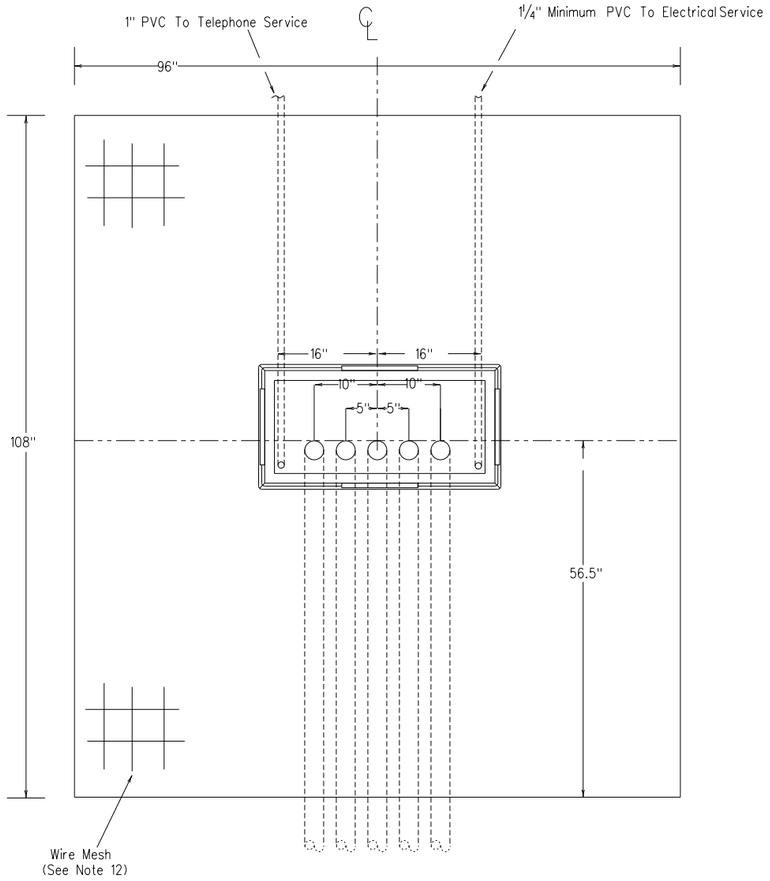
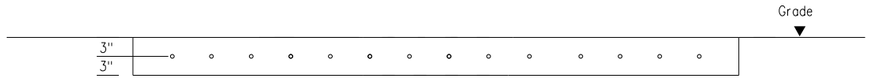
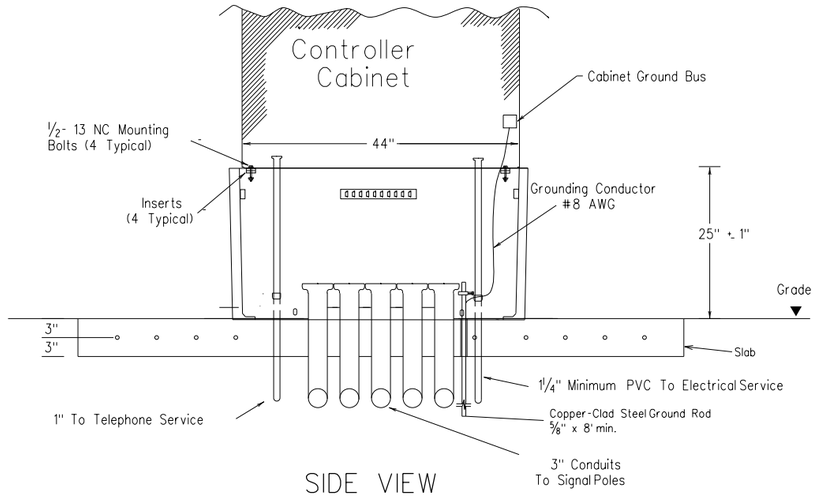
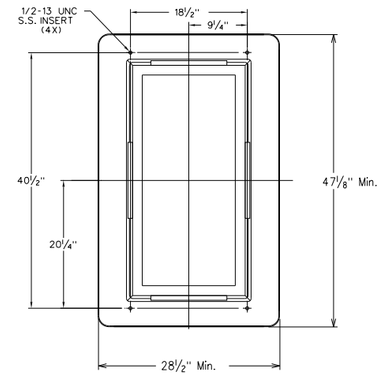
TOP VIEW (Slab & Base)







SIDE VIEW (Slab & Base)



CABINET BASE

TRAFFIC SIGNAL CONTROLLER BASE:

1. Provide a traffic signal controller base (cabinet base) manufactured of polymer concrete material consisting of calcareous and siliceous stone; glass fibers and thermoset polyester resin. The polymer concrete cabinet base must be reinforced on the inside of the cabinet base with fiberglass matting. Provide one of the following bases: Armorcast Part # A6001848X24, Quazite Model # PG3048Z709, or other as approved by TxDOT Traffic Operation Division.
2. The polymer concrete material must have a minimum compressive strength of 10,300 pounds per square inch (psi), minimum flexural strength of 3600 psi, and minimum shear strength of 3600 psi.
3. The polymer concrete cabinet base must conform to the dimensions shown and must accommodate a standard TxDOT basemount cabinet.
4. Supply the cabinet base with four ½"-13 UNC stainless steel inserts for attachment of the cabinet to the base. Inserts must withstand a minimum torque of 50 ft-lb and a minimum straight pull out strength of 750 lbs.
5. Provide the cabinet base with 4 cable racks mounted one on each side of the base 2" to 7 " from the top edge of the base. Unless approved otherwise, cable racks must be 1-1/2 x 9/16x 3/16inch steel channel with eight T-slots spaced at 1-1/2 inches. The cable racks must easily accommodate the insertion of tie wraps to attach field wiring to the racks to serve as strain relief. Secure cable racks to the base using ½"-13 UNC stainless steel screws and inserts.
6. The cabinet base, when secured to the concrete slab with controller cabinet attached, must withstand a minimum wind load of 125 mph or a 850 lb force applied at 49" above the bottom of the base without causing the base or cabinet to come out of their anchored position or cause any permanent deformation. The manufacturer must supply certification by an independent testing laboratory or sealed by a Texas Licensed Professional Engineer. Provide the cabinet base with hardware for attachment to a concrete slab.
7. The traffic signal base must be permanently marked either by impress or by permanent ink with the manufacturer's model number and name or logo.
8. Seal the base to the concrete with a silicone caulk bead and fastened to the slab per manufacturer's instructions.

CONCRETE SLAB:

9. Traffic signal controller pad must be a portland cement concrete slab poured in place, must conform to the dimensions shown, and must be level.
10. Bond a #8 AWG copper ground wire and an 8 ft ground rod bonded to the reinforcing mesh by a suitable UL Listed clamp and terminated to the cabinet grounding bus for the purpose of providing a local ground for the electrical grounding conductor. The electrical grounding conductor specified in Item 680-3.A.4 is required and must be terminated to the cabinet ground bus.
11. Install a PVC sleeve to prevent the ground rod from direct embedment in the slab.
12. Provide welded wire mesh 6X6-W2.9 X W2.9 for reinforcement. Provide joints and splices in the mesh with a minimum 6-inch overlap. Center the mesh between top and bottom and provide a minimum 3 inch cover on the edges.
13. Provide Class B concrete minimum for the slab in accordance with Item 421. Construct the slab in accordance with Item 531.

CONDUITS:

14. Stub up and run 3-inch conduits through the slab to the various traffic signal poles and ground boxes as shown on the layouts. Install the number of conduits as shown on layouts plus two additional 3 inch conduits for future use. Terminate the conduits with a bushing between 2 and 4-inches above the slab.
15. Extend conduits for future use at least 18-inches from the edge of the slab, terminate underground with a coupling, and cap and seal so that the seal can be removed without damaging the coupling. This must also apply to unused telephone conduit.
16. Stub up two separate conduits through the slab from the electrical and telephone services. Run the conduit for the electrical feed directly to the electrical service enclosure. Run the conduit for the telephone line directly to the telephone service, usually located on the same pole as the electrical service. Telephone must not under any circumstance share a conduit with any other function.
17. Terminate electric and telephone conduits above the slab with a coupling. After the base is installed, extend the conduits above the top of the base and secure to the base using a steel one-hole strap or similar suitable substitute.

CONTROLLER CABINET:

18. Anchor the controller cabinet to the base using four stainless steel 1/2-13 NC bolts.
19. The silicone caulk bead specified in Item 680.3.B must be RTV 133.

PAYMENT:

20. Bid TS-CF as subsidiary to Item 680.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL CONTROLLER CABINET BASE AND PAD

TS-CF-04

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12-04 REVISIONS	CONT	SECT	JOB	HIGHWAY
	DIST	COUNTY		SHEET NO.

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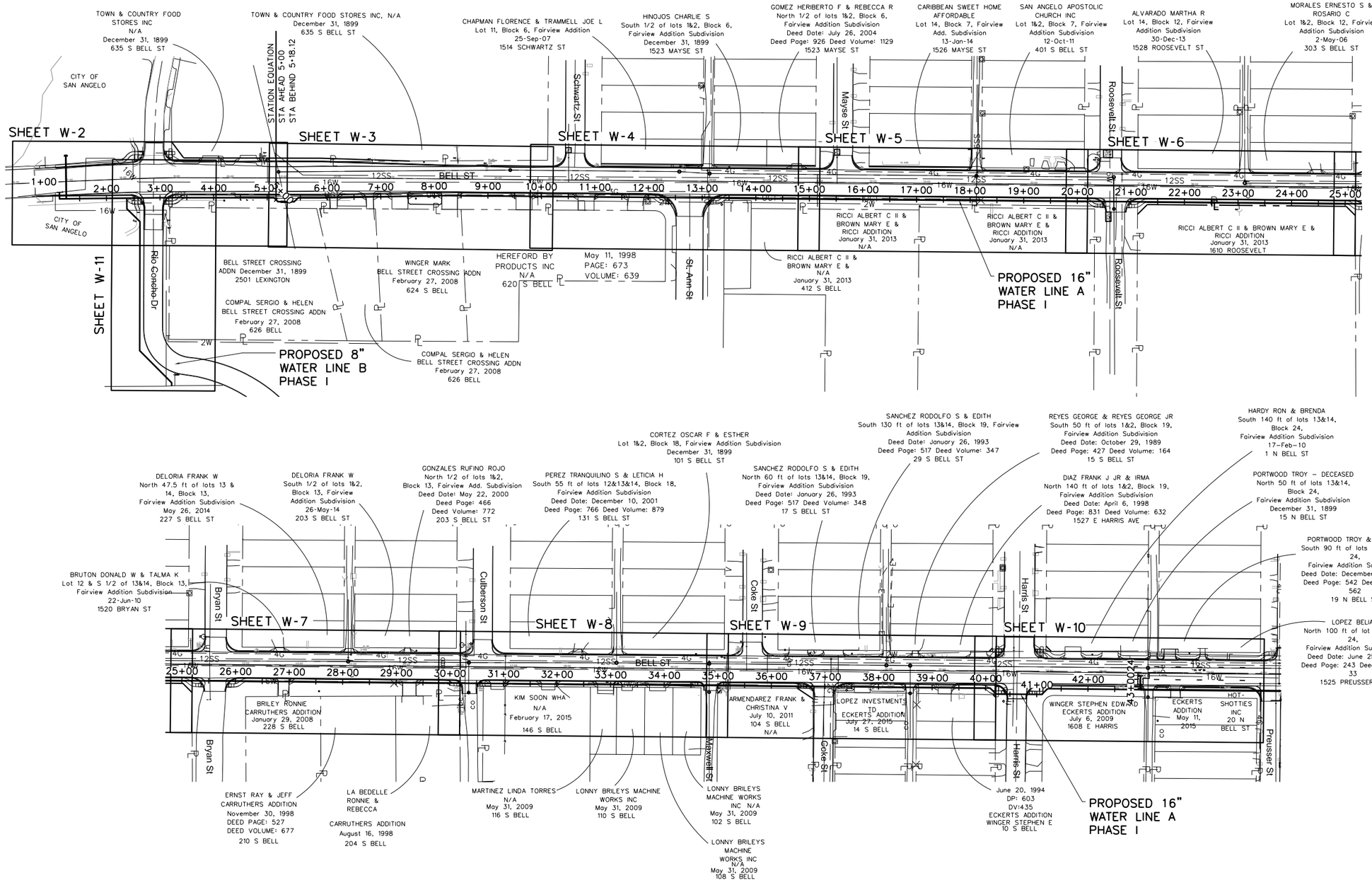

NORTH

0 100' 200'

SCALE IN FEET
HORIZONTAL

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

STATE OF TEXAS
AARON B. CONINE
109794
LICENSED PROFESSIONAL ENGINEER
23 Oct 2017

FREESE NICHOLS

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Web – www.freese.com

CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
CIVIL
WATER LINE 'A' SITE LAYOUT

F&N JOB NO.	SAN16188
DATE	OCT 2017
DESIGNED	ABC
DRAWN	SB
REVISED	
CHECKED	DGS
FILE NAME	CV-PPL-PL-SITE01.dwg

NO. | ISSUE | BY | DATE

VERIFY SCALE
Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

SHEET
W-1

SEQ.
100

100% SUBMITTAL

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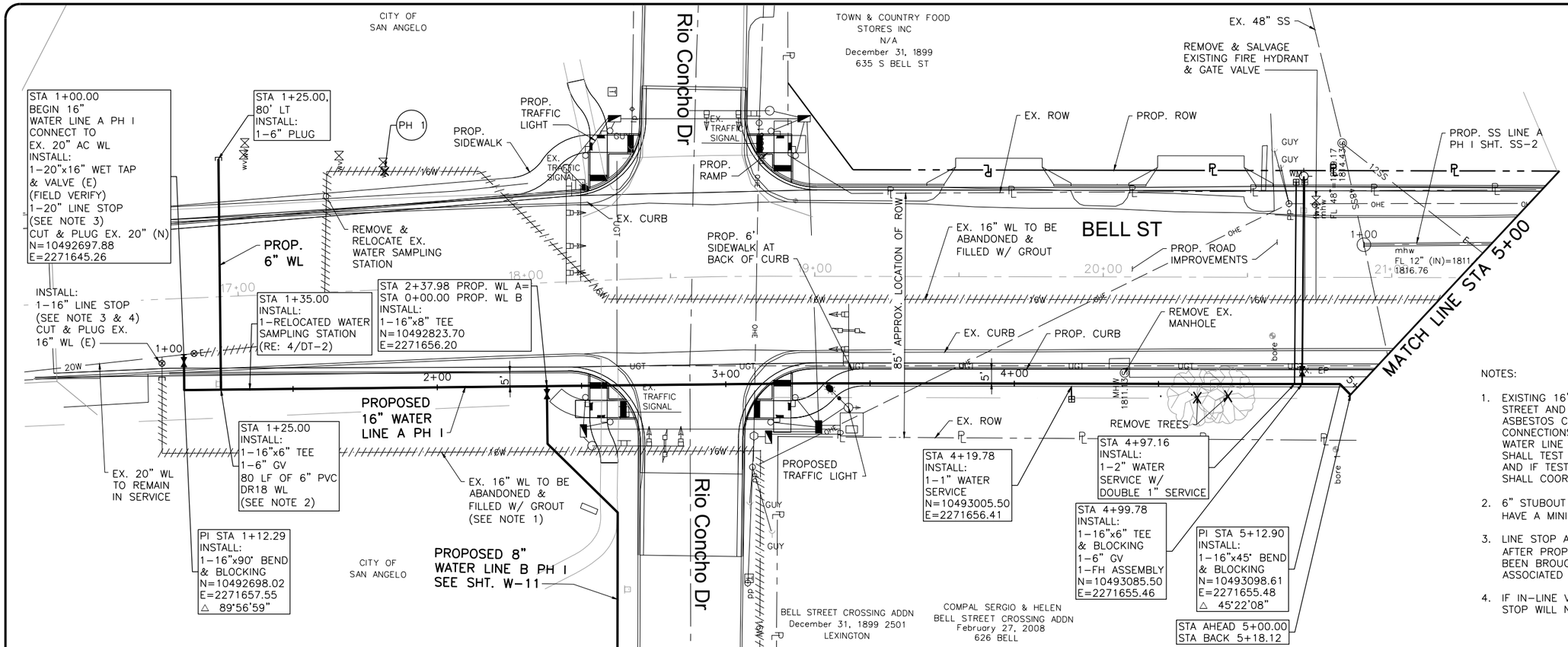

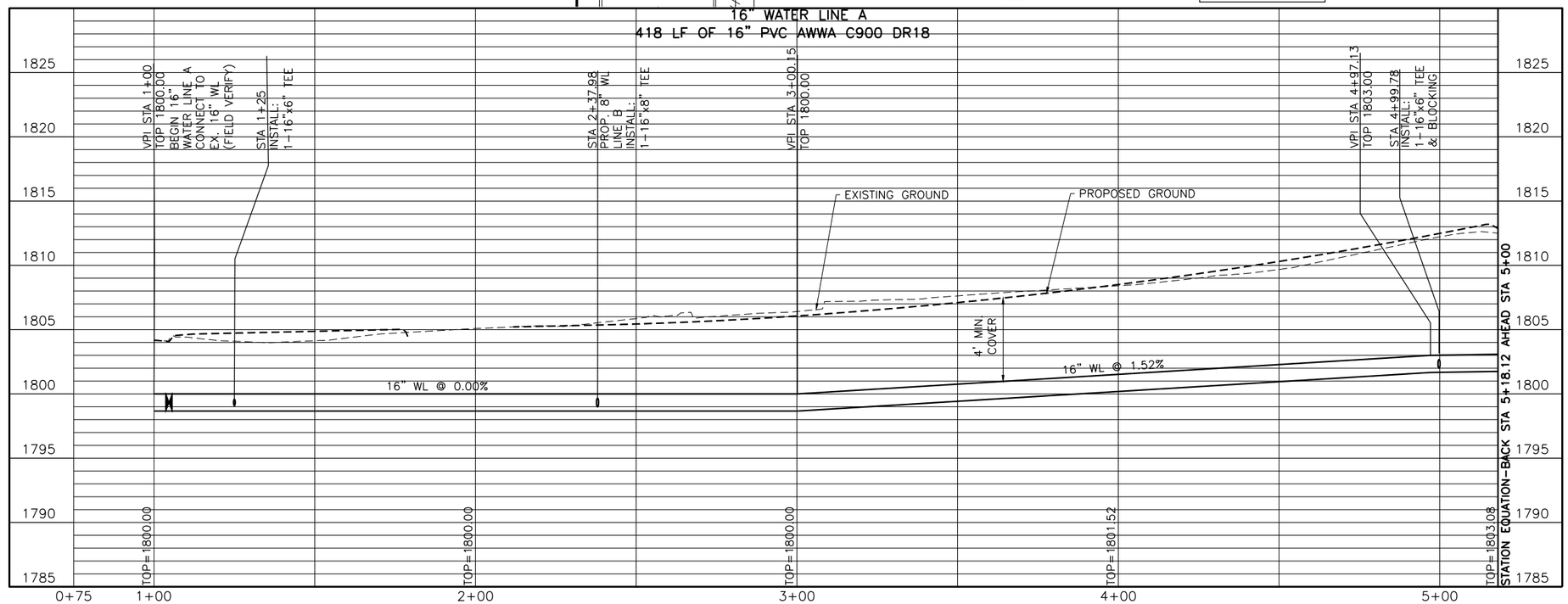

NOTES:

1. EXISTING 16" WATER LINE EAST OF BELL STREET AND ALONG RIO CONCHO MAY BE ASBESTOS CEMENT PIPE. PRIOR TO CONNECTIONS OR DISTURBING EXISTING WATER LINE IN THIS AREA CONTRACTOR SHALL TEST WATER LINE FOR ASBESTOS AND IF TEST IS POSITIVE, THE CONTRACTOR SHALL COORDINATE WITH OWNER.
2. 6" STUBOUT FOR PARK SERVICE SHALL HAVE A MINIMUM COVER OF 4'.
3. LINE STOP AND PLUG SHALL BE INSTALLED AFTER PROPOSED 16" WATER LINE A HAS BEEN BROUGHT INTO SERVICE TO INCLUDE ASSOCIATED DISTRIBUTION LINE CONNECTION.
4. IF IN-LINE VALVES ARE FUNCTIONAL, LINE STOP WILL NOT BE REQUIRED.

CAUTION!!!
EXISTING UNDERGROUND AND OVERHEAD UTILITIES IN THE AREA. 48 HOURS PRIOR TO CONSTRUCTION CONTACT 1-800-DIG-TESS

NORTH
SCALE IN FEET HORIZONTAL: 0 20' 40'
SCALE IN FEET VERTICAL: 0 5' 10'

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144
STATE OF TEXAS
AARON B. CONINE
109794
LICENSED PROFESSIONAL ENGINEER
23 Oct 2017

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4055 International Plaza, Suite 200
Fort Worth, Texas 76109-4895
Phone - (817) 735-7300
Fax - (817) 735-7491
Web - www.freese.com

CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
WATER LINE A
PLAN AND PROFILE
STA 1+00 TO STA 5+00

NO.	ISSUE	BY	DATE

FAN JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DGS
FILE NAME WATER LINE A.dwg

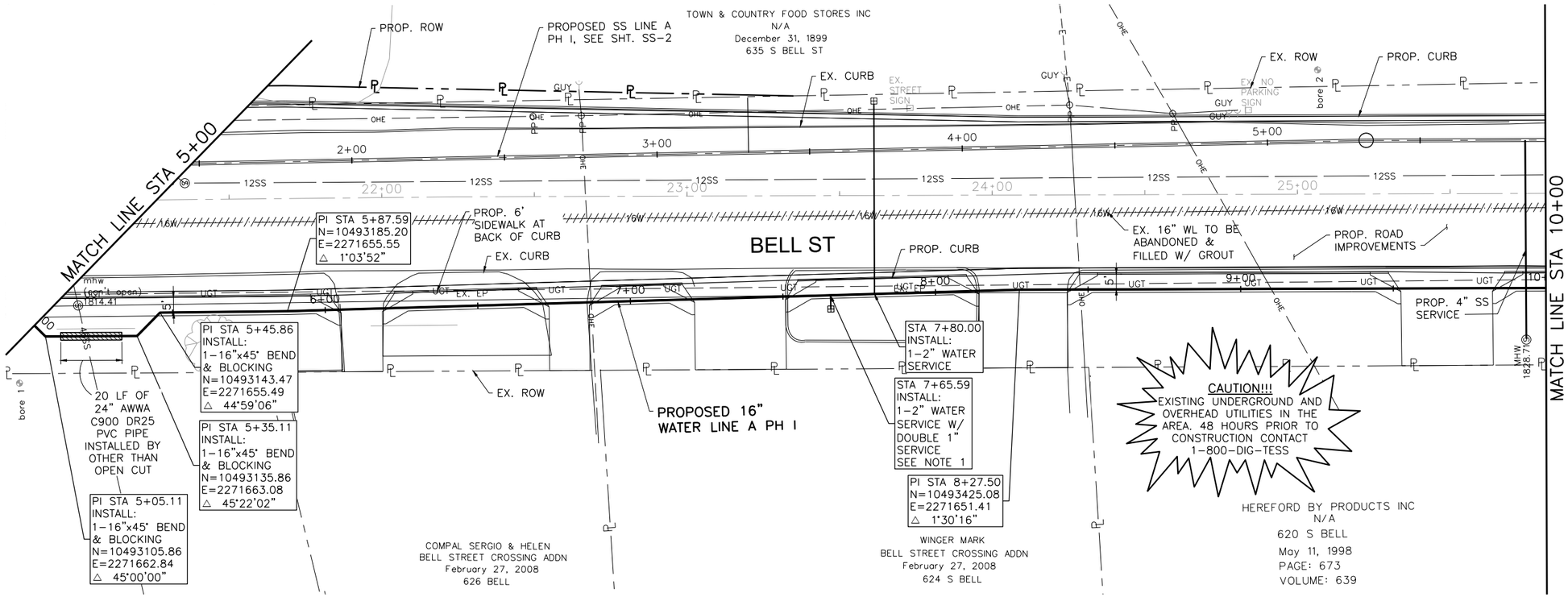
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

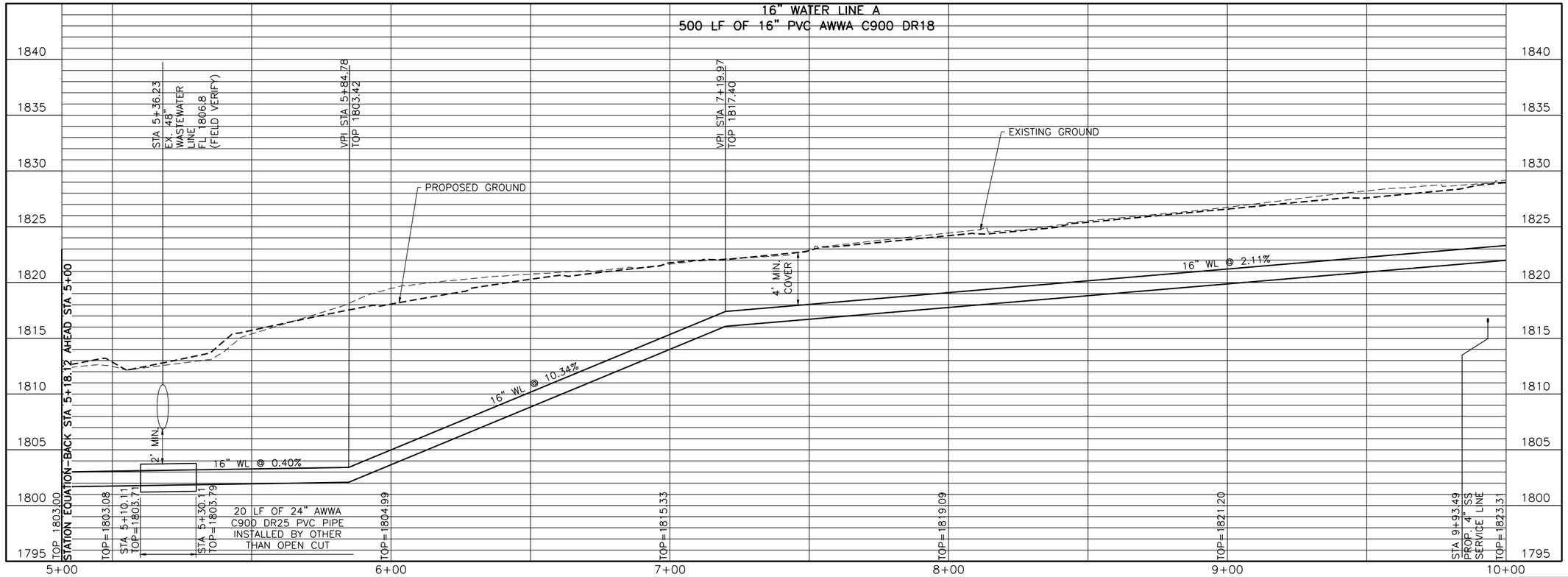
SHEET W-2
SEQ. 101

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WATER LINE A.dwg
Last Saved: 9/20/2017 9:15 AM Saved By: mdc

Plot Date: 9/20/2017 11:47 AM Plot By: mdc Filename: N:\WTU\Drawings\WATER LINE A.dwg





NORTH

0 20' 40'
SCALE IN FEET
HORIZONTAL

0 5' 10'
SCALE IN FEET
VERTICAL

NOTES:

1. COORDINATE WITH PROPERTY OWNER TO RELOCATE WATER SERVICE FROM BACK OF LOT TO BELL STREET.

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CITY OF SAN ANGELO, TEXAS
PHASE I

BELL ST. ROADWAY & UTILITY IMPROVEMENTS

WATER LINE A

PLAN AND PROFILE STA 5+00 TO STA 10+00

NO.	ISSUE	BY	DATE

F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DGS
FILE NAME WATER LINE A.dwg

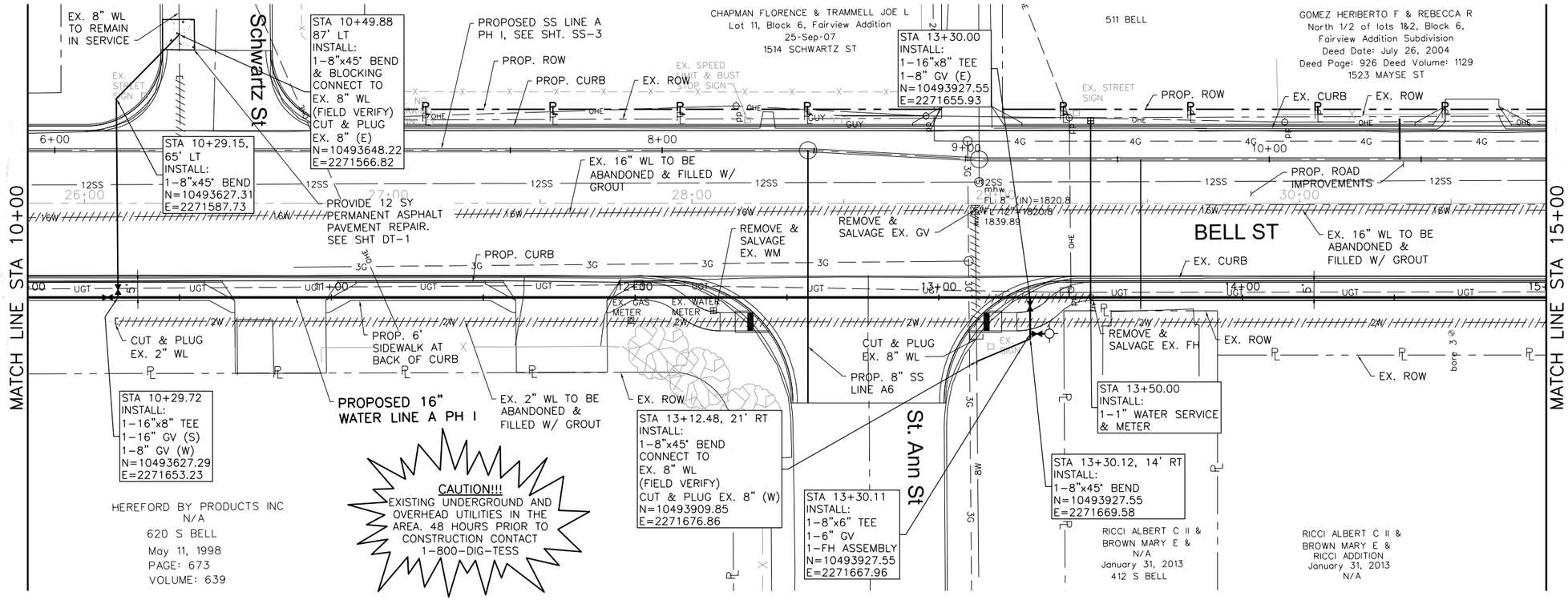
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

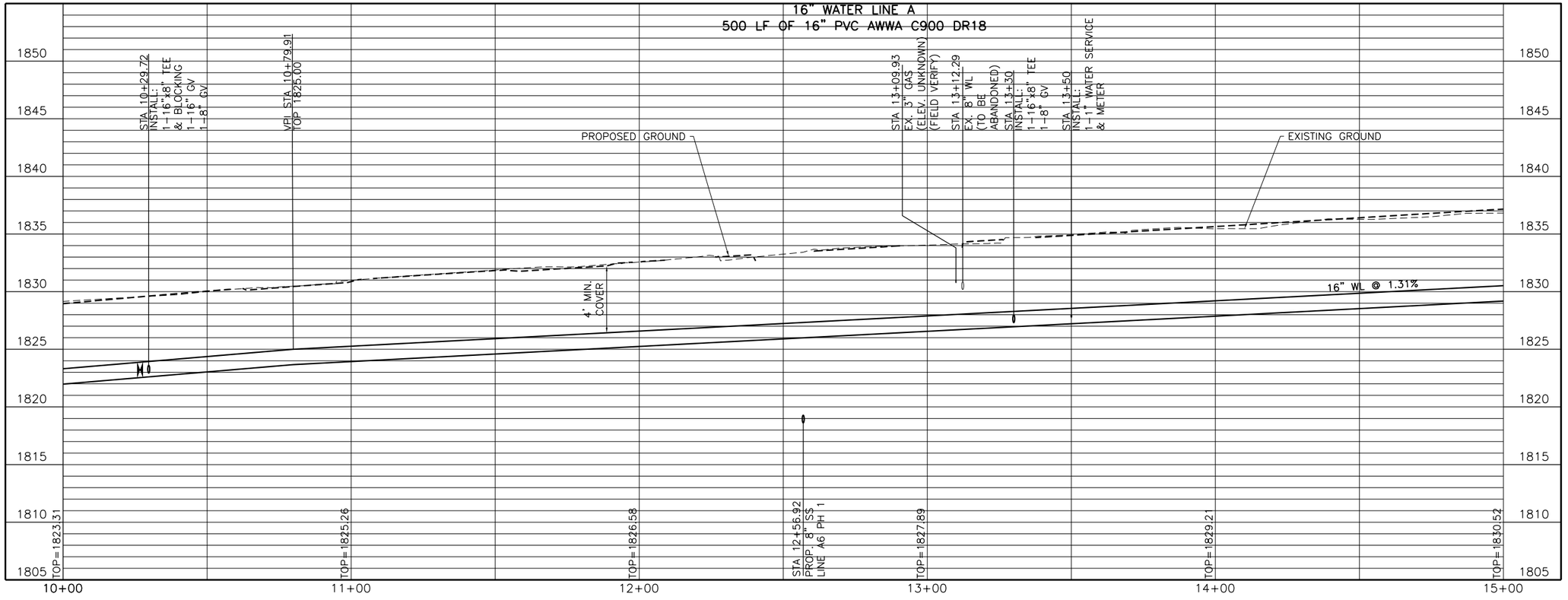
SHEET W-3
SEQ. 102

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WATER LINE A.dwg
Last Saved: 9/20/2017 9:15 AM Saved By: mdc

Plot Date: 9/20/2017 11:48 AM Plot By: mdc Filename: N:\WTU\Drawings\WATER LINE A.dwg





0 20' 40'
SCALE IN FEET
HORIZONTAL

0 5' 10'
SCALE IN FEET
VERTICAL

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Texas Registered Engineering Firm F-2144

STATE OF TEXAS
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23 Oct 2017

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
WATER LINE A
PLAN AND PROFILE
STA 10+00 TO STA 15+00

NO.	ISSUE	BY	DATE

FAN JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DCS
FILE NAME WATER LINE A.dwg

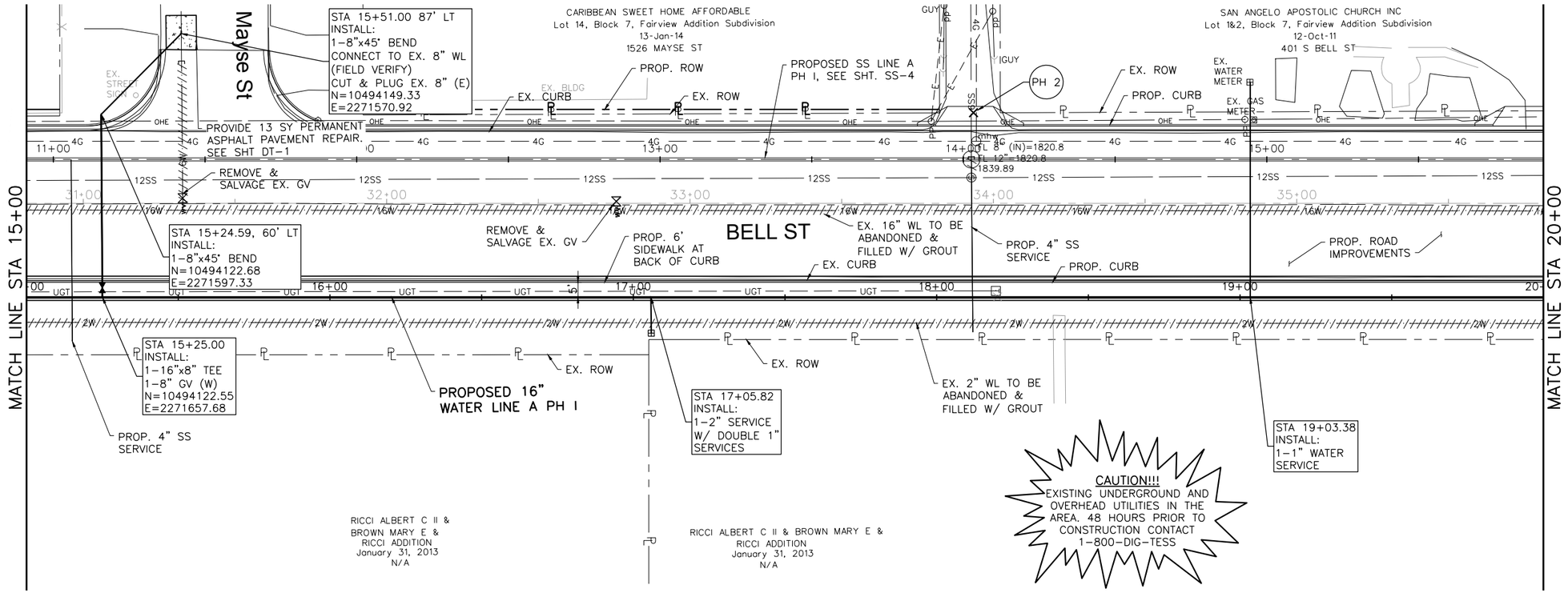
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

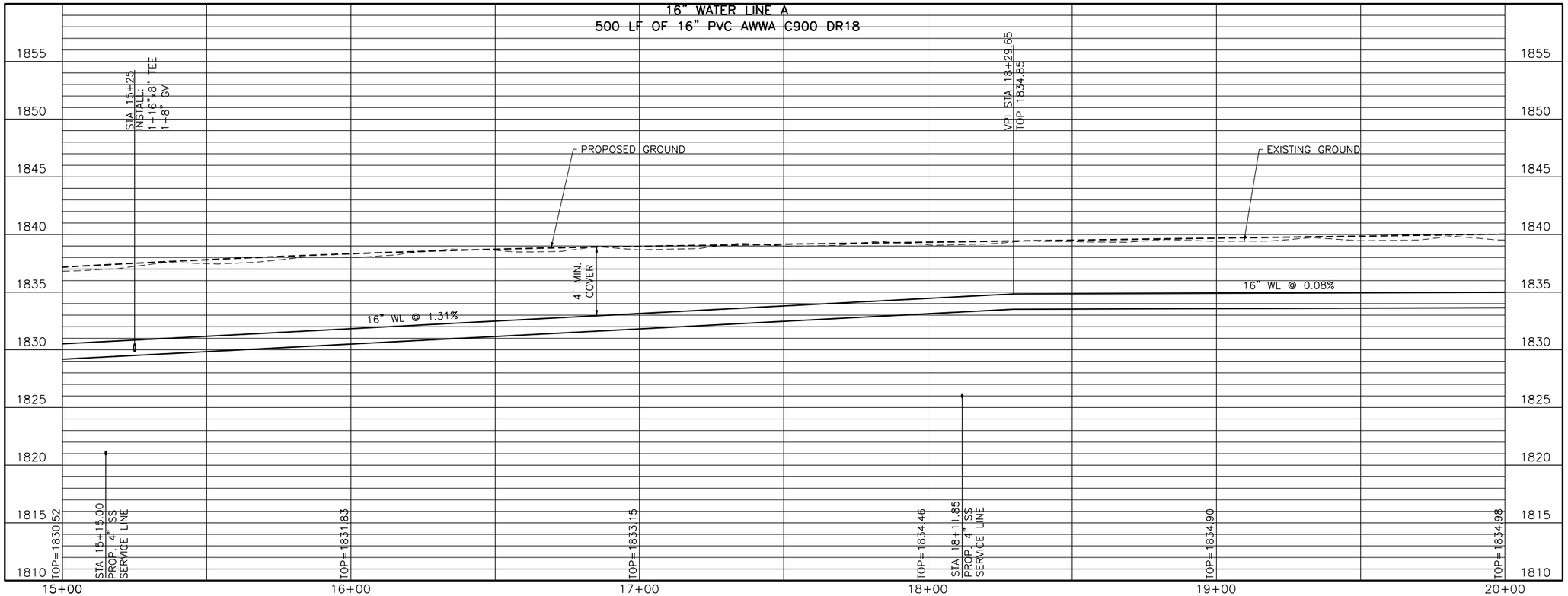
SHEET W-4
SEQ. 103

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WATER LINE A.dwg
Last Saved: 10/23/2017 3:34 PM Saved By: sb

Plot Date: 10/23/2017 5:34 PM Plot By: sb Filename: N:\WTU\Drawings\WATER LINE A.dwg





NORTH

0 20' 40'
SCALE IN FEET
HORIZONTAL

0 5' 10'
SCALE IN FEET
VERTICAL

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

STATE OF TEXAS
AARON B. CONINE
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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
WATER LINE A
PLAN AND PROFILE
STA 15+00 TO STA 20+00

NO.	ISSUE	BY	DATE

FAN JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DGS
FILE NAME WATER LINE A.dwg

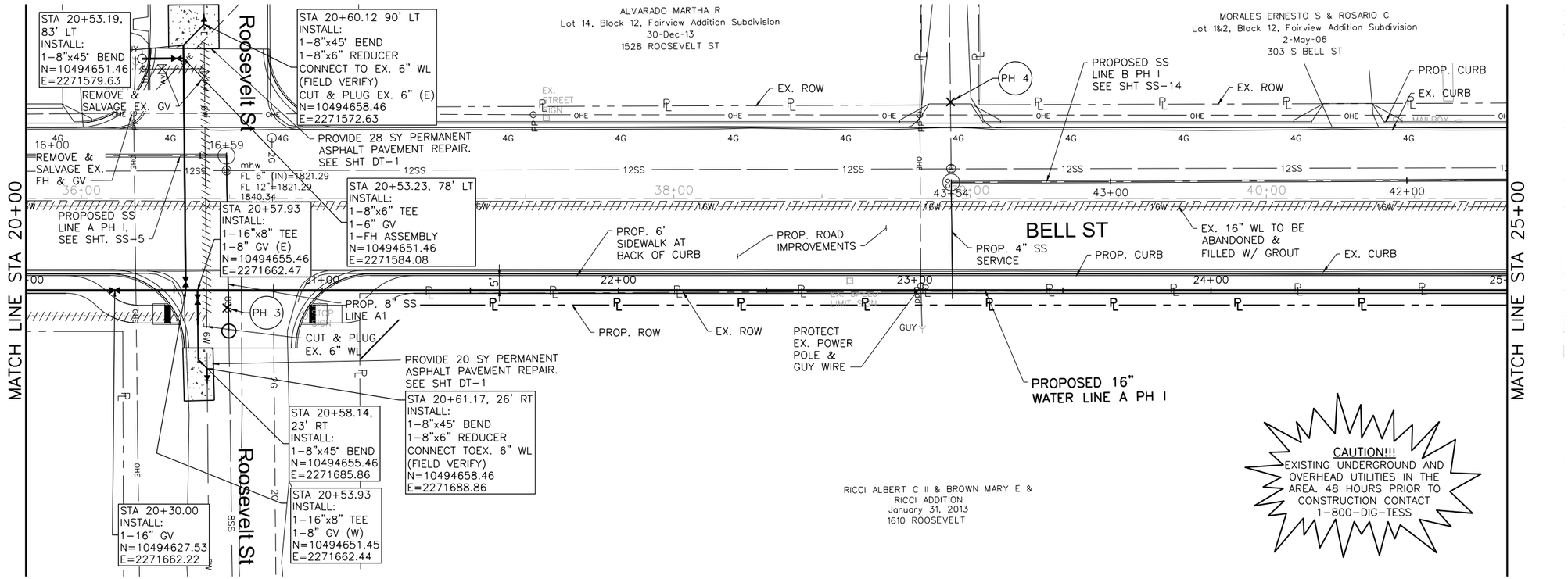
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

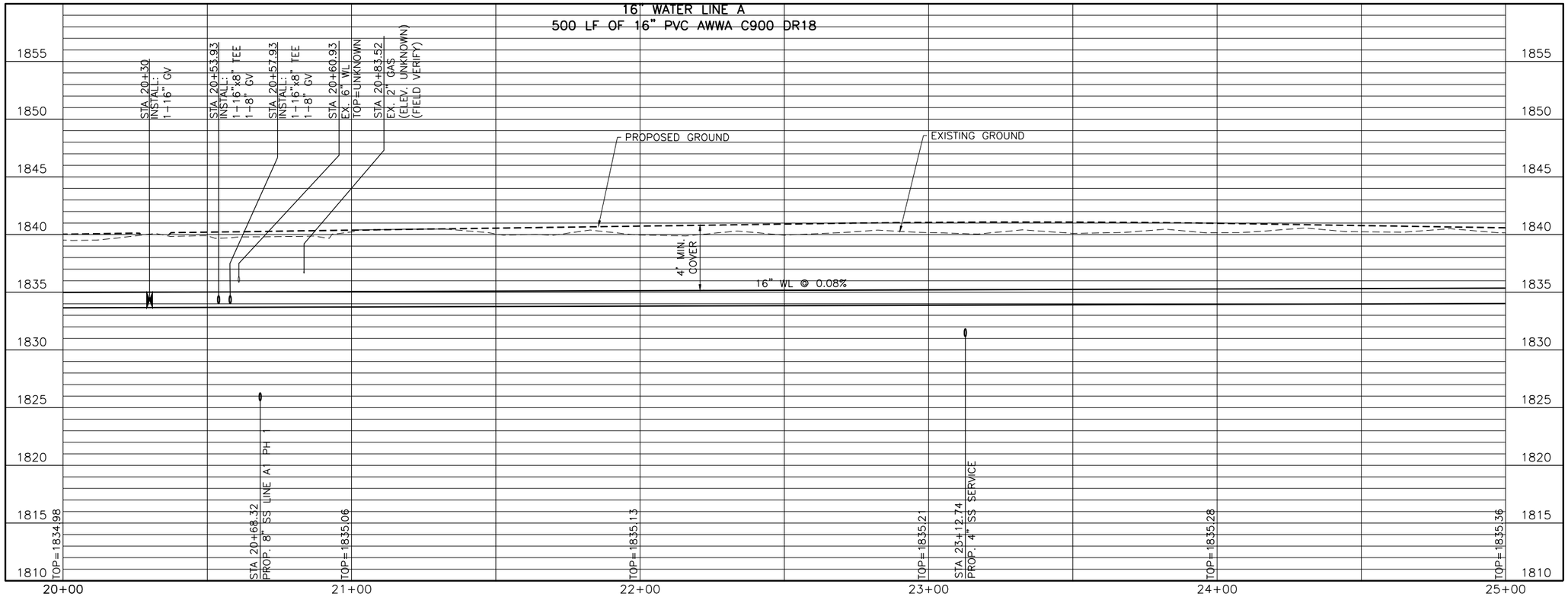
SHEET W-5
SEQ. 104

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WATER LINE A.dwg
Last Saved: 9/20/2017 9:15 AM Saved By: mdc

Plot Date: 9/20/2017 11:48 AM Plot By: mdc Filename: N:\WTU\Drawings\WATER LINE A.dwg





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Texas Registered Engineering Firm F-2144

STATE OF TEXAS
AARON B. CONINE
109794
LICENSED PROFESSIONAL ENGINEER
23 Oct 2017

NORTH
0 20' 40'
SCALE IN FEET
HORIZONTAL
0 5' 10'
SCALE IN FEET
VERTICAL

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
WATER LINE A
PLAN AND PROFILE
STA 20+00 TO STA 25+00

NO.	ISSUE	BY	DATE

FAN JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DGS
FILE NAME WATER LINE A.dwg

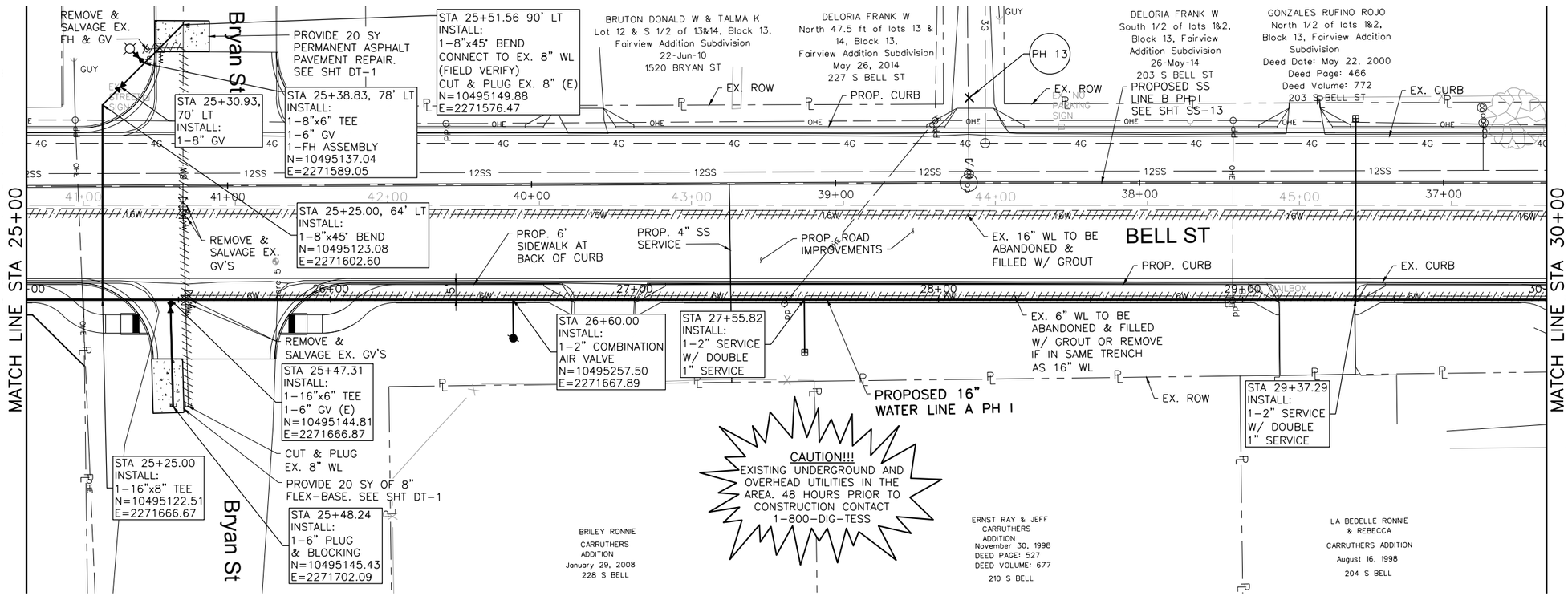
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

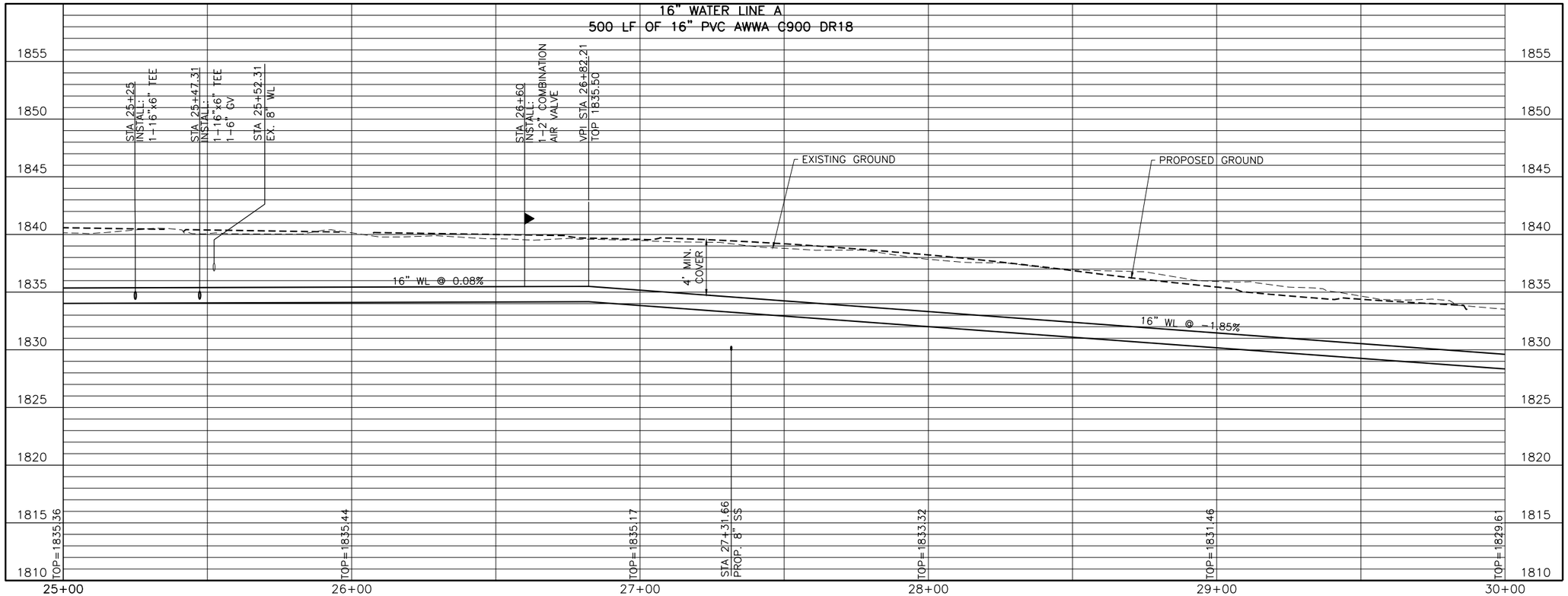
SHEET W-6
SEQ. 105

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WATER LINE A.dwg
Last Saved: 9/20/2017 9:15 AM Saved By: mdc

Plot Date: 9/20/2017 11:49 AM Plot By: mdc Filename: N:\WTU\Drawings\WATER LINE A.dwg





Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

AARON B. CONINE 109794 LICENSED PROFESSIONAL ENGINEER STATE OF TEXAS

23 Oct 2017

NORTH

0 20' 40'
SCALE IN FEET
HORIZONTAL

0 5' 10'
SCALE IN FEET
VERTICAL

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CITY OF SAN ANGELO, TEXAS
PHASE I

BELL ST. ROADWAY & UTILITY IMPROVEMENTS

WATER LINE A

PLAN AND PROFILE STA 25+00 TO STA 30+00

NO.	ISSUE	BY	DATE

FAN JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DGS
FILE NAME WATER LINE A.dwg

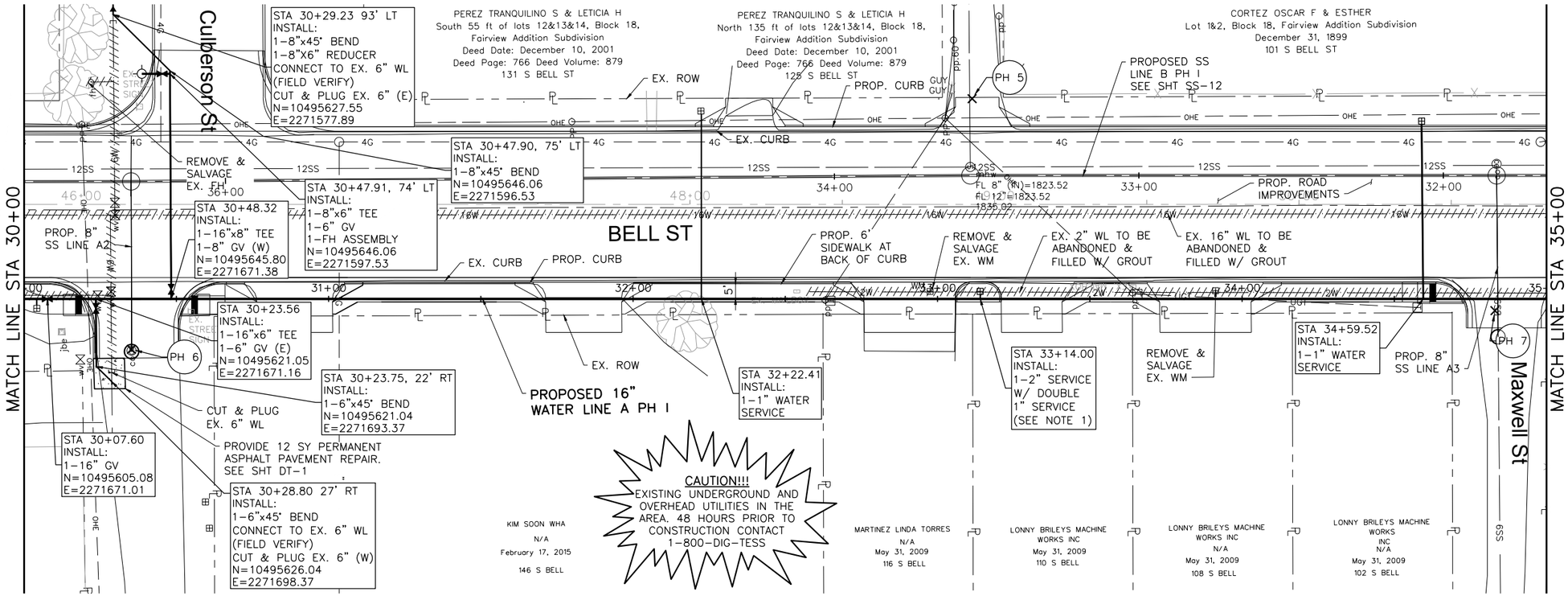
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

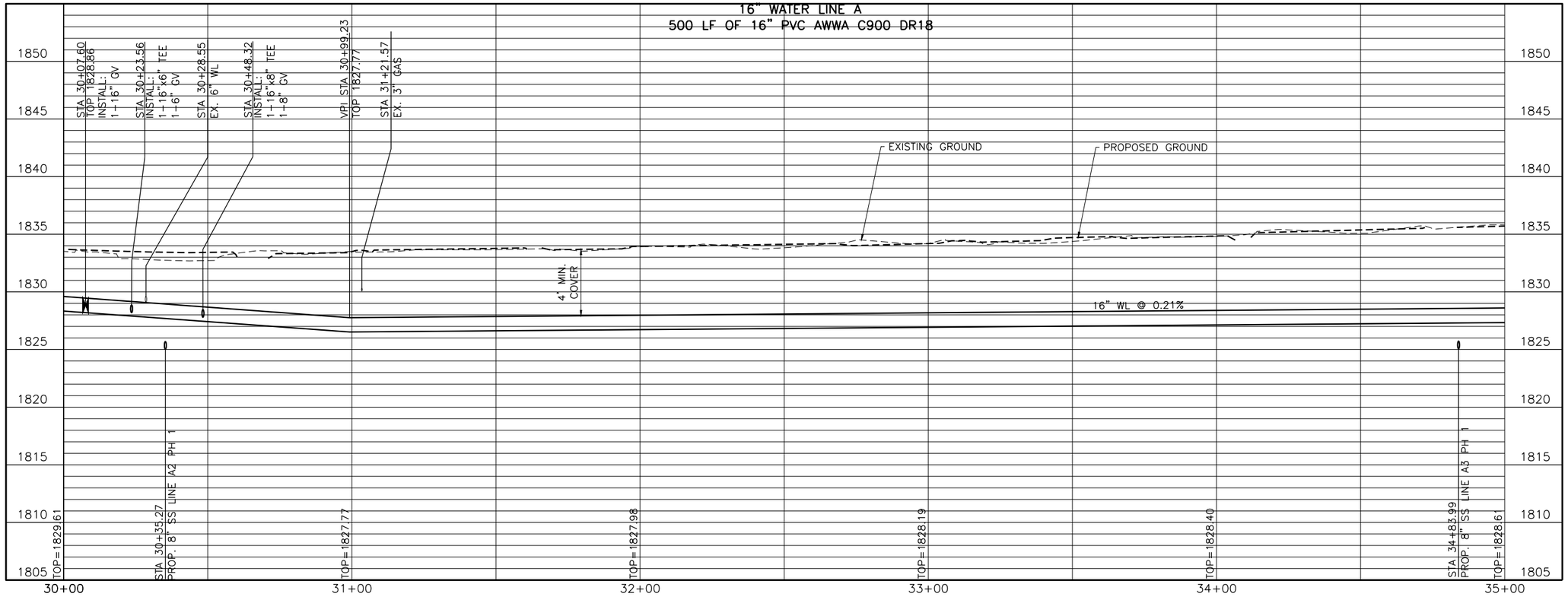
SHEET W-7
SEQ. 106

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WATER LINE A.dwg
Last Saved: 9/20/2017 9:15 AM Saved By: mdc

Plot Date: 9/20/2017 11:49 AM Plot By: mdc Filename: N:\WTU\Drawings\WATER LINE A.dwg





NOTES:

1. COORDINATE RELOCATION AND RECONNECTION OF EXISTING WATER SERVICES.

NORTH

0 20' 40'
SCALE IN FEET
HORIZONTAL

0 5' 10'
SCALE IN FEET
VERTICAL

Freese and Nichols, Inc.
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STATE OF TEXAS
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23 Oct 2017

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CITY OF SAN ANGELO, TEXAS
PHASE I

BELL ST. ROADWAY & UTILITY IMPROVEMENTS

WATER LINE A

PLAN AND PROFILE
STA 30+00 TO STA 35+00

NO.	ISSUE	BY	DATE

F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DCS
FILE NAME WATER LINE A.dwg

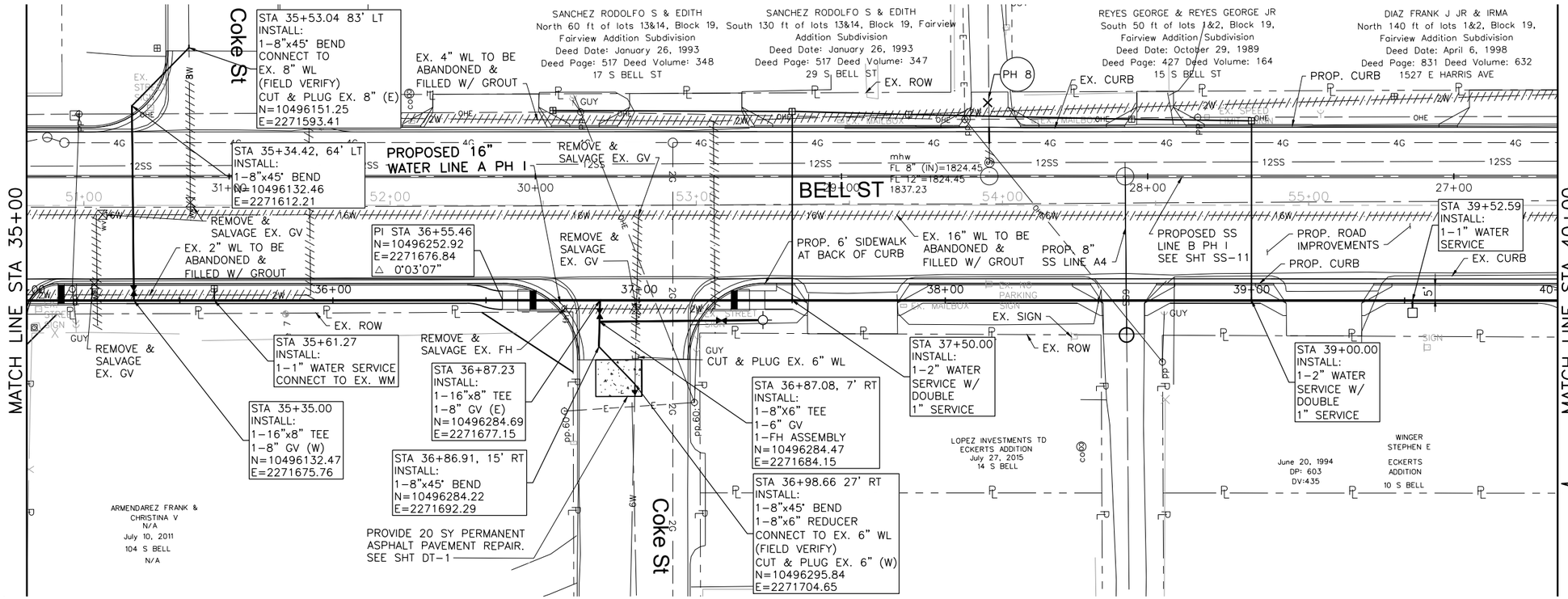
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

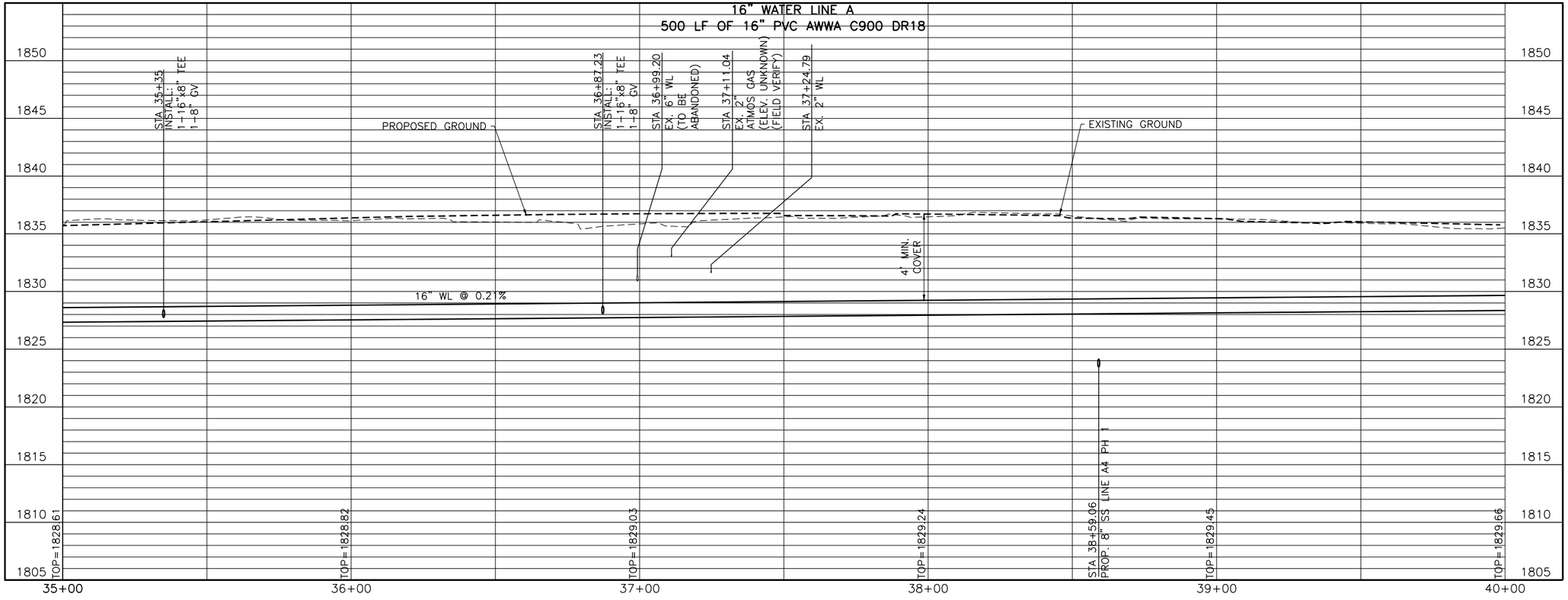
SHEET W-8
SEQ. 107

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WATER LINE A.dwg
Last Saved: 9/20/2017 9:15 AM Saved By: mdc

Plot Date: 9/20/2017 11:49 AM Plot By: mdc Filename: N:\WTU\Drawings\WATER LINE A.dwg





NORTH

0 20' 40'
SCALE IN FEET
HORIZONTAL

0 5' 10'
SCALE IN FEET
VERTICAL

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

AARON B. CONINE
109794
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ENGINEER
STATE OF TEXAS

23 Oct 2017

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
WATER LINE A
PLAN AND PROFILE
STA 35+00 TO STA 40+00

NO.	ISSUE	BY	DATE

F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DCS
FILE NAME WATER LINE A.dwg

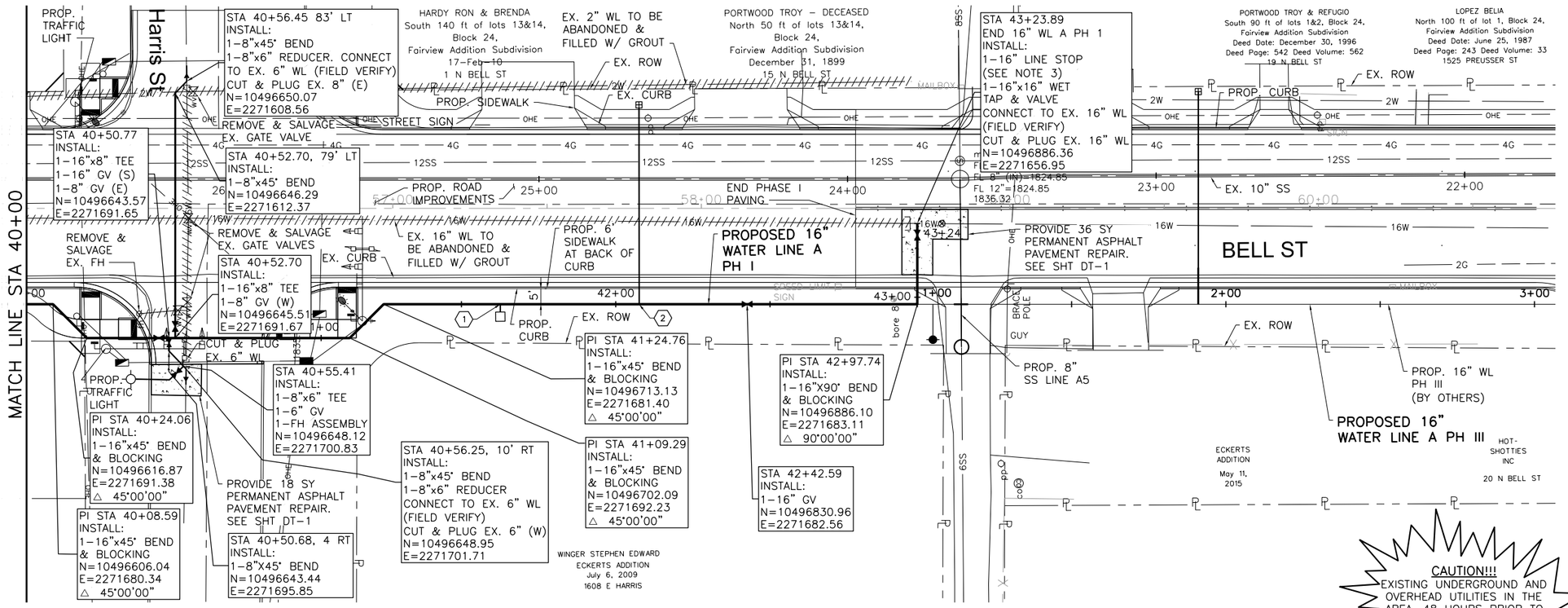
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

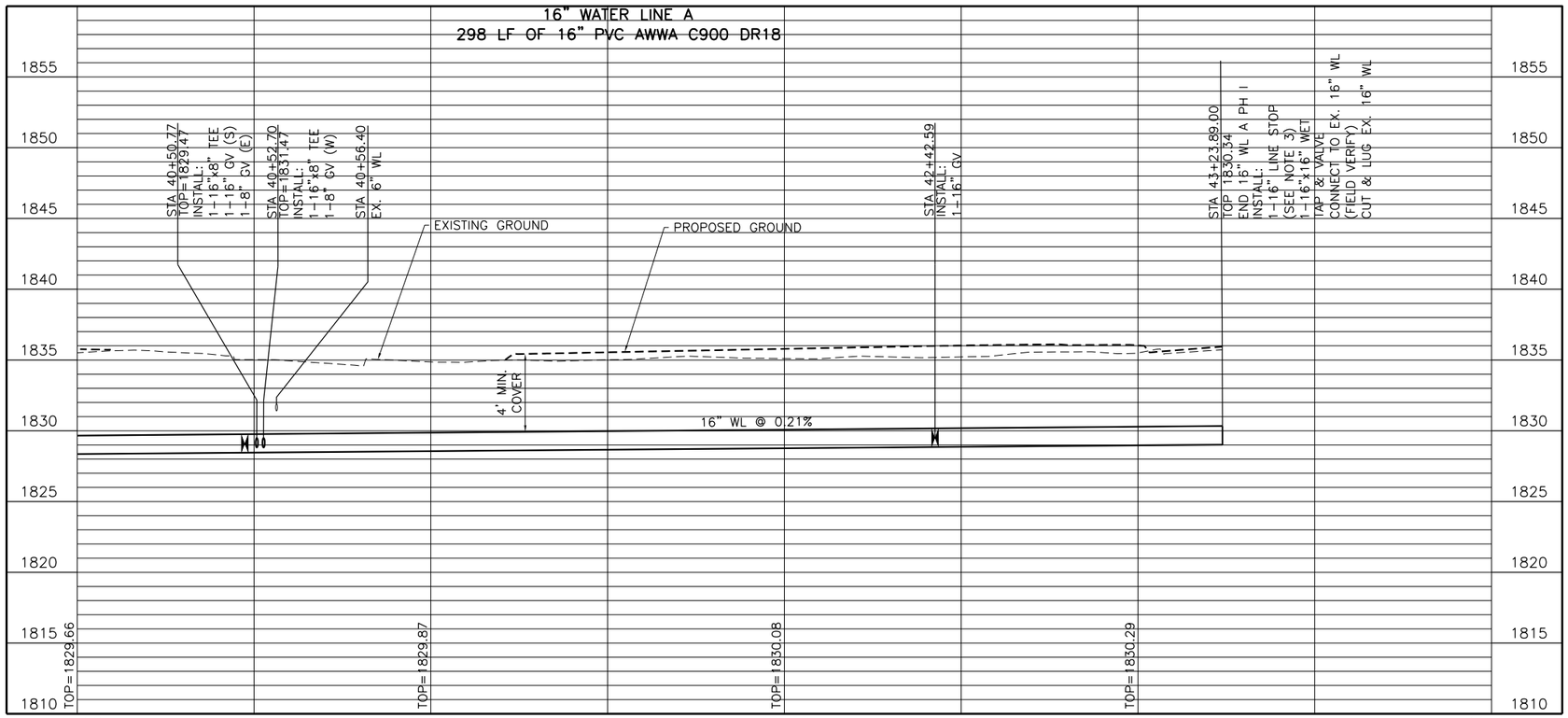
SHEET W-9
SEQ. 108

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WATER LINE A.dwg
Last Saved: 9/20/2017 9:15 AM Saved By: mdc

Plot Date: 9/20/2017 11:50 AM Plot By: mdc Filename: N:\WTU\Drawings\WATER LINE A.dwg





NORTH

0 20' 40'
SCALE IN FEET HORIZONTAL

0 5' 10'
SCALE IN FEET VERTICAL

NOTES BY SYMBOL "⬡"

1. STA 41+60.93
   INSTALL:
   1-1" WATER SERVICE
2. STA 42+05.93
   1-2" WATER SERVICE
   W/ DOUBLE 1" SERVICE
3. LINE STOP AND PLUG SHALL BE INSTALLED AFTER PROPOSED 16" WATER LINE A HAS BEEN BROUGHT INTO SERVICE TO INCLUDE ASSOCIATED DISTRIBUTION LINE CONNECTION.

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STATE OF TEXAS
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23 Oct 2017

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
WATER LINE A
PLAN AND PROFILE
STA 40+00 TO END

NO.	ISSUE	BY	DATE

FAN JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED
CHECKED DCS
FILE NAME WATER LINE A.dwg

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

SHEET W-10
SEQ. 109

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WATER LINE A.dwg
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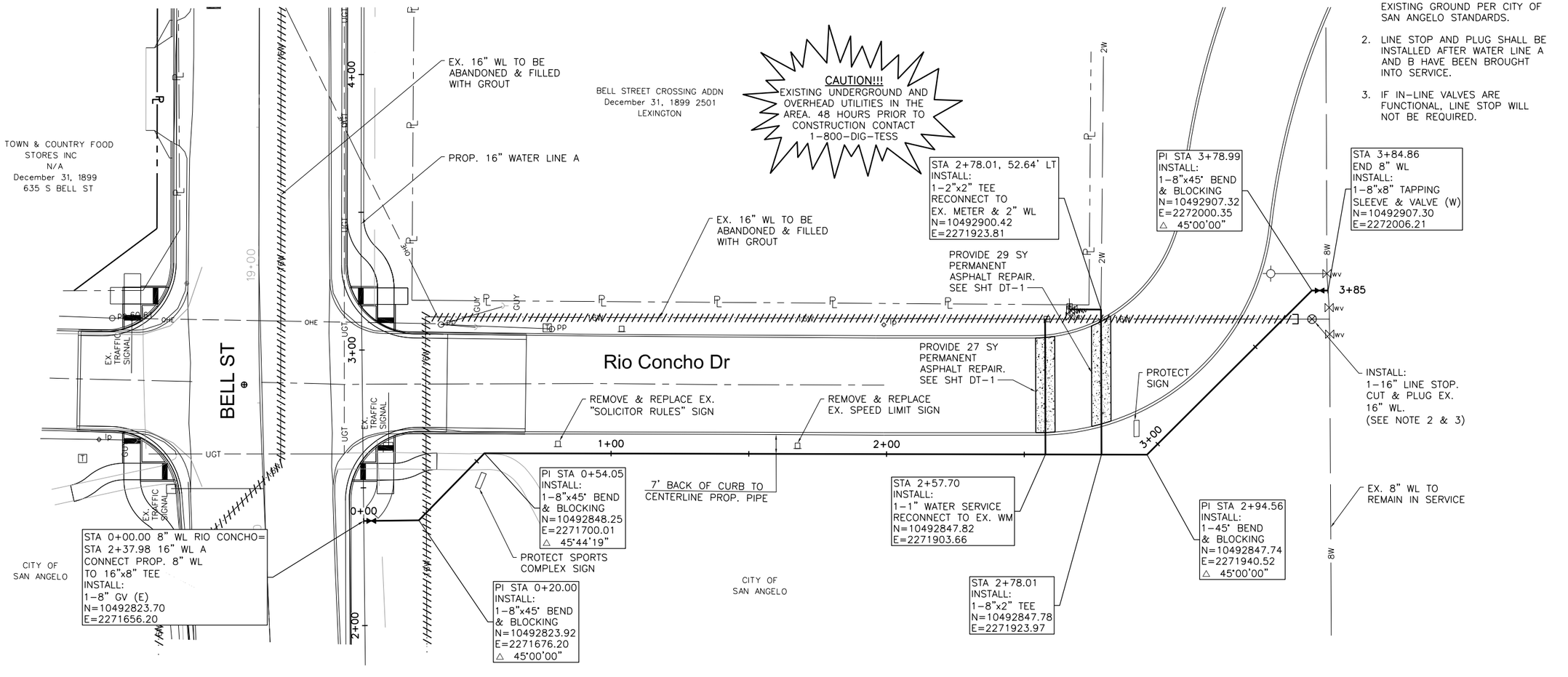
Plot Date: 10/23/2017 3:24 PM Plot By: sb Filename: N:\WTU\Drawings\WATER LINE A.dwg



NOTE:

1. TOP OF PROPOSED 8" WATER LINE SHALL BE 30" UNDER EXISTING GROUND PER CITY OF SAN ANGELO STANDARDS.
2. LINE STOP AND PLUG SHALL BE INSTALLED AFTER WATER LINE A AND B HAVE BEEN BROUGHT INTO SERVICE.
3. IF IN-LINE VALVES ARE FUNCTIONAL, LINE STOP WILL NOT BE REQUIRED.

100% SUBMITTAL

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

STATE OF TEXAS
AARON B. CONINE
109794
LICENSED PROFESSIONAL ENGINEER
23 Oct 2017

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CITY OF SAN ANGELO, TEXAS
PHASE I

BELL ST. ROADWAY & UTILITY IMPROVEMENTS

WATER LINE B

8 INCH WATER LINE

FAN JOB NO.	SAN16188
DATE	OCT 2017
DESIGNED	ABC
DRAWN	SB
REVISED	-
CHECKED	DGS
FILE NAME	C-PPL-PL-WTRL01.dwg

NO. | ISSUE | BY | DATE

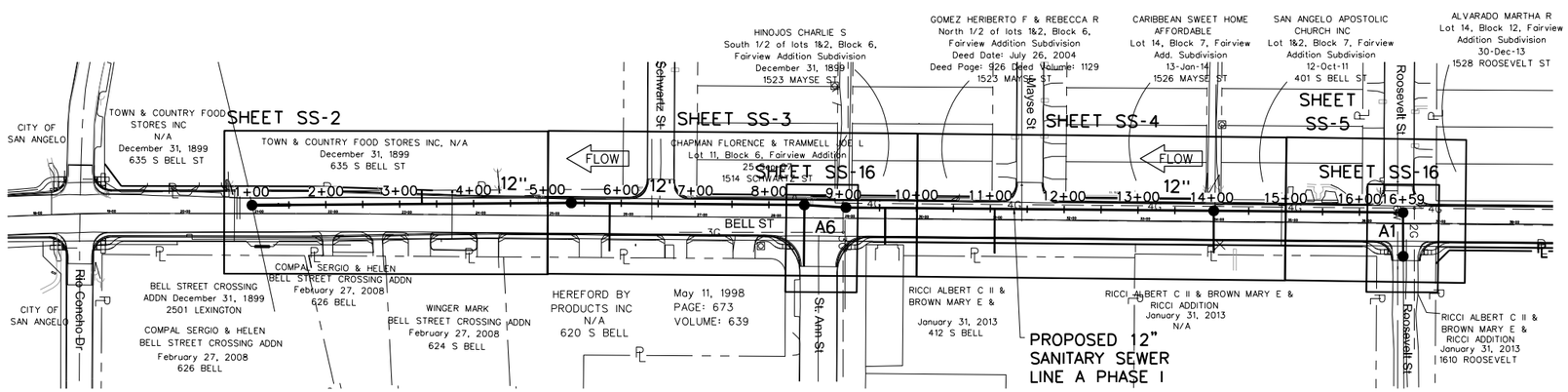
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

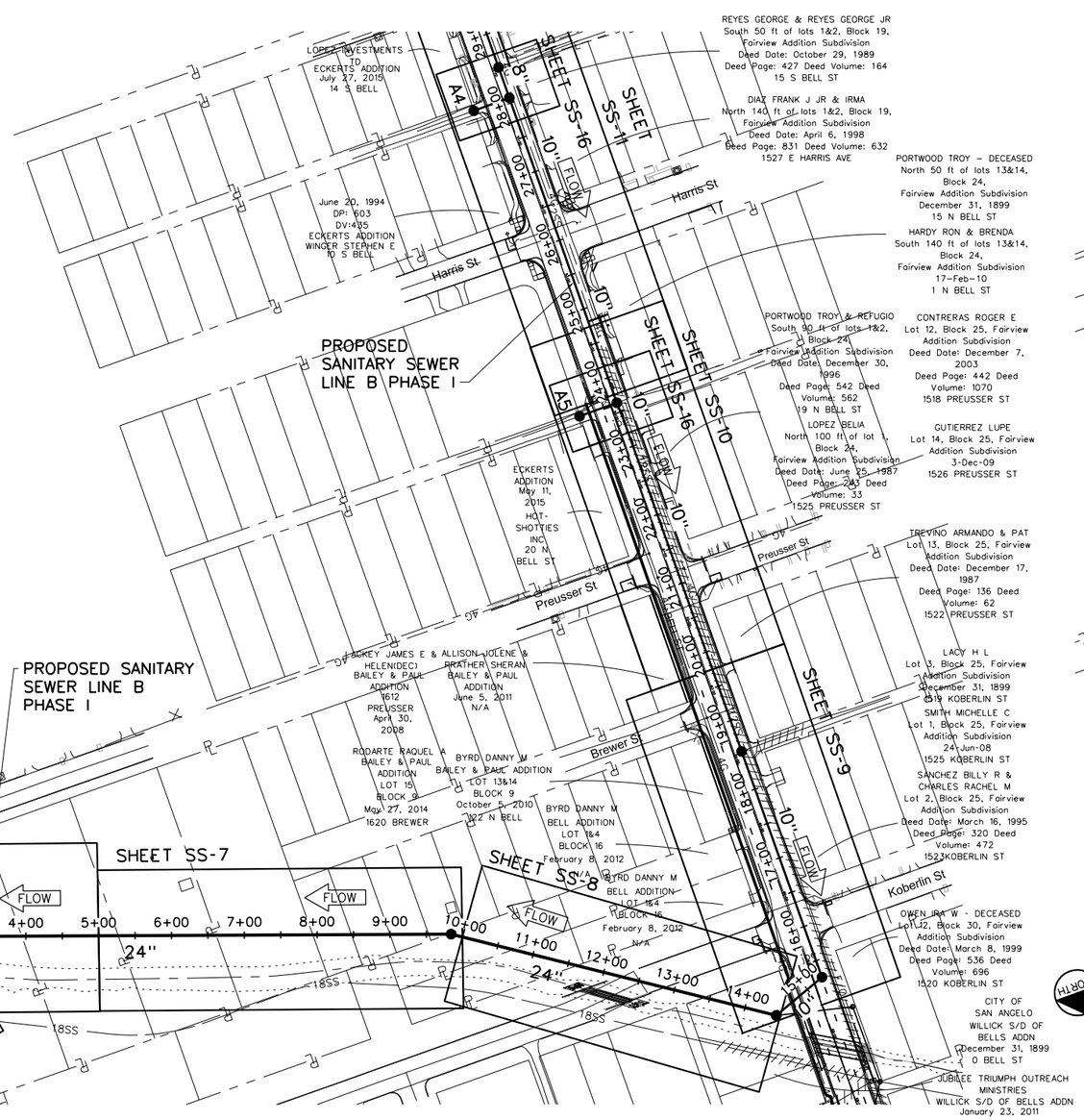
SHEET W-11

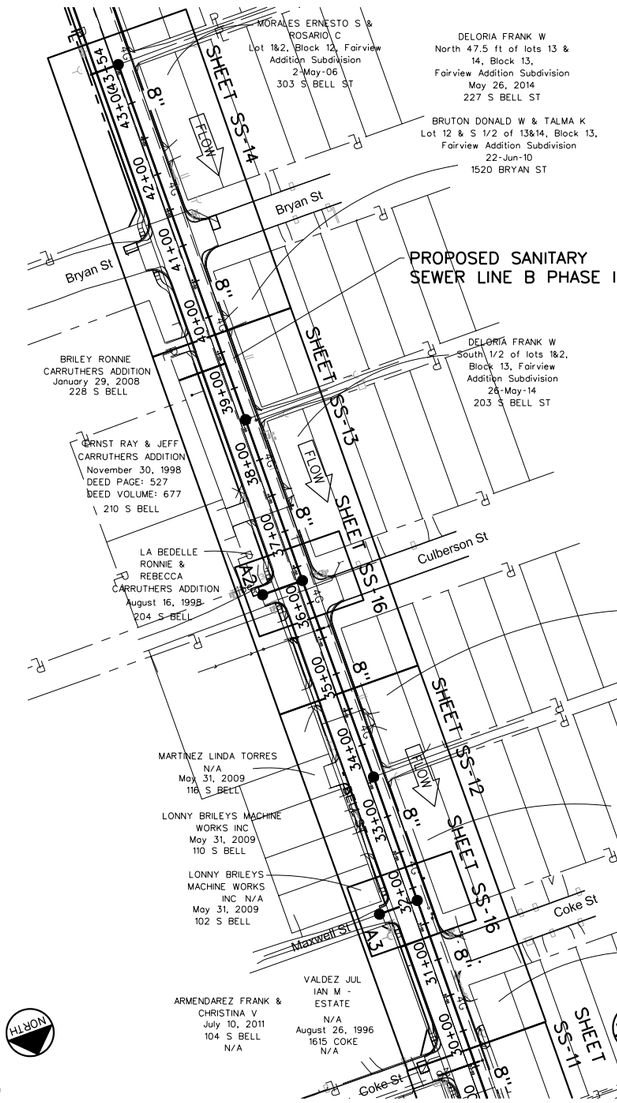
SEQ. 110

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\C-PPL-PL-WTRL01.dwg
Last Saved: 10/23/2017 3:33 PM Saved By: sb

Plot Date: 10/23/2017 3:34 PM Plot By: sb Filename: N:\WTU\Drawings\C-PPL-PL-WTRL01.dwg







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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
SITE
LINES A & B SANITARY SEWER SITE LAYOUT

NO.	ISSUE	BY	DATE

F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED
CHECKED DGS
DATE
FILE NAME CV-PPL-PL-SITE02.dwg

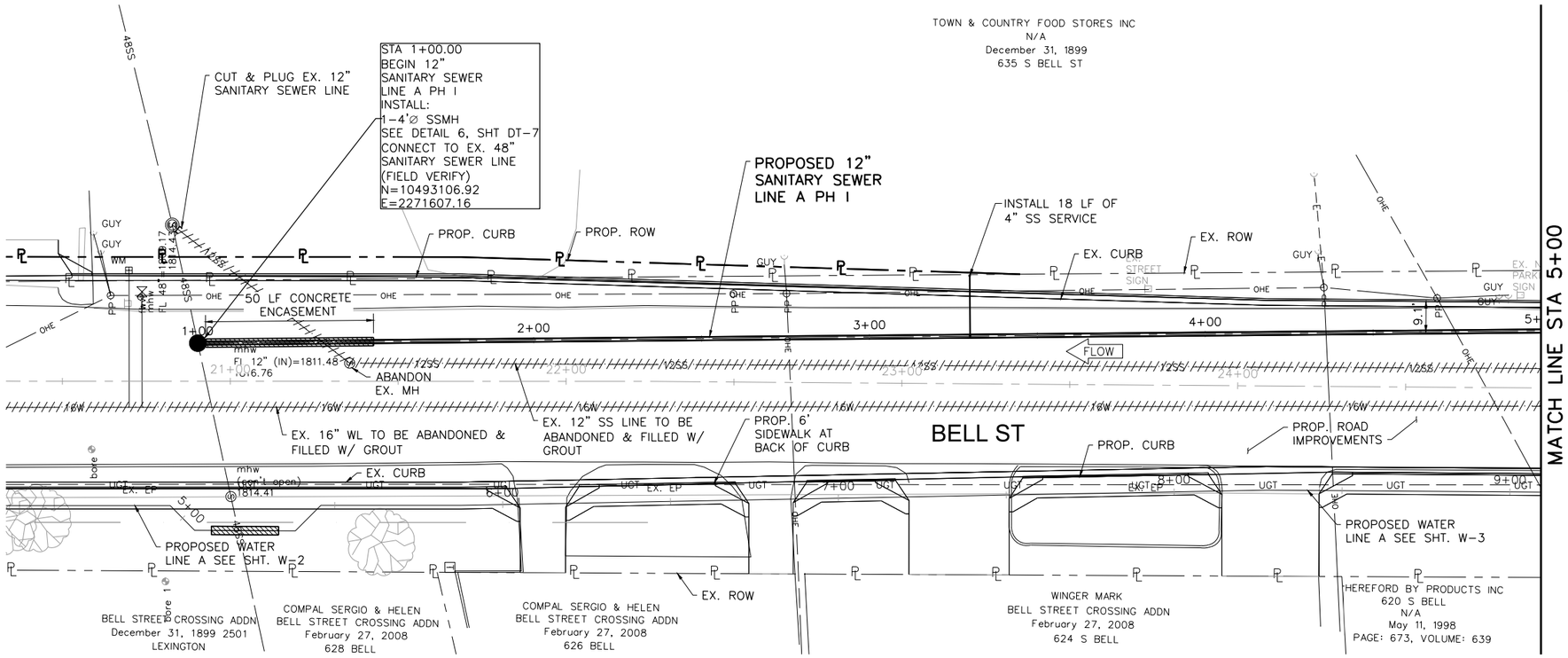
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

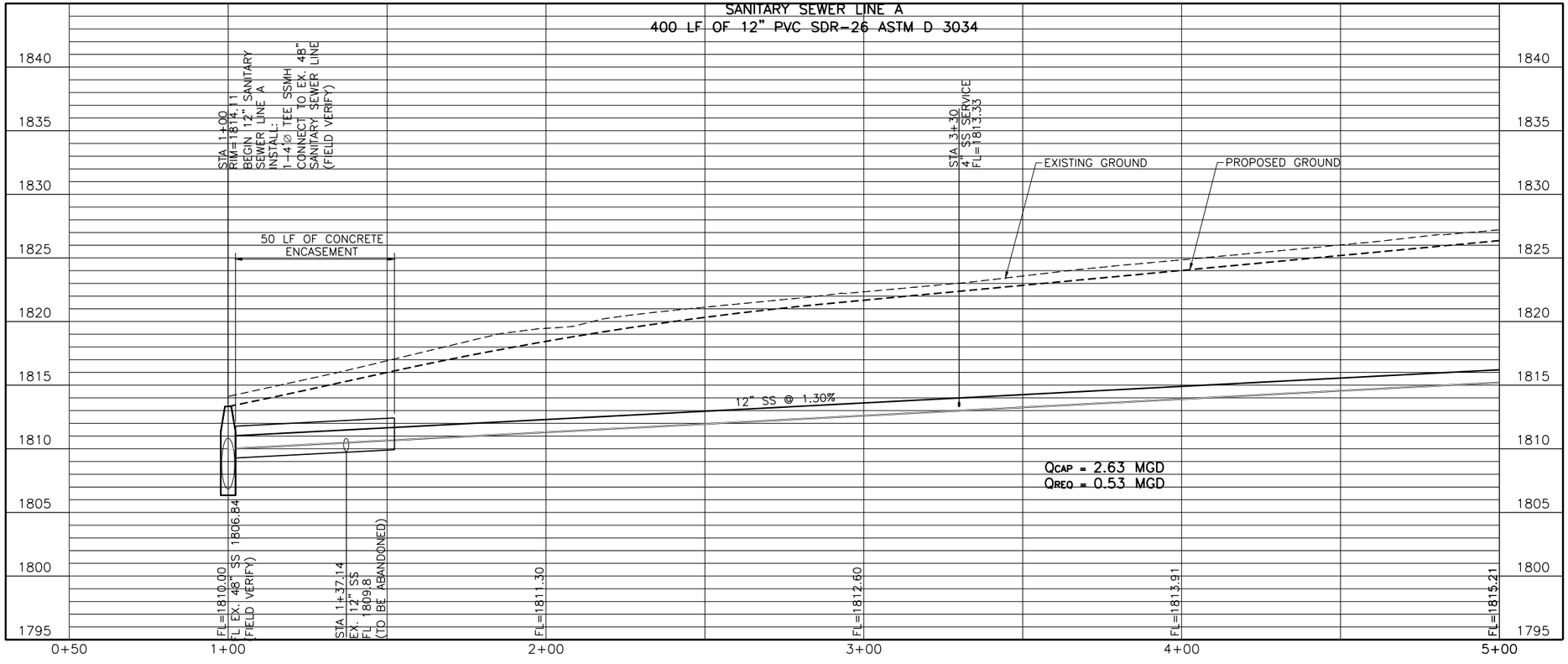
SHEET SS-1
SEQ. 111

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\CV-PPL-PL-SITE02.dwg
Last Saved: 9/20/2017 9:19 AM Saved By: sb

Plot Date: 10/23/2017 3:47 PM Plot By: sb Filename: N:\WTU\Drawings\CV-PPL-PL-SITE02.dwg





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Web - www.freese.com

CAUTION!!!
EXISTING UNDERGROUND AND OVERHEAD UTILITIES IN THE AREA. 48 HOURS PRIOR TO CONSTRUCTION CONTACT 1-800-DIG-TESS

NORTH
0 20' 40'
SCALE IN FEET
HORIZONTAL
0 5' 10'
SCALE IN FEET
VERTICAL

CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
SANITARY SEWER LINE A
PLAN & PROFILE
STA 1+00 TO STA 5+00

NO.	ISSUE	BY	DATE

F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DCS
FILE NAME WASTEWATER LINE A PH I.dwg

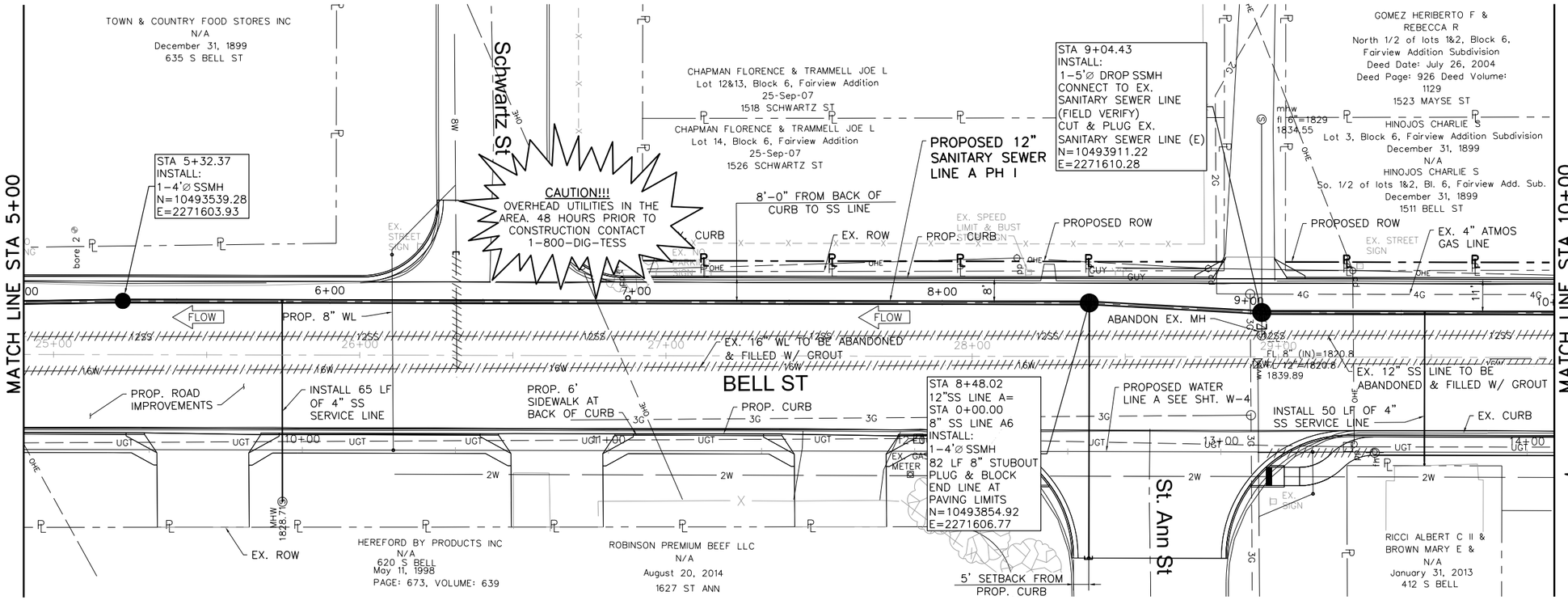
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

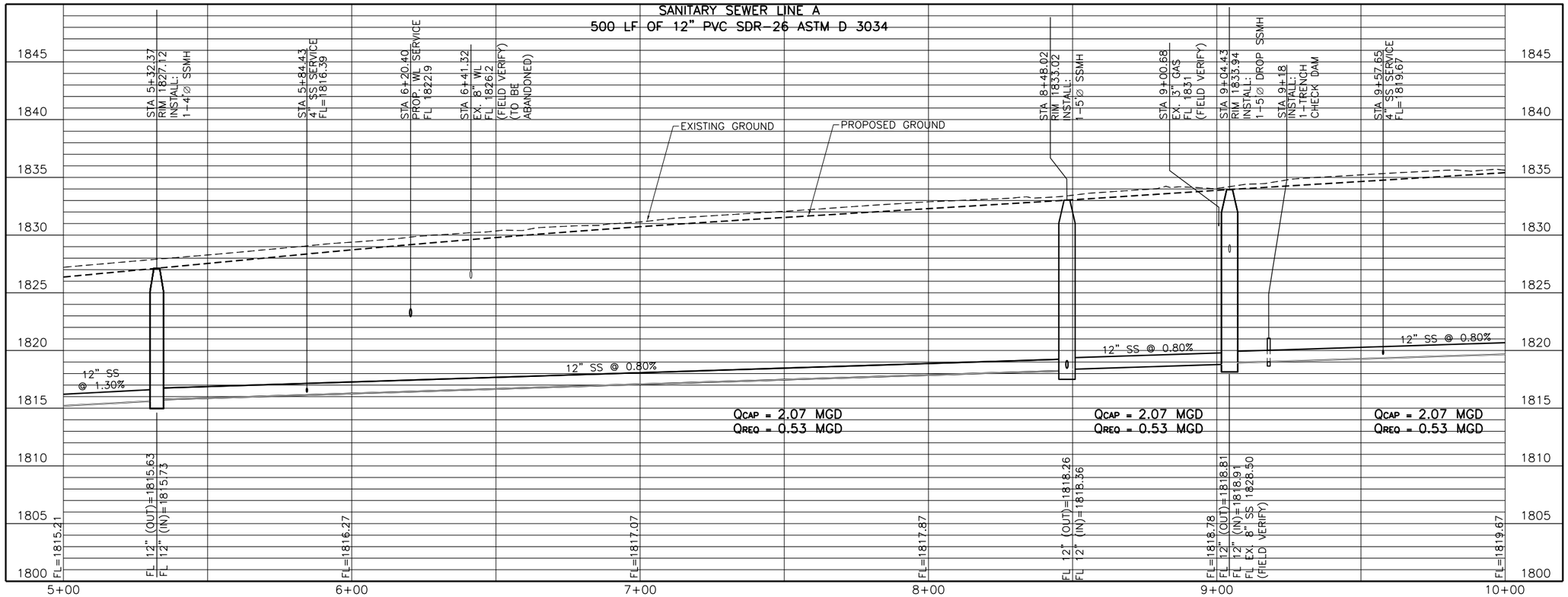
SHEET SS-2
SEQ. 112

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WASTEWATER LINE A PH I.dwg
Last Saved: 9/20/2017 9:24 AM Saved By: mdc

Plot Date: 9/20/2017 11:53 AM Plot By: mdc Filename: N:\WTU\Drawings\WASTEWATER LINE A PH I.dwg





CAUTION!!!
EXISTING UNDERGROUND AND
OVERHEAD UTILITIES IN THE
AREA. 48 HOURS PRIOR TO
CONSTRUCTION CONTACT
1-800-DIG-TESS

GENERAL CONSTRUCTION NOTE:

1. CONTRACTOR TO COORDINATE SERVICES NOT PREVIOUSLY IDENTIFIED WITH ENGINEER VIA THE PRE-CONSTRUCTION TV INFORMATION.

100% SUBMITTAL

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144
23 Oct 2017
FREESE NICHOLS
4055 International Plaza, Suite 200
Fort Worth, Texas 76109-4895
Phone (817) 735-7300
Fax (817) 735-7491
Web - www.freese.com

CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
SANITARY SEWER LINE A
PLAN AND PROFILE
STA 5+00 TO STA 10+00

NO.	ISSUE	BY	DATE
	VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale. 0 1		

FAN JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DCS
FILE NAME WASTEWATER LINE A PH I.dwg

SHEET SS-3
SEQ. 113

ACAD Rel: 21.0s (LMS Tech)
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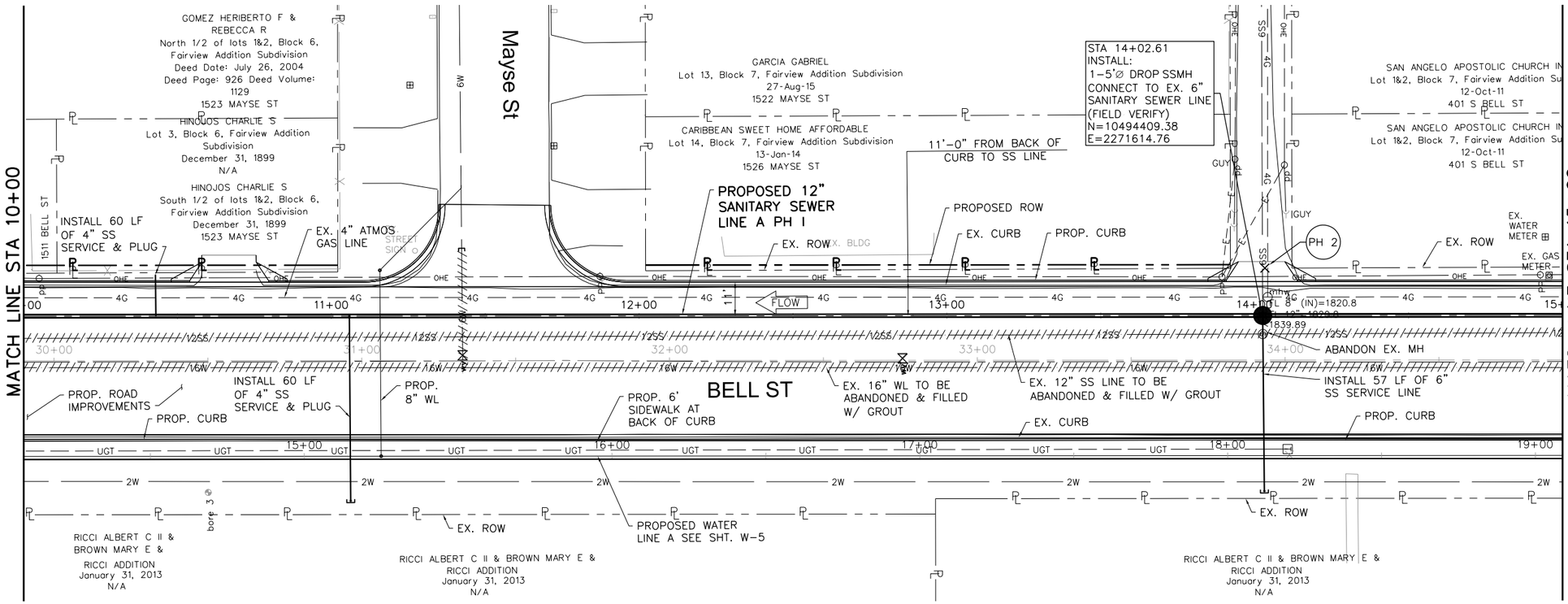
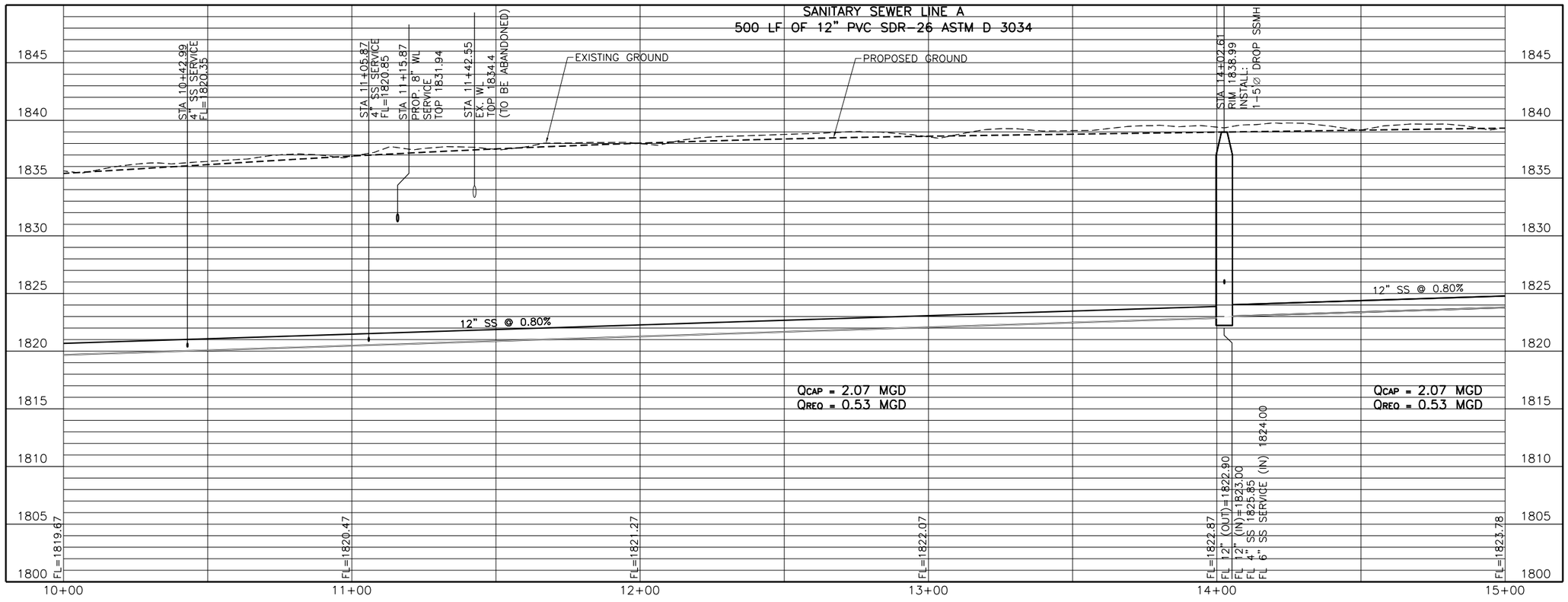
Plot Date: 10/23/2017 5:43 PM Plot By: sb Filename: N:\WTU\Drawings\WASTEWATER LINE A PH I.dwg





NORTH

0 20' 40'
SCALE IN FEET
HORIZONTAL

0 5' 10'
SCALE IN FEET
VERTICAL

CAUTION!!!
EXISTING UNDERGROUND AND OVERHEAD UTILITIES IN THE AREA. 48 HOURS PRIOR TO CONSTRUCTION CONTACT 1-800-DIG-TESS

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

AARON B. CONINE
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23 Oct 2017

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
SANITARY SEWER LINE A
PLAN AND PROFILE
STA 10+00 TO STA 15+00

NO.	ISSUE	BY	DATE

FAN JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DCS
FILE NAME WASTEWATER LINE A PH I.dwg

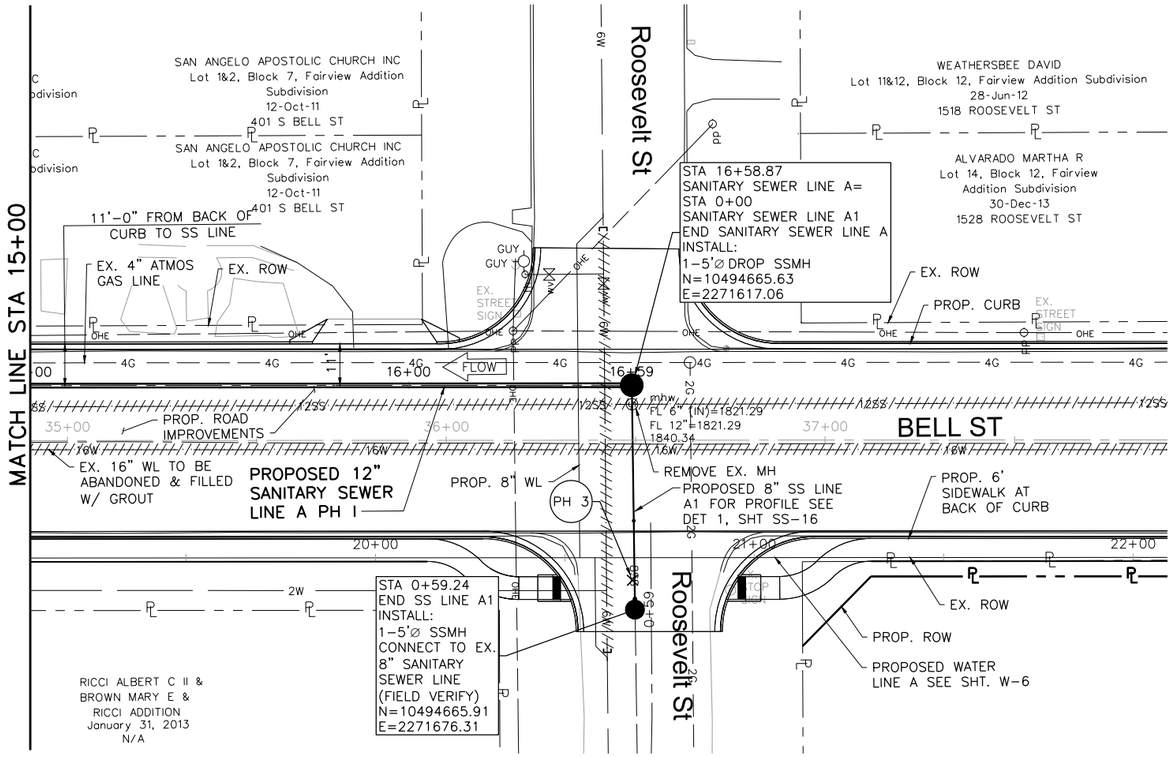
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

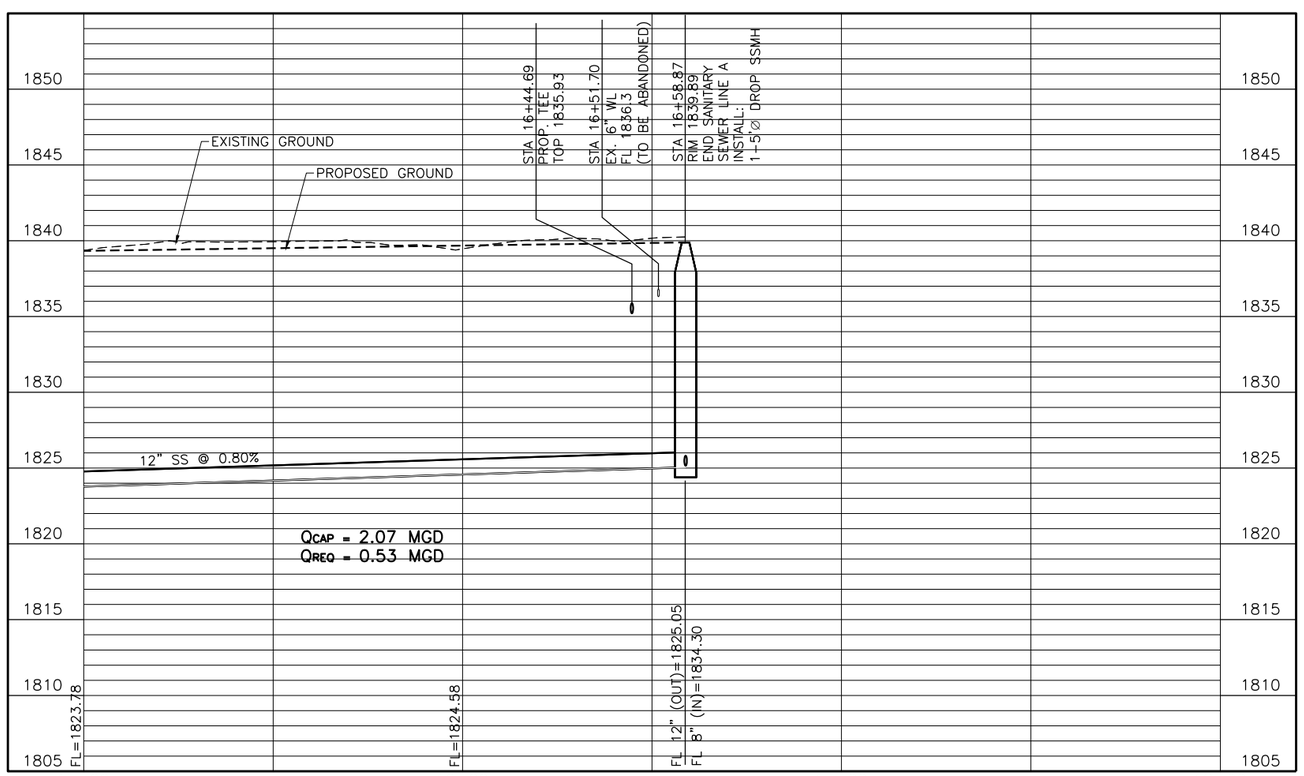
SHEET SS-4
SEQ. 114

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WASTEWATER LINE A PH I.dwg
Last Saved: 10/23/2017 4:28 PM Saved By: sb

Plot Date: 10/23/2017 5:43 PM Plot By: sb Filename: N:\WTU\Drawings\WASTEWATER LINE A PH I.dwg





CAUTION!!!
EXISTING UNDERGROUND AND OVERHEAD UTILITIES IN THE AREA. 48 HOURS PRIOR TO CONSTRUCTION CONTACT 1-800-DIG-TESS

NORTH
0 20' 40'
SCALE IN FEET HORIZONTAL
0 5' 10'
SCALE IN FEET VERTICAL

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

STATE OF TEXAS
AARON B. CONINE
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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
SANITARY SEWER LINE A
PLAN AND PROFILE
STA 15+00 TO END

NO.	ISSUE	BY	DATE

F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DCS
FILE NAME WASTEWATER LINE A PH I.dwg

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

SHEET SS-5
SEQ. 115

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
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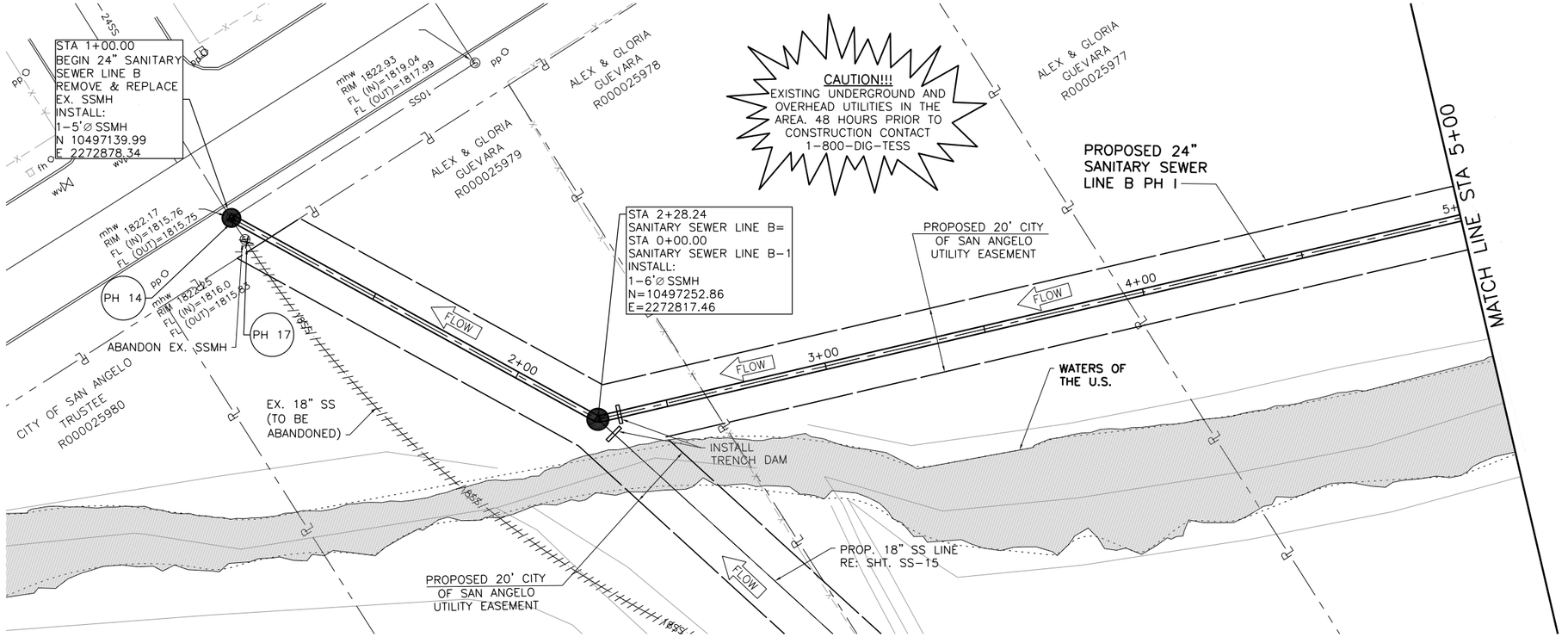
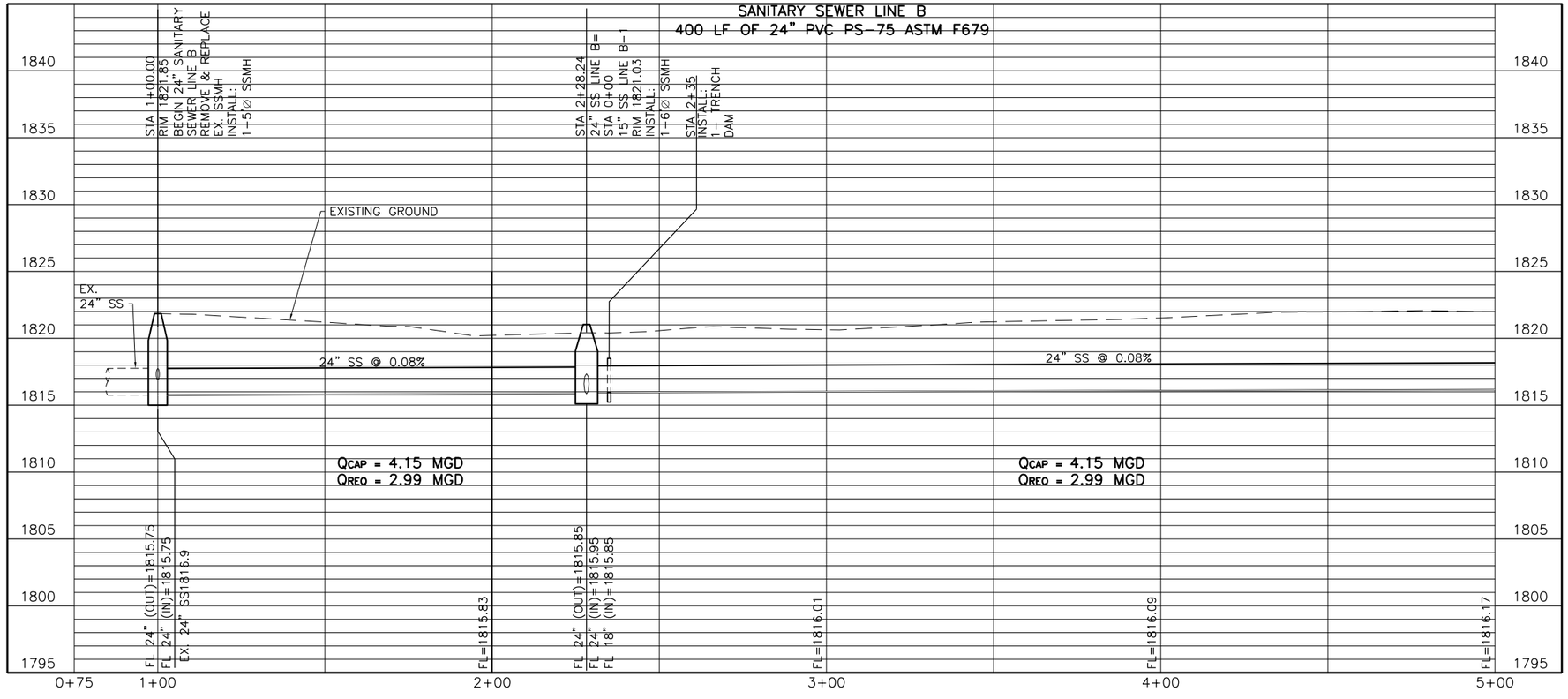
Last Saved: 9/20/2017 9:24 AM Saved By: mdc

Plot Date: 9/20/2017 11:54 AM Plot By: mdc Filename: N:\WTU\Drawings\WASTEWATER LINE A PH I.dwg





NORTH

0 20' 40'
SCALE IN FEET
HORIZONTAL

0 5' 10'
SCALE IN FEET
VERTICAL

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

STATE OF TEXAS
AARON B. CONINE
109794
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23 Oct 2017

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CITY OF SAN ANGELO, TEXAS
PHASE I

BELL ST. ROADWAY & UTILITY IMPROVEMENTS

SANITARY SEWER LINE B

PLAN AND PROFILE STA 1+00 TO STA 5+00

NO.	ISSUE	BY	DATE

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

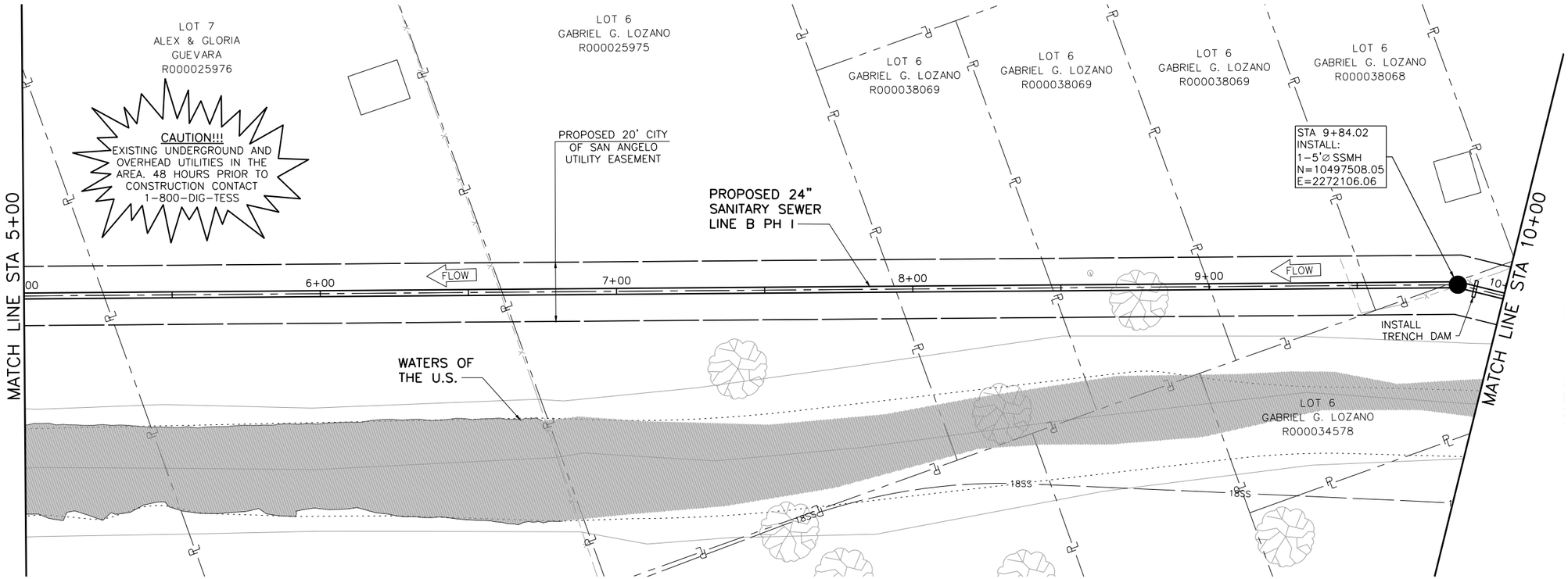
F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED
CHECKED DCS
FILE NAME WASTEWATER LINE B PH I.DWG

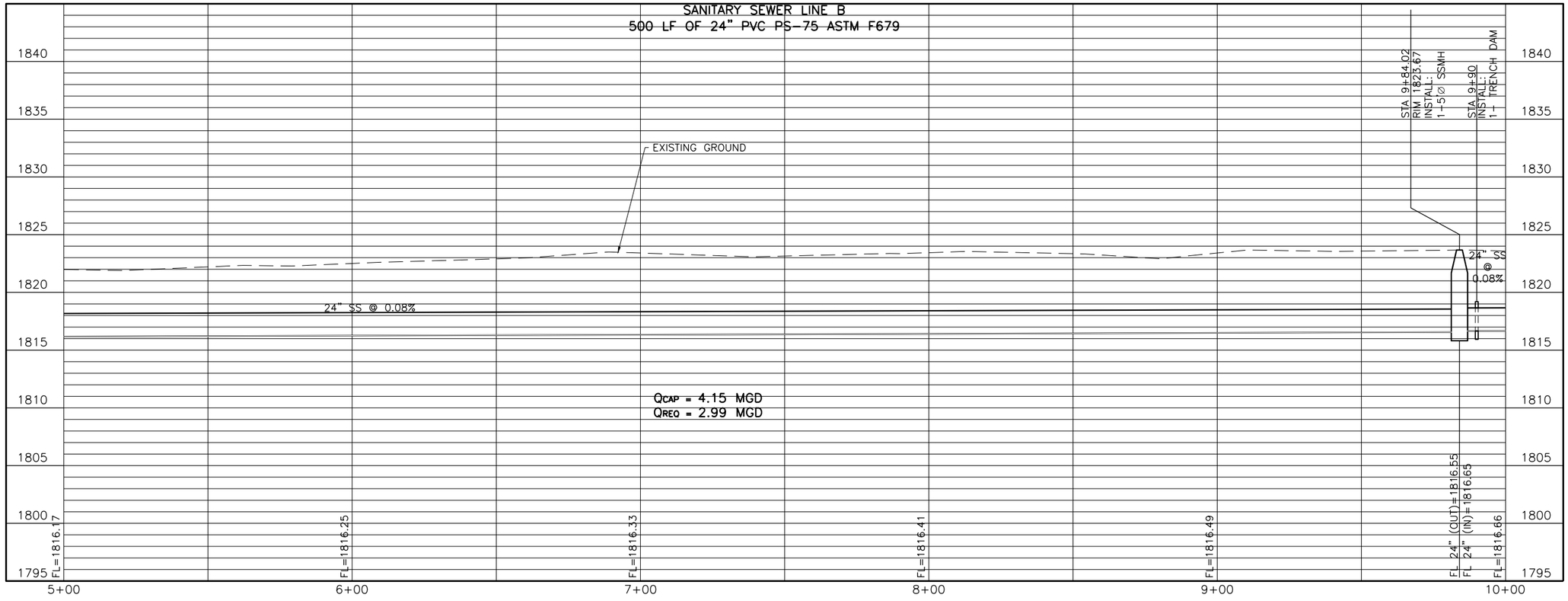
SHEET SS-6
SEQ. 116

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WASTEWATER LINE B PH I.DWG
Last Saved: 9/20/2017 9:34 AM Saved By: mdc

Plot Date: 10/23/2017 4:31 PM Plot By: sb Filename: N:\WTU\Drawings\WASTEWATER LINE B PH I.DWG





HI HON

0 20' 40'
SCALE IN FEET
HORIZONTAL

0 5' 10'
SCALE IN FEET
VERTICAL

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144
STATE OF TEXAS
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23 Oct 2017

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CITY OF SAN ANGELO, TEXAS
PHASE I

BELL ST. ROADWAY & UTILITY IMPROVEMENTS

SANITARY SEWER LINE B

PLAN AND PROFILE STA 5+00 TO STA 10+00

NO.	ISSUE	BY	DATE

F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DGS
FILE NAME WASTEWATER LINE B PH I.dwg

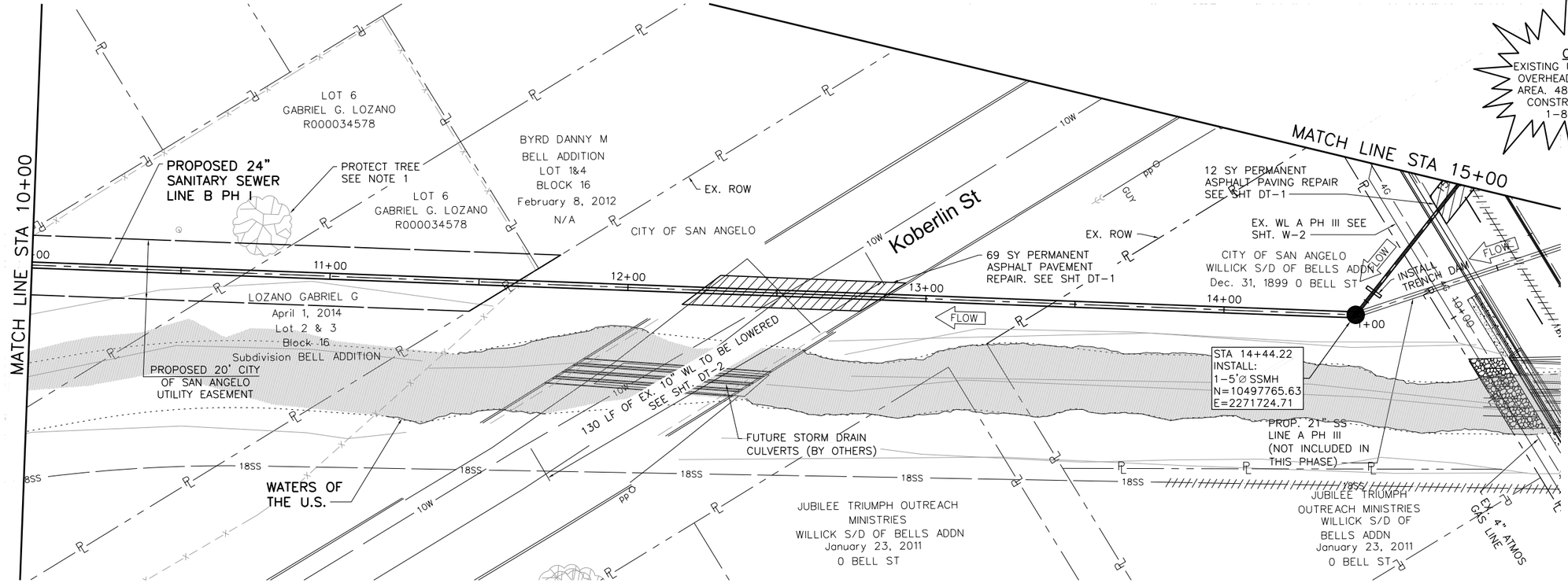
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

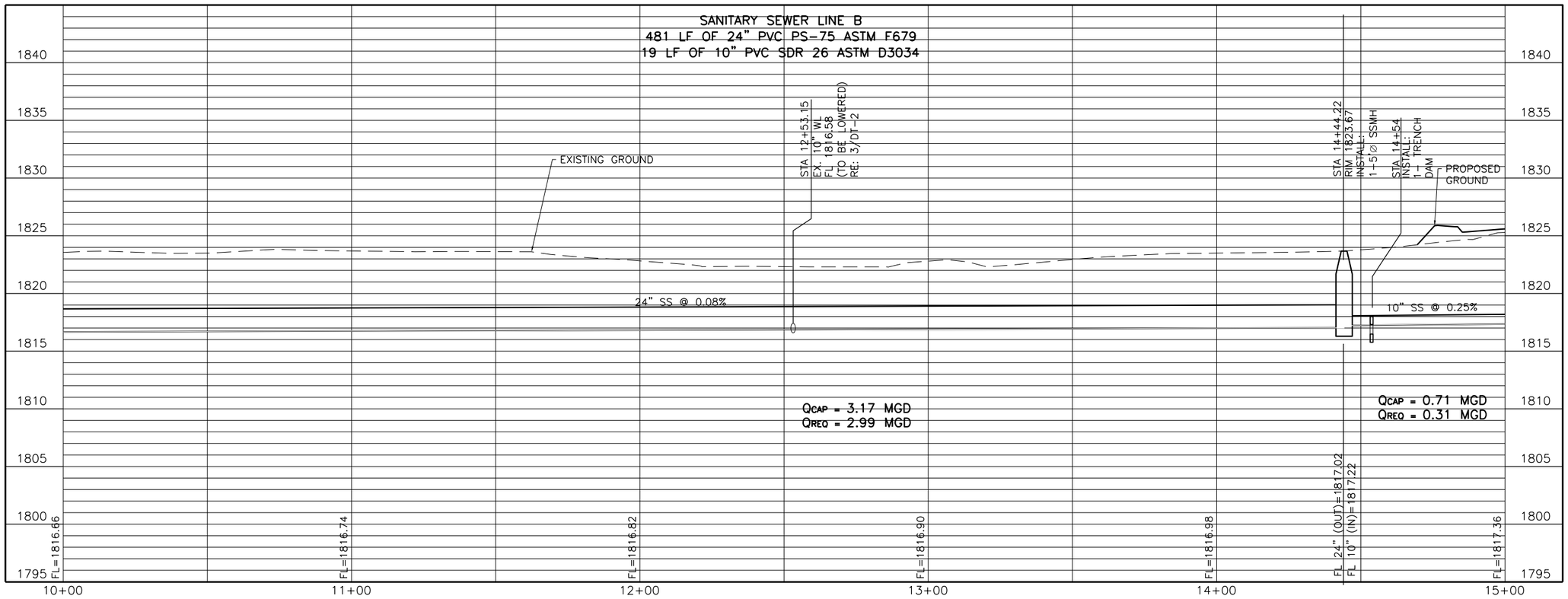
SHEET SS-7
SEQ. 117

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WASTEWATER LINE B PH I.dwg
Last Saved: 9/20/2017 9:34 AM Saved By: mdc

Plot Date: 9/20/2017 11:55 AM Plot By: mdc Filename: N:\WTU\Drawings\WASTEWATER LINE B PH I.dwg





CAUTION!!!
EXISTING UNDERGROUND AND OVERHEAD UTILITIES IN THE AREA. 48 HOURS PRIOR TO CONSTRUCTION CONTACT 1-800-DIG-TESS

NOTES:
1. TREES OUTSIDE OF EX. ROW OR PROPOSED EASEMENT SHALL BE PROTECTED.

NORTH
0 20' 40'
SCALE IN FEET HORIZONTAL
0 5' 10'
SCALE IN FEET VERTICAL

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144
STATE OF TEXAS AARON B. CONINE 109794 PROFESSIONAL ENGINEER
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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
SANITARY SEWER LINE B
PLAN AND PROFILE
STA 10+00 TO STA 15+00

F&N JOB NO.	SAN16188
DATE	OCT 2017
DESIGNED	ABC
DRAWN	SB
REVISED	
CHECKED	DGS
FILE NAME	WASTEWATER LINE B PH I.DWG

NO. | ISSUE | BY | DATE

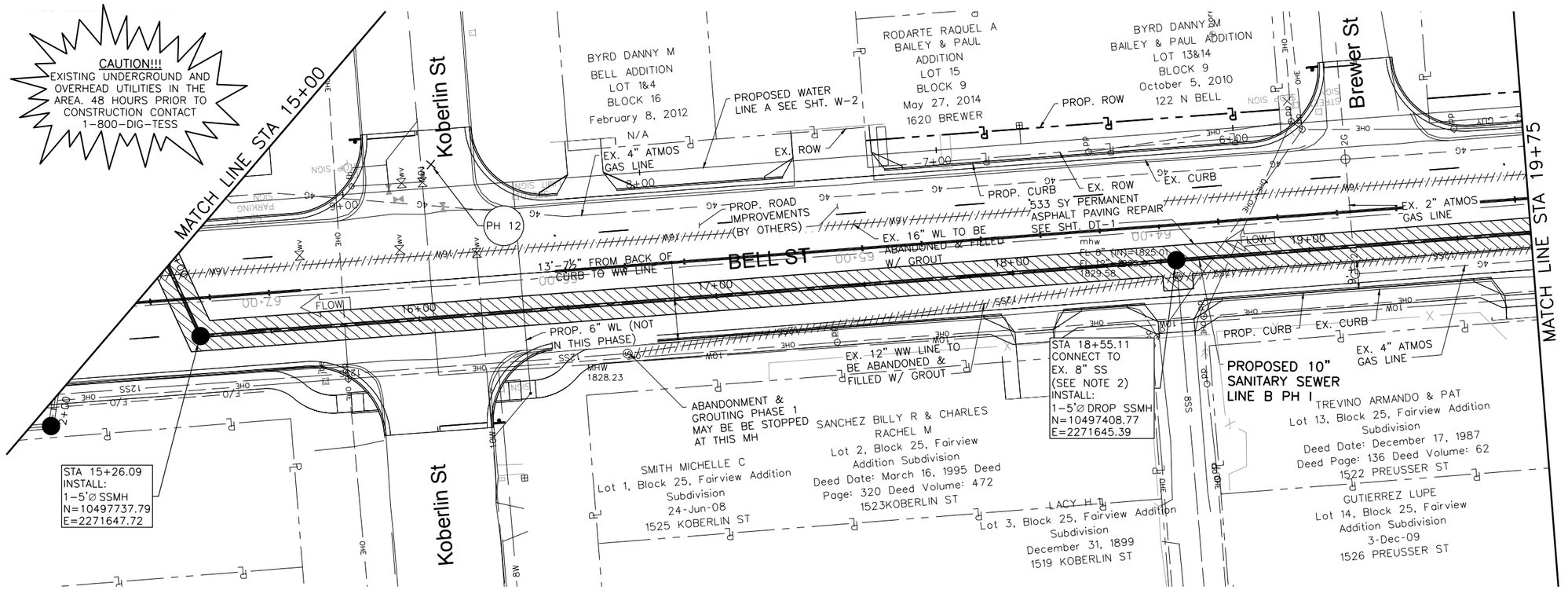
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

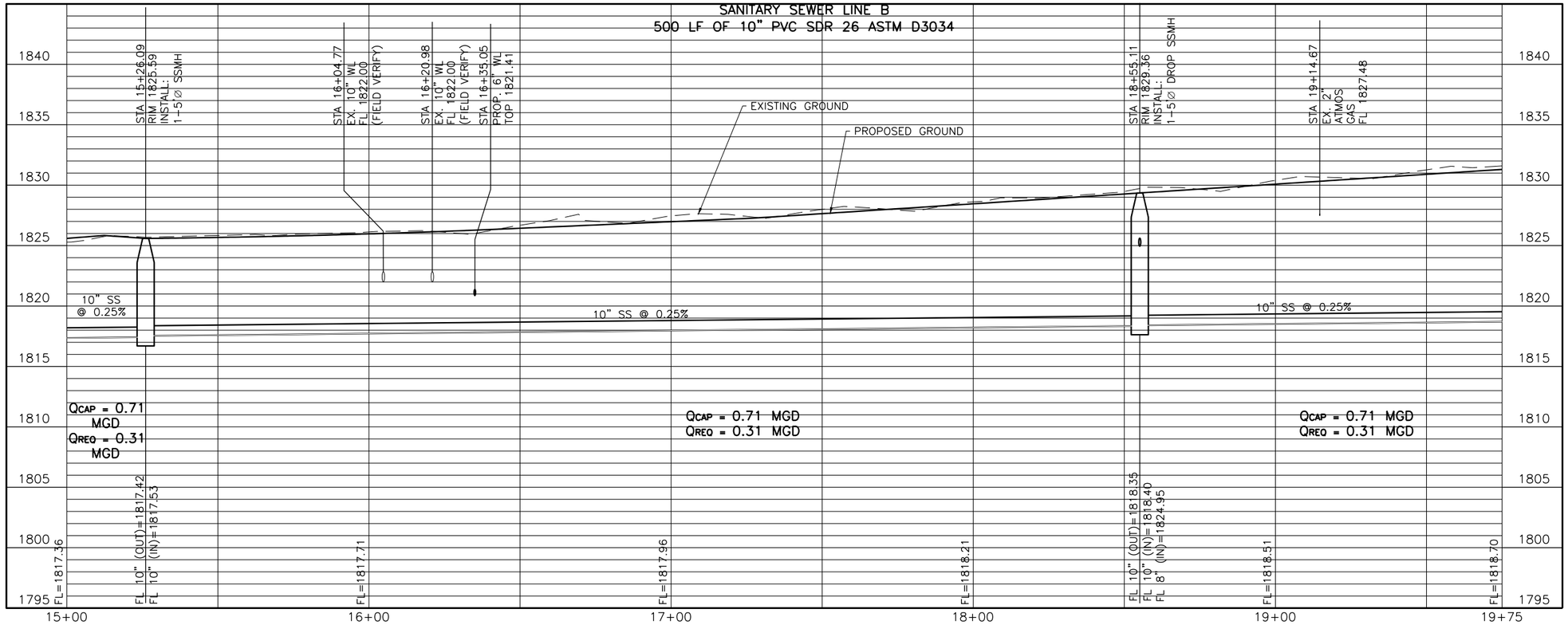
SHEET SS-8
SEQ. 118

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WASTEWATER LINE B PH I.DWG
Last Saved: 9/20/2017 9:34 AM Saved By: sb

Plot Date: 10/23/2017 4:41 PM Plot By: sb Filename: N:\WTU\Drawings\WASTEWATER LINE B PH I.DWG





NOTES:

1. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO BEGINNING OF CONSTRUCTION.
2. CONTRACTOR TO MATCH EXISTING GRADE OF 8" SANITARY SEWER AT RECONNECTION.
3. ALL PAVING, SIDEWALK AND WATER LINE IMPROVEMENTS ON THIS SHEET ARE NOT PART OF THIS PHASE.

NORTH

0 20' 40'
SCALE IN FEET HORIZONTAL

0 5' 10'
SCALE IN FEET VERTICAL

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144
AARON B. CONINE 109794 LICENSED PROFESSIONAL ENGINEER
23 Oct 2017

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
SANITARY SEWER LINE B
PLAN AND PROFILE
STA 15+00 TO STA 20+00

NO.	ISSUE	BY	DATE

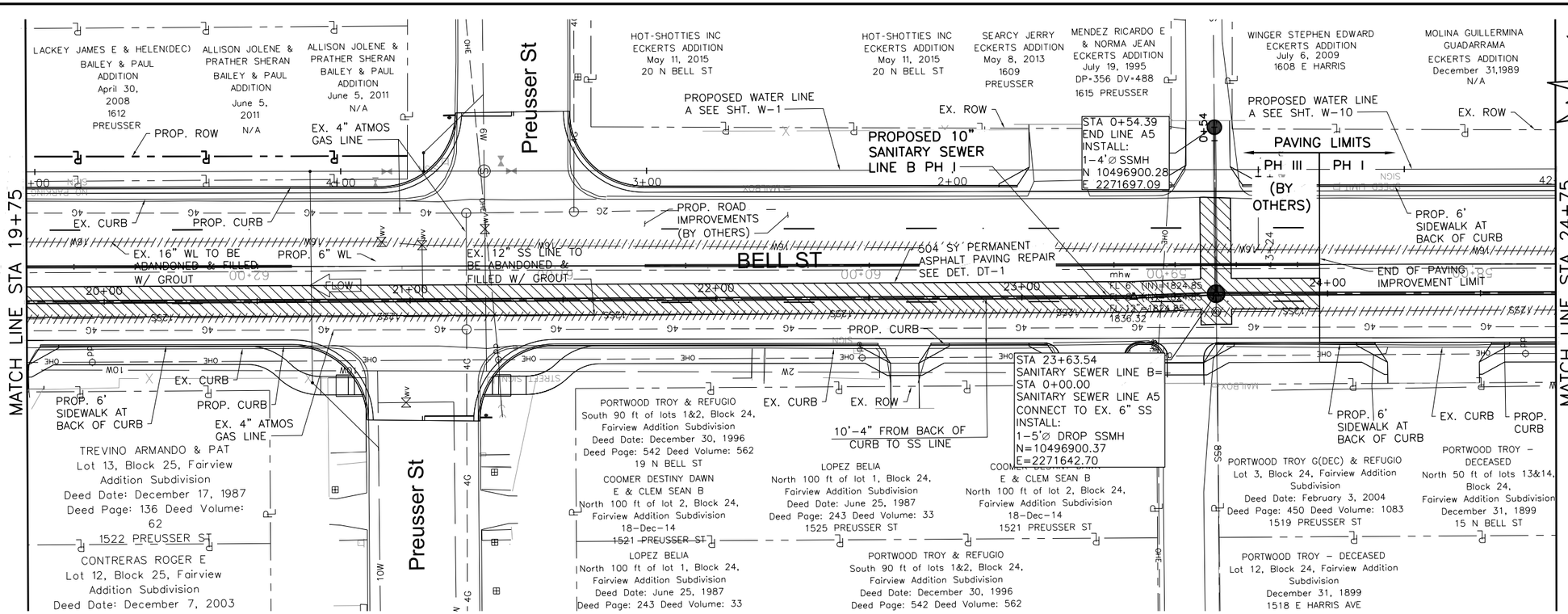
F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DCS
FILE NAME WASTEWATER LINE B PH I.dwg

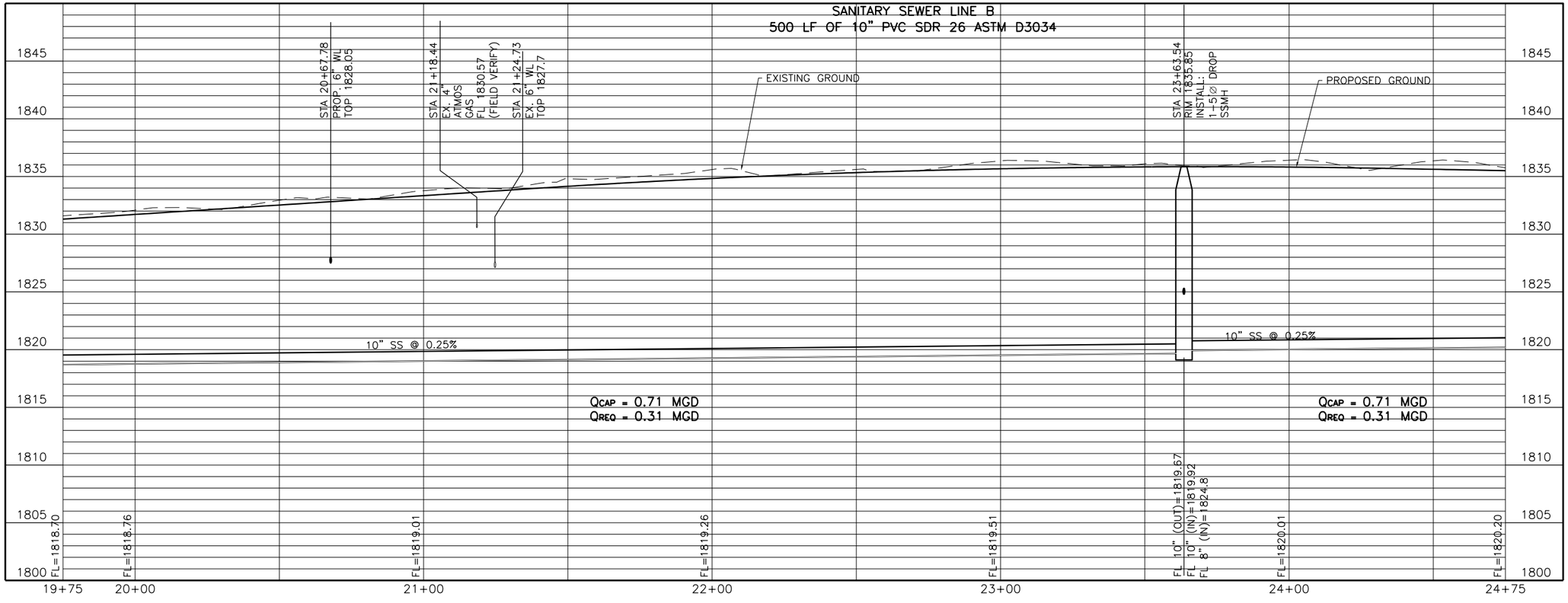
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

SHEET SS-9
SEQ. 119

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WASTEWATER LINE B PH I.dwg
Last Saved: 9/20/2017 9:34 AM Saved By: mdc
Plot Date: 9/20/2017 11:56 AM Plot By: mdc Filename: N:\WTU\Drawings\WASTEWATER LINE B PH I.dwg





CAUTION!!!
EXISTING UNDERGROUND AND OVERHEAD UTILITIES IN THE AREA. 48 HOURS PRIOR TO CONSTRUCTION CONTACT 1-800-DIG-TESS

NORTH

0 20' 40'
SCALE IN FEET HORIZONTAL

0 5' 10'
SCALE IN FEET VERTICAL

NOTES:

1. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO BEGINNING OF CONSTRUCTION.
2. CONTRACTOR TO MATCH EXISTING GRADE OF 8" SANITARY SEWER AT RECONNECTION.
3. ALL PAVING, SIDEWALK AND WATER LINE IMPROVEMENTS SHOWN NORTH OF THE PHASING LIMITS LINE AT STA 23+97.39 ARE NOT INCLUDED IN THIS PHASE.

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

STATE OF TEXAS
AARON B. CONINE
109794
PROFESSIONAL ENGINEER
23 Oct 2017

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Web - www.freese.com

CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
SANITARY SEWER LINE B
PLAN AND PROFILE
STA 20+00 TO STA 25+00

NO.	ISSUE	BY	DATE

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED
CHECKED DCS
FILE NAME WASTEWATER LINE B PH I.DWG

SHEET SS-10
SEQ. 120

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
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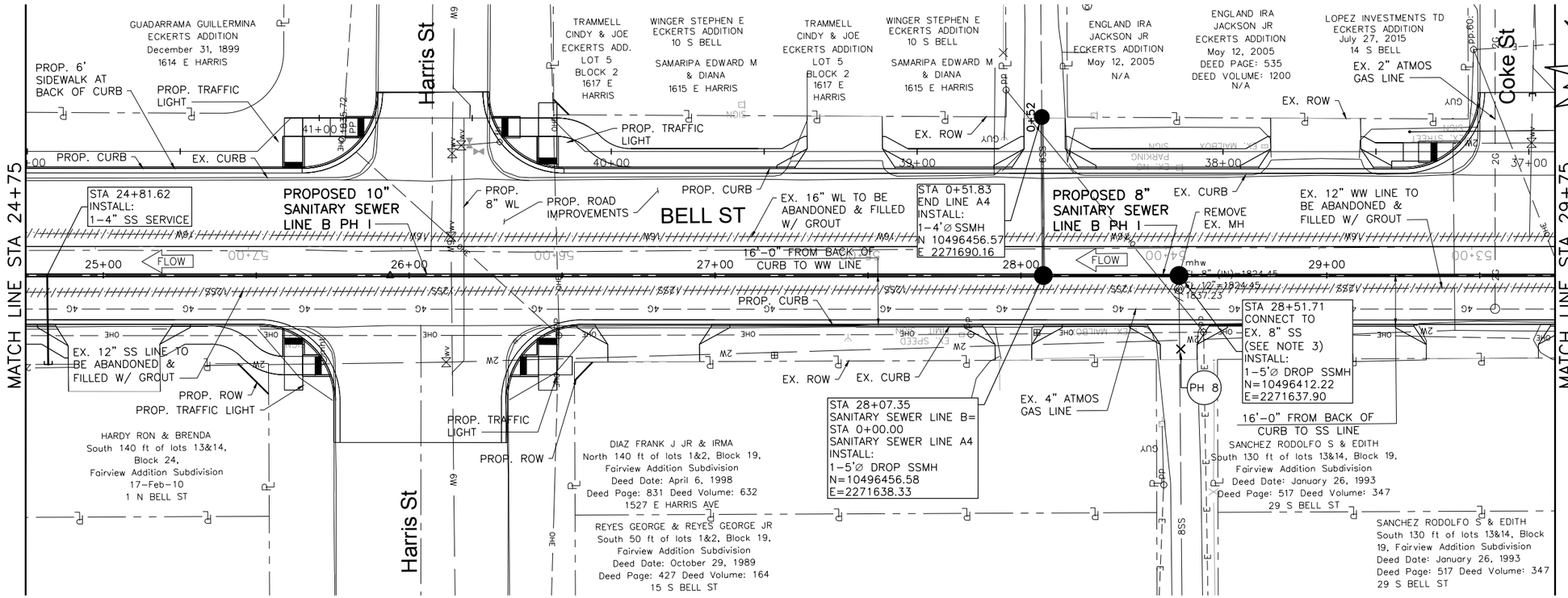
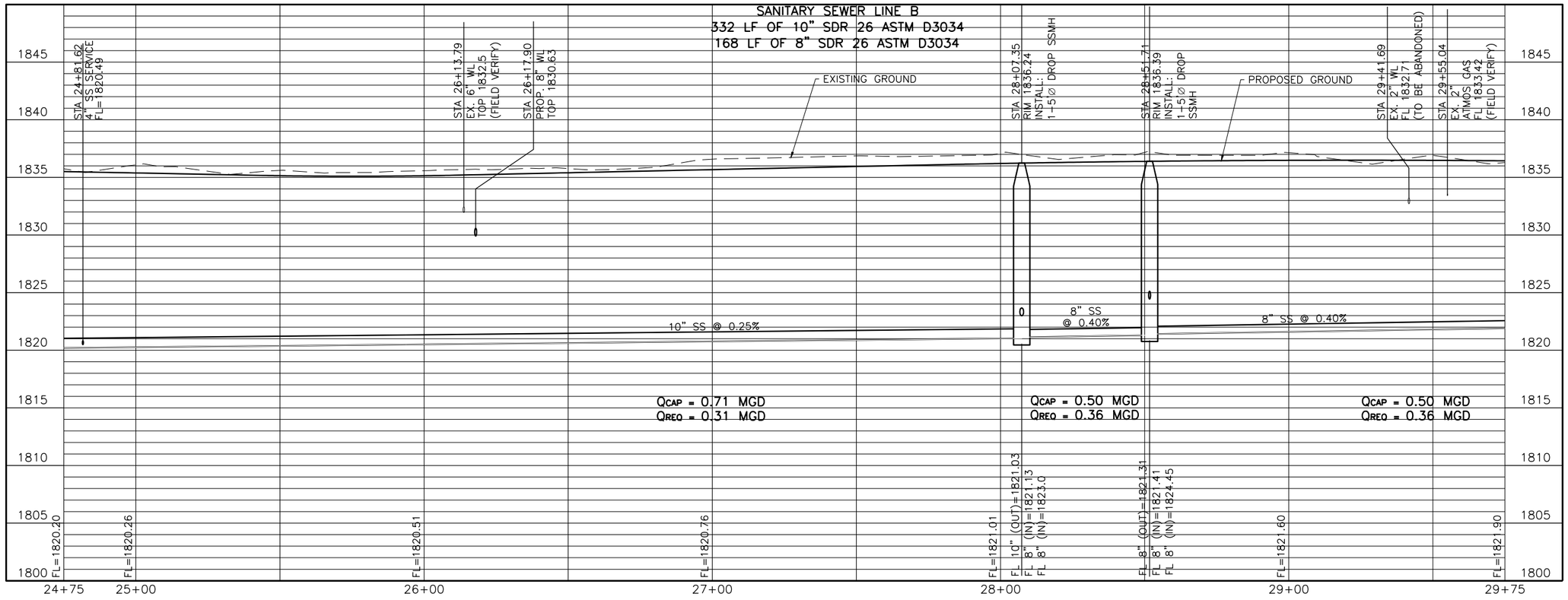
Last Saved: 9/20/2017 9:34 AM Saved By: sb

Plot Date: 10/23/2017 4:45 PM Plot By: sb Filename: N:\WTU\Drawings\WASTEWATER LINE B PH I.DWG





CAUTION!!!
EXISTING UNDERGROUND AND OVERHEAD UTILITIES IN THE AREA. 48 HOURS PRIOR TO CONSTRUCTION CONTACT 1-800-DIG-TESS

NOTES:

1. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO BEGINNING OF CONSTRUCTION.
2. CONTRACTOR SHALL ENSURE EX. 16" WL IS OUT OF SERVICE/ABANDONED PRIOR TO BRINGING PROPOSED 12" SS IN TO SERVICE.
3. ALL PAVING, SIDEWALK AND WATER LINE IMPROVEMENTS ON THIS SHEET ARE NOT PART OF THIS PHASE.

NORTH
0 20' 40'
SCALE IN FEET HORIZONTAL
0 5' 10'
SCALE IN FEET VERTICAL

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

STATE OF TEXAS
AARON B. CONINE
109794
LICENSED PROFESSIONAL ENGINEER
23 Oct 2017

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Fort Worth, Texas 76109-4895
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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
SANITARY SEWER LINE B
PLAN AND PROFILE
STA 25+00 TO STA 30+00

NO.	ISSUE	BY	DATE

FAN JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DGS
FILE NAME WASTEWATER LINE B PH I.dwg

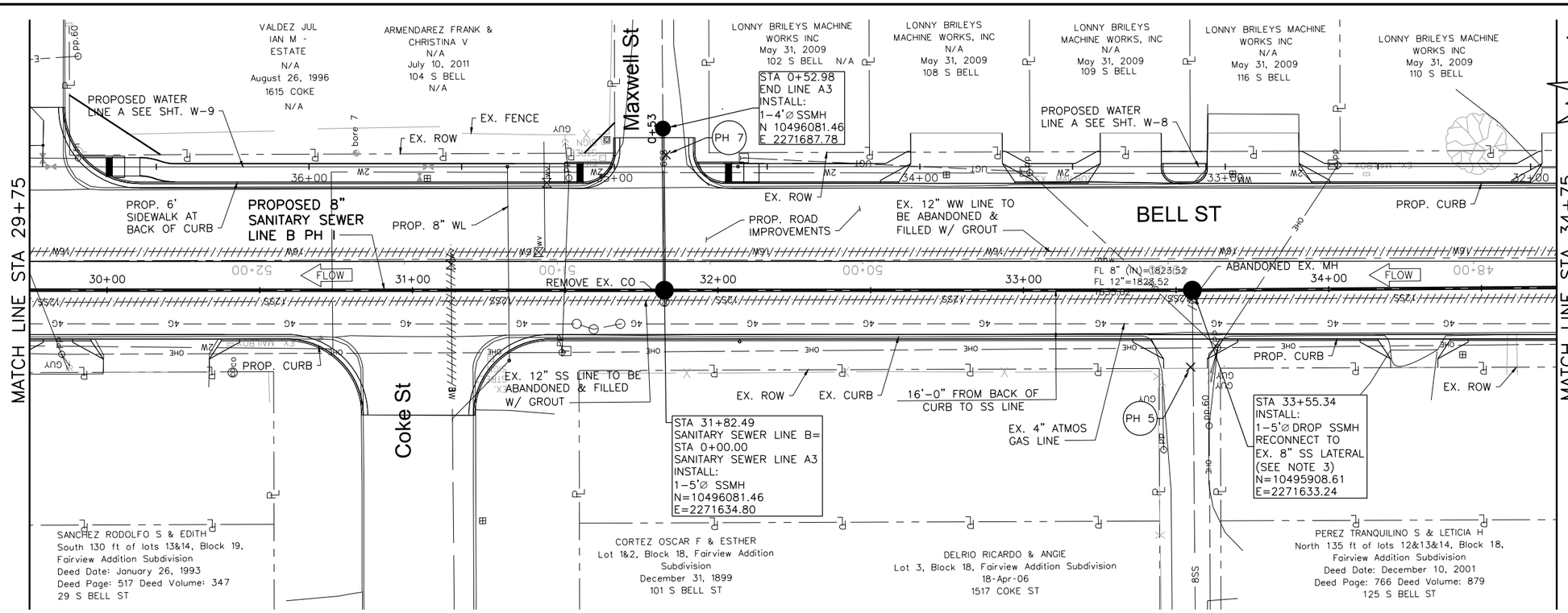
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

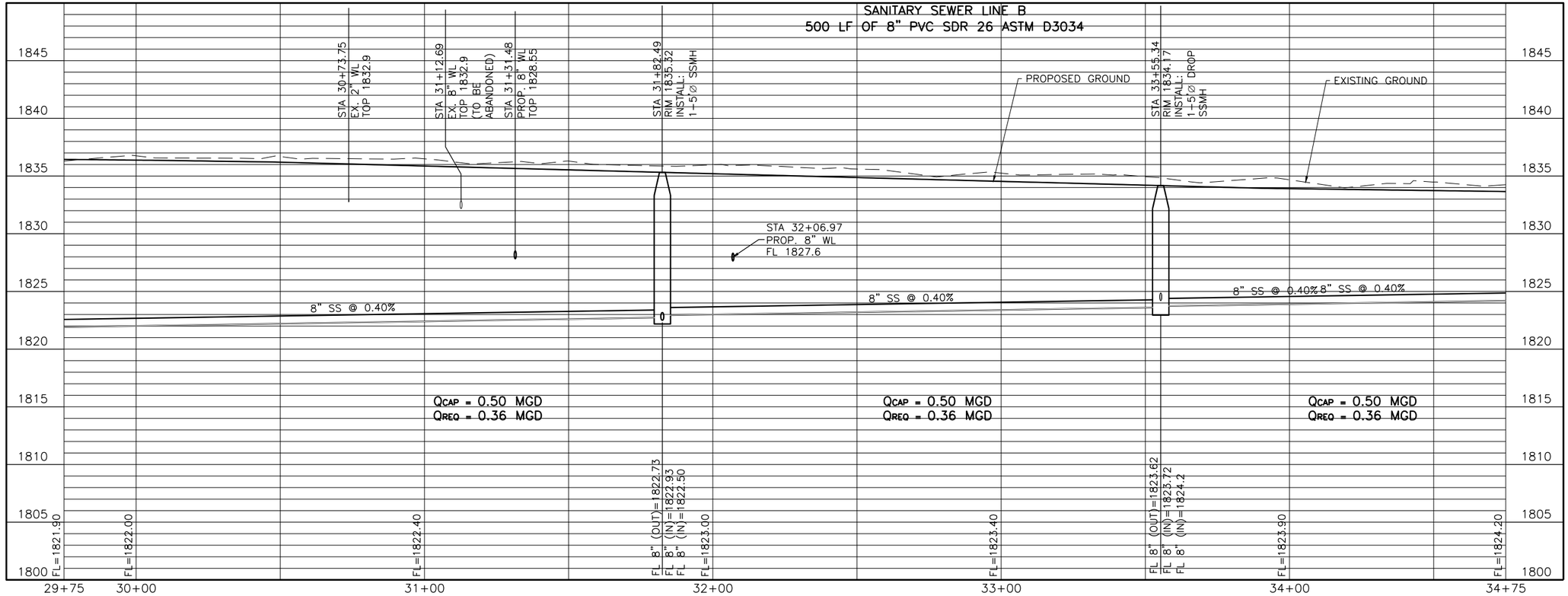
SHEET SS-11
SEQ. 121

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WASTEWATER LINE B PH I.dwg
Last Saved: 9/20/2017 9:34 AM Saved By: mdc

Plot Date: 9/20/2017 11:57 AM Plot By: mdc Filename: N:\WTU\Drawings\WASTEWATER LINE B PH I.dwg





CAUTION!!!
EXISTING UNDERGROUND AND OVERHEAD UTILITIES IN THE AREA. 48 HOURS PRIOR TO CONSTRUCTION CONTACT 1-800-DIG-TESS

NORTH

0 20' 40'
SCALE IN FEET HORIZONTAL

0 5' 10'
SCALE IN FEET VERTICAL

NOTES:

1. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO BEGINNING OF CONSTRUCTION.
2. CONTRACTOR SHALL ENSURE EX. 16" WL IS OUT OF SERVICE/ABANDONED PRIOR TO BRINGING PROPOSED 12" SS IN TO SERVICE.
3. ALL PAVING, SIDEWALK AND WATER LINE IMPROVEMENTS ON THIS SHEET ARE NOT PART OF THIS PHASE.

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

STATE OF TEXAS
AARON B. CONINE
109794
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23 Oct 2017

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
SANITARY SEWER LINE B
PLAN AND PROFILE
STA 30+00 TO STA 35+00

NO.	ISSUE	BY	DATE

F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DCS
FILE NAME WASTEWATER LINE B PH I.dwg

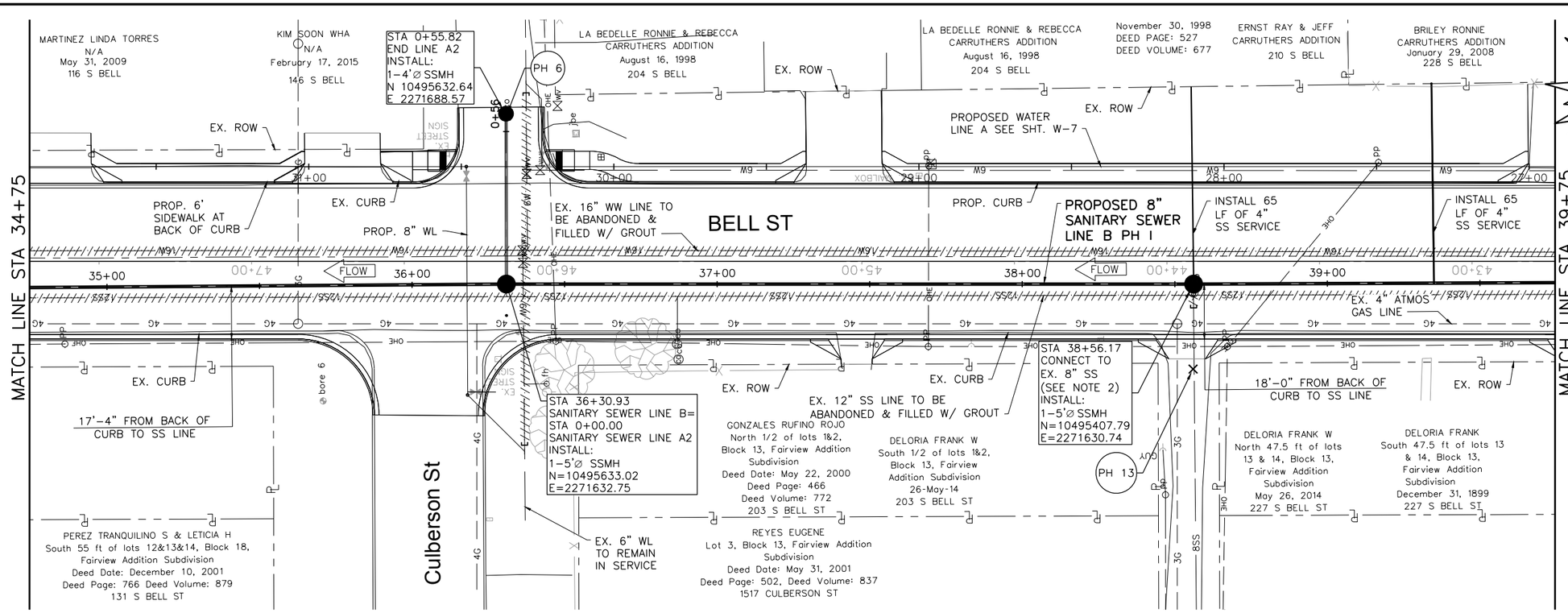
VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

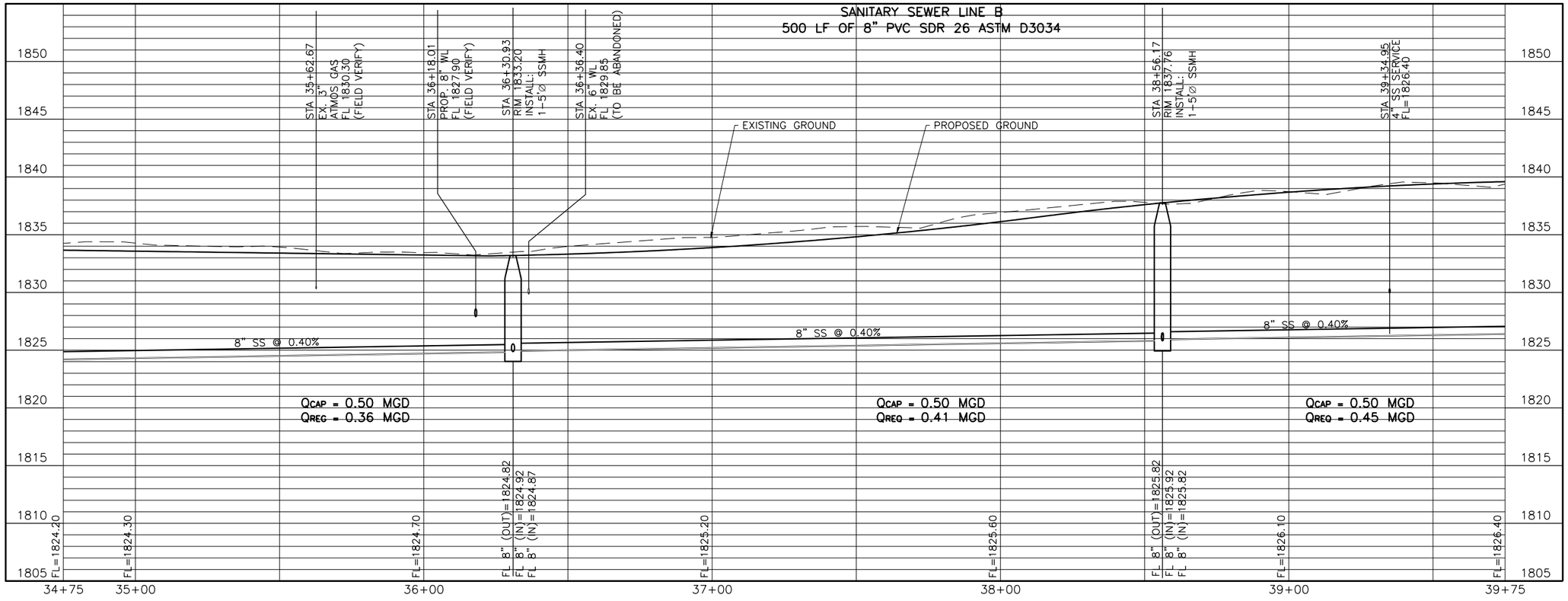
SHEET SS-12
SEQ. 122

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
Filename: N:\WTU\Drawings\WASTEWATER LINE B PH I.dwg
Last Saved: 9/20/2017 9:34 AM Saved By: mdc

Plot Date: 9/20/2017 11:57 AM Plot By: mdc Filename: N:\WTU\Drawings\WASTEWATER LINE B PH I.dwg





CAUTION!!!
EXISTING UNDERGROUND AND OVERHEAD UTILITIES IN THE AREA. 48 HOURS PRIOR TO CONSTRUCTION CONTACT 1-800-DIG-TESS

NORTH

0 20' 40'
SCALE IN FEET
HORIZONTAL

0 5' 10'
SCALE IN FEET
VERTICAL

NOTES:

1. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO BEGINNING OF CONSTRUCTION.
2. CONTRACTOR SHALL ENSURE EX. 16" WL IS OUT OF SERVICE/ABANDONED PRIOR TO BRINGING PROPOSED 8" SS IN TO SERVICE.
3. ALL PAVING, SIDEWALK AND WATER LINE IMPROVEMENTS ON THIS SHEET ARE NOT PART OF THIS PHASE.

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

STATE OF TEXAS
AARON B. CONINE
109794
LICENSED
PROFESSIONAL ENGINEER
23 Oct 2017

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
SANITARY SEWER LINE B
PLAN AND PROFILE
STA 35+00 TO STA 40+00

NO.	ISSUE	BY	DATE

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DCS
FILE NAME WASTEWATER LINE B PH I.dwg

SHEET SS-13
SEQ. 123

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
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Last Saved: 9/20/2017 9:34 AM Saved By: mdc

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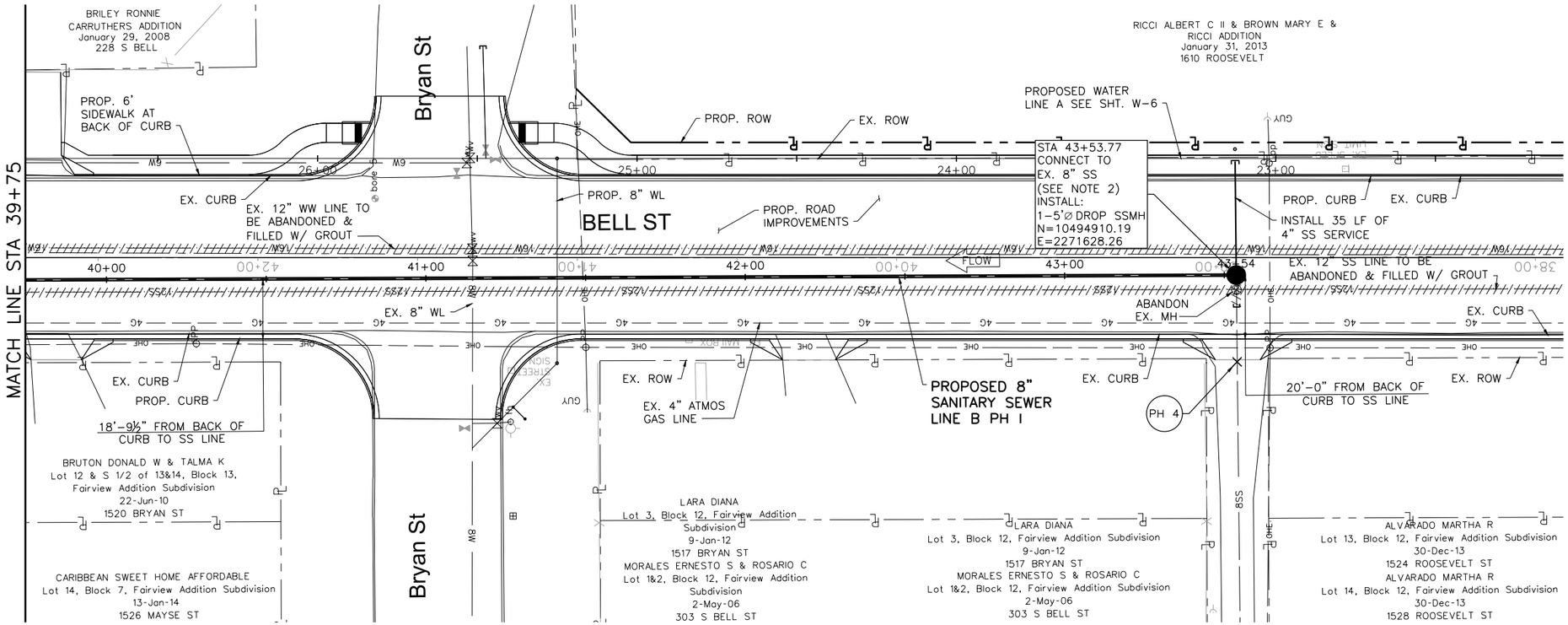

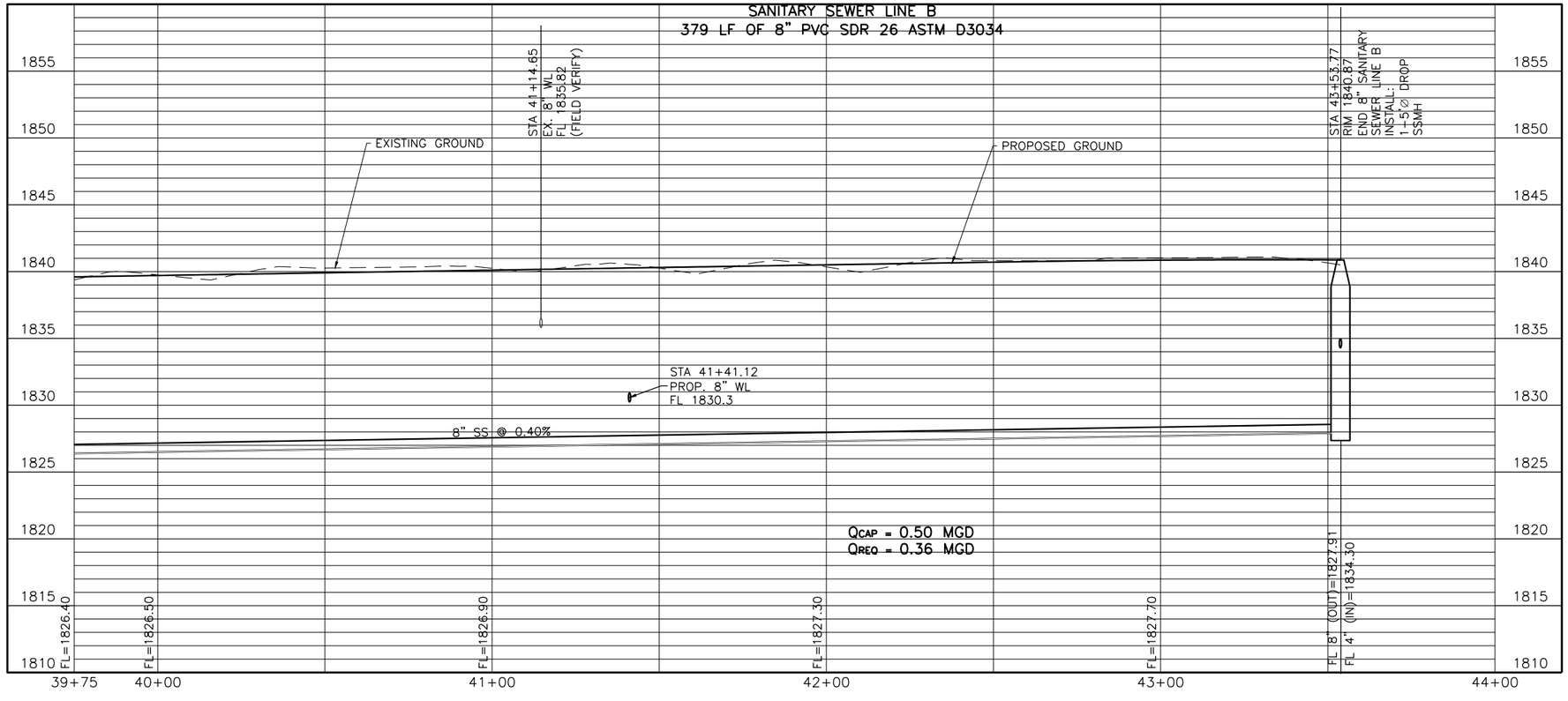

CAUTION!!!
EXISTING UNDERGROUND AND OVERHEAD UTILITIES IN THE AREA. 48 HOURS PRIOR TO CONSTRUCTION CONTACT 1-800-DIG-TESS

NOTES:

1. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO BEGINNING OF CONSTRUCTION.
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3. ALL PAVING, SIDEWALK AND WATER LINE IMPROVEMENTS ON THIS SHEET ARE NOT PART OF THIS PHASE.

NORTH
0 20' 40'
SCALE IN FEET HORIZONTAL
0 5' 10'
SCALE IN FEET VERTICAL

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144
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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
SANITARY SEWER LINE B
PLAN AND PROFILE
STA 40+00 TO END

NO.	ISSUE	BY	DATE

F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DCS
FILE NAME WASTEWATER LINE B PH I.dwg

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

SHEET SS-14
SEQ. 124

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
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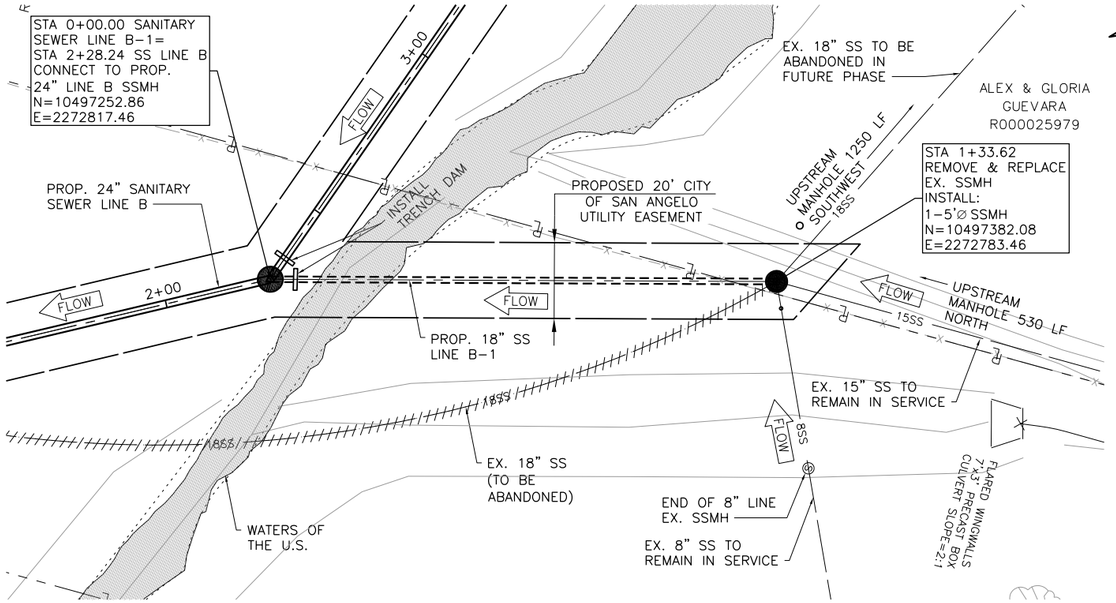
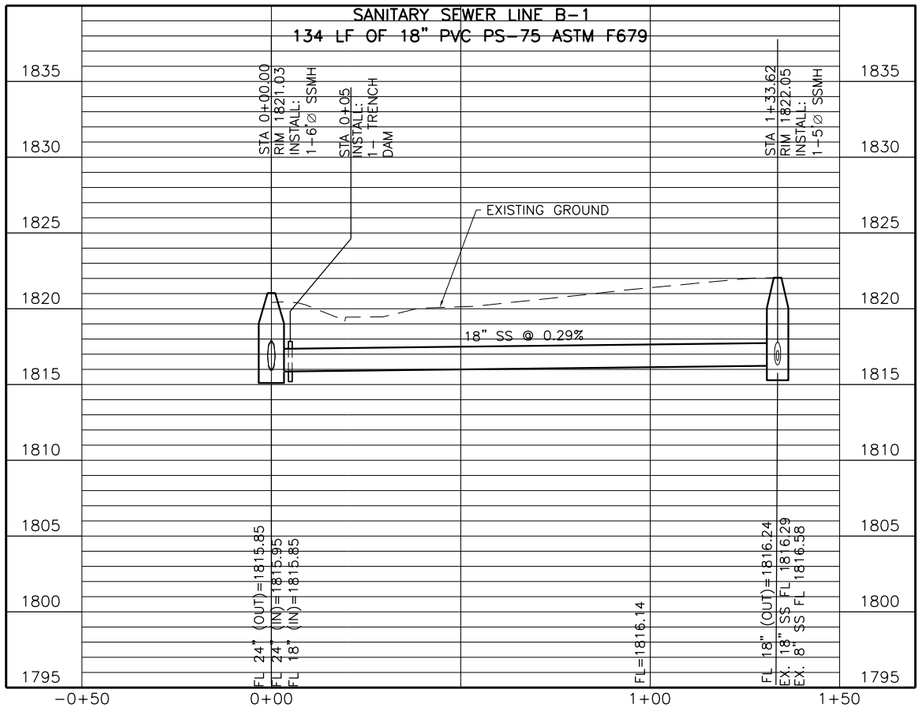
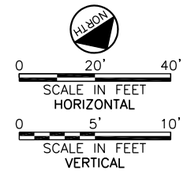
Last Saved: 9/20/2017 9:34 AM Saved By: mdc

Plot Date: 9/20/2017 11:58 AM Plot By: mdc Filename: N:\WTU\Drawings\WASTEWATER LINE B PH I.dwg



CAUTION!!!
EXISTING UNDERGROUND AND OVERHEAD UTILITIES IN THE AREA. 48 HOURS PRIOR TO CONSTRUCTION CONTACT 1-800-DIG-TESS





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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
SANITARY SEWER LINE B-1
STA 0+00 TO END

NO.	ISSUE	BY	DATE

F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED
CHECKED DGS
FILE NAME WASTEWATER LINE B PH I.DWG

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

SHEET SS-15
SEQ. 125

100% SUBMITTAL

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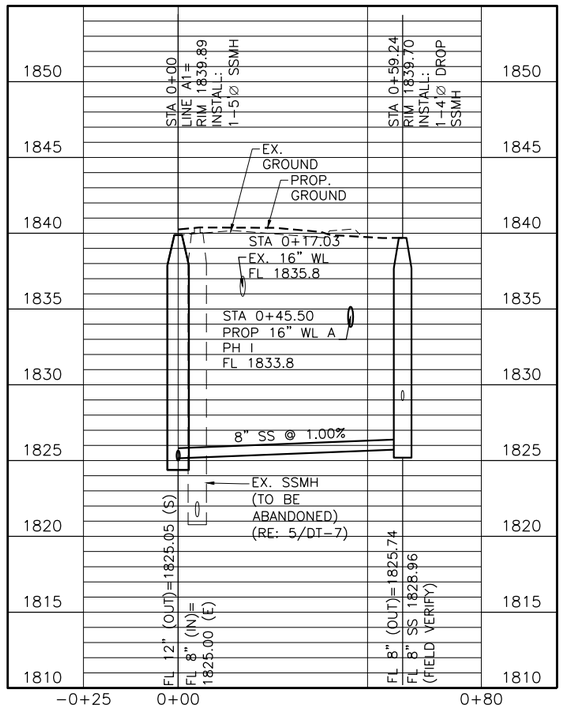
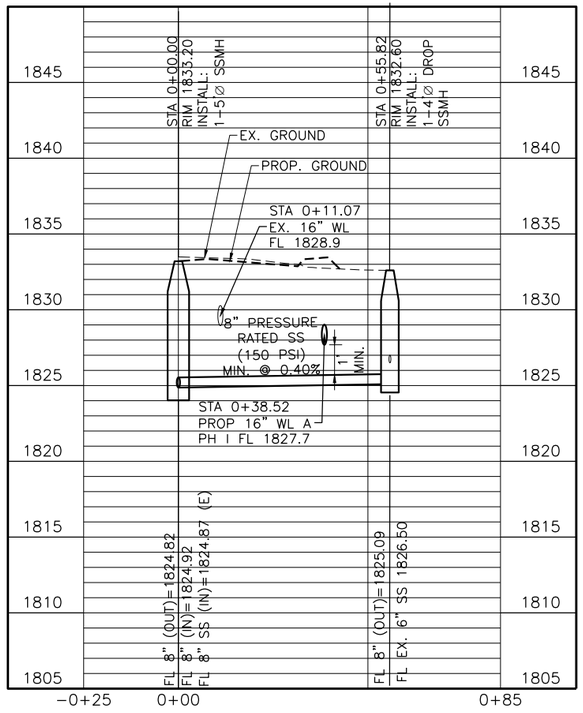
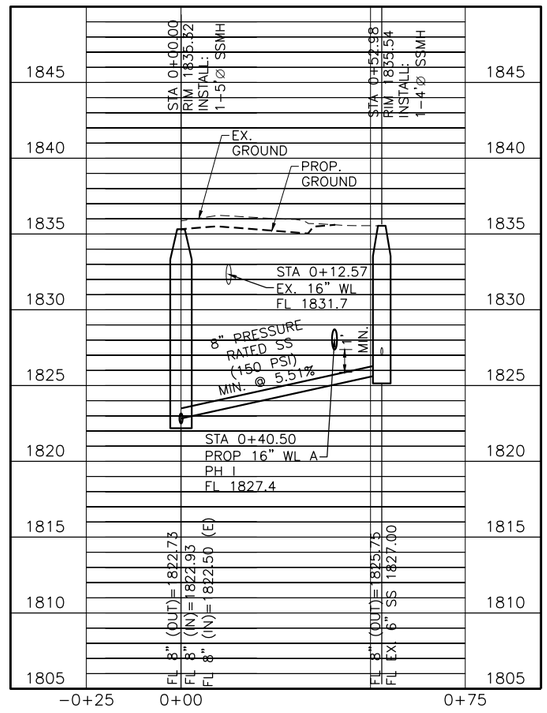


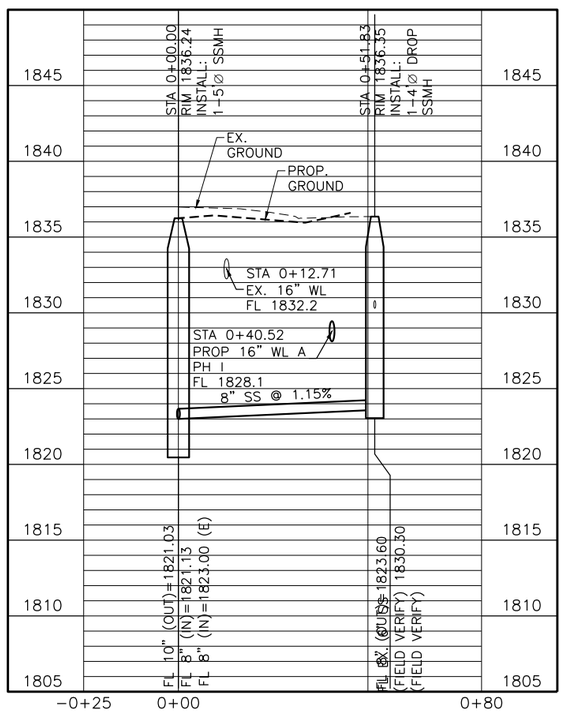
1 SS-5 SANITARY SEWER LINE A1



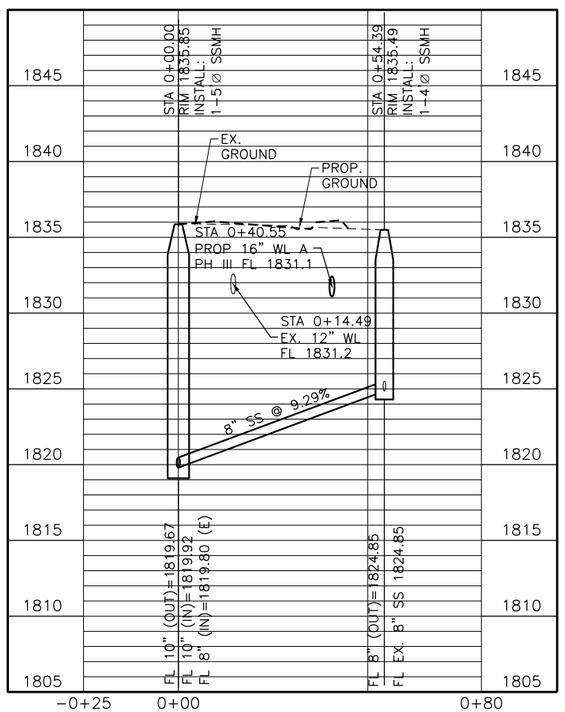
2 SS-13 SANITARY SEWER LINE A2



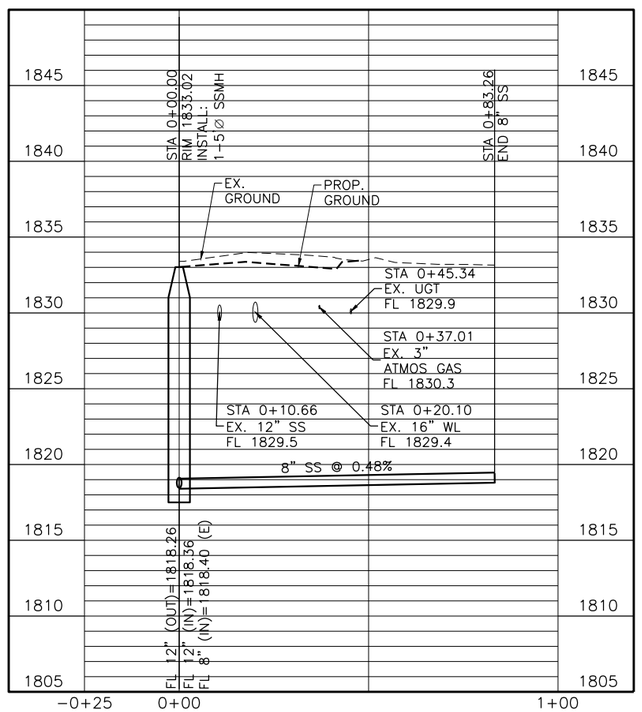
3 SS-12 SANITARY SEWER LINE A3



4 SS-11 SANITARY SEWER LINE A4



5 SS-10 SANITARY SEWER LINE A5



6 SS-3 SANITARY SEWER LINE A6

CAUTION!!!
EXISTING UNDERGROUND AND OVERHEAD UTILITIES IN THE AREA. 48 HOURS PRIOR TO CONSTRUCTION CONTACT 1-800-DIG-TESS

NORTH
0 20' 40'
SCALE IN FEET
HORIZONTAL
0 5' 10'
SCALE IN FEET
VERTICAL

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
SANITARY SEWER :LINE A & B
PROFILES
PROFILE LINE A1 - A6

NO.	ISSUE	BY	DATE

FAN JOB NO.	SAN16188
DATE	OCT 2017
DESIGNED	ABC
DRAWN	SB
REVISED	-
CHECKED	DGS
FILE NAME	WASTEWATER LINE A PH I.dwg

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0 1"

SHEET SS-16
SEQ. 126

100% SUBMITTAL

ACAD Rel: 21.0s (LMS Tech)
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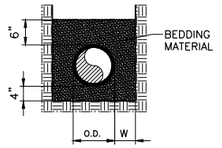
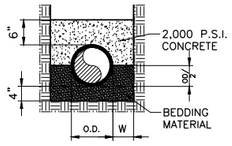
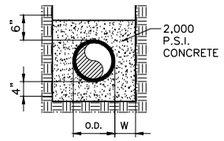


GRAVEL EMBEDMENT



CONCRETE CAP



CONCRETE ENCASEMENT

STANDARD TRENCH WIDTH	
PIPE SIZE	W
16" OR LESS	6"
GREATER THAN 16"	AS SPECIFIED BY PIPE MFG. & APPROVED BY CITY ENGINEER

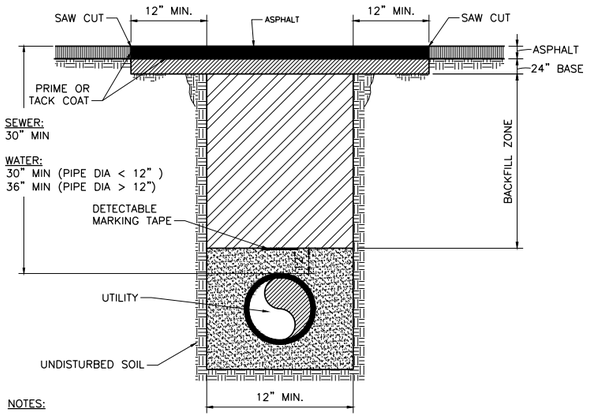
NOTES:

1. BEDDING MATERIAL FOR THE INSTALLATION OF WATER AND SEWER MAINS SHALL BE CRUSHED STONE OR PEA GRAVEL THAT WILL REMAIN FIRM AND NOT PERMIT DISPLACEMENT OF THE PIPE EITHER DURING PIPE LAYING OR BACKFILLING OR FOLLOWING THE COMPLETION OF CONSTRUCTION.
2. BEDDING MATERIAL SHALL BE FROM AN APPROVED BEDDING MATERIAL SOURCE PER THE LIST OF APPROVED BEDDING SUPPLIERS OR BE APPROVED BY THE CITY ENGINEER.
3. TRENCH SPOILS ARE NOT ACCEPTABLE FOR "EMBEDMENT ZONE MATERIAL"

1 – PIPE EMBEDMENT ZONE WATER AND SEWER MAINS

NOT TO SCALE JUNE 2016 W-BED-1

UTILITY TRENCH SECTION
ASPHALT PAVEMENT



NOTES:

ASPHALT: 2" LAYER
TYPE D, TxDOT HOT MIX OR
TYPE D, TxDOT HOT MIX – COLD LAID
(MUST HAVE PRIOR CITY APPROVAL)
4" LAYER TYPE B, TxDOT HOT MIX

PRIME COAT: TXDOT MC-30 OR AE-P ASPHALT AT THE RATE OF 0.25 TO 0.35 GALLON PER SQUARE YARD OF SURFACE

TACK COAT: SHALL MEET THE REQUIREMENTS OF TXDOT ITEM 300 "ASPHALTS, OILS, AND EMULSIONS".

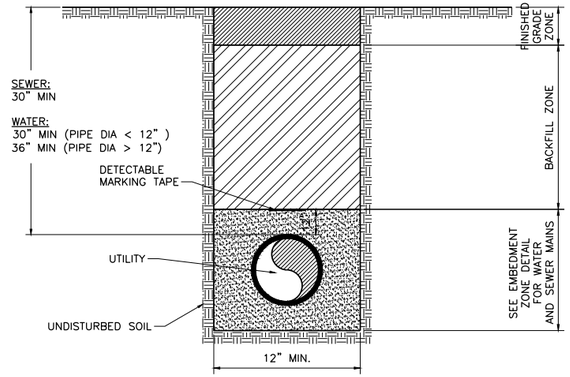
BASE: FLEXIBLE BASE PER CITY OF SAN ANGELO SPECIFICATIONS COMPACTED IN 6" HORIZONTAL LAYERS. MINIMUM DENSITY 95% MODIFIED PROCTOR. FLOWABLE FILL (CLSM) MAY BE USED IN LIEU OF FLEX-BASE.

BACKFILL ZONE: WHERE NATIVE PULVERIZED OR GRANULAR MATERIAL IS AVAILABLE FROM EXCAVATION WHICH IS FREE OF SHARP EDGED STONES, OR STONES LARGER THAN 3" IN DIAMETER, CLAY, ORGANIC MATTER, OR OTHER UNSUITABLE SUBSTANCES, HAS A PI<= 20 AND LL<=40, AND MEETS THE APPROVAL OF THE CITY. SUCH MATERIAL MAY BE USED FOR BACKFILL MATERIAL AS INSTRUCTED BY THE OWNER.

COVER: WATER OR SEWER MAINS AND SERVICES WITH LESS THAN 30" OF COVER AT ANY LOCATION SHALL REQUIRE C.O.S.A. APPROVAL PRIOR TO CONSTRUCTION.

4 – UTILITY TRENCH SECTION ASPHALT TEMPORARY/PERMANENT PAVEMENT REPAIR

1"=10' JUNE 2016 W-UTR-ASP



NOTES:

BACKFILL ZONE:

OPTION #1: WHERE PULVERIZED OR GRANULAR MATERIAL IS AVAILABLE FROM EXCAVATION WHICH IS FREE OF SHARP EDGED STONES, OR STONES LARGER THAN 3" IN DIAMETER, CLAY, ORGANIC MATTER, OF OTHER UNSUITABLE SUBSTANCES, HAS A PI<=20 AND LL<=40, AND MEETS THE APPROVAL OF THE CITY SUCH MATERIAL MAY BE USED FOR BACKFILL MATERIAL AS INSTRUCTED BY THE OWNER. BACKFILL SHALL BE COMPACTED TO DENSITIES EQUAL TO OR GREATER THAN THAT OF SURROUNDING SOIL.

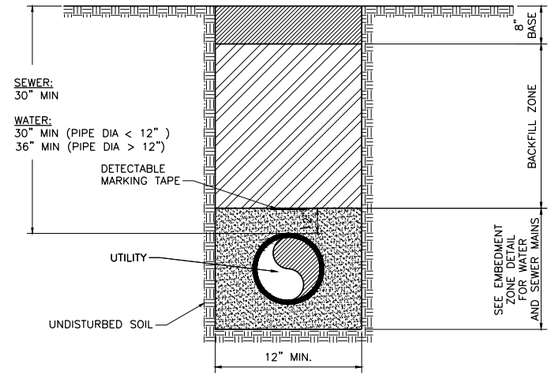
OPTION #2: FLEXIBLE BASE PER CITY OF SAN ANGELO SPECIFICATIONS COMPACTED IN 6" HORIZONTAL LAYERS TO MINIMUM DENSITY 95% MODIFIED PROCTOR.

FINISHED GRADE ZONE:

BACKFILL SHALL MATCH EXISTING GROUND CONDITIONS (SEE OPTIONS BELOW) OR AS DIRECTED BY THE OWNER.
OPTION A: UTILIZE BACKFILL ZONE MATERIAL FROM OPTION #1
OPTION B: 6" TOP SOIL.
OPTION C: 8" FLEXIBLE BASE
COVER:
WATER OR SEWER MAINS AND SERVICES WITH LESS THAN 30" OF COVER AT ANY LOCATION SHALL REQUIRE C.O.S.A. APPROVAL PRIOR TO CONSTRUCTION.

2 – UTILITIY TRENCH SECTION OTHER UNPAVED AREAS

1"=10' JUNE 2016 W-UTR-OUA



NOTES:

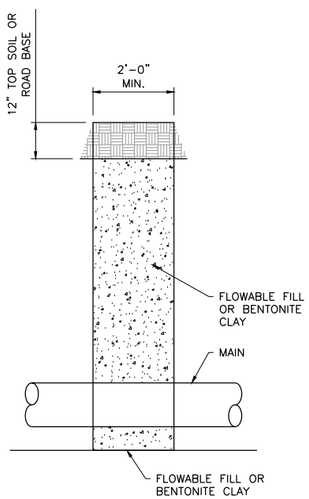
BASE: FLEXIBLE BASE PER CITY OF SAN ANGELO SPECIFICATIONS. COMPACTED IN 6" LAYERS. MINIMUM DENSITY 95% MODIFIED PROCTOR.

BACKFILL ZONE: WHERE PULVERIZED OR GRANULAR MATERIAL IS AVAILABLE FROM EXCAVATION WHICH IS FREE OF SHARP EDGED STONES, OR STONES LARGER THAN 3" IN DIAMETER, CLAY, ORGANIC MATTER, OR OTHER UNSUITABLE SUBSTANCES, HAS A PI<= 20 AND LL<=40, AND MEETS THE APPROVAL OF THE CITY. SUCH MATERIAL MAY BE USED FOR BACKFILL MATERIAL AS INSTRUCTED BY THE OWNER.

COVER: WATER OR SEWER MAINS AND SERVICES WITH LESS THAN 30" COVER AT ANY LOCATION SHALL REQUIRE C.O.S.A. APPROVAL PRIOR TO CONSTRUCTION.

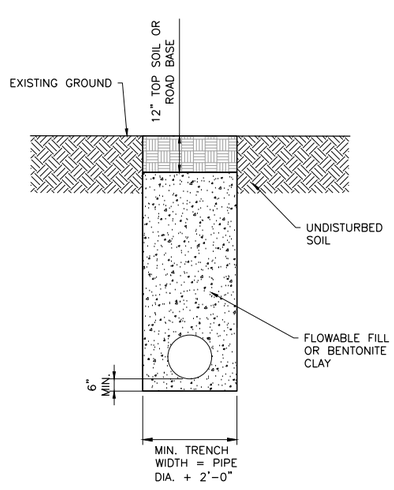
3 – UTILITIY TRENCH SECTION UNPAVED STREETS, ALLEYS AND DRIVEWAYS

1"=10' JUNE 2016 W-UTR-USA



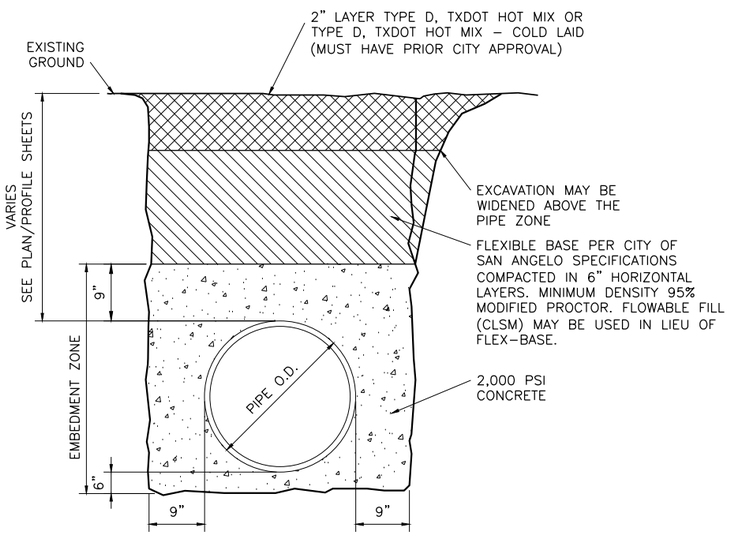
5 – TRENCH CHECK DAM PROFILE

NOT TO SCALE



6 – TRENCH CHECK DAM SECTION

NOT TO SCALE



7 – TYPICAL CONCRETE ENCASEMENT

NOT TO SCALE

100% SUBMITTAL

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

STATE OF TEXAS
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23 Oct 2017

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
WATER & SANITARY SEWER DETAILS
TRENCH DETAILS

NO.	ISSUE	BY	DATE

F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED DCS
DRAWN SB
REVISED
CHECKED DCS
FILE NAME CV-PPL-DT-DET01.dwg

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

SHEET DT-1
SEQ. 127

ACAD Rel: 21.0s (LMS Tech)
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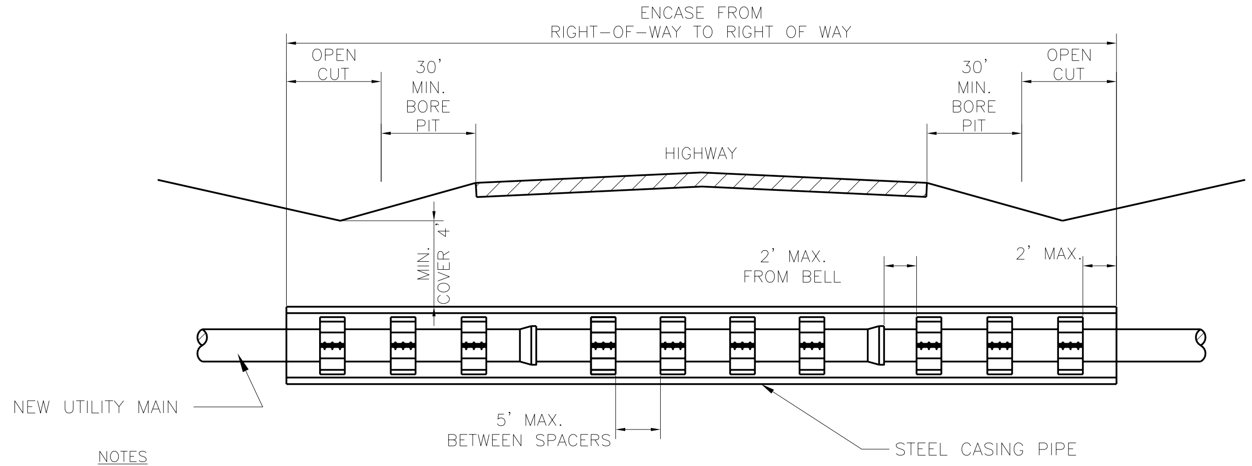
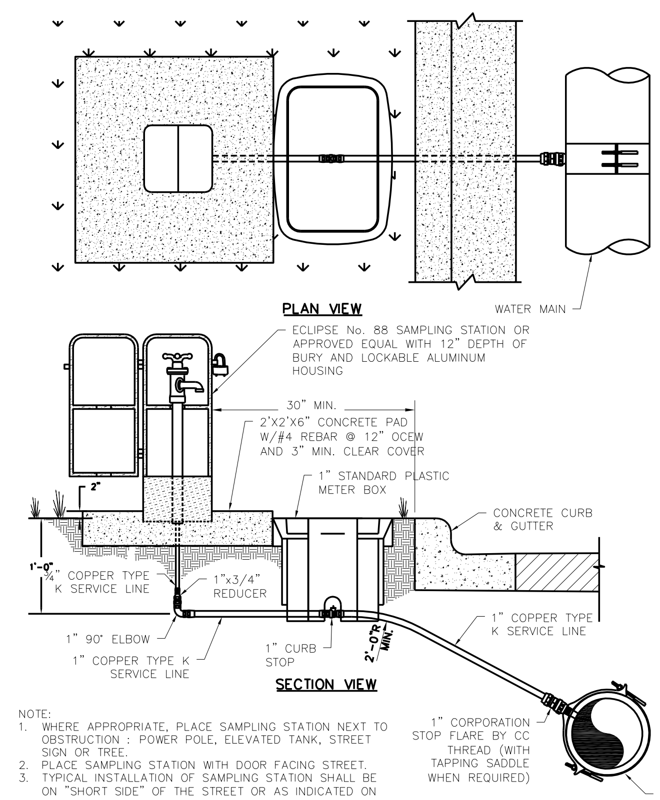


NOTES

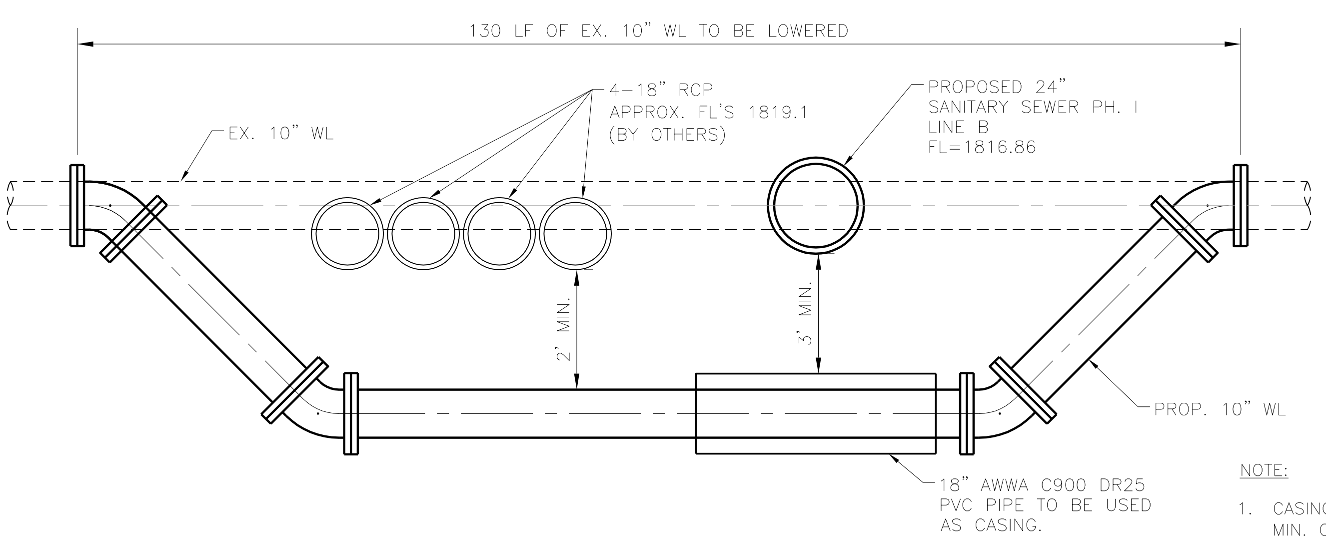
1. ALL HIGHWAY CROSSINGS AND STREET CROSSINGS WHERE REQUIRED SHALL BE MADE BY BORING OR TUNNELING.
2. CASING PIPE SHALL BE MINIMUM 3/8" STEEL PIPE WITH WELDED JOINTS AND BE TWO NOMINAL PIPE SIZES LARGER THAN THE CARRIER PIPE.
3. CASING SHALL EXTEND FROM EDGE OF RIGHT-OF-WAY TO EDGE OF RIGHT-OF-WAY OR AS SPECIFIED IN THE PLANS.
4. EACH END OF CASING SHALL BE SEALED WITH WATERTIGHT NON-SHRINK GROUT OR A MANUFACTURED WATERTIGHT SEAL.
5. ALL OVER CUTTING IN EXCESS OF 1" AROUND CASING PIPE SHALL BE PRESSURE GROUTED.
6. GROUT SHALL HAVE A MINIMUM STRENGTH OF 1,800 P.S.I. IN 28 DAYS WITH A SLUMP OF 10" OR GREATER.
7. HDPE CASING SPACERS SHALL BE PLACED AT MAXIMUM 5' INTERVALS AND 2' FROM EACH BELL AND END OF CASING.
8. BORE PITS SHALL BE LOCATED AND CONFINED TO THE WORK EASEMENT AND SHALL BE CONSTRUCTED IN SUCH A MANNER AS TO NOT INTERFERE WITH HIGHWAY STRUCTURAL INTEGRITY OR SAFE TRAFFIC OPERATIONS. IF NECESSARY, SHORING SHALL BE USED.

1 HIGHWAY CROSSING

NOT TO SCALE JUNE 2016 W-HWY-XING



NOTE:
1. WHERE APPROPRIATE, PLACE SAMPLING STATION NEXT TO OBSTRUCTION : POWER POLE, ELEVATED TANK, STREET SIGN OR TREE.
2. PLACE SAMPLING STATION WITH DOOR FACING STREET.
3. TYPICAL INSTALLATION OF SAMPLING STATION SHALL BE ON "SHORT SIDE" OF THE STREET OR AS INDICATED ON THE DRAWINGS.
4. WHEN PLACING STATION ADJACENT TO FIRE HYDRANT, DO NOT TAP FIRE HYDRANT LEAD AND MAINTAIN DISTANCE OF 4 FEET FOR PROPER OPERATION OF FIRE HYDRANT.



NOTE:
1. CASING SHALL BE A MIN. OF 20' CENTERED ON THE SS CROSSING.

2 WATER LINE LOWERING DETAIL

NOT TO SCALE

3 WATER SAMPLE STATION

NOT TO SCALE

ACAD Rel: 21.0s (LMS Tech)
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Last Saved: 10/23/2017 5:47 PM Saved By: 02435

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23 Oct 2017

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
WATER & SANITARY SEWER DETAILS
CASING DETAILS

FN JOB NO.	SAN16188
DATE	OCT 2017
DESIGNED	DGS
DRAWN	SB
REVISED	
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SHEET DT-2

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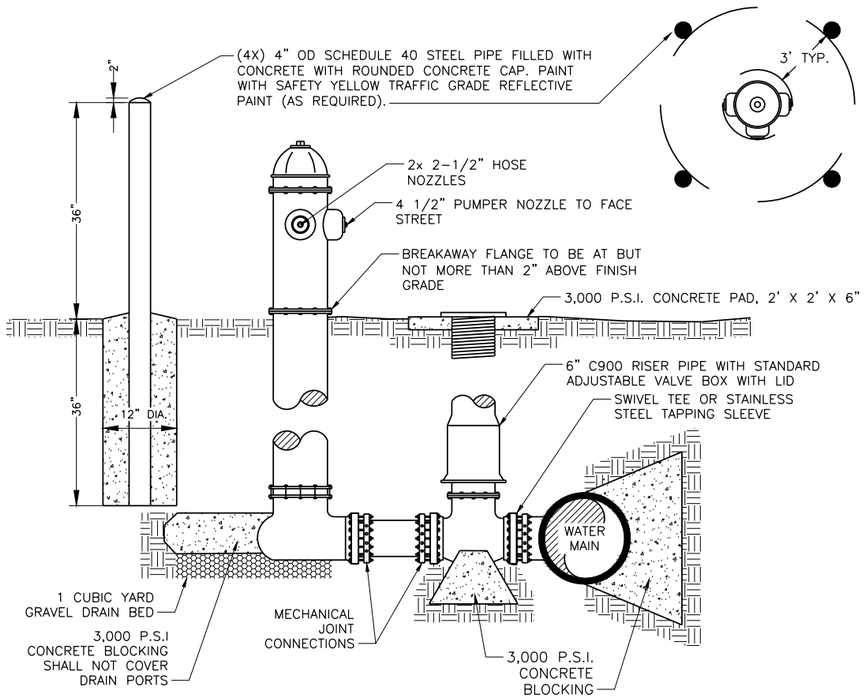
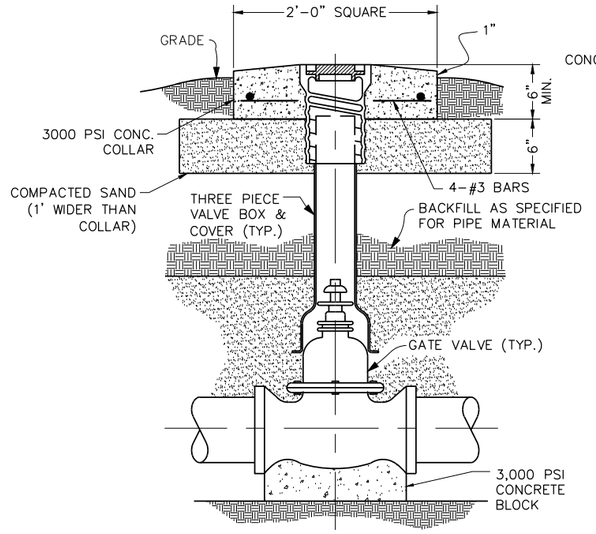


NOTES

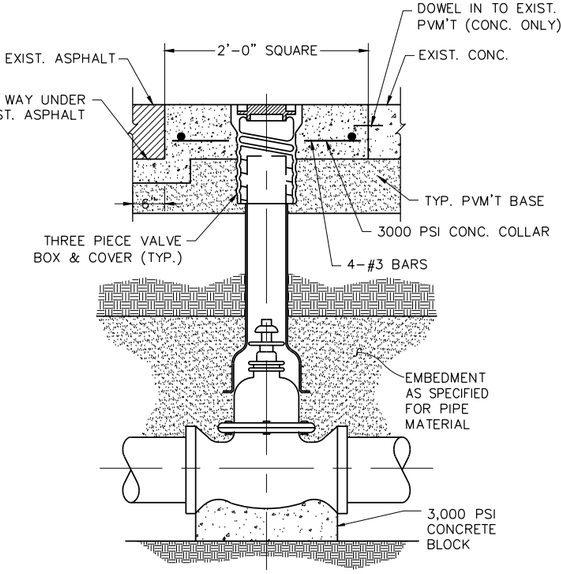
1. CONCRETE BLOCKING TO BE POURED TO UNDISTURBED SOIL.
2. PUMPER NOZZLE CAP TO BE NOT LESS THAN 18" NOR MORE THAN 36" BEHIND CURB.
3. WRAP ALL VALVES & FITTINGS WITH 3 MIL. POLYETHYLENE SHEET PLASTIC.
4. FIRE HYDRANT SHALL BE FACTORY PAINTED YELLOW.
5. ALL MECHANICAL JOINT CONNECTIONS SHALL BE MECHANICALLY RESTRAINED.
6. ALL PIPE SECTIONS SHALL BE A MINIMUM OF 10' IN LENGTH, UNLESS TOTAL LENGTH OF FIRE HYDRANT LEAD IS LESS THAN 10', OR UNLESS APPROVED OTHERWISE BY THE CITY.
7. BOLLARDS REQUIRED IN AREAS WHERE HYDRANT IS SUSCEPTIBLE TO VEHICULAR DAMAGE OR SPECIFIED ON THE PLANS.

1 — FIRE HYDRANT WITH PIPE BOLLARD PROTECTION

NOT TO SCALE JUNE 2016 W-FHI-BOL



UNPAVED AREAS



PAVED AREAS

NOTES:

1. THE VALVE AND JOINT ASSEMBLIES SHALL BE WRAPPED IN POLYETHYLENE ACCORDING TO AWWA C105.
2. THE JOINT TYPE SHALL BE MECHANICAL JOINT UNLESS OTHERWISE SPECIFIED IN THE PLANS.
3. GATE VALVE SHALL BE RESILIENT SEAT TYPE WITH A NON RISING STEM AND A 2-INCH SQUARE OPERATOR. RESILIENT SEAT GATE VALVE SHALL CONFORM TO AWWA C509.
4. A PERMANENTLY ATTACHED VALVE EXTENSION STEM SHALL BE REQUIRED FOR ANY VALVE WITH AN OPERATING NUT LOCATED IN EXCESS OF 3 FEET BELOW THE TOP OF VALVE BOX. THIS EXTENSION SHALL BE SUFFICIENT LENGTH TO ENSURE THAT ITS TOP IS WITHIN 3 FEET OF VALVE BOX LID.

2 — GATE VALVE INSTALLATION

NOT TO SCALE

Freese and Nichols, Inc.
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23 Oct 2017
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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
WATER & SANITARY SEWER DETAILS
FIRE HYDRANT & GATE VALVE DETAILS

F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED DCS
DRAWN SB
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FILE NAME CV-PPL-DT-DET01.dwg

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SEQ. 129

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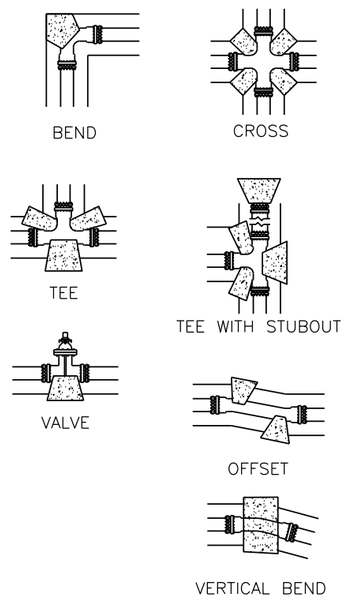
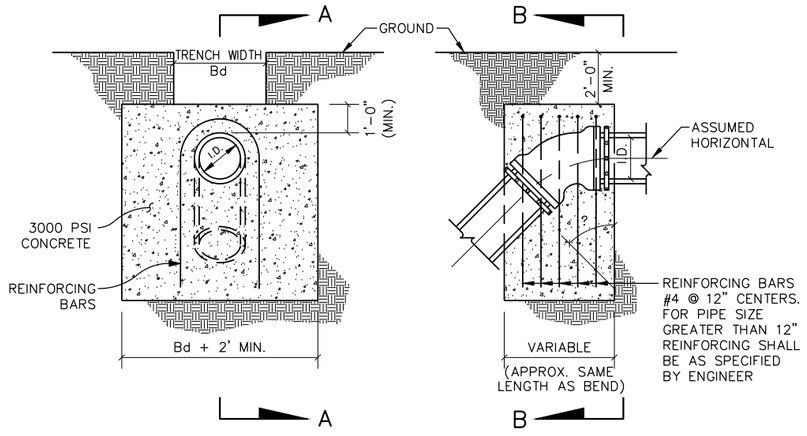


NOTES:

1. ALL MECHANICAL JOINT CONNECTIONS ON BENDS AND VALVES SHALL BE MECHANICALLY RESTRAINED AND CONCRETE BLOCKED AS SHOWN.
2. ALL CONCRETE SHALL BE 3,000 P.S.I.
3. ALL STUB OUT PIPE SECTIONS SHALL BE A MINIMUM OF 20' IN LENGTH UNLESS APPROVED OTHERWISE BY THE CITY
4. IF STUBOUT ENCOMPASSES MORE THAN ONE JOINT, BELL JOINT RESTRAINTS SHALL BE USED.
5. ALL DUCTILE IRON SHALL BE WRAPPED IN MINIMUM 3 MIL. POLY SHEETING

1 — THRUST BLOCKING
1"=10' JUNE 2016 W-TB-1



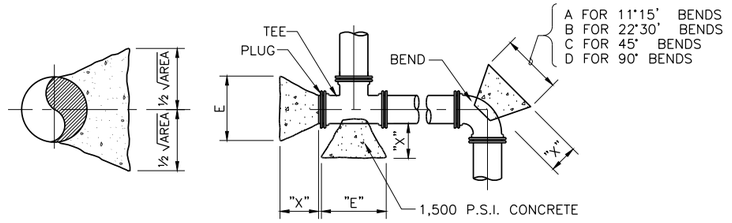
ELEVATION "B-B" SECTION "A-A"

VERTICAL THRUST BLOCK TABLE

△→	11.25°		22.50°		30.00°		45.00°		67.50°		90.00°		△←
I.D. (IN.)	THRUST (TONS)	VOL. (C.Y.)	THRUST (TONS)	VOL. (C.Y.)	THRUST (TONS)	VOL. (C.Y.)	THRUST (TONS)	VOL. (C.Y.)	THRUST (TONS)	VOL. (C.Y.)	THRUST (TONS)	VOL. (C.Y.)	I.D. (IN.)
4,6,8	1.0	0.5	2.0	1.0	2.5	1.3	3.6	1.8	4.6	2.3	5.0	2.5	4,6,8
10,12	2.2	1.1	4.3	2.2	5.7	2.8	8.0	4.0	10.5	5.2	11.3	5.7	10,12
24"	8.2	4.4	17.3	8.7	22.6	11.3	32.0	16.0	41.8	20.4	45.2	22.6	24

NOTES:
1. WRAP ALL BELOW GROUND IRON ASSEMBLIES IN POLYETHYLENE ACCORDING TO AWWA C105.
2. ALL TEES, BENDS, PLUGS, ETC. SHALL BE MECHANICALLY RESTRAINED BY MEGALUG OR APPROVED EQUAL.

2 — VERTICAL THRUST BLOCK
NOT TO SCALE



CONCRETE HORIZONTAL

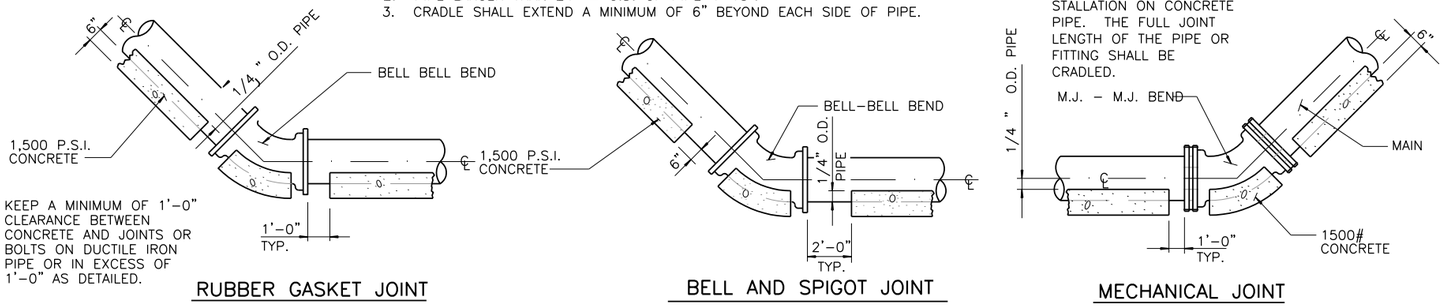
HORIZONTAL BLOCKING TABLE

PIPE SIZE	"X" FT.	11°15' "A" IN.	11°15' MIN. AREA FT.²	22°30' "B" IN.	22°30' MIN. AREA FT.²	45° "C" IN.	45° MIN. AREA FT.²	90° "D" IN.	90° MIN. AREA FT.²	TEE & PLUG "E" IN.	TEE & PLUG MIN. AREA FT.²
6"	1.0	9	1.04	13	2.07	18	4.05	24	7.49	20	10.59
8"	1.0	12	1.85	17	3.67	24	7.20	32	13.31	27	18.82
10"	1.0	15	2.88	21	5.74	29	11.25	40	20.79	34	29.41
12"	1.25	18	4.15	25	8.26	35	16.20	48	29.94	40	42.34
16"	1.5	24	7.38	34	14.68	47	28.81	64	53.23	54	75.28
20"	1.75	30	12	42	23.86	59	46.82	80	86.5	68	122.33
24"	2.0	36	16.60	50	33.04	71	64.82	96	119.77	81	169.38
30"	2.25	–	25.94	–	51.63	–	101.28	–	187.14	–	264.65
36"	2.75	–	37.36	–	74.35	–	145.83	–	269.47	–	381.09
42"	3.0	–	50.84	–	101.20	–	198.50	–	366.78	–	518.71

NOTES :
1. CONTRACTOR SHALL VERIFY ALL SOIL BEARING STRENGTHS.
2. BEARING AREAS SHOWN ARE BASED ON 150 P.S.I. TEST AND 2,000 P.S.F. SOIL BEARING VALUE.
3. THE EARTH BEARING SURFACE SHALL BE UNDISTURBED MATERIAL. KEEP ALL FITTINGS FREE FROM CONCRETE. THRUST BLOCKS ARE TO BE CONSTRUCTED OF 1,500 P.S.I. (28 DAY) CONCRETE AND PLACED AS SHOWN ON TYPICAL THRUST BLOCKING DETAIL.
4. ALL VALUES ARE MINIMUM. IF SOIL BEARING VALUE IS LESS THAN 2000 P.S.F., CONTRACTOR SHALL HAVE A TEXAS REGISTERED PROFESSIONAL ENGINEER DESIGN THE NECESSARY THRUST BLOCKING.
5. VERTICAL DIMENSION OF BLOCKING SHALL BE IDENTICAL TO THE APPLICABLE HORIZONTAL (A,B,D,C,E) DIMENSION AS LISTED IN TABLE, OR GREATER.
6. DIMENSION "X" MAY VARY IF NECESSARY TO PROVIDE BEARING AGAINST UNDISTURBED TRENCH WALL.

3 — HORIZONTAL BLOCKING DETAIL
NOT TO SCALE

NOTES: TRENCH WIDTH:
1. PIPE 24" I.D. AND SMALLER = 24" OR O.D. + 12" WHICHEVER IS GREATER.
2. PIPE LARGER THAN 24" = O.D. OF PIPE + 18".
3. CRADLE SHALL EXTEND A MINIMUM OF 6" BEYOND EACH SIDE OF PIPE.



4 — CRADLE DETAIL
NOT TO SCALE

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Freese and Nichols, Inc.
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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
WATER & SANITARY SEWER DETAILS

WATER LINE BLOCKING DETAILS

NO.	ISSUE	BY	DATE

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DATE OCT 2017
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0" 1"

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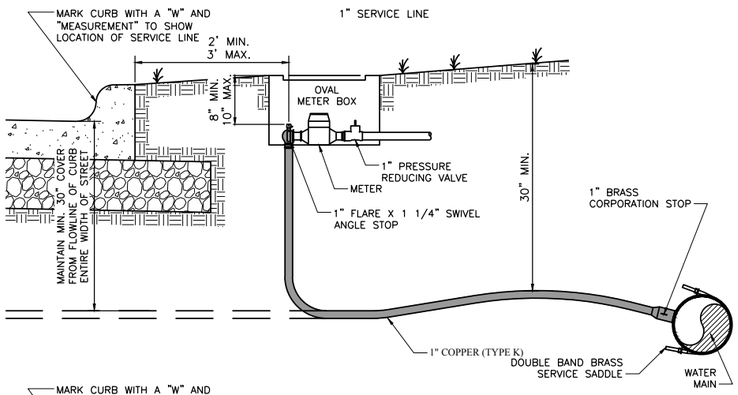
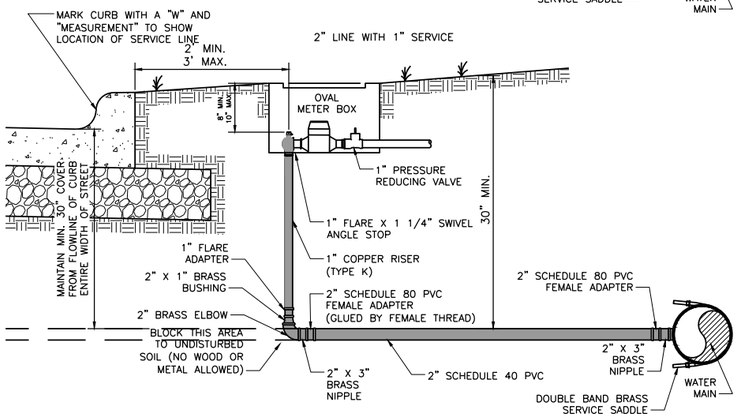


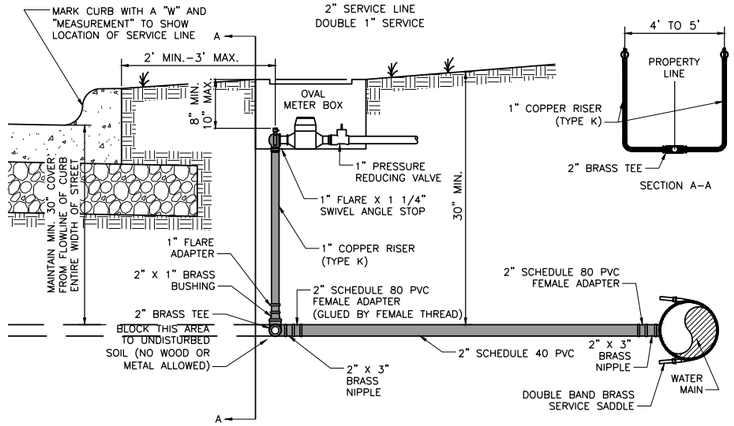


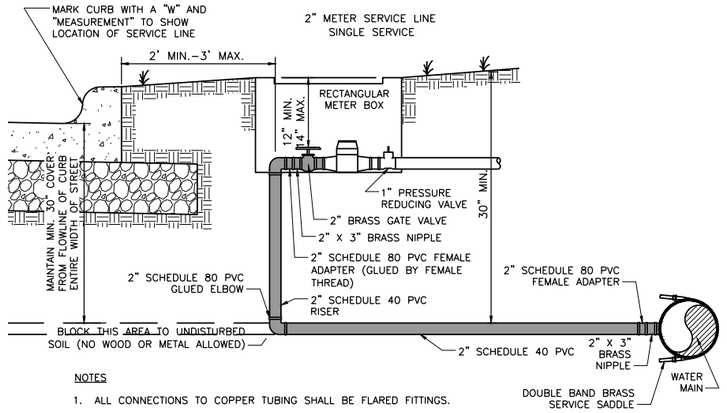
NOTES

1. ALL CONNECTIONS TO COPPER TUBING SHALL BE FLARED FITTINGS.
2. ALL PVC FITTINGS SHALL BE SCHEDULE 80 WITH GLUED JOINTS.
3. ANY BUSHINGS REQUIRED SHALL BE BRASS WITH NEOPRENE GASKET.
4. ANGLE STOP SHALL BE LOCATED BETWEEN 2' AND 5' FROM BACK OF CURB.

1 — 1" WATER SERVICE LINE

1 1/2"=1'-0" JUNE 2016 W-SL-1





NOTES

1. ALL CONNECTIONS TO COPPER TUBING SHALL BE FLARED FITTINGS.
2. ALL PVC FITTINGS SHALL BE SCHEDULE 80 WITH GLUED JOINTS.
3. ANY BUSHINGS REQUIRED SHALL BE BRASS WITH NEOPRENE GASKET.
4. ANGLE STOP SHALL BE LOCATED BETWEEN 2' AND 5' FROM BACK OF CURB.

2 — 2" SERVICE LINE

1 1/2"=1'-0" JUNE 2016 W-SL-2

NOTES:

- 0.75– TO 1–INCH: WATTS COMPANY, MODEL LFN45B–EZ
- 0.5– TO 0.75–INCH: WATTS COMPANY, MODEL LF123LP
- 1.5– TO 3–INCH: WATTS COMPANY, MODEL 127SS

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
WATER & SANITARY SEWER DETAILS
WATER SERVICE DETAILS

F&N JOB NO.	SAN16188
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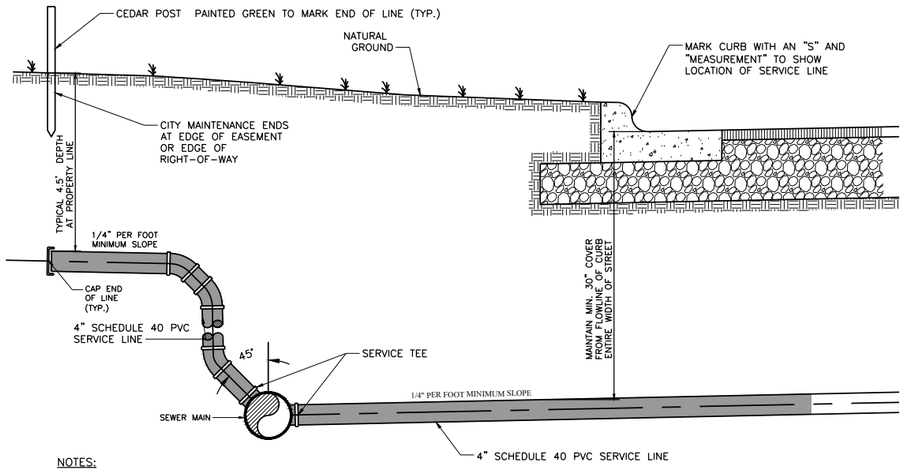

NOTES:

1. SEWER SERVICE LINES SHALL BE MINIMUM 4" SCHEDULE 40 PVC WITH GLUED JOINTS.
2. SERVICE LINE PIPE SHALL BE STANDARD 20' JOINTS, UNLESS TOTAL LENGTH OF SERVICE LINE IS LESS THAN 10', OR UNLESS APPROVED OTHERWISE BY THE CITY OF SAN ANGELO.
3. SERVICE LINE BENDS AND WYES SHALL BE SWEPT. MAXIMUM ALLOWABLE BEND FITTINGS SHALL BE 45°.
4. SEWER SERVICES WITH LESS THAN 30" OF COVER FROM THE FLOWLINE OF CURB ON THE SHALLOWER SIDE OF THE STREET SHALL BE INSTALLED WITH A CONCRETE CAP ACROSS THE ENTIRE WIDTH OF STREET.
5. SEWER SERVICE WITH LESS THAN 24" OF COVER FROM THE FLOWLINE OF CURB REQUIRE CITY OF SAN ANGELO APPROVAL.

1/– 4" SEWER SERVICE LINE

1"=10' JUNE 2016 W-SA-SL-1

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

STATE OF TEXAS
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23 Oct 2017

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CITY OF SAN ANGELO, TEXAS
PHASE I

BELL ST. ROADWAY & UTILITY IMPROVEMENTS

WATER & SANITARY SEWER DETAILS

WASTEWATER SERVICE DETAILS

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SEQ. 132

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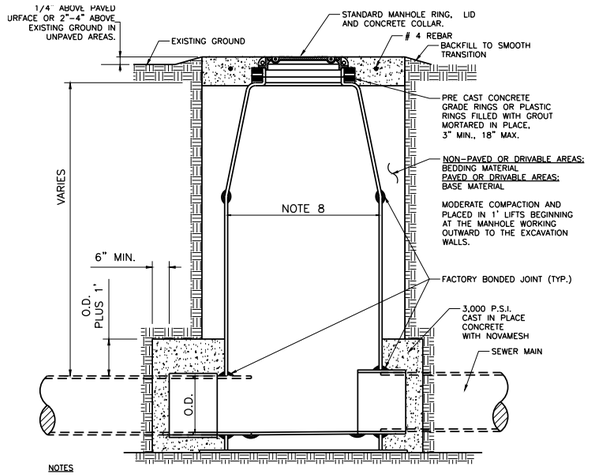
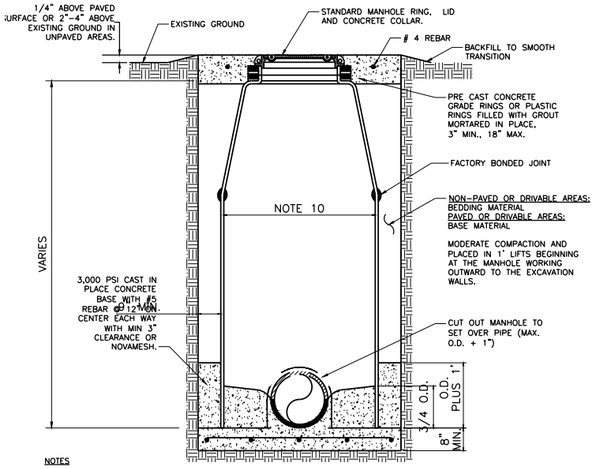


NOTES

1. CONTRACTOR SHALL VERIFY MANHOLE DEPTHS, INLET AND OUTLET ELEVATIONS.
2. MANHOLE FLOOR SHALL BE FACTORY INSTALLED INTEGRAL FIBERGLASS BENCH AND INVERT AREA. CONCRETE IS NOT ALLOWED.
3. ALL INLETS AND OUTLETS SHALL BE BONDED INTO THE MANHOLE RISER BY THE MANUFACTURER.
4. CONCRETE SHALL BE PLACED A MINIMUM OF 6" BEYOND AND 1' ABOVE ALL CONNECTIONS.
5. MANHOLES SHALL BE STUBBED OUT WITH SUITABLE SIZE PIPE WHEREVER FUTURE EXTENSION OF THE SEWER IS ANTICIPATED.
6. STUB-OUTS SHALL EXTEND BEYOND THE EDGE OF EXISTING OR PROPOSED PAVING.
7. MANHOLES LOCATED WITHIN A 100-YEAR FLOOD PLAIN OR ANY AREA SUBJECT TO STORMWATER INFILTRATION SHALL INCORPORATE A WATERTIGHT, BOLT-DOWN RING AND LID AND AN INFLOW PREVENTION DEVICES (IPDs).
8. MANHOLE SPACING, DIAMETER AND DEPTHS SHALL BE AS FOLLOWS:
9. MINIMUM ELEVATION DIFFERENCE ACROSS MANHOLE INVERTS SHALL BE AS FOLLOWS:

PIPE DIAMETER	MANHOLE DEPTH	MANHOLE DIAMETER	MAX. SPACING BETWEEN MANHOLES
15" OR SMALLER	0-16'	48"	500'
15" OR SMALLER	OVER 16'	60"	500'
OVER 15"	ALL DEPTHS	60"	800'

1 — FIBERGLASS MANHOLE – TYPE A
1"=10' JUNE 2016 W-SA-MH-A



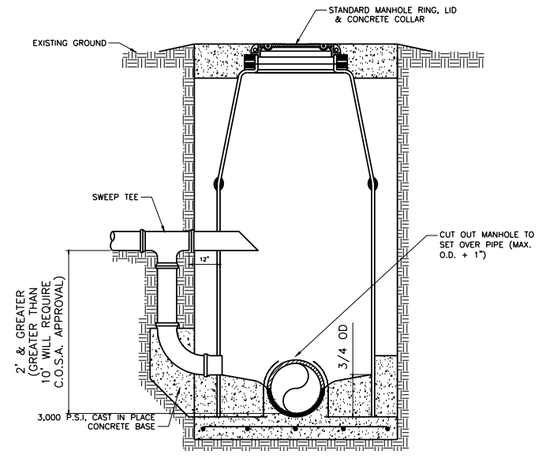
NOTES

1. CONTRACTOR SHALL VERIFY MANHOLE DEPTHS, INLET AND OUTLET ELEVATIONS.
2. MANHOLE CUTOUT TO BE MADE AT TIME OF INSTALLATION.
3. CONCRETE BASE TO BE POURED IN PLACE IN TRENCH AND MANHOLE TO BE INSTALLED BY INSERTING INTO WET CONCRETE BASE.
4. FLOW LINE INVERT MAY BE CHANNEL FORMED IN CONCRETE FLOOR OR PIPE SECTION WITH TOP CUT OUT.
5. SEAL CONCRETE TO PIPE WITH ELASTOMERIC GASKET SEAL.
6. CONCRETE SHALL BE PLACED A MINIMUM OF 6" BEYOND AND 1' ABOVE ALL CONNECTIONS.
7. MANHOLES SHALL BE STUBBED OUT WITH SUITABLE SIZE PIPE WHEREVER FUTURE EXTENSION OF THE SEWER IS ANTICIPATED.
8. STUB-OUTS SHALL EXTEND BEYOND THE EDGE OF EXISTING OR PROPOSED PAVING.
9. MANHOLES LOCATED WITHIN A 100-YEAR FLOOD PLAIN OR ANY AREA SUBJECT TO STORMWATER INFILTRATION SHALL INCORPORATE A WATERTIGHT, BOLT-DOWN RING AND LID AND AN INFLOW PREVENTION DEVISES (IPDs).
10. MANHOLE SPACING, DIAMETER AND DEPTH SHALL BE AS FOLLOWS:
11. MINIMUM ELEVATION DIFFERENCE ACROSS MANHOLE INVERTS SHALL BE AS FOLLOWS:

PIPE DIAMETER	MANHOLE DEPTH	MANHOLE DIAMETER	MAX. SPACING BETWEEN MANHOLES
15" OR SMALLER	0-16'	48"	500'
15" OR SMALLER	OVER 16'	60"	500'
OVER 15"	ALL DEPTHS	60"	800'

DEFLECTION ANGLE BETWEEN INLET / OUTLET	MIN. ELEVATION DIFFERENCE
LESS THAN 30°	0.10'
GREATER THAN 30°	0.20'

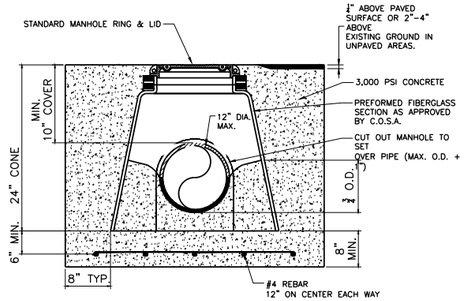
2 — FIBERGLASS MANHOLE – TYPE B
1"=10' JUNE 2016 W-SA-MH-B



NOTES

1. CONSTRUCTION OF THE DROP MANHOLE IS IDENTICAL WITH THE STANDARD MANHOLES A, B AND PRECAST CONCRETE MANHOLE IN EVERY RESPECT EXCEPT THE METHOD OF ENTRANCE OF THE SEWAGE FROM THE LATERALS SHALL BE CONSTRUCTED AS SHOWN ABOVE.
2. WHEN ENTERING AN EXISTING MANHOLE WITH A NEW LINE AND THE DIFFERENCE IN ELEVATION OF THE TWO INVERTS EXCEEDS 2' THE METHOD OF ENTRANCE SHALL BE AS ABOVE.
3. BACKFILL SHALL BE COMPACTED IN 6" HORIZONTAL LAYERS MINIMUM DENSITY 95% MODIFIED PROCTOR.

3 — DROP MANHOLE
1"=10' JUNE 2016 W-SA-MH-D

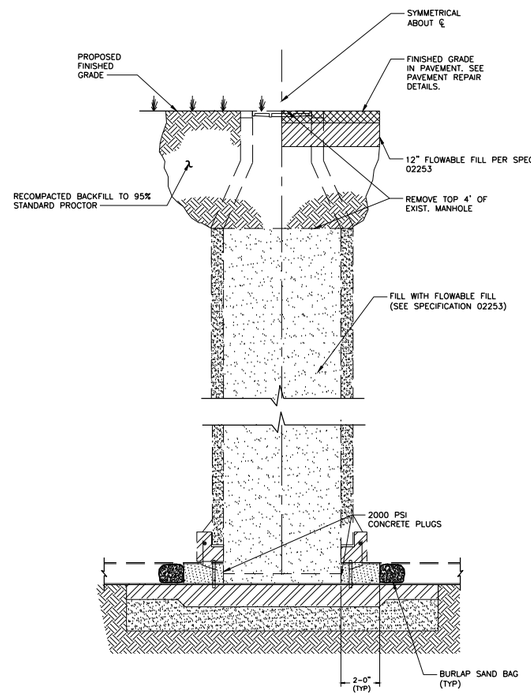


NOTES

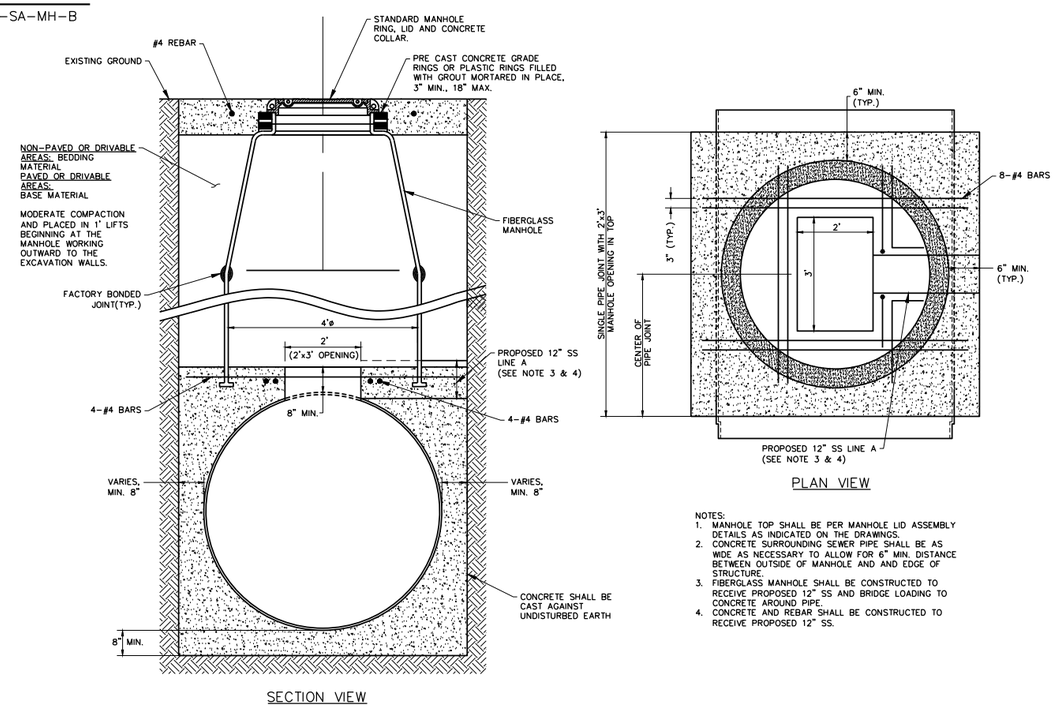
1. DETAIL IS APPLICABLE FOR COVER LESS THAN 30" BUT A MINIMUM OF 10" AND FOR MAINS 12" OR SMALLER.
2. MANHOLES LOCATED WITHIN A 100-YEAR FLOOD PLAIN OR ANY AREA SUBJECT TO STORMWATER INFILTRATION SHALL INCORPORATE A WATERTIGHT, BOLT-DOWN RING AND LID AND AN INFLOW PREVENTION DEVICES (IPDs).
3. MINIMUM ELEVATION DIFFERENCE ACROSS MANHOLE INVERTS SHALL BE AS FOLLOWS:
4. THIS IS A NONE TRAFFIC RATED MANHOLE AND APPROVED ON A CASE BY CASE BASIS BY C.O.S.A. PRIOR TO CONSTRUCTION.

DEFLECTION ANGLE BETWEEN INLET / OUTLET	MIN. ELEVATION DIFFERENCE
LESS THAN 30°	0.10'
GREATER THAN 30°	0.20'

4 — SHALLOW MANHOLE
1"=10' JUNE 2016 W-SA-MH-S



5 — MANHOLE ABANDONMENT DETAIL
NOT TO SCALE



NOTES:
1. MANHOLE TOP SHALL BE PER MANHOLE LID ASSEMBLY DETAILS AS INDICATED ON THE DRAWINGS.
2. CONCRETE SURROUNDING SEWER PIPE SHALL BE AS WIDE AS NECESSARY TO ALLOW FOR 6" MIN. DISTANCE BETWEEN OUTSIDE OF MANHOLE AND AND EDGE OF STRUCTURE.
3. FIBERGLASS MANHOLE SHALL BE CONSTRUCTED TO RECEIVE PROPOSED 12" SS AND BRIDGE LOADING TO CONCRETE AROUND PIPE.
4. CONCRETE AND REBAR SHALL BE CONSTRUCTED TO RECEIVE PROPOSED 12" SS.

6 — MANHOLE FOR CORRECTION TO EXISTING 48" SS MAIN
NOT TO SCALE

100% SUBMITTAL

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

STATE OF TEXAS
AARON B. CONINE
109794
LICENSED PROFESSIONAL ENGINEER
23 Oct 2017

FREESE NICHOLS
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Fort Worth, Texas 76109-4895
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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
WATER & SANITARY SEWER DETAILS

MANHOLE DETAILS

NO.	ISSUE	BY	DATE

F&N JOB NO.	SAN16188
DATE	OCT 2017
DESIGNED	DCS
DRAWN	SB
REVISED	
CHECKED	DCS
FILE NAME	CV-PPL-DT-DET01.dwg

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

SHEET DT-7
SEQ. 133

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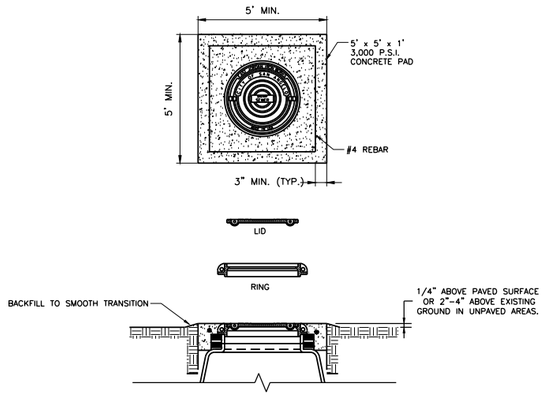
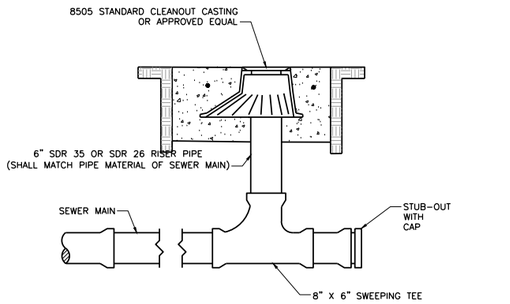


NOTES:

1. MANHOLE RING (V-1420) & LID (V-1430) SHALL BE EAST JORDAN IRON WORKS OR APPROVED EQUAL WITH "CITY OF SAN ANGELO" CUSTOM LETTERING.
2. WATER TIGHT, BOLT-DOWN SPECIFIED RING (V-1420) & LID (V-1430) SHALL BE EAST JORDAN IRON WORKS OR APPROVED EQUAL WITH AN INFLOW PREVENTION DEVICE (IPD).
3. MANHOLE RING & LID SHALL BE MACHINE FITTED WITH TWO (2) PICK BAR SLOTS.
4. MANHOLE RING AND COVER SHALL BE CAST IRON, MEETING THE LATEST REVISION OF ASTM A-48 CLASS 30 WITH A HIGHWAY LOAD RATING OF H-20.
5. MANHOLES LOCATED WITHIN A 100-YEAR FLOOD PLAIN OR ANY AREA SUBJECT TO STORMWATER INFILTRATION SHALL INCORPORATE A WATERTIGHT, BOLT-DOWN RING AND LID AND AN INFLOW PREVENTION DEVICES (IPDs).
6. MANHOLES LOCATED WITHIN UNDEVELOPED AREAS, AGRICULTURAL FIELDS, OR ANY AREA SUBJECT TO BEING OVERGROWN OR OTHERWISE OBSCURED SHALL INCORPORATE A BOLLARD AT EACH CORNER OF THE CONCRETE COLLAR, FOUR (4) TOTAL.

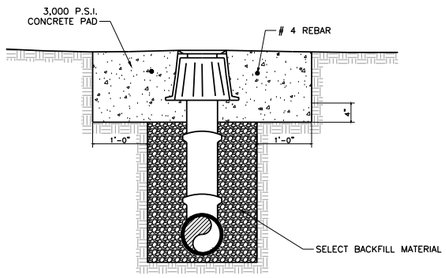
1 – SEWER MANHOLE RING & LID WITH CONCRETE COLLAR

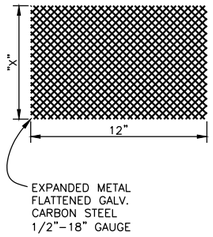
NOT TO SCALE JUNE 2016 W-SA-LID



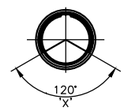
2 – SEWER MAIN CLEANOUT

NOT TO SCALE JUNE 2016 W-SA-CO



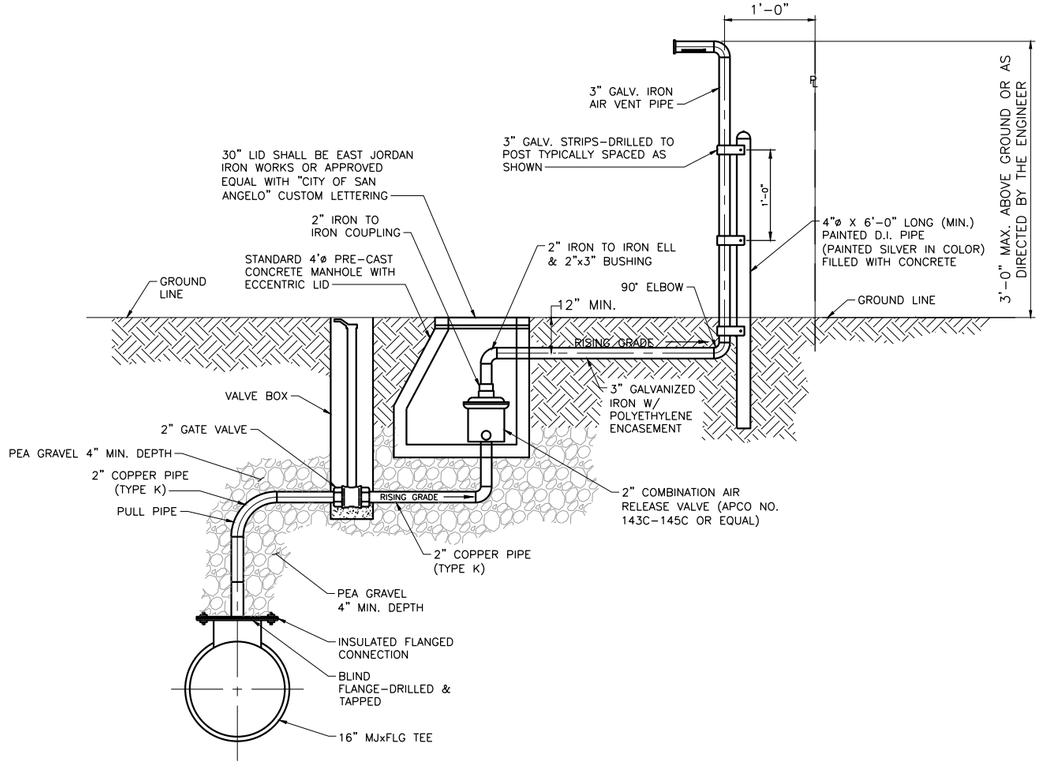


NOTE: EXPANDED METAL PIPE SHALL BE TACK WELDED



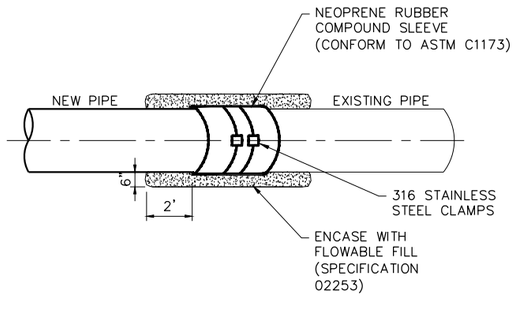
SECTION A-A

DETAIL "A"
NOT TO SCALE



3 – COMBINATION AIR & VACUUM RELEASE VALVE AND METER BOX DETAIL

NOT TO SCALE



4 – SANITARY SEWER SLEEVE DETAIL

NOT TO SCALE

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

STATE OF TEXAS
DANIEL STOUTENBURG JR.
99271
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23 Oct 2017

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
WATER & SANITARY SEWER DETAILS
MISCELLANEOUS WASTEWATER DETAILS

F&N JOB NO.	SAN16188		
DATE	OCT 2017		
DESIGNED	DCS		
DRAWN	SB		
REVISED			
CHECKED	DCS		
FILE NAME	CV-PPL-DT-DET01.dwg		

NO.	ISSUE	BY	DATE

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0" 1"

SHEET DT-8
SEQ. 134

100% SUBMITTAL

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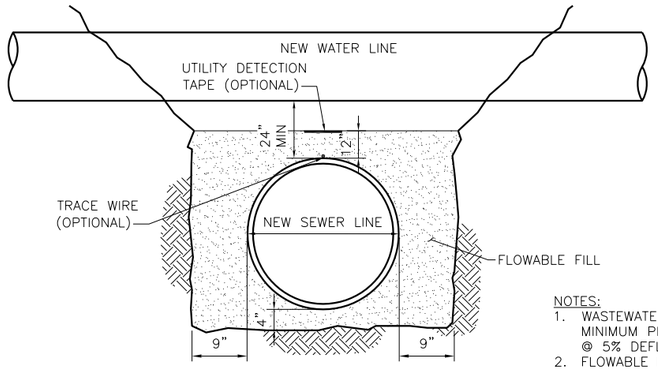
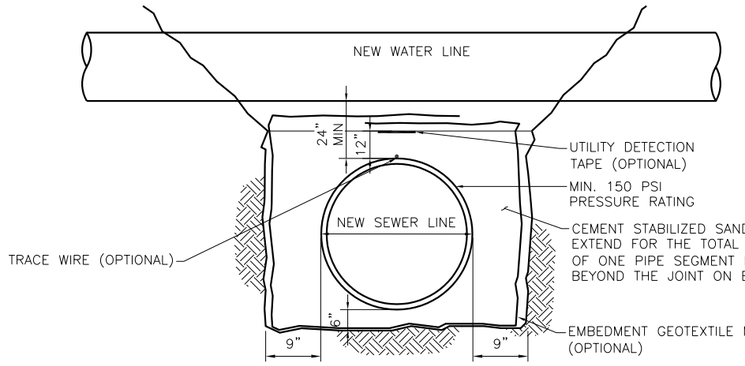


NOTES:
1. WASTEWATER PIPE SHALL HAVE A MINIMUM PIPE STIFFNESS OF 115 PSI @ 5% DEFLECTION.
2. FLOWABLE FILL SHALL EXTEND FOR THE TOTAL LENGTH OF ONE JOINT PLUS 12" BEYOND EACH JOINT END.
3. REFER TO TCEQ 290.44.(E).(4).(B).(iii) FOR MORE INFORMATION.

1 – NEW WATER LINE CROSSING OVER NEW, NON-PRESSURE RATED WASTEWATER MAIN (STD. LENGTH OF PIPE > 18') DETAIL

NOT TO SCALE

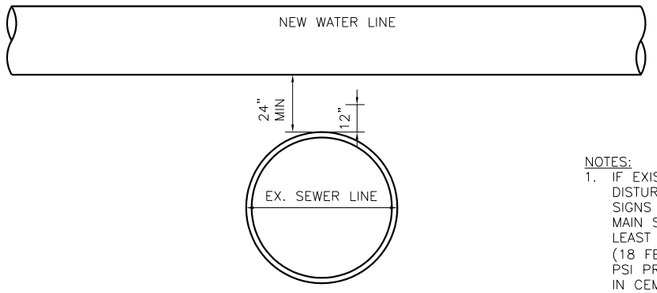
AGGREGATE FILL TABLE				
RCP & RCCP (ALL SIZES)	CI, DI & CORRUGATED METAL PIPE (ALL SIZES)	NON-REINFORCED CONCRETE, VC, PVC & CENTRIFUGALLY CAST FIBERGLASS REINFORCED MORTAR PIPE		
		18" & SMALLER WATER LINE	ALL SEWER SIZES	24" & LARGER WATER LINE
CLASS 2	CLASS 3	CLASS 10	CLASS 3	CLASS 3



NOTES:
1. CEMENT STABILIZED SAND SHALL HAVE A MINIMUM OF 10% CEMENT PER CUBIC YARD OF CEMENT STABILIZED SAND MIXTURE, BASED ON LOOSE DRY WEIGHT VOLUME.
2. REFER TO TCEQ 290.44.(E).(4).(B).(iii) FOR MORE INFORMATION.

2 – NEW WATER LINE CROSSING OVER NEW, NON-PRESSURE RATED WASTEWATER MAIN (STD. LENGTH OF PIPE < 18') DETAIL

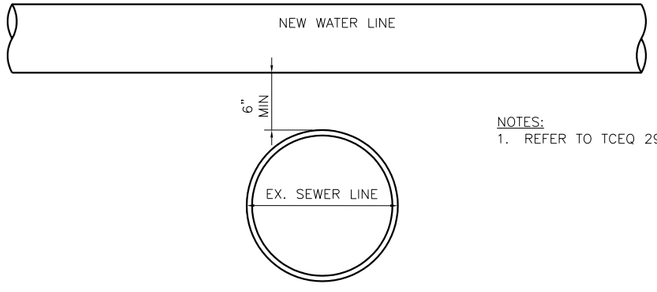
NOT TO SCALE



NOTES:
1. IF EXISTING WASTEWATER MAIN IS DISTURBED WHEN CROSSING OR SHOW SIGNS OF LEAKING, THE WASTEWATER MAIN SHALL BE REPLACED FOR AT LEAST NINE FEET IN BOTH DIRECTIONS (18 FEET TOTAL) WITH AT LEAST 150 PSI PRESSURE-RATED PIPE EMBEDDED IN CEMENT STABILIZED SAND.
2. REFER TO TCEQ 290.44.(E).(4).(B).(i).

3 – NEW WATER LINE CROSSING OVER EXISTING, NON-PRESSURE RATED WASTEWATER MAIN DETAIL

NOT TO SCALE



NOTES:
1. REFER TO TCEQ 290.44.(E).(4).(B).(i).(II).

5 – NEW WATER LINE CROSSING OVER EXISTING, PRESSURE RATED WASTEWATER MAIN DETAIL

NOT TO SCALE

Freese and Nichols, Inc.
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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
CIVIL
CROSSING DETAIL I

F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED
CHECKED DGS
FILE NAME CV-PPL-DT-DET01.dwg

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SEQ. 135

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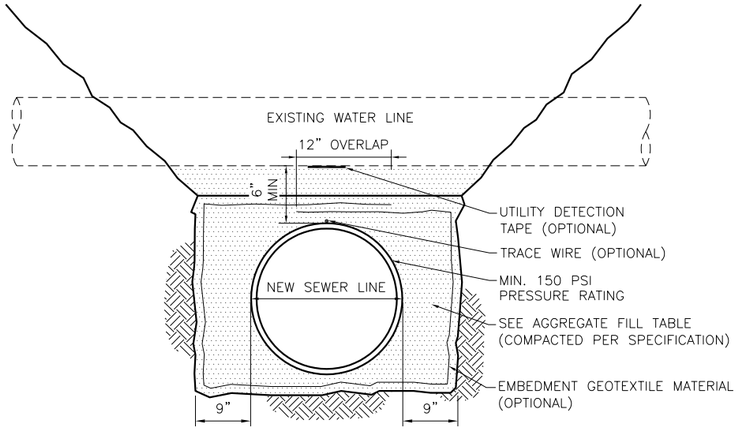
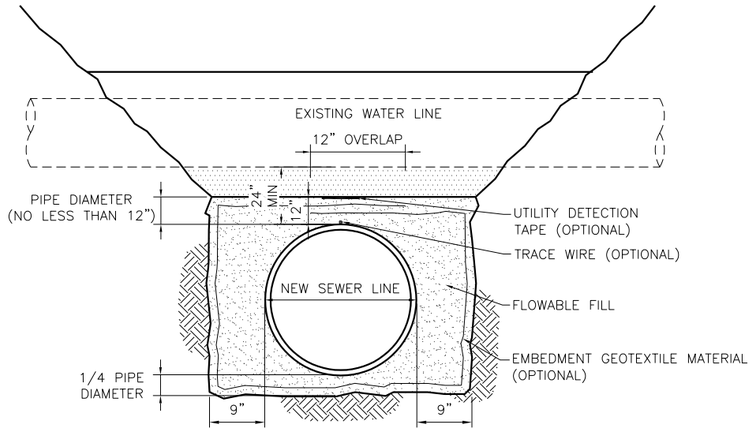


AGGREGATE FILL TABLE				
RCP & RCCP (ALL SIZES)	CI, DI & CORRUGATED METAL PIPE (ALL SIZES)	NON-REINFORCED CONCRETE, VC, PVC & CENTRIFUGALLY CAST FIBERGLASS REINFORCED MORTAR PIPE		
CLASS 2	CLASS 3	18" & SMALLER WATER LINE	ALL SEWER SIZES	24" & LARGER WATER LINE
		CLASS 10	CLASS 3	CLASS 3

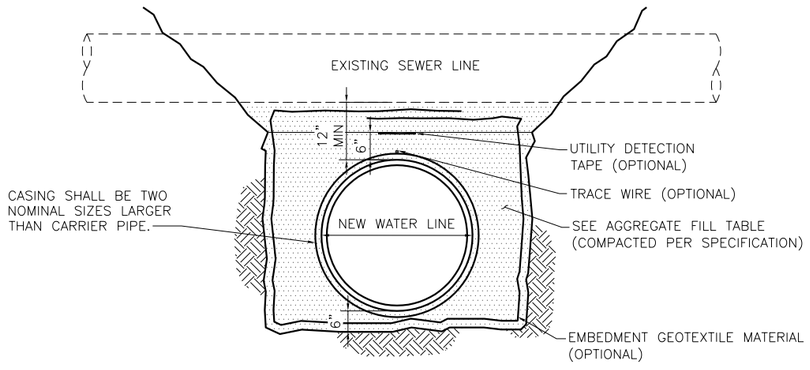
1 — EXISTING WATER OVER NEW PRESSURE RATED WASTEWATER MAIN DETAIL

NOT TO SCALE



2 — EXISTING WATER OVER NEW NON-PRESSURE RATED WASTEWATER MAIN DETAIL

NOT TO SCALE

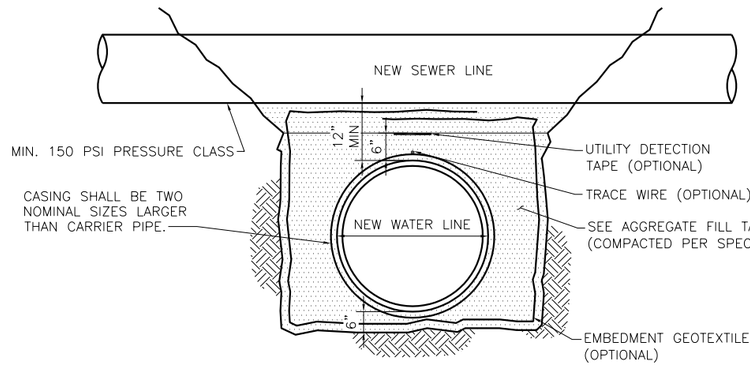


NOTES:
1. CASING SHALL BE AN 18' OR LONGER SECTION OF PIPE.
2. EACH END OF THE CASING SHALL BE SEALED WITH WATERTIGHT NON-SHRINK CEMENT GROUT OR A MANUFACTURERS WATERTIGHT SEAL.
3. SPACERS SHALL BE PLACED AT 5' OR LESS INTERVALS OR CASING SHALL BE FILLED TO THE SPRING LINE WITH WASHED SAND.
4. IF WATER LINE IS CONSTRUCTED OF DUCTILE IRON OR STEEL PIPE WITH MECHANICAL OR WELDED JOINTS THEN CASING IS NOT REQUIRED.
5. BOTH THE WATER LINE AND WASTE WATER LINE MUST PASS A PRESSURE AND LEAKAGE TEST AS SPECIFIED IN AWWA-C600.
6. REFER TO TCEQ 290.44.(E).(4).(B).(II).(iii)

AGGREGATE FILL TABLE				
RCP & RCCP (ALL SIZES)	CI, DI & CORRUGATED METAL PIPE (ALL SIZES)	NON-REINFORCED CONCRETE, VC, PVC & CENTRIFUGALLY CAST FIBERGLASS REINFORCED MORTAR PIPE		
CLASS 2	CLASS 3	18" & SMALLER WATER LINE	ALL SEWER SIZES	24" & LARGER WATER LINE
		CLASS 10	CLASS 3	CLASS 3

3 — EXISTING WASTEWATER MAIN CROSSING OVER NEW WATER LINE DETAIL

NOT TO SCALE



NOTES:
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6. REFER TO TCEQ 290.44.(E).(4).(B).(II).(iii)

AGGREGATE FILL TABLE				
RCP & RCCP (ALL SIZES)	CI, DI & CORRUGATED METAL PIPE (ALL SIZES)	NON-REINFORCED CONCRETE, VC, PVC & CENTRIFUGALLY CAST FIBERGLASS REINFORCED MORTAR PIPE		
CLASS 2	CLASS 3	18" & SMALLER WATER LINE	ALL SEWER SIZES	24" & LARGER WATER LINE
		CLASS 10	CLASS 3	CLASS 3

4 — NEW PRESSURE RATED WASTEWATER MAIN CROSSING OVER NEW WATER LINE DETAIL

NOT TO SCALE

Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144
STATE OF TEXAS
DANIEL STOUTENBURG
99271
LICENSED
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23 Oct 2017

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL ST. ROADWAY & UTILITY IMPROVEMENTS
CIVIL
CASING DETAIL II

NO.	ISSUE	BY	DATE

F&N JOB NO. SAN16188
DATE OCT 2017
DESIGNED ABC
DRAWN SB
REVISED -
CHECKED DCS
FILE NAME CV-PPL-DT-DET01.dwg

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SEQ. 136

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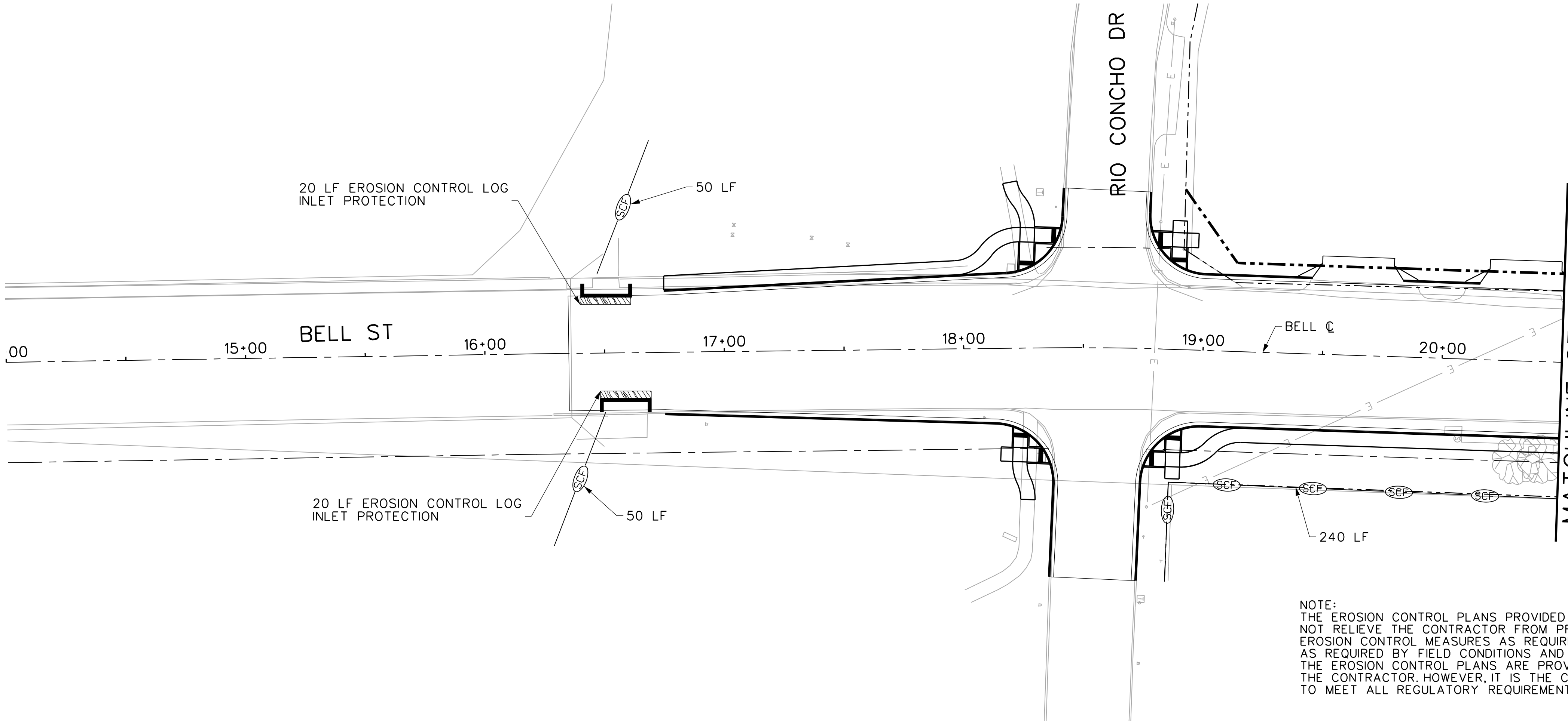

NOTE:
THE EROSION CONTROL PLANS PROVIDED IN THE PLAN SET DOES NOT RELIEVE THE CONTRACTOR FROM PROVIDING ADDITIONAL EROSION CONTROL MEASURES AS REQUIRED BY THE SWPPP OR AS REQUIRED BY FIELD CONDITIONS AND DIRECTED BY THE CITY. THE EROSION CONTROL PLANS ARE PROVIDED AS A COURTESY TO THE CONTRACTOR. HOWEVER, IT IS THE CONTRACTORS RESPONSIBILITY TO MEET ALL REGULATORY REQUIREMENTS FOR EROSION CONTROL.

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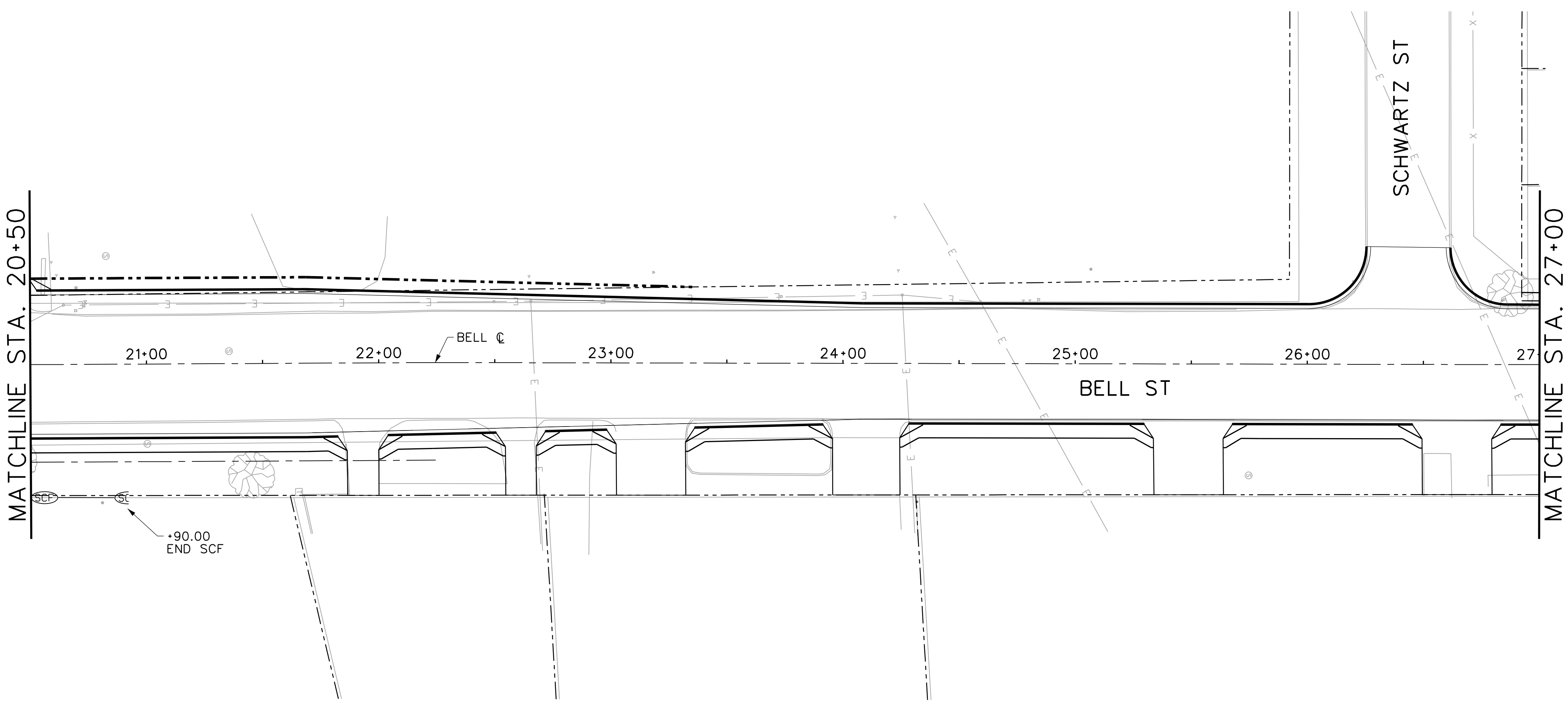

LEGEND

SCF — SEDIMENT CONTROL FENCE

N

0 10' 20' 30' 60'
SCALE IN FEET

FREESE AND NICHOLS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-2144

STATE OF TEXAS
WAYNE P. HART
118231
LICENSED
PROFESSIONAL ENGINEER

10/23/2017

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4055 International Plaza, Suite 200
Fort Worth, Texas 76109-4895
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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL STREET ROADWAY AND UTILITIES IMPROVEMENTS
EROSION CONTROL
EROSION PLAN
BEGIN TO STA. 27+00

F&N JOB NO.	SAN16188
DATE	07/2017
DESIGNED	JWP
DRAWN	EB
REVISED	
CHECKED	WH
FILE NAME	ph1-trt-pl-eros01.dgn

NO.	ISSUES	BY	DATE

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0 1"

SHEET
EP-01
SEQ.
137

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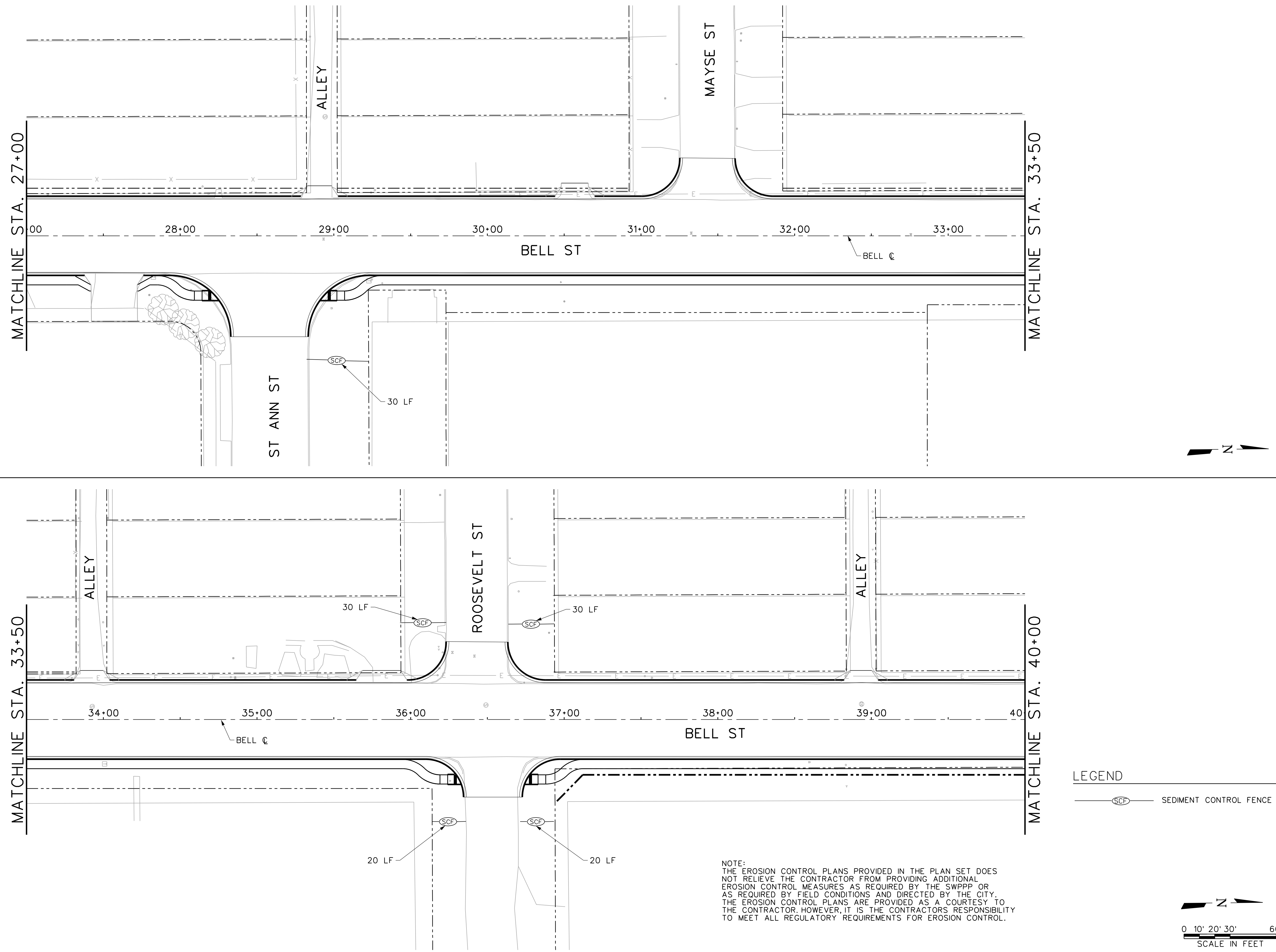

LEGEND

SCF — SEDIMENT CONTROL FENCE

NOTE:
THE EROSION CONTROL PLANS PROVIDED IN THE PLAN SET DOES NOT RELIEVE THE CONTRACTOR FROM PROVIDING ADDITIONAL EROSION CONTROL MEASURES AS REQUIRED BY THE SWPPP OR AS REQUIRED BY FIELD CONDITIONS AND DIRECTED BY THE CITY. THE EROSION CONTROL PLANS ARE PROVIDED AS A COURTESY TO THE CONTRACTOR. HOWEVER, IT IS THE CONTRACTORS RESPONSIBILITY TO MEET ALL REGULATORY REQUIREMENTS FOR EROSION CONTROL.

FREESE AND NICHOLS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-2144

STATE OF TEXAS — WAYNE P. HARTT — 118231 — LICENSED PROFESSIONAL ENGINEER

10/23/2017

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL STREET ROADWAY AND UTILITIES IMPROVEMENTS

EROSION CONTROL
EROSION PLAN
STA. 27+00 TO STA. 40+00

NO.	ISSUES	BY	DATE

F&N JOB NO.	SAN16188
DATE	04/2017
DESIGNED	JWP
DRAWN	EB
REVISED	
CHECKED	WH
FILE NAME	ph1-trt-pl-eros02.dgn

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SHEET EP-02

SEQ. 138

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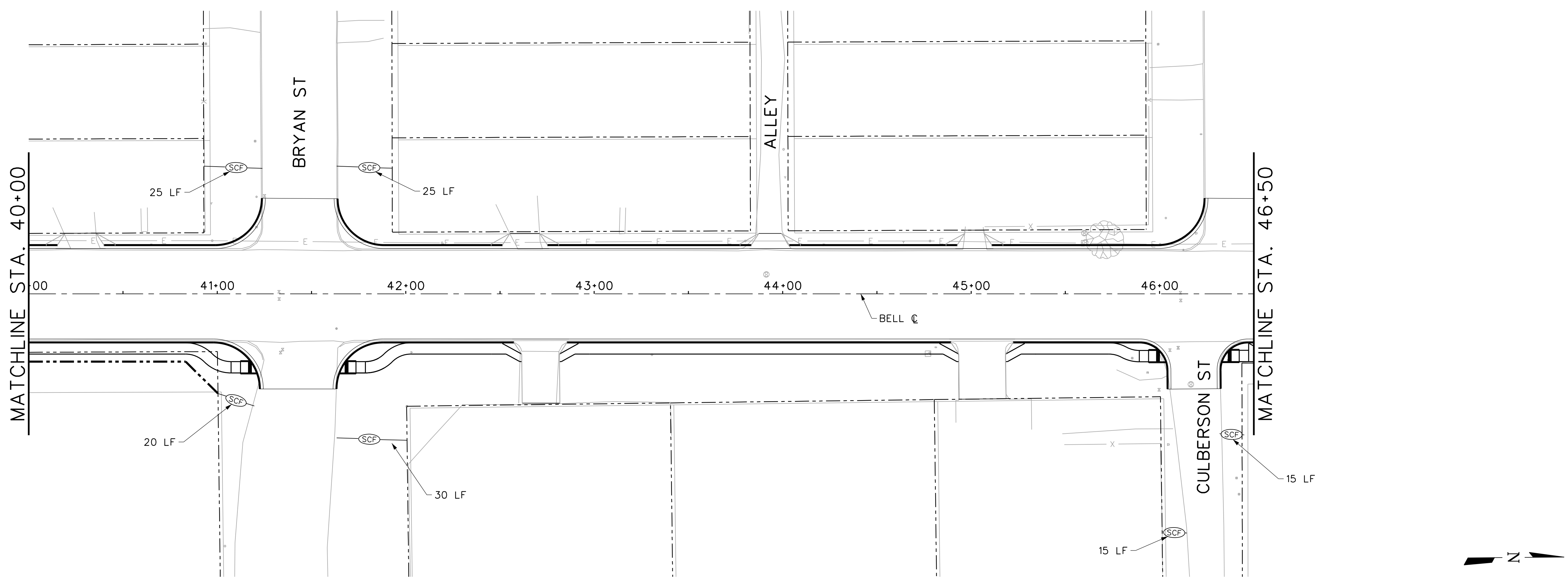

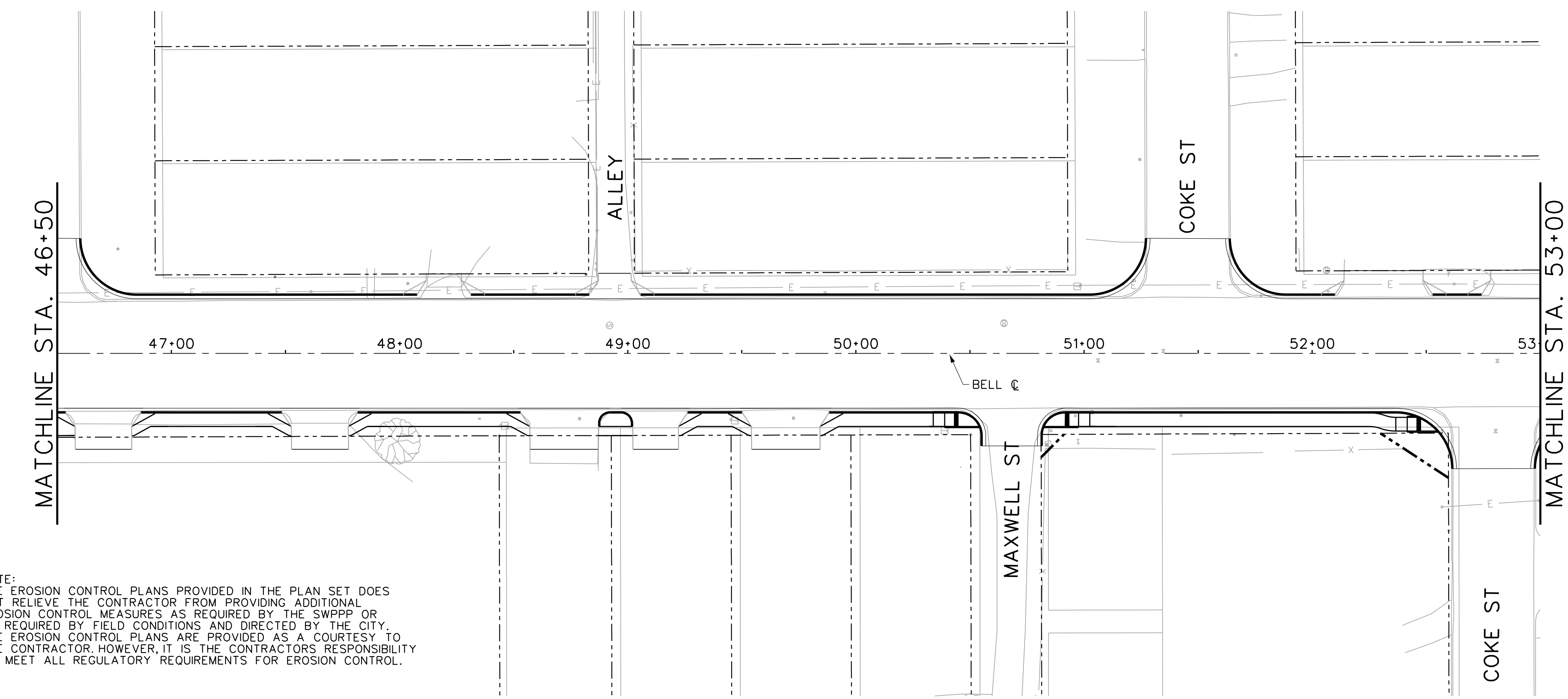

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LEGEND

SCF — SEDIMENT CONTROL FENCE

0 10' 20' 30' 60'
SCALE IN FEET

FREESE AND NICHOLS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-2144

STATE OF TEXAS
WAYNE P. HARTT
118231
LICENSED PROFESSIONAL ENGINEER
10/23/2017

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL STREET ROADWAY AND UTILITIES IMPROVEMENTS
EROSION CONTROL
EROSION PLAN
STA. 40+00 TO STA. 53+00

NO.	ISSUES	BY	DATE

F&N JOB NO.	SAN16188
DATE	04/2017
DESIGNED	JWP
DRAWN	EB
REVISED	
CHECKED	WH
FILE NAME	ph1-trt-pl-eros03.dgn

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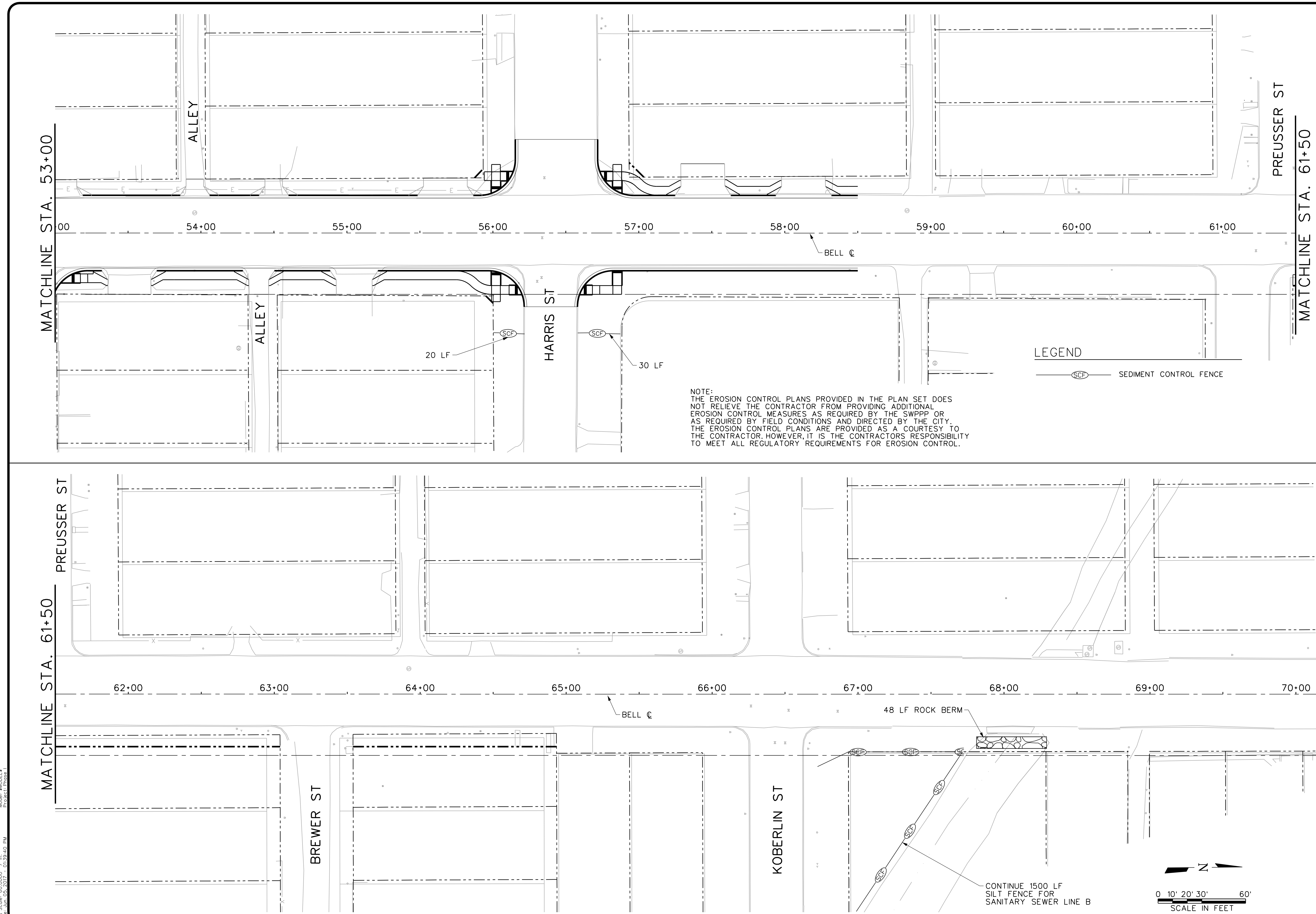
0 1"

SHEET
EP-03
SEQ.
139



FREESE AND NICHOLS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-2144

STATE OF TEXAS
WAYNE P. HARTT
118231
LICENSED
PROFESSIONAL ENGINEER

10/23/2017

FREESE NICHOLS
4055 International Plaza, Suite 200
Fort Worth, Texas 76109-4895
Phone - (817) 735-7300
Fax - (817) 735-7491
Web - www.freese.com

CITY OF SAN ANGELO, TEXAS

PHASE I
BELL STREET ROADWAY AND UTILITIES IMPROVEMENTS

EROSION CONTROL

EROSION PLAN
STA. 53+00 TO END

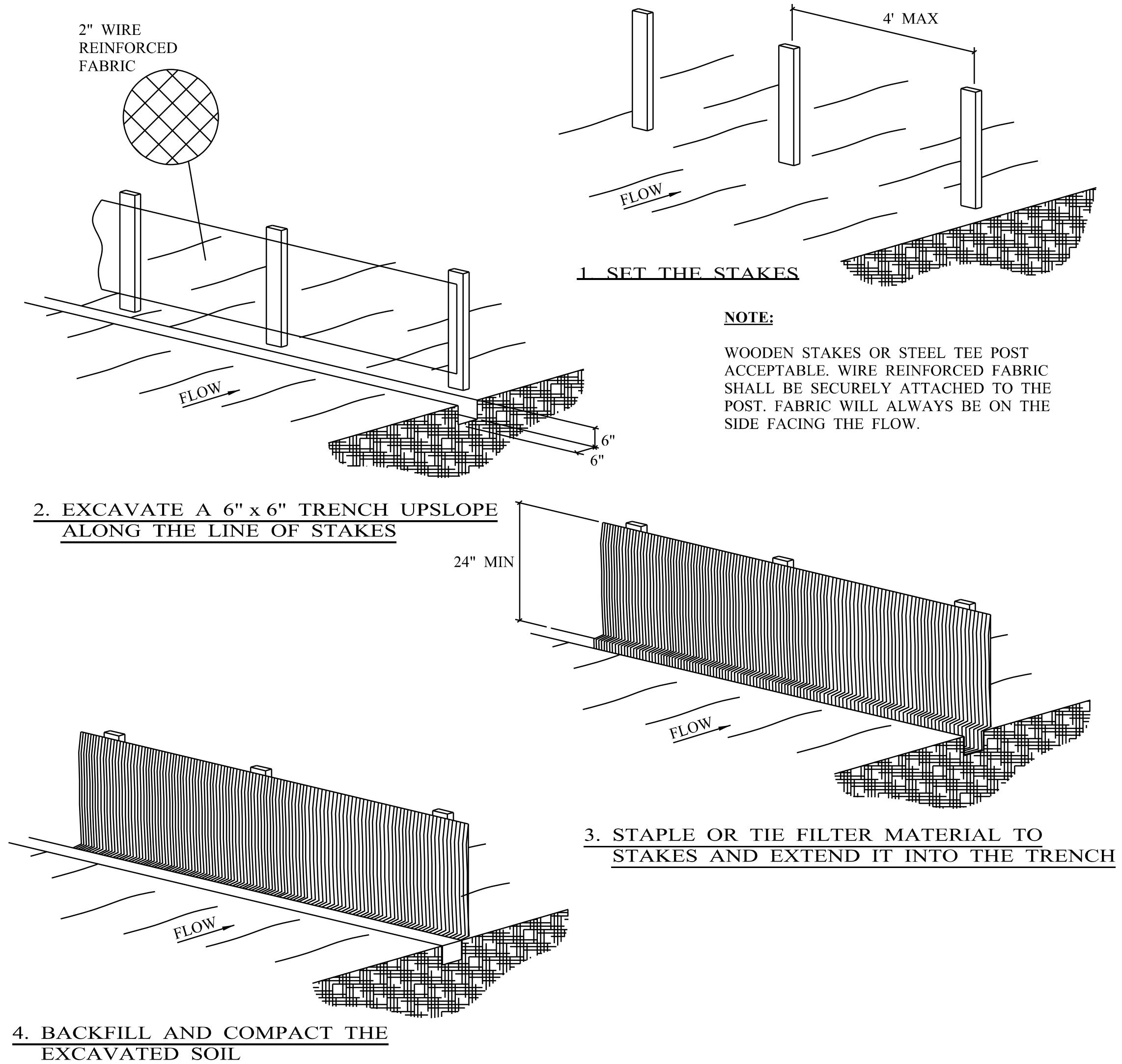
NO.	ISSUES	BY	DATE

F&N JOB NO.	SAN16188
DATE	04/2017
DESIGNED	JWP
DRAWN	EB
REVISED	
CHECKED	WH
FILE NAME	ph1-trt-pl-eros04.dgn

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale. 0 1

SHEET EP-04

SEQ. 140



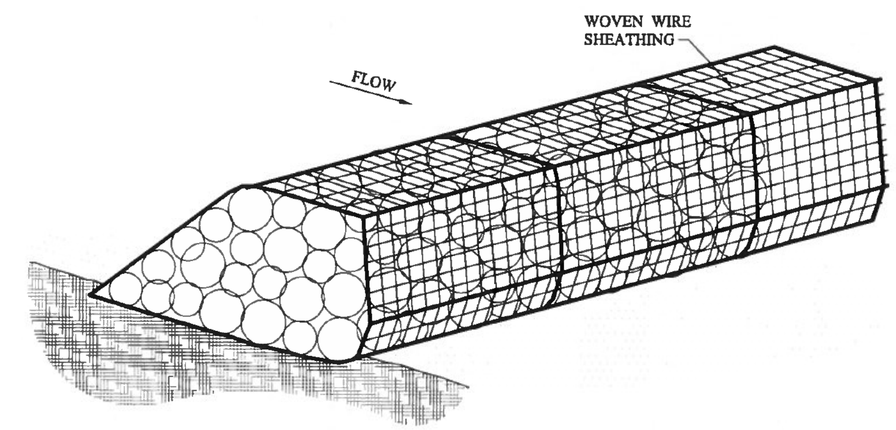
NOTES:

1. STEEL POSTS WHICH SUPPORT THE SILT FENCE SHALL BE INSTALLED ON A SLIGHT ANGLE TOWARD THE ANTICIPATED RUNOFF SOURCE. POST MUST BE EMBEDDED A MINIMUM OF ONE FOOT.
2. A CITY-APPROVED FILTER FABRIC WILL BE USED.
3. THE TRENCH MUST BE MINIMUM OF 6 INCHES DEEP AND 6 INCHES WIDE TO ALLOW FOR THE SILT FENCE FABRIC TO BE LAID IN THE GROUND AND BACKFILLED WITH COMPACTED MATERIAL.
4. SILT FENCE SHOULD BE SECURELY FASTENED TO EACH WOODEN OR STEEL SUPPORT POST. THERE SHALL BE A 3 FOOT OVERLAP, SECURELY FASTENED, WHERE ENDS OF FABRIC MEET.
5. INSPECTION SHALL BE MADE WEEKLY OR AFTER EACH ≥1/2" RAINFALL EVENT AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
6. SILT FENCE SHALL BE REMOVED WHEN THE SITE IS COMPLETELY STABILIZED SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.
7. ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF 6 INCHES. THE SILT SHALL BE DISPOSED OF IN AN APPROVED SITE AND IN SUCH A MANNER AS TO NOT CONTRIBUTE TO ADDITIONAL SILTATION.

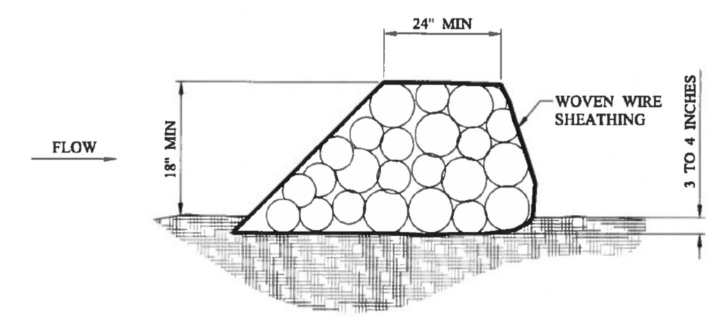
CITY OF SAN ANGELO

SILT FENCE STANDARDS

S-CC-1



ISOMETRIC PLAN VIEW
NOT TO SCALE



CROSS SECTION
NOT TO SCALE

ROCK BERM GENERAL NOTES:

1. USE ONLY OPEN GRADED ROCK 4-8 INCHES IN DIAMETER FOR STREAM FLOW CONDITION. USE OPEN GRADED ROCK 3-5 INCHES IN DIAMETER FOR OTHER CONDITIONS.
2. THE ROCK BERM SHALL BE SECURED WITH A WOVEN WIRE SHEATHING HAVING A MAXIMUM OPENING OF 1 INCH AND A MINIMUM WIRE SIZE OF 20 GAUGE AND SHALL BE BURIED IN A TRENCH APPROXIMATELY 3 TO 4 INCHES DEEP.
3. THE ROCK BERM SHALL BE INSPECTED EVERY TWO WEEKS OR AFTER EACH > 1/2" RAIN EVENT AND SHALL BE REPLACED WHEN THE STRUCTURE CEASES TO FUNCTION AS INTENDED DUE TO SILT ACCUMULATION AMONG THE ROCKS, WASHOUT, CONSTRUCTION TRAFFIC DAMAGE, ETC.
4. WHEN SILT REACHES A DEPTH EQUAL TO ONE-THIRD OF THE HEIGHT OF THE BERM OR ONE FOOT, WHICHEVER IS LESS, THE SILT SHALL BE REMOVED AND DISPOSED OF PROPERLY.
5. WHEN THE SITE IS COMPLETELY STABILIZED, THE BERM AND ACCUMULATED SILT SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED MANNER.
6. ROCK BERM SHOULD BE USED AS CHECK DAMS FOR CONCENTRATED FLOW AND ARE NOT INTENDED FOR USE IN PERIMETER PROTECTION.

CITY OF SAN ANGELO

ROCK BERM

S-CC-3

FREESE AND NICHOLS, INC.
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STATE OF TEXAS
WAYNE P. HART
118231
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10/23/2017

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CITY OF SAN ANGELO, TEXAS
ALL PHASES
BELL STREET ROADWAY AND UTILITIES IMPROVEMENTS
CIVIL
EROSION CONTROL DETAILS

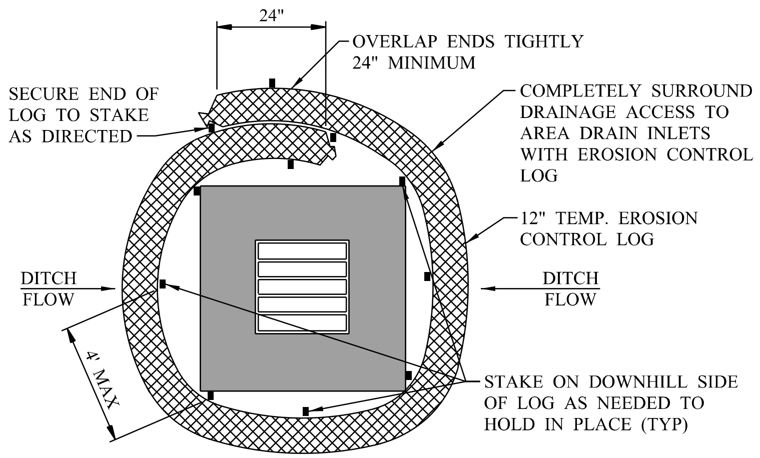
F&N JOB NO.	SAN16188
DATE	AUG 2016
DESIGNED	JWP
DRAWN	EB
REVISED	
CHECKED	WH
FILE NAME	cv-trt-dt-eros01.dgn

NO.	ISSUES	BY	DATE

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1

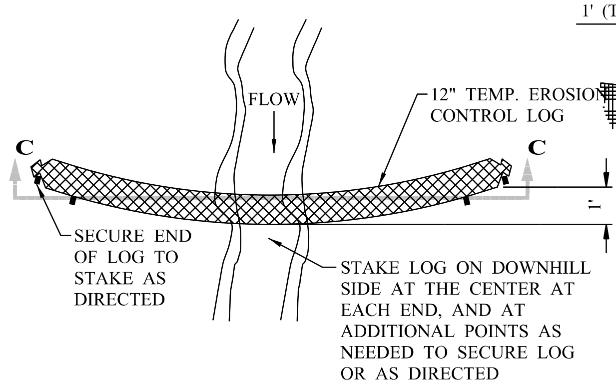
SHEET
ECD-01

SEQ.
141



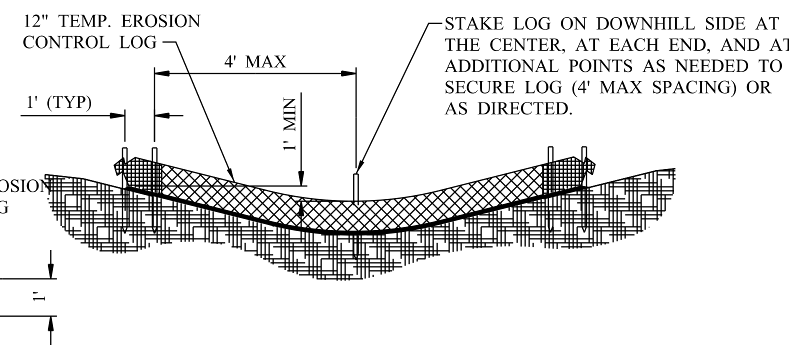
LOGS PLACED AT AREA DRAIN INLETS

NOT TO SCALE



PLAN VIEW

NOT TO SCALE



SECTION C-C

NOT TO SCALE

EROSION CONTROL LOG CHECK DAM

NOT TO SCALE

GENERAL NOTES:

1. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED. MAXIMUM LENGTH OF LOGS SHALL BE 60' FOR 18" DIAMETER OR 30' FOR 12" DIAMETER LOGS.

2. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WITH REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.

3. STUFF LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE DENSITY THAT WILL HOLD SHAPE WITHOUT EXCESSIVE DEFORMATION.

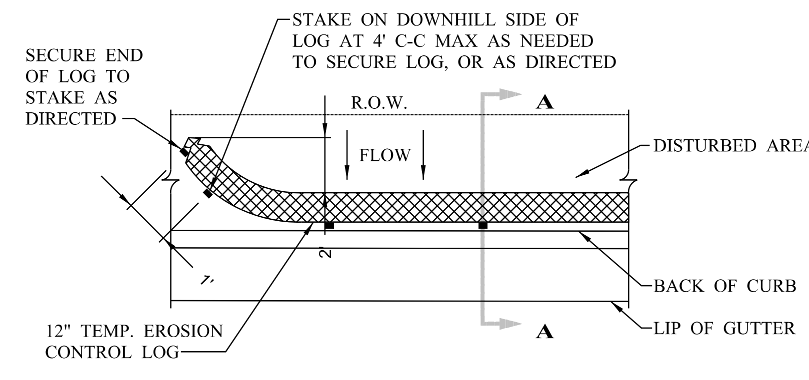
4. STAKES SHALL BE 2" x 2" WOOD OR T-POSTS 4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED.

5. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.

CITY OF SAN ANGELO

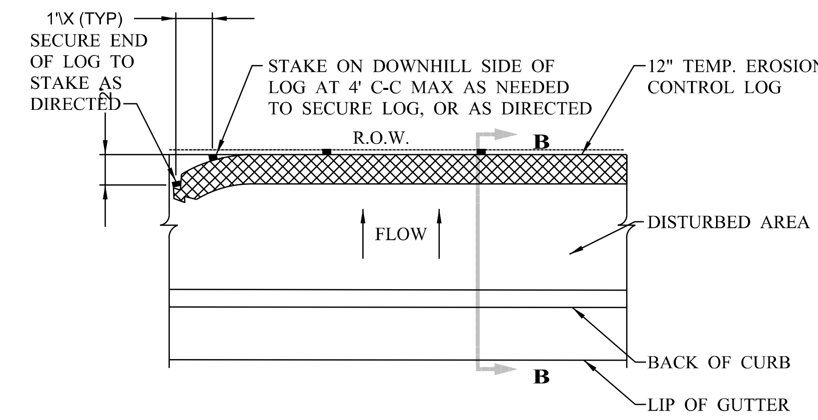
TEMPORARY EROSION CONTROL LOGS

S-CC-4



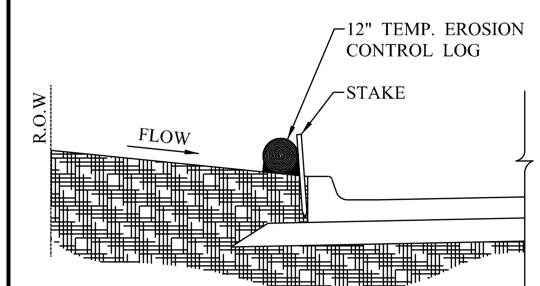
PLAN VIEW

NOT TO SCALE



PLAN VIEW

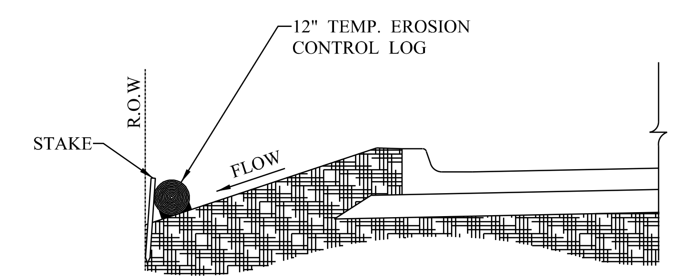
NOT TO SCALE



SECTION A-A

LOG PLACED AT BACK OF CURB

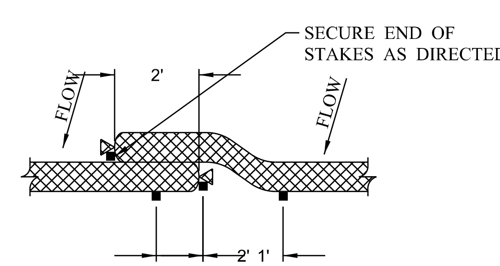
NOT TO SCALE



SECTION B-B

LOG PLACED AT EDGE OF RIGHT-OF-WAY

NOT TO SCALE



LAP DETAIL

NOT TO SCALE

NOTES

SEE SHEET S-CC-4 FOR GENERAL NOTES.

CITY OF SAN ANGELO

TEMPORARY EROSION CONTROL LOGS

S-CC-5

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TEXAS REGISTERED ENGINEERING FIRM F-2144

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WAYNE F. HART
118231
LICENSED PROFESSIONAL ENGINEER

10/23/2017

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Web - www.freese.com

CITY OF SAN ANGELO, TEXAS

ALL PHASES

BELL STREET ROADWAY AND UTILITIES IMPROVEMENTS

EROSION CONTROL DETAILS

EROSION CONTROL DETAILS

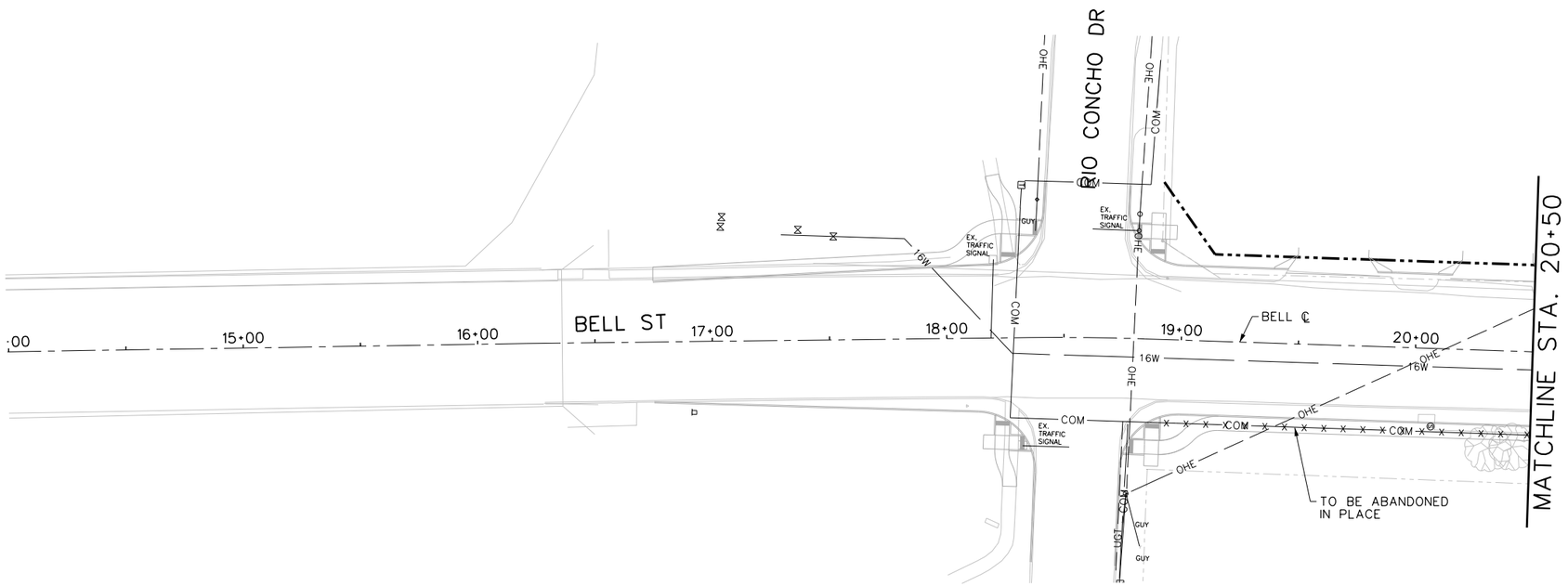
NO.	ISSUES	BY	DATE

F&N JOB NO. SAN16188
DATE 04/2017
DESIGNED JWP
DRAWN EB
REVISED
CHECKED WH
FILE NAME cv-trt-dt-eros02.dgn

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.

SHEET ECD-02

SEQ. 142



LEGEND OF UTILITY TYPES

Communications

AT&T UNDERGROUND TELEPHONE — UGT
FRONTIER — COM
SUDDENLINK — FO

Gas / Petroleum

ATMOS — G

Electric / Power

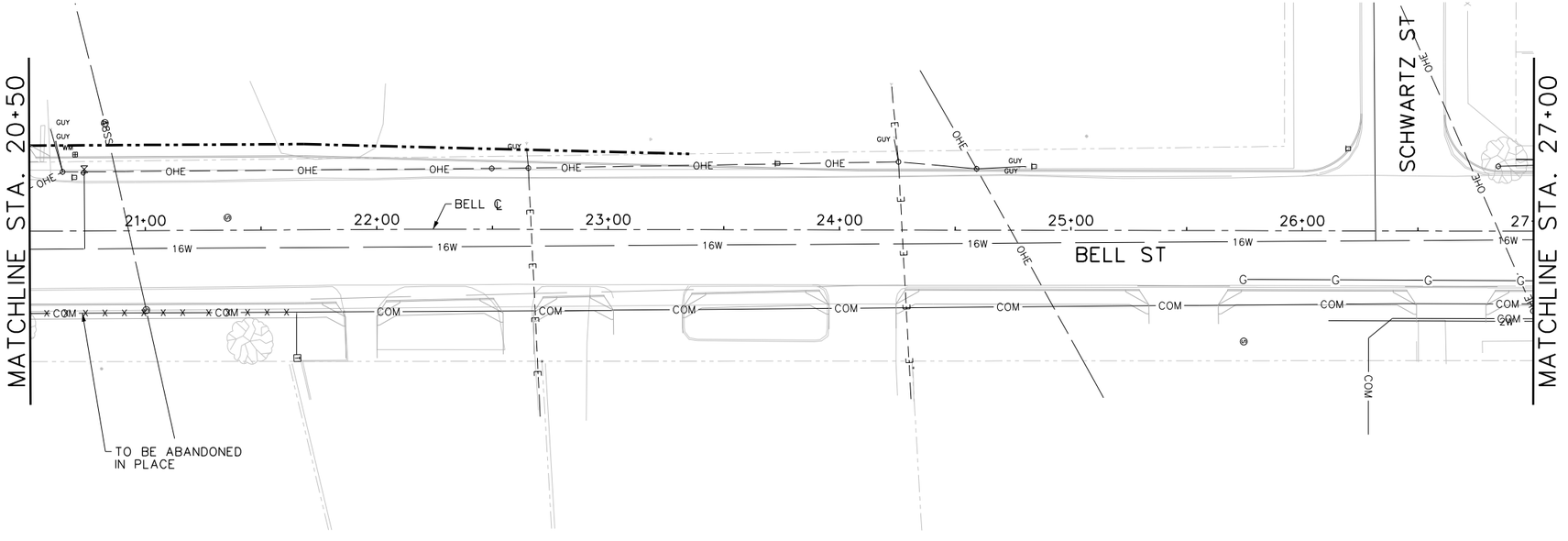
AEP OVERHEAD ELECTRIC — OHE
AEP ELECTRIC — E

Potable Water

2" WATERLINE — 2W
4" WATERLINE — 4W
6" WATERLINE — 6W
8" WATERLINE — 8W
10" WATERLINE — 10W
12" WATERLINE — 12W
16" WATERLINE — 16W
20" WATERLINE — 20W

Sanitary Sewer

6" VCP WASTE WATER — 6SS
8" VCP WASTE WATER — 8SS
10" VCP WASTE WATER — 10SS
12" VCP WASTE WATER — 12SS
15" VCP WASTE WATER — 15SS
18" VCP WASTE WATER — 18SS
48" VCP WASTE WATER — 48SS



FREESE AND NICHOLS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-2144
STATE OF TEXAS
WAYNE F. HARTT
118231
LICENSED
PROFESSIONAL
ENGINEER
10/23/2017

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Fort Worth, Texas 76109-4895
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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL STREET ROADWAY AND UTILITIES IMPROVEMENTS
EXISTING UTILITIES
EXISTING UTILITIES
BEGIN TO STA. 27+00

NO.	ISSUES	BY	DATE

F&N JOB NO. SAN16188
DATE 04/2017
DESIGNED JWP
DRAWN EB
REVISED
CHECKED WH
FILE NAME ph1-trt-pl-exut01.dgn

VERIFY SCALE Bar is one inch on orignal drawing. If not one inch on this sheet, adjust scale.
0 1"

SHEET EU-01
SEQ. 143

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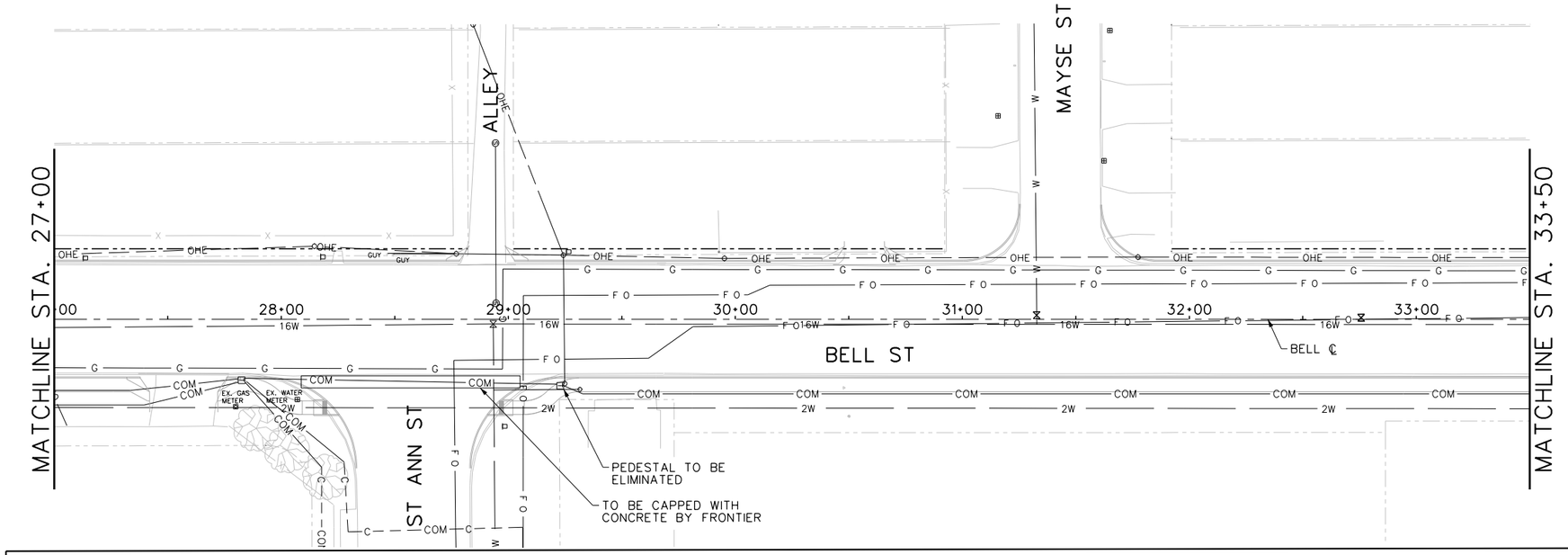


LEGEND OF UTILITY TYPES

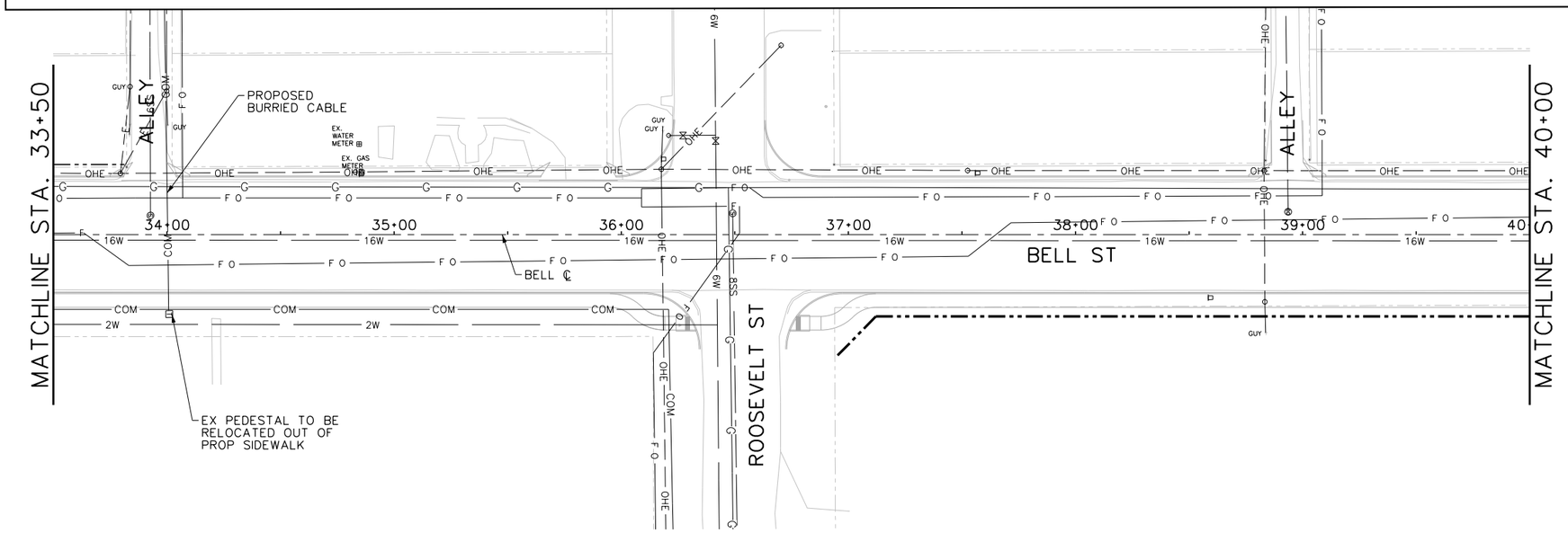
Communications
AT&T UNDERGROUND TELEPHONE
FRONTIER
SUDDENLINK

Gas / Petroleum
ATMOS

Electric / Power
AEP OVERHEAD ELECTRIC
AEP ELECTRIC

Potable Water
2" WATERLINE
4" WATERLINE
6" WATERLINE
8" WATERLINE
10" WATERLINE
12" WATERLINE
16" WATERLINE
20" WATERLINE

Sanitary Sewer
6" VCP WASTE WATER
8" VCP WASTE WATER
10" VCP WASTE WATER
12" VCP WASTE WATER
15" VCP WASTE WATER
18" VCP WASTE WATER
48" VCP WASTE WATER



N

0 10' 20' 30' 60'
SCALE IN FEET

FREESE AND NICHOLS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-2144

STATE OF TEXAS
WAYNE F. HARTT
118231
LICENSED
PROFESSIONAL
ENGINEER
10/23/2017

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Fort Worth, Texas 76109-4895
Phone - (817) 735-7300
Fax - (817) 735-7491
Web - www.freese.com

CITY OF SAN ANGELO, TEXAS
PHASE I
BELL STREET ROADWAY AND UTILITIES IMPROVEMENTS
EXISTING UTILITIES
STA. 27+00 TO STA. 40+00

F&N JOB NO. SAN16188
DATE 04/2017
DESIGNED JWP
DRAWN EB
REVISED
CHECKED WH
FILE NAME ph1-trt-pl-exut02.dgn

NO.	ISSUES	BY	DATE

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

SHEET
EU-02
SEQ.
144

MicroStation V8 User: sli Office: Frisco
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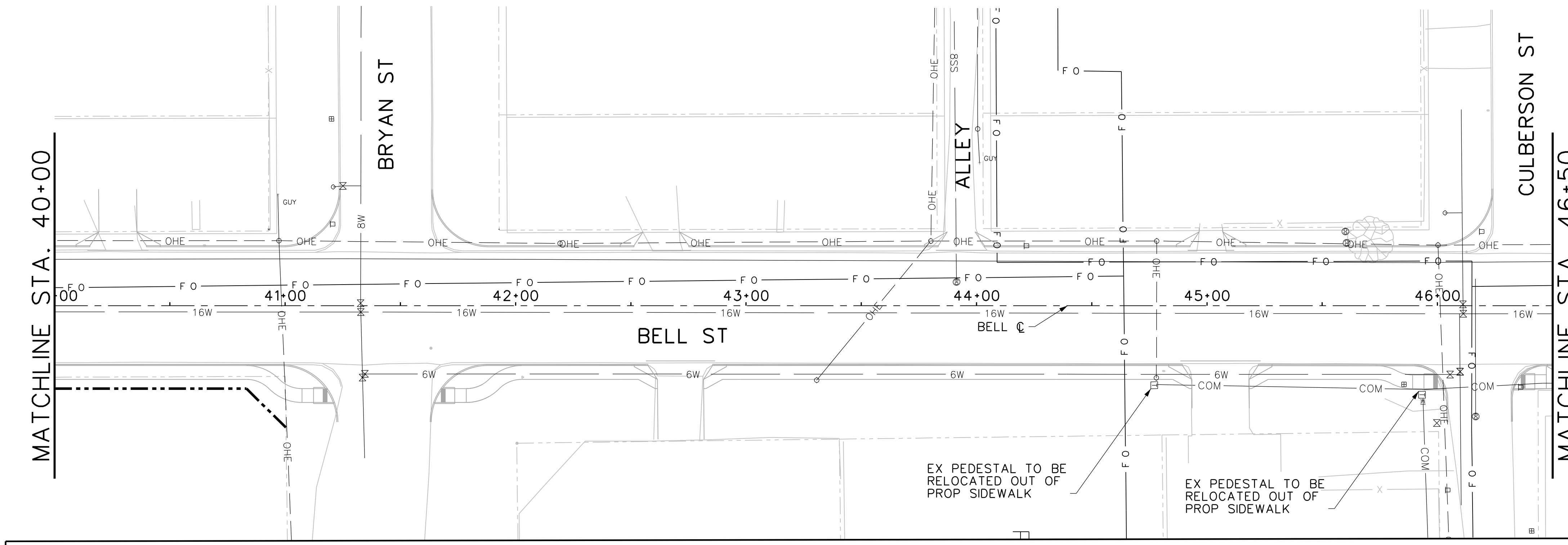

LEGEND OF UTILITY TYPES

Communications

AT&T UNDERGROUND TELEPHONE — UGT

FRONTIER — COM

SUDDENLINK — FO

Gas / Petroleum

ATMOS — G

Electric / Power

AEP OVERHEAD ELECTRIC — OHE

AEP ELECTRIC — E

Potable Water

2" WATERLINE	2W
4" WATERLINE	4W
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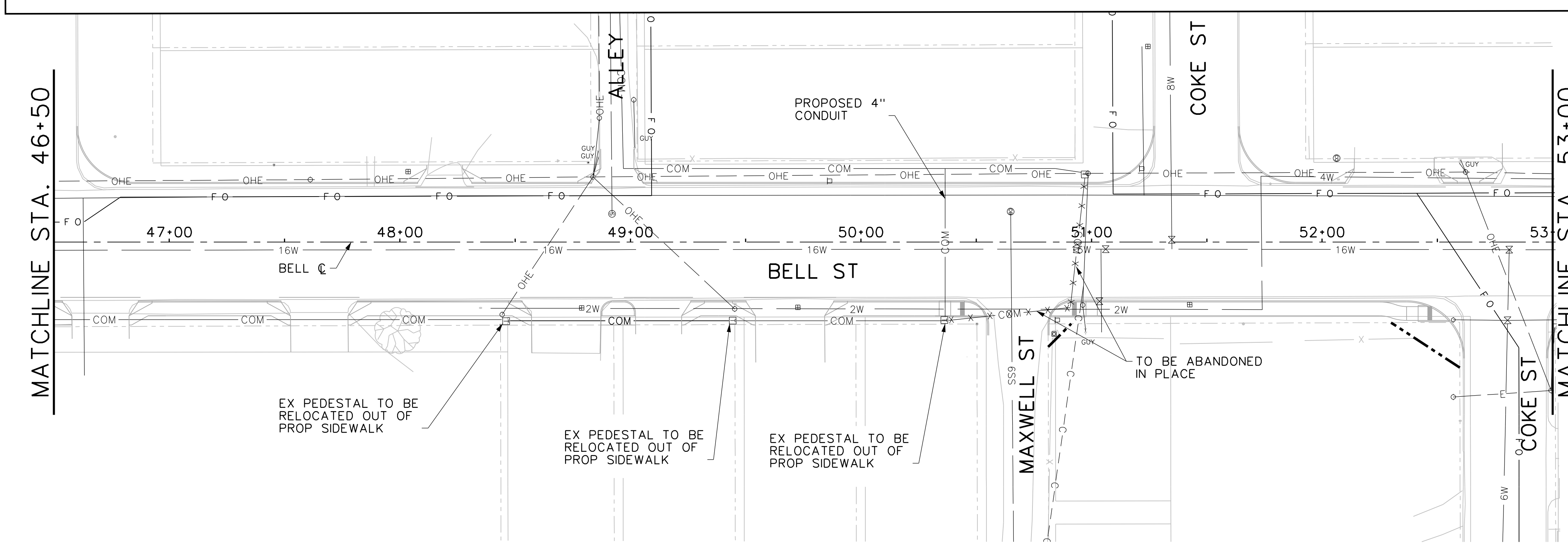
12" VCP WASTE WATER	12SS
15" VCP WASTE WATER	15SS
18" VCP WASTE WATER	18SS
48" VCP WASTE WATER	48SS



0 10' 20' 30' 60'
SCALE IN FEET

FREESE AND NICHOLS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-2144

10/23/2017

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4055 International Plaza, Suite 200
Fort Worth, Texas 76109-4895
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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL STREET ROADWAY AND UTILITIES IMPROVEMENTS
EXISTING UTILITIES

EXISTING UTILITIES STA. 40+00 TO STA. 53+00

F&N JOB NO.	SAN16188
DATE	04/2017
DESIGNED	JWP
DRAWN	EB
REVISED	
CHECKED	WH
FILE NAME	ph1-trt-pl-exut03.dgn

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.

SHEET EU-03
SEQ. 145

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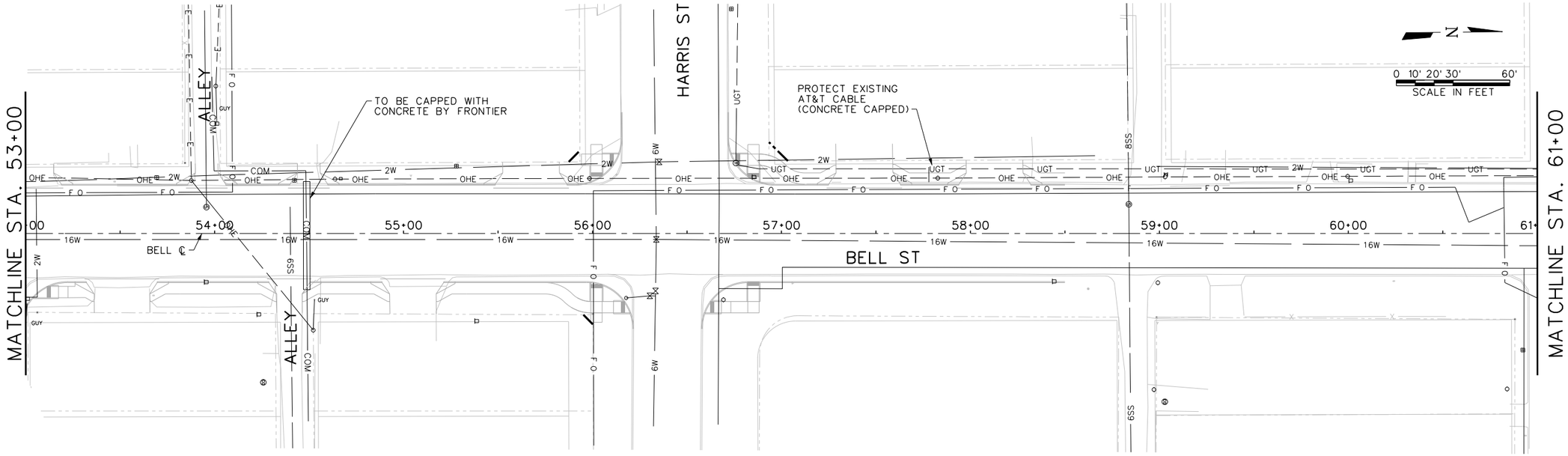

LEGEND OF UTILITY TYPES

Communications

- AT&T UNDERGROUND TELEPHONE — UGT
- FRONTIER — COM
- SUDDENLINK — FO

Gas / Petroleum

- ATMOS — G

Electric / Power

- AEP OVERHEAD ELECTRIC — OHE
- AEP ELECTRIC — E

Potable Water

- 2" WATERLINE — 2W
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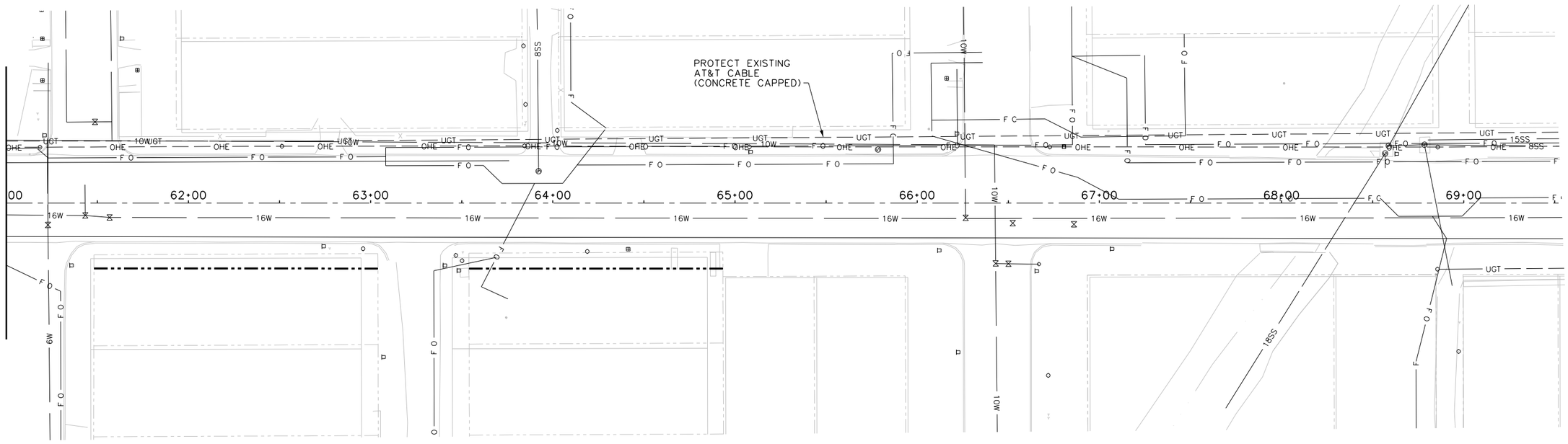

FREESE AND NICHOLS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-2144

STATE OF TEXAS — JAMES W. WILLIAMS — 118231 — LICENSED PROFESSIONAL ENGINEER — 10/23/2017

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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL STREET ROADWAY AND UTILITIES IMPROVEMENTS

EXISTING UTILITIES STA. 53+00 TO END

NO.	ISSUES	BY	DATE

F&N JOB NO. SAN16188
DATE 07/2017
DESIGNED JWP
DRAWN EEB
REVISED
CHECKED WH
FILE NAME ph1-trt-pl-exut04.dgn

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

SHEET EU-04
SEQ. 146

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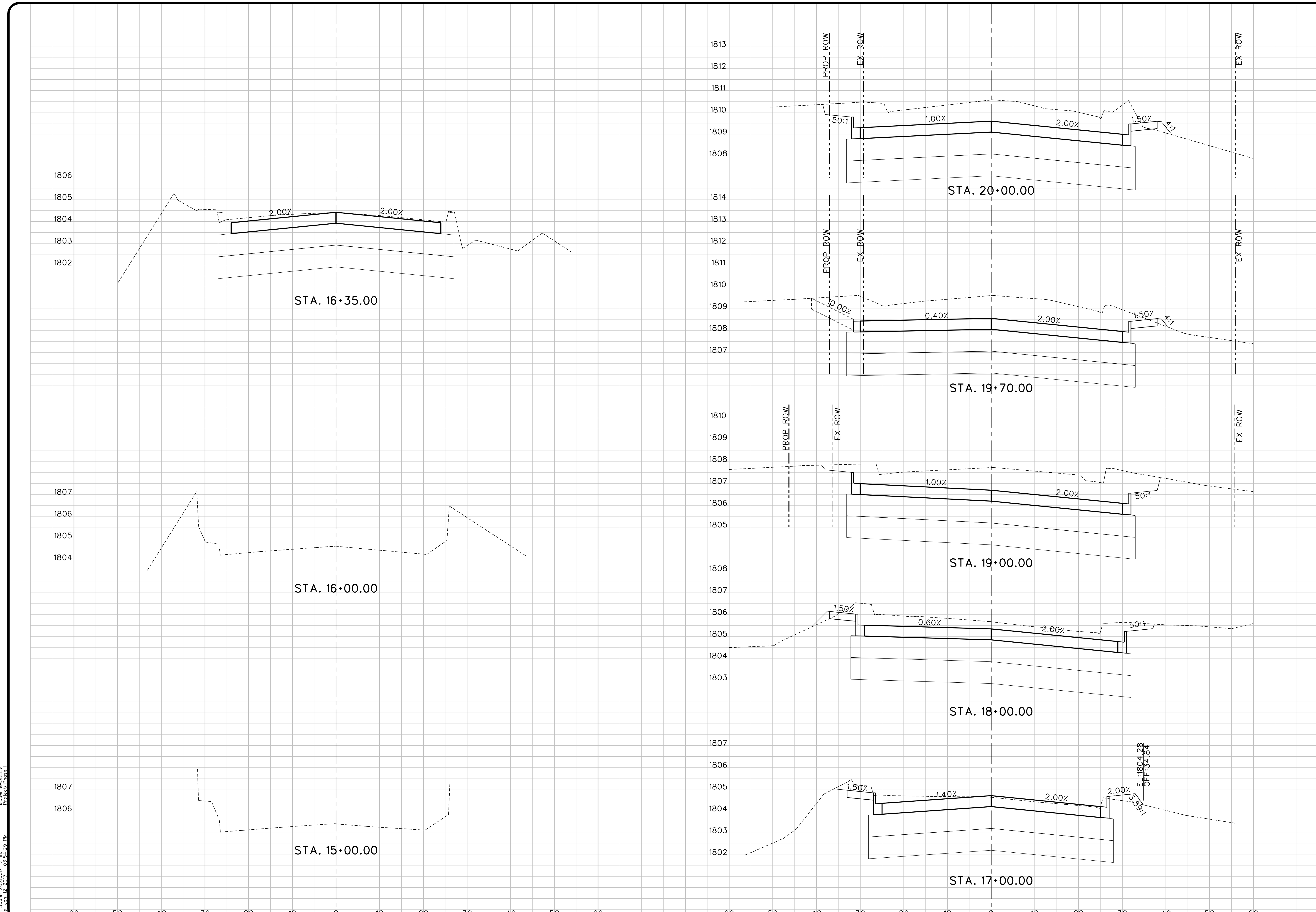

FREESE AND NICHOLS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-2144

STATE OF TEXAS
WAYNE P. HARTT
118231
LICENSED PROFESSIONAL ENGINEER

10/23/2017

FREESE AND NICHOLS
4055 International Plaza, Suite 200
Fort Worth, TX 76109-4895
Phone - (817) 735-7300
Fax - (817) 735-7491
Web - www.freese.com

CITY OF SAN ANGELO, TEXAS

PHASE I
BELL STREET ROADWAY AND UTILITIES IMPROVEMENTS

CROSS SECTIONS
BELL STREET

NO.	ISSUES	BY	DATE

F&N JOB NO. SAN16188
DATE 04/2017
DESIGNED JWP
DRAWN EB
REVISED
CHECKED WH
FILE NAME ph1-trt-xs-road01.sht

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
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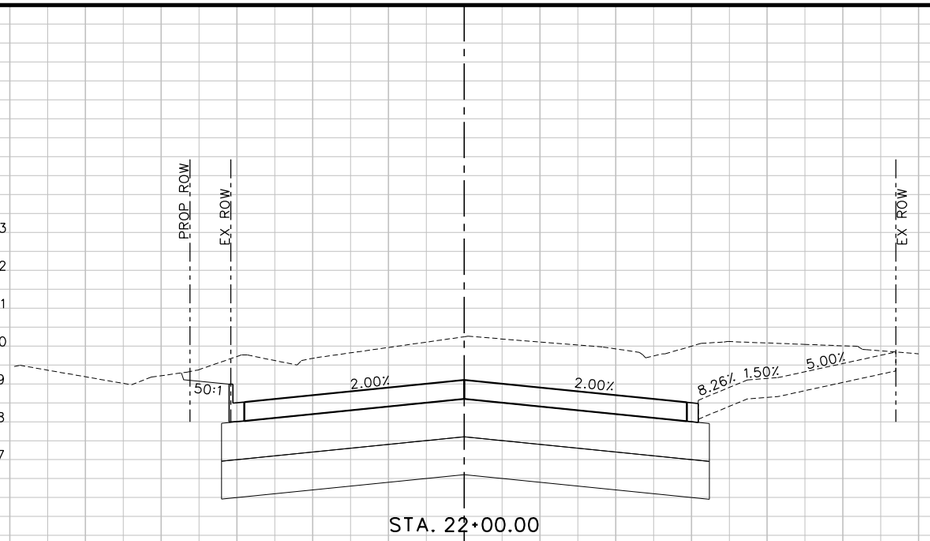
SHEET XS-01
SEQ. 147



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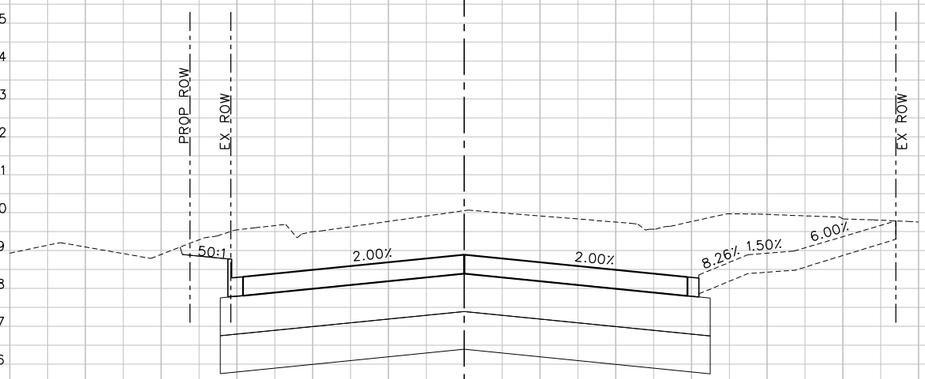
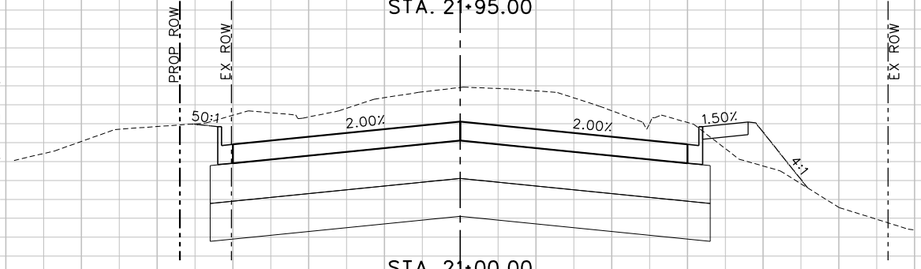
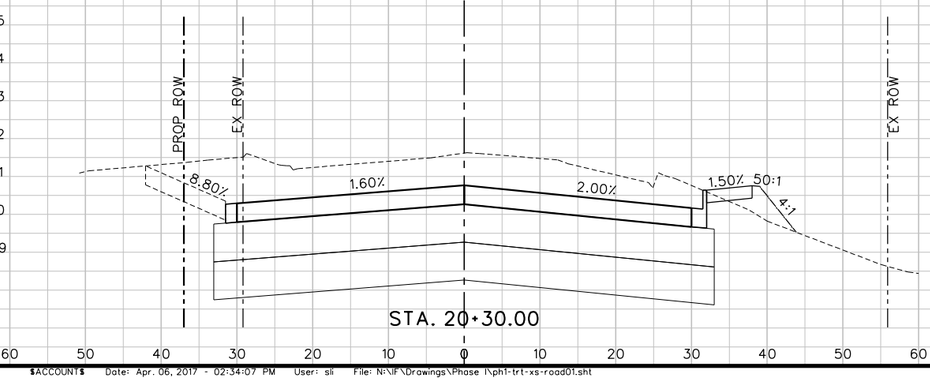


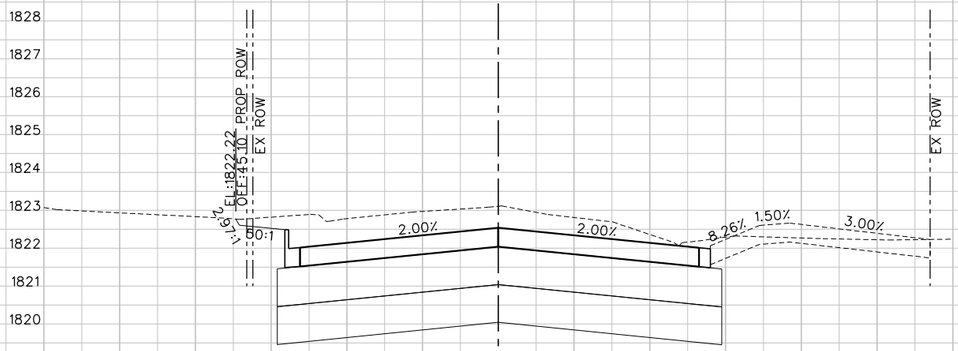
STA. 21+95.00



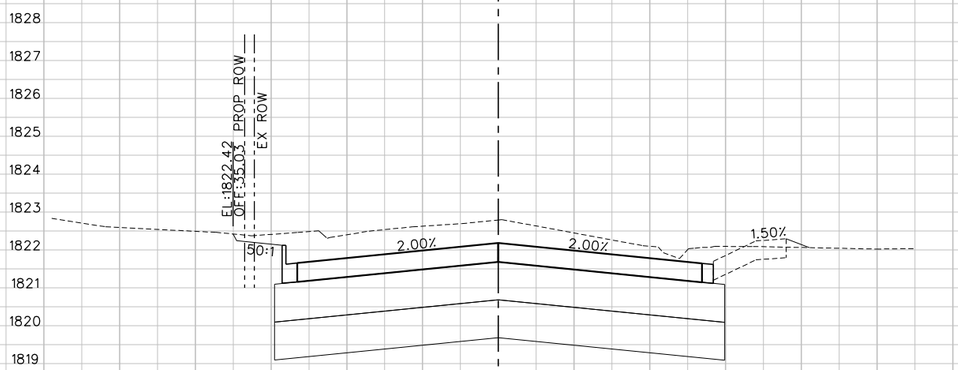
STA. 21+00.00



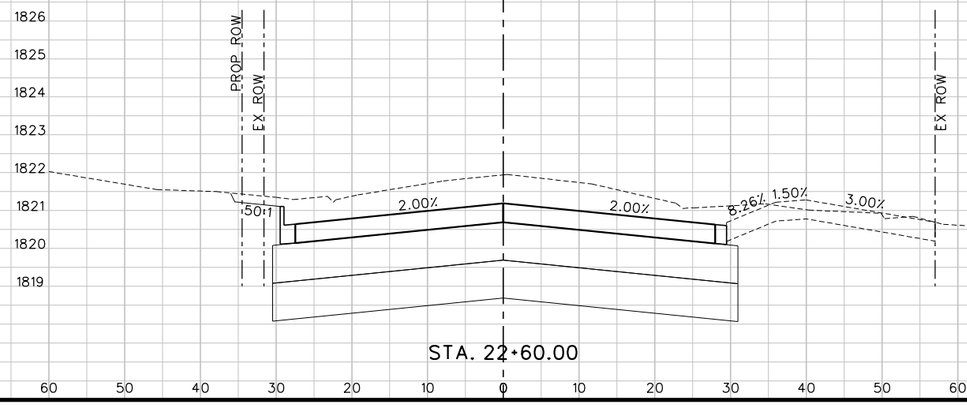
STA. 20+30.00



STA. 23+15.00



STA. 23+00.00



STA. 22+60.00

FREESE AND NICHOLS, INC.
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WAYNE P. HART
110231
LICENSED
PROFESSIONAL ENGINEER

10/23/2017

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Fax - (817) 335-7351
Web - www.freese.com

CITY OF SAN ANGELO, TEXAS

PHASE I
BELL STREET ROADWAY AND UTILITIES IMPROVEMENTS

CROSS SECTIONS
BELL STREET

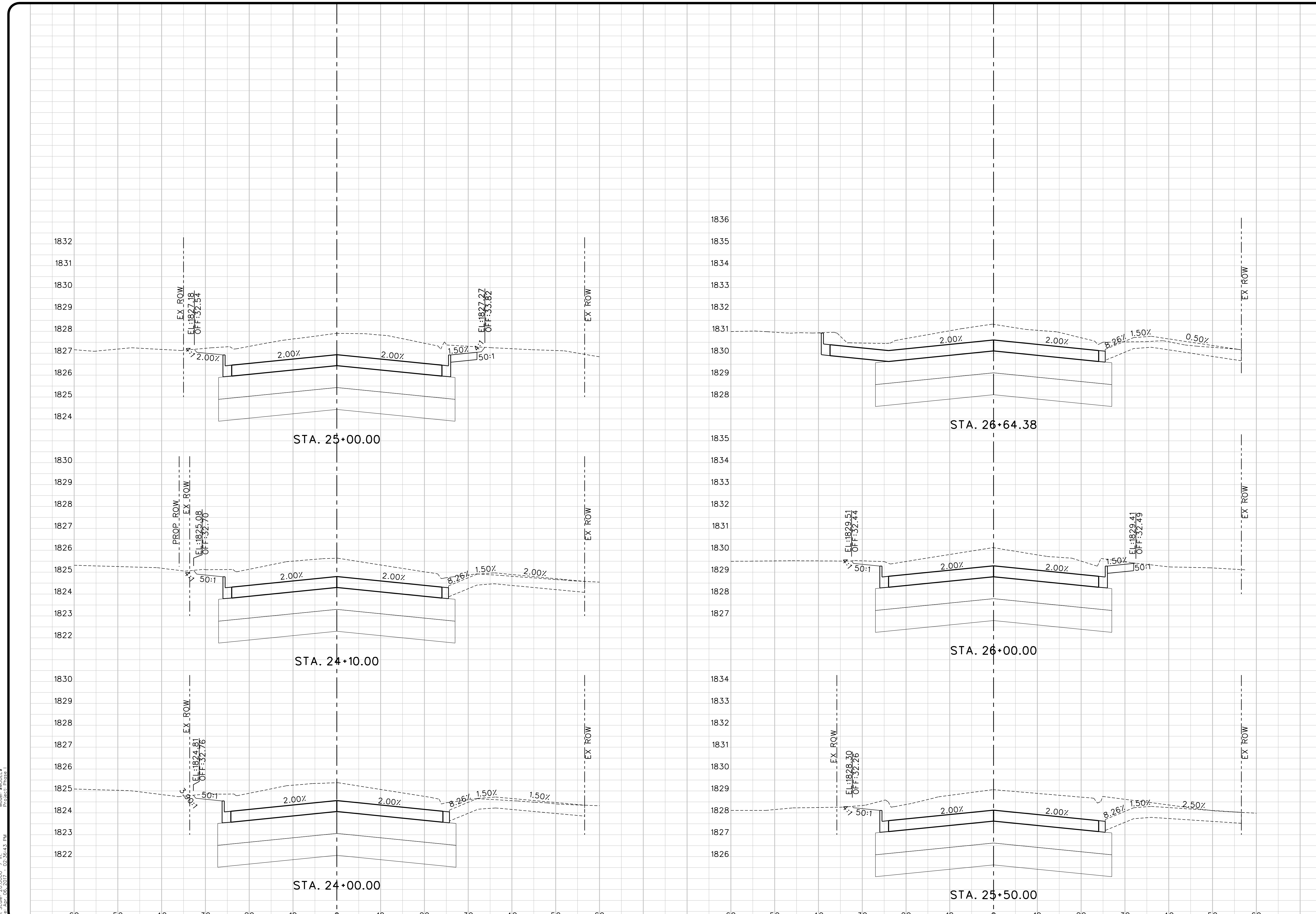
NO.	ISSUES	BY	DATE

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

F&N JOB NO. SAN16188
DATE 04/2017
DESIGNED JWP
DRAWN EB
REVISED
CHECKED WH
FILE NAME ph1-trt-xs-road01.sht

SHEET XS-02
SEQ. 148

MicroStation V8 User: sli Office: Frisco
$ACCOUNT$ pw:\\Drawings\Phase I\ph1-trt-xs-road01.sht
Project: SAN16188 Phase I Model: $MODEL$
Plot Scale: 20.0000 '/ in. Project Phase I
Date: Apr. 06, 2017 - 02:34:07 PM



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CITY OF SAN ANGELO, TEXAS
PHASE I
BELL STREET ROADWAY AND UTILITIES IMPROVEMENTS

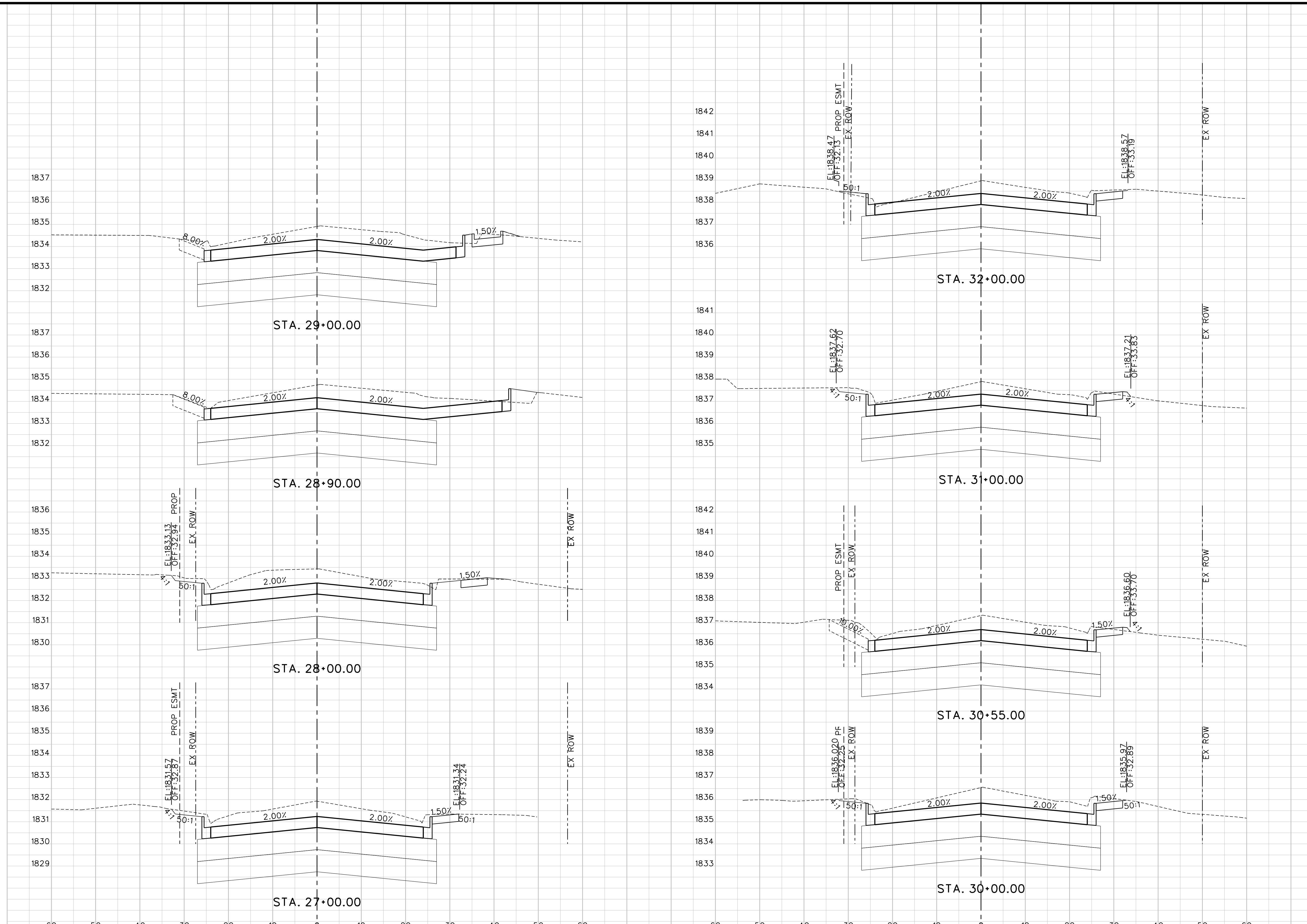
CROSS SECTIONS
BELL STREET

F&N JOB NO.	SAN16188
DATE	04/2017
DESIGNED	JWP
DRAWN	EB
REVISED	
CHECKED	WH
FILE NAME	ph1-trt-xs-road01.sht

NO. ISSUES BY DATE

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.

SHEET XS-03
SEQ. 149



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PHASE I
BELL STREET ROADWAY AND UTILITIES IMPROVEMENTS

CROSS SECTIONS
BELL STREET

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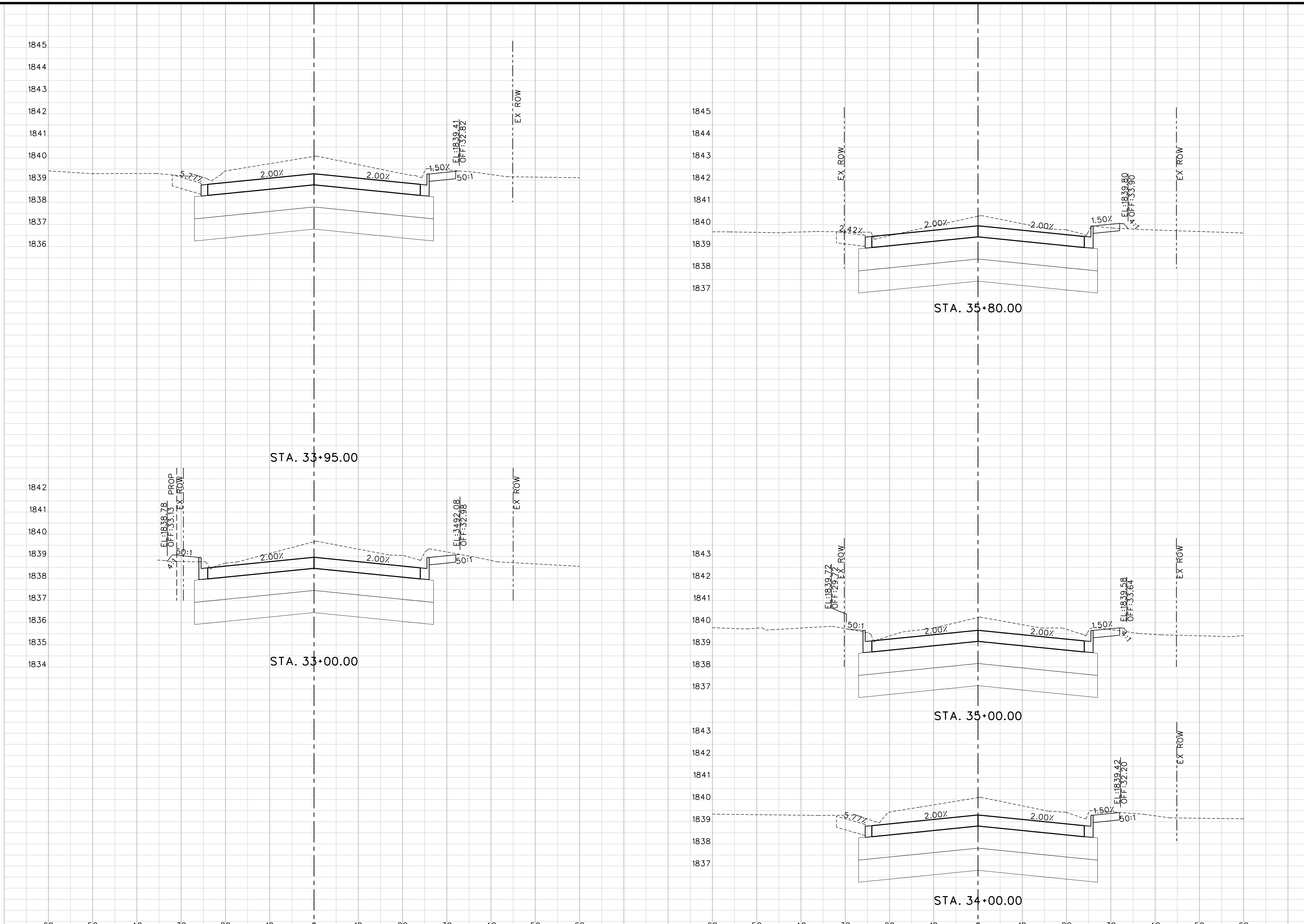
NO.	ISSUES	BY	DATE	F&N JOB NO. SAN16188
				DATE 04/2017
				DESIGNED JWP
				DRAWN EB
				REVISED
				CHECKED WH

FILE NAME ph1-trt-xs-road01.sht

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale. 0 1

SHEET XS-04

SEQ. 150



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PHASE I

BELL STREET ROADWAY AND UTILITIES IMPROVEMENTS

CROSS SECTIONS
BELL STREET

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F&N JOB NO. SAN16188
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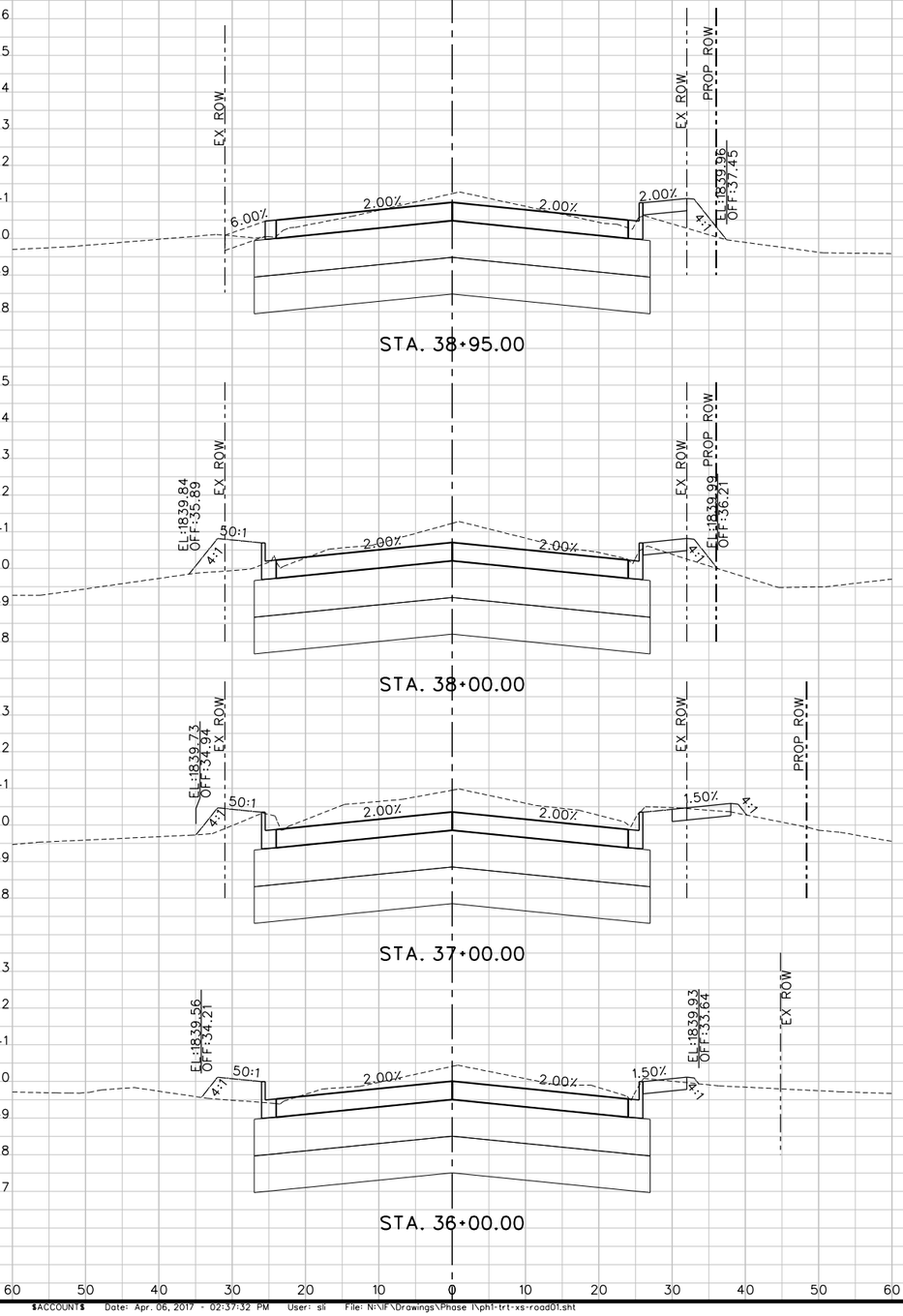
REVISED
CHECKED WH
FILE NAME ph1-trt-xs-road01.sht

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1

SHEET XS-05

SEQ. 151



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PHASE I
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CROSS SECTIONS
BELL STREET

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0 1"

F&N JOB NO. SAN16188
DATE 04/2017
DESIGNED JWP
DRAWN EB
REVISED
CHECKED WH
FILE NAME ph1-trt-xs-road01.sht

SHEET XS-06
SEQ. 152

MicroStation V8 User: sli Office: Frisco
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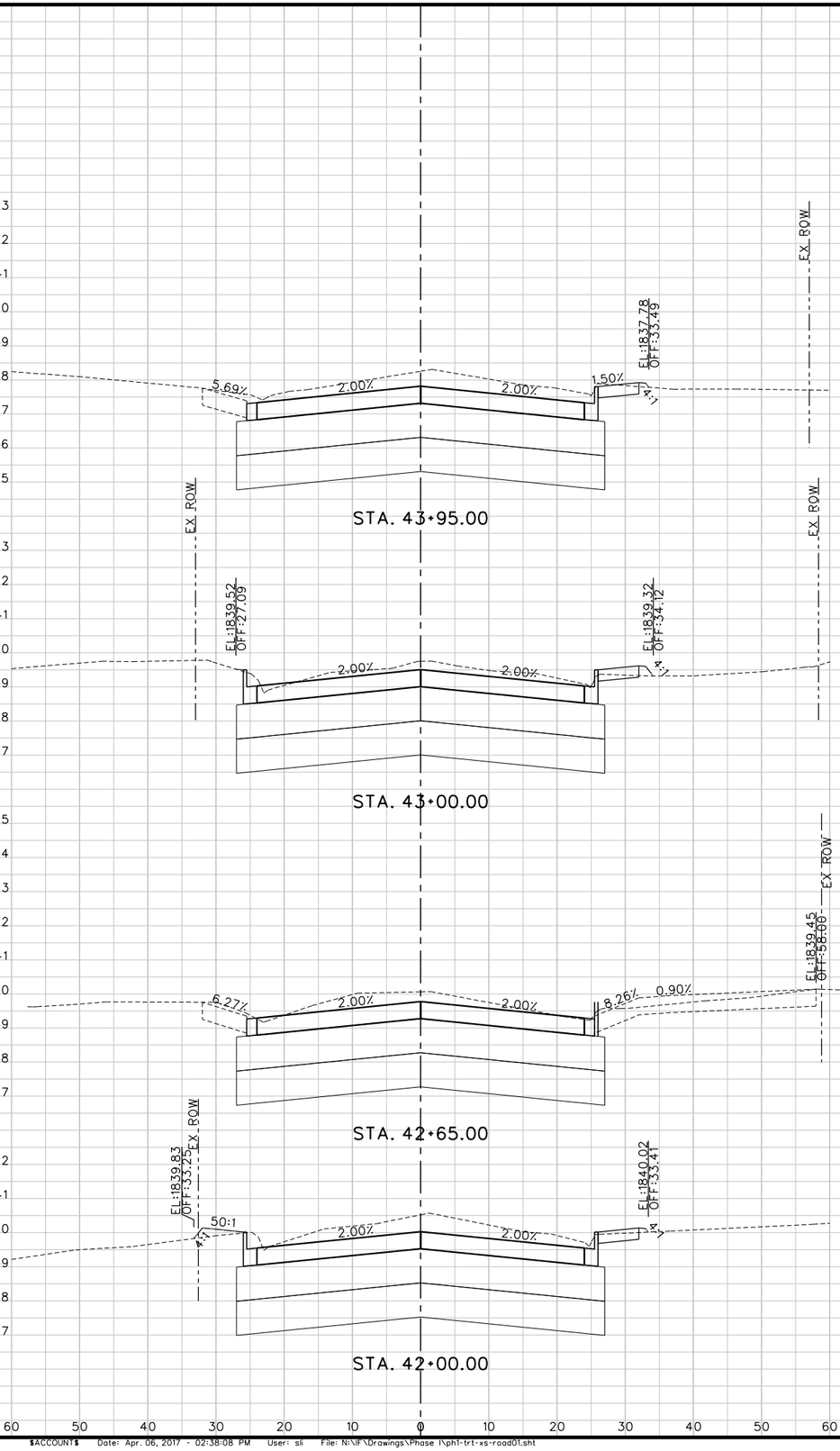
Date: Apr. 06, 2017 - 02:37:32 PM Project Phase I



MicroStation V8 User: sli Office: Frisco
$ACCOUNT$ N:\IF\Drawings\Phase I\ph1-trt-xs-road01.sht
Plot Driver: HP DesignJet 800 PS for Windows Model: $MODEL$
Plot Scale: 20.0000 '/ in. Project: Phase I
Date: Apr. 06, 2017 - 02:38:08 PM

Office: Frisco $ACCOUNT$ Date: Apr. 06, 2017 - 02:38:08 PM User: sli File: N:\IF\Drawings\Phase I\ph1-trt-xs-road01.sht

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CITY OF SAN ANGELO, TEXAS
PHASE I
ROADWAY AND UTILITIES IMPROVEMENTS

CROSS SECTIONS
BELL STREET

F&N JOB NO. SAN16188
DATE 04/2017
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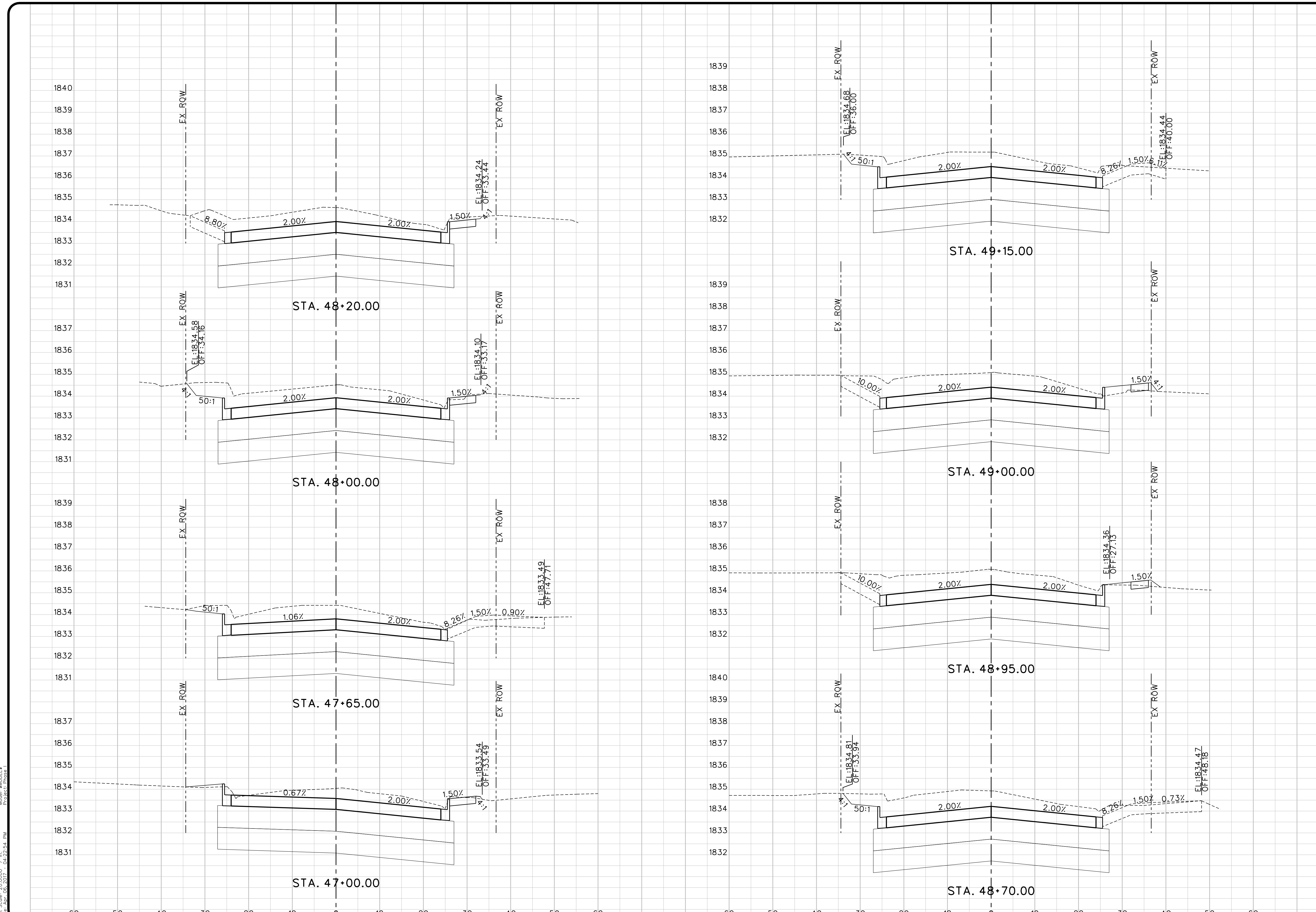
NO.	ISSUES	BY	DATE

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

SHEET XS-07
SEQ. 153



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CITY OF SAN ANGELO, TEXAS

PHASE I

BELL STREET ROADWAY AND UTILITIES IMPROVEMENTS

CROSS SECTIONS
BELL STREET

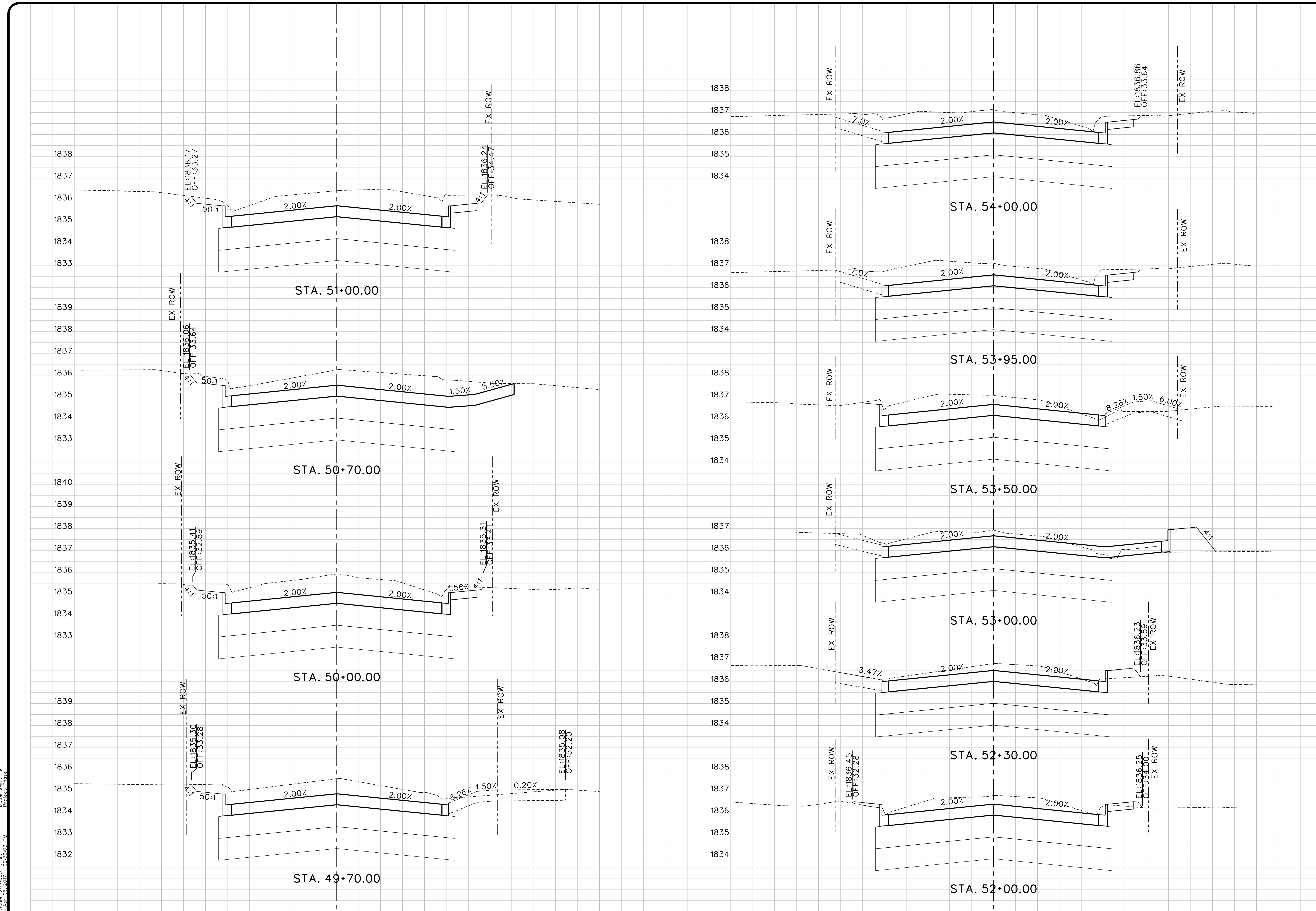
NO.	ISSUES	BY	DATE

F&N JOB NO.	SAN16188
DATE	04/2017
DESIGNED	JWP
DRAWN	EB
REVISED	
CHECKED	WH
FILE NAME	ph1-trt-xs-road01.sht

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1"

SHEET XS-08

SEQ. 154



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CROSS SECTIONS
BELL STREET

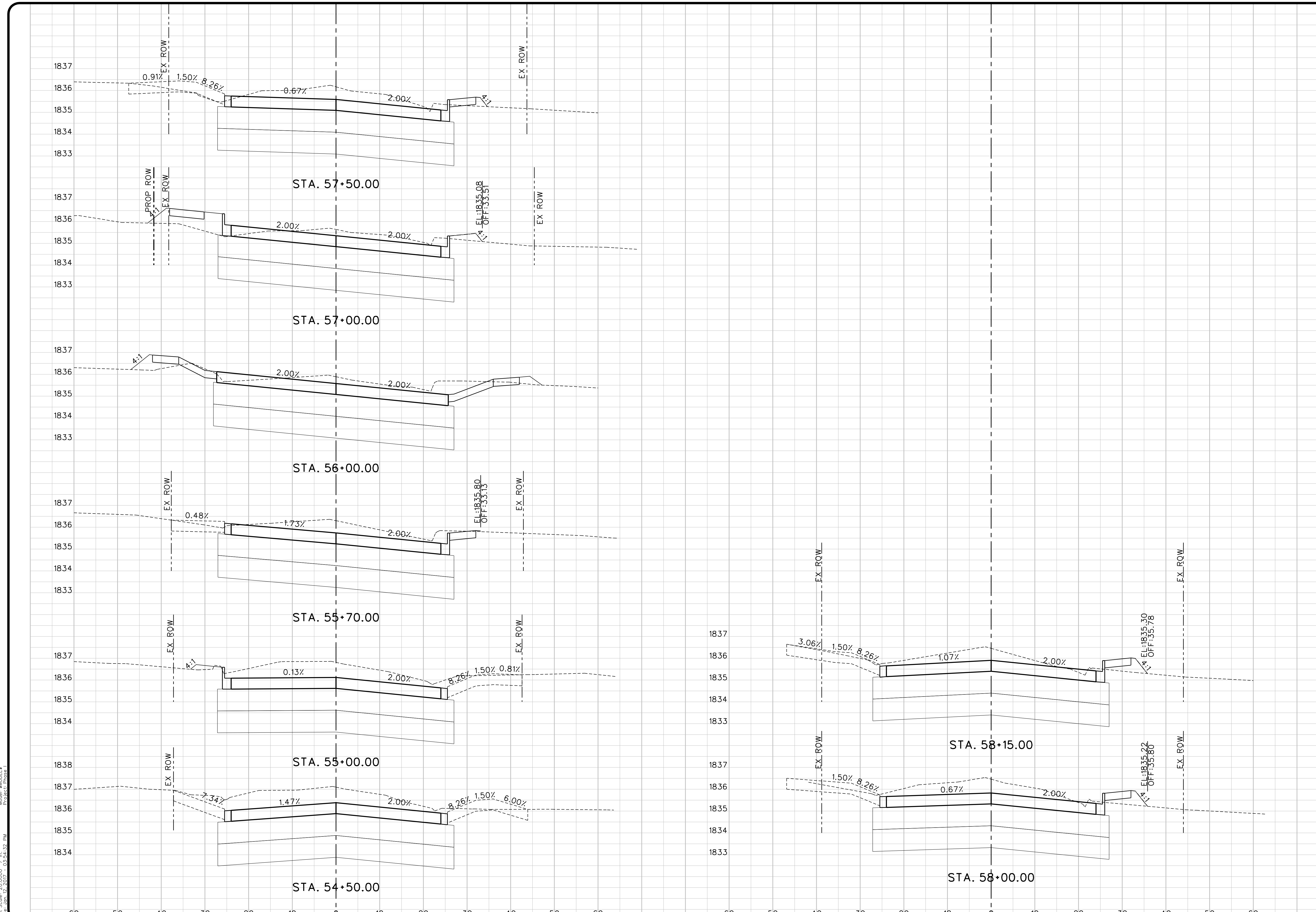
F&N JOB NO.	SAN16188
DATE	04/2017
DESIGNED	JWP
DRAWN	EB
REVISED	
CHECKED	WH
FILE NAME	ph1-trt-xs-road01.sht

NO.	ISSUES	BY	DATE

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.

SHEET XS-09

SEQ. 155



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CROSS SECTIONS
BELL STREET

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CHECKED WH
FILE NAME ph1-trt-xs-road01.sht

VERIFY SCALE Bar is one inch on original drawing. If not one inch on this sheet, adjust scale.
0 1

SHEET XS-10
SEQ. 156

Office: Fort Worth $ACCOUNT$ Date: Jan. 12, 2017 - 03:54:32 PM User: 02235 File: N:\IF\Drawings\Phase I\ph1-trt-xs-road01.sht