



DOMINION CONDUIT SPECIFICATIONS

Date:

WR#

Customer's Name:

Customer's Address:

Customer's City & Zip:

CONDUIT SPECIFICATIONS

Introduction

1. Per your request, following is a list of conduit specifications that Virginia Electric and Power Company doing business as Dominion Energy Virginia and Dominion Energy North Carolina (the "Company") and its contractors follow when installing conduit or duct bank for its own use.
2. This list of requirements is not to be considered exhaustive. Field conditions may dictate additions to or deletions from this list. Final approval of the conduit or duct bank installation and associated facilities ultimately rests with the Company. Company field personnel shall be considered to have authority to direct changes as necessary.
3. Some drawings from the Company's Construction Manual are incorporated by attachment into these specifications. These drawings are attached as guidelines to assist the designer or to install with some common construction work practices.

Section I – Material

1. The customer shall provide all material except items specifically supplied by the Company and those previously agreed upon.
2. Conduit shall be PVC Schedule 40 or galvanized steel for direct burial applications and PVC Schedule 40 for concrete encasement. PVC schedule 40 conduit shall conform to NEMA TC-2 and NEMA TC-3 specifications. Galvanized steel should not be used for single phase primary cable.
3. Sweep ells shall have a minimum radius of six times the conduit diameter with the exception of two-inch conduit, which shall be twenty four inch minimum radius.
4. No use of any material other than that approved by the Company will be allowed.
5. The Company shall be notified, and reserves the right of approval, as to the type of conduits to be installed by the customer.

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Section II – Trenching and Installation

1. The customer will assume sole responsibility for damage to any utility lines on or adjacent to the proposed facilities. Also, all such utility lines are to be assumed in service. Exploration to determine the location and depth of all existing underground facilities necessary to establish the required depth and location of proposed Company facilities will be the customer's responsibility and at his expense. The customer will be responsible for calling Virginia 811 or North Carolina 811 prior to any excavation.
 - a. Virginia 811: Dial 811
 - b. North Carolina 811: Dial 811
2. All permit and easement issues must be resolved during the design stage of the project before commencing any excavation work. Generally, the customer shall obtain all permits where necessary to excavate in the local jurisdiction's right-of-way. The customer shall also obtain permission to excavate in all privately owned adjacent property. The Company must obtain an easement of right-of-way prior to the installation of any Company facilities or prior to taking ownership of a customer installed conduit system.
3. The customer is to perform all trenching and backfilling where noted by the Company. This shall include, but not be limited to, removal of unsuitable backfill material and purchase and installation of select backfill material if suitable backfill material is unavailable in adjacent materials. Debris, such as rocks, pieces of wood, brush, and other similar materials shall not be backfilled into trenches. All trench lines are to be compacted and the customer shall correct any settlement of the backfill. Trench depth and level of conduits shall be in accordance with the requirements of the local jurisdiction or the National Electrical Safety Code, whichever is greater, but in any case, minimum cover from final grade to the top of the concrete encasement shall be 30". Minimum cover for direct buried conduits shall be 24" from the final grade for secondary voltage applications (less than or equal to 600v) and 30" for primary voltage applications (greater than 600v).
4. All PVC conduits are to be joined with couplings and glued with PVC solvent type of cement.
5. The customer will assume responsibility for all permanent and/or temporary restoration that may be required due to trenching operations. This shall include all types of surfaces (i.e. grass sod or seed, asphalt and/or concrete).
6. Obstructions encountered in conduit construction that cannot be economically relocated shall be bypassed by splitting or offsetting the conduit line. When a concrete envelope is split, each portion shall be encased in concrete and the intervening space backfilled with compact select material. Approval of the Project Management or Construction Department is required to split the envelope. The divergence of the ducts shall start a minimum of 8 feet before and after the obstruction.
7. The inner surface of the conduit must be free of obstructions that may damage cable during installation. When construction of the conduit line is completed, all conduits shall be rodded with

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a mandrel having a diameter of ¼" (inch) less than bore diameter of the conduit, and be brushed with a stiff wire brush. All conduits are then to contain "polyolefin" 1,000 pounds stress pull lines or better, to accommodate the pulling of cable.

8. During construction, plugs should be installed at the end of each working day.
9. The ends of any conduit installed by the customer must be clearly marked to assist the Company in locating the conduit.
10. It is the Customer's responsibility to follow all erosion and sediment control requirements as required by the State, including notification, maintenance and inspections of erosion and sediment control measures.

Section III-Concrete Encasement

1. When specified by the Company concrete encasement shall have the following:
 - a. Minimum of 3000 psi concrete with a maximum ¾" (inch) aggregate.
 - b. Three inch envelope of concrete surrounding the conduit system.
 - c. Vibrated to eliminate voids.
2. All concrete encased conduit runs, (duct banks) regardless of the number of ducts, shall have a minimum of 1 ½" (inch) horizontal and vertical spacing between ducts, except at the entrance to manholes. The concrete envelope, or encasement, shall be a minimum of 3" (inch) thick. When entering manholes, ducts are to have a vertical and horizontal separation of not less than 2 ½" (inch). Point of separation should begin a minimum of 8' (feet) from the manhole wall.
3. Standard spacers, located at 5' (foot) intervals, shall be used in all conduit construction regardless of concrete encasement as follows:
 - a. For 600 volt cable with 4 or more sets of conduit.
 - b. For 2000 volt cable and greater with 5 or more sets of conduit.
4. The conduit or concrete envelope shall have a minimum of 12" (inch) separation from all obstructions and existing utilities except with permission by the Company.
5. The duct bank configuration will normally be two (2) conduits wide and the required number in depth. However, with the Company's approval, the customer may configure the conduits more than two (2) wide to avoid obstructions. When entering a manhole, the duct bank configuration must be 2 conduits wide.

Section IV-Manholes

1. For projects involving customer installed manholes, the Company's drawing entitled "Standard Duct Face Construction" is enclosed. This drawing is for 6" conduit but must be adjusted based on conduit size. Bell ends are to be installed on conduit at the point where it enters a vault or manhole. The bell ends shall be flush with the interior wall and the wall shall be parged to provide a smooth transition. All excess concrete shall be removed. Manhole shall be cleaned of all debris.

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2. Manhole design shall be based on HS-20 loading of the latest editions of the “Standard Specification for Highway Bridges” of the American Association of State Highway and Transportation Officials (AASHTO) and the American Concrete Institute 318 (ACI-318). The customer is to assume sole and complete liability for failure of manholes to support vehicle loading. The customer will be required to make repairs or replace the manholes should they deteriorate within one year after acceptance by the Company.
3. All precast concrete manholes and splice boxes are to be set by the customer so the frame and cover is flush with the final grade surface. The burial depth cannot exceed 60” (inches) of chimney height with a 24” (inch) burial depth preferred. A precise or field constructed collar is to be installed between the frame and the top of the manhole. The minimum collar heights shall be 12 inches. This collar height is adjustable within the range given to compensate for the setting depth of the manhole as installed. The Company will make 30” (inch) diameter frame and covers available at our office for pickup and installation by the customer. Only Company-provided manhole covers are to be used on Company manholes.
4. A 6” to 8” (inch) bed of gravel is to be placed in the bottom of the excavation holes prior to setting manholes. Crushed rock (#57 stone, 2A and smaller size aggregate grades), pea gravel and sand are suitable for this purpose. Smaller composite type splice boxes do not require a gravel bed.
5. Manholes should be buried as soon as possible to limit personnel safety concerns around the open excavation and to avoid the possibility of a flooding rain floating, shifting or causing structural issues to the manhole. In general, an unburied manhole should not be allowed to fill with water. The best backfilling practice is to uniformly backfill in equal 6” lifts with no more than a couple feet difference between side walls. This minimizes the potential of lateral manhole displacement due to excess soil pressure on one side.
6. Manhole grounding may be either:
 - a. Four (4) six-foot copper ground rods are to be installed in each manhole, one rod in each corner. The Company shall supply the ground rods for the customer to install.
 - b. Counterpoise and/or Ufer grounding method is to be installed as required by the Company. Ufer method cannot be used if ductbank has steel reinforcement included due to reaction of dissimilar metals.
7. Field poured manholes, when necessary, shall be designed by a 3rd party engineering company with experience designing underground structures. Manholes shall have minimum concrete compressive strength of 5000 psi at 28 days. They must be designed for HS-20 loading regardless of location. and adhere to the latest revision of the applicable sections of following ASTM and ACI standards:

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- a. ACI 318 Building Code Requirements for Structural Concrete and Commentary
- b. ASTM C857 Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
- c. ASTM C891 Standard Practice for Installation of Underground Precast Concrete Utility Structures
- d. ASTM A123 - Zinc (Hot-Galvanized) Coatings on Iron and Steel Products.
- e. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- f. ASTM A615 - Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- g. ASTM C31 - Making and Curing Concrete Test Specimens in the Field.
- h. ASTM C33 - Concrete Aggregates.
- i. ASTM C39 - Compressive Strength of Cylindrical Concrete Specimens.
- j. ASTM C40 - Organic Impurities in Fine Aggregates for Concrete.
- k. ASTM C42 - Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
- l. ASTM C88 - Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
- m. ASTM C94 - Ready-Mixed Concrete.
- n. ASTM C143 - Slump of Hydraulic Cement Concrete.
- o. ASTM C150 - Portland Cement.
- p. ASTM C172 - Sampling Freshly Mixed Concrete.
- q. ASTM C192 - Making and Curing Concrete Test Specimens in the Laboratory.
- r. ASTM C231 - Air Content of Freshly Mixed Concrete by the Pressure Method.
- s. ASTM C233 - Testing Air-Entraining Admixtures for Concrete.
- t. ASTM C260 - Air-Entraining Admixtures for Concrete.
- u. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- v. ASTM C494 - Chemical Admixtures for Concrete.
- w. ASTM C618 - Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- x. ASTM D1752 - Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- y. ASTM E96 - Test Methods for Water Vapor Transmission of Materials.

Other American Concrete Institute (ACI) Standards:

- a. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- b. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- c. ACI 305 - Hot Weather Concreting.
- d. ACI 306 - Cold Weather Concreting.
- e. ACI 309 - Guide for Consolidation of Concrete.
- f. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary.

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Section V – Inspection

1. No concrete encasement of any duct bank will occur until the Company has had the opportunity to inspect the conduit run. The provision of a construction schedule as required, should allow for a smoothly progressing inspection process.
2. It is the customer's sole responsibility to notify the Company at least seven (7) days prior to the beginning of duct bank construction. This lead time is required to insure the availability of inspection personnel. The notification to the Company must be in writing with a brief construction schedule included. The name and telephone number of the individual supervising the work shall be included with the notification.

Section VI – Conduits Terminating in Building or Transformer

1. All conduits, including spares, terminating in an open or exterior area including at poles, buildings or other structures shall be plugged to prevent entrance of foreign material.
2. Conduit in most cases shall be terminated on exterior of building walls using a 90 degree PVC sweep elbow with a radius as described in Section I, paragraph 3. If the conduit extends through the building wall for an indoor installation, it must meet depth of cover in accordance with Section II, Item #3.
3. It shall be the customer's responsibility to waterseal all conduits and duct banks entering a building. The sealing material must be compatible with the polyethylene insulation of the Company's cable.
4. Insofar as practical, the Company will install a seal intended to prevent the entrance of gas, on the external end of the conduit(s) entering buildings. The Customer also is required to install the water seal where he owns and installs the service lateral. Should the customer conduit and service lateral extend to the Company transformer, the Company will install a seal intended to prevent the entrance of gas, on the transformer end of the conduit(s) insofar as practical.
5. Conduit to be provided within a building for the Company's use shall be installed so that the entire installation meets the National Electric Code criteria for exterior wire. This type of installation requires special arrangements between the property owner, the Company and the local authority having jurisdiction. Reference the latest edition of the National Electrical Code, Articles 230-6 and 450, part III for more information.
6. Transformer pad sizes and well dimensions vary greatly depending on the size of the transformer. The Company will supply transformer pad drawings for proposed transformer installations.



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Section VII – Customer Responsibility

1. Customer designed conduit plan and profile drawings for facilities encased in concrete must be submitted to the Company for approval prior to customer installation, unless mutually agreed upon that a plan and profile is not necessary. Plan and profile drawings may be required for any project based on the Company’s discretion.
2. Subsequent to the notification outline in Section V, a pre-construction meeting will be held at the Company’s local office located at:

_____ (Address)

_____ (City)

_____ (State / Zip Code)

3. Representatives from the general contractor and appropriate subcontractors are required to attend the meeting. The Company’s Construction Management Department representative will review the proposed construction schedule and discuss any construction practices and/or methods applicable to the project at hand. The undersigned Company representative will coordinate and schedule this meeting.
4. The customer agrees that no work will proceed until the conduit specifications are executed and returned to the Company. Additionally, a copy of the specifications will be kept in the site office and will be presented on demand to the Company’s authorized representative.
5. The customer will supply two copies of the as-built drawings showing the final locations of the duct bank and manholes, or conduits as actually installed in the field.
6. The Company will not consider the requirements of these specifications complete and in full compliance, until all cable has been installed, terminated and energized. It is the customer’s sole responsibility to make repairs, corrections, or alterations to conduits not meeting the requirements of this specification. The customer will be required to make repairs or replace the manholes, conduit system or any part thereof, should they deteriorate within one year after acceptance by the Company.

Section VIII - Clearances

1. The sizes and location of pad mounted devices shown on drawings may not be to scale. In addition, architectural plans may not be available during design of the duct system. Therefore, the following clearances must be met for pad mounted devices:
 - a. A minimum of 10' (feet) of clear flat ground must be maintained on the door ends of pad mounted equipment. Doors are located on two ends of a pad mount switch.
 - b. A minimum of three feet must be maintained on the remaining two sides of a pad mount device from another pad mounted device, wall or other obstruction.
 - c. A minimum clearance of five feet must be maintained between any pad mounted device and a window or ventilating system.
 - d. A minimum of 20' (feet) must be maintained between any pad mounted device and a fire escape.
 - e. Transformers and other devices cannot be placed within 5' (feet) of building air intake systems.

Section IX – Miscellaneous

1. Pad mounted devices can be screened. Any screening must allow for and maintain required clearances. For example, gates may installed on the door end (or ends) of any device to allow Company personnel to safely operate it. Any screening must be submitted to the Company for approval.
2. Pad mounted devices should not interfere with line of sight for vehicles at intersections or at driveway entrances.
3. The cost to relocate facilities to meet required clearances or line of site will be the customer's responsibility.



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LETTER OF AGREEMENT

WR#:

We understand and agree with your requirements as submitted. All conduit work and inspection coordination will comply fully with these specifications. It is further agreed that all appropriate subcontractors have been made aware of Company requirements. Compliance by all parties is guaranteed. Any questions arising during the construction phase will be brought to the Company representative immediate attention.

Firm Name: _____

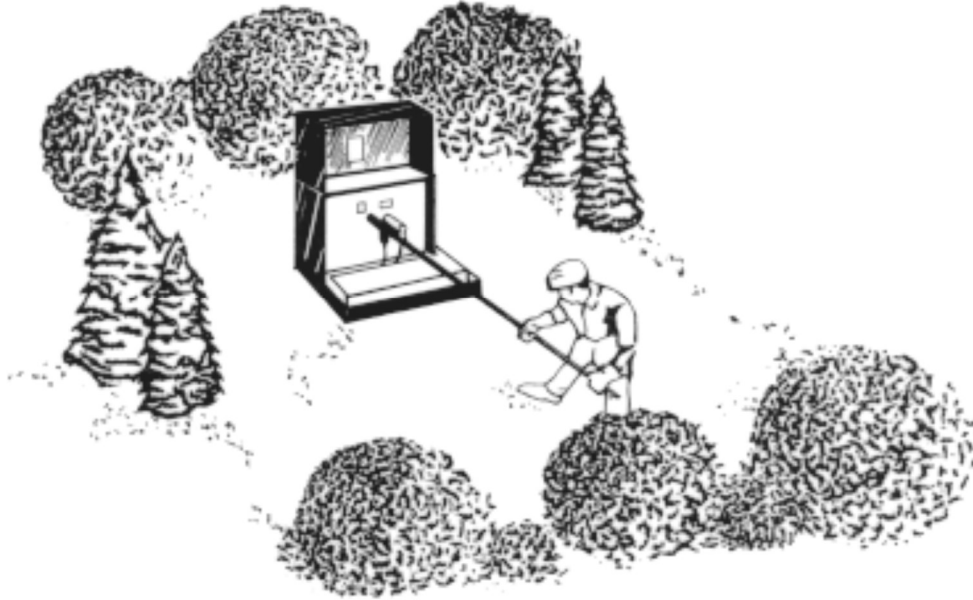
Signature: _____

Print Name: _____

Date: _____

Contact email address: _____

Contact Telephone #: _____

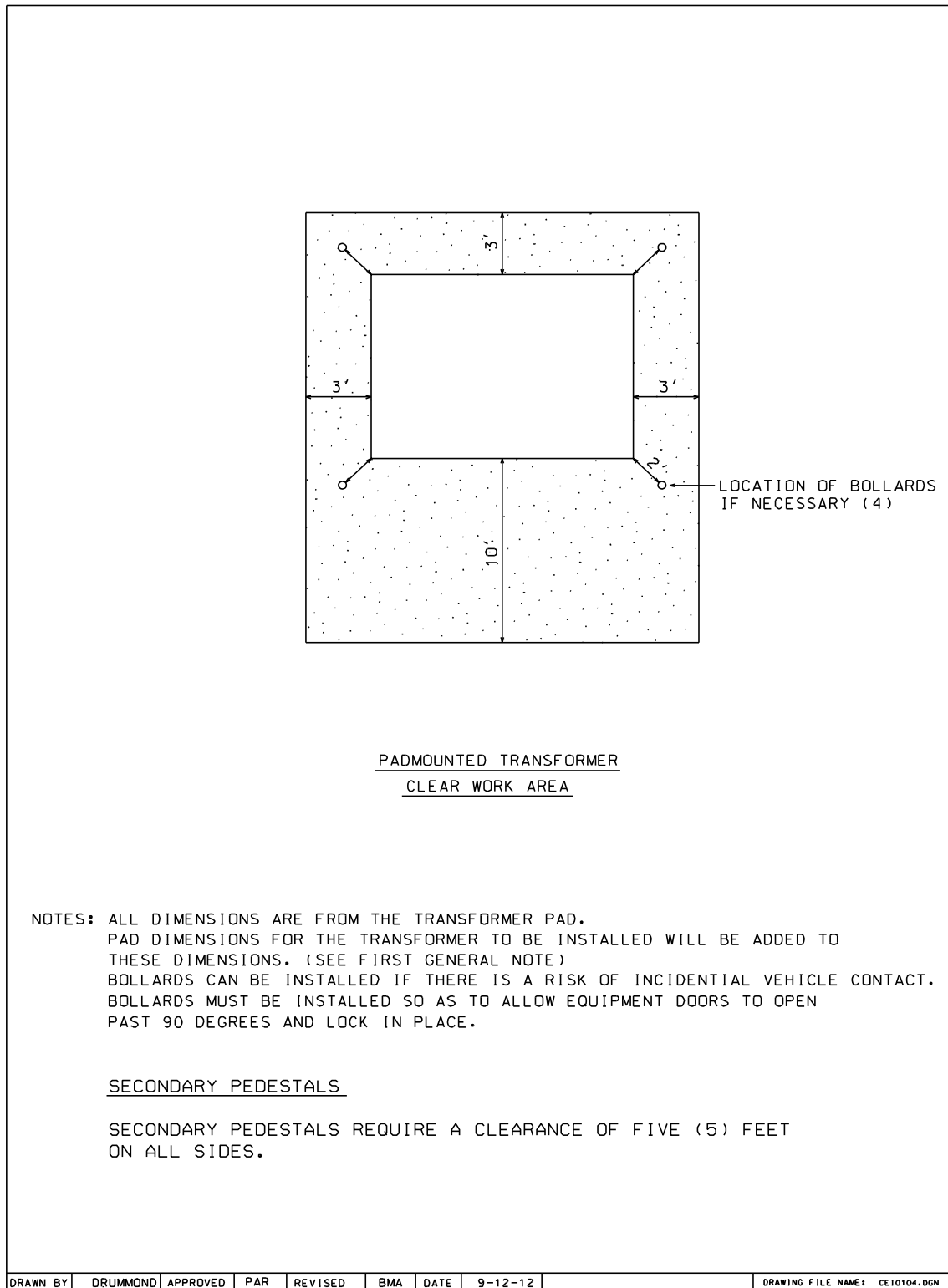


**WE NEED ROOM TO WORK SAFELY
ON THIS DEVICE.**

**PLEASE KEEP SHRUBS AND
STRUCTURES 10 FEET AWAY FROM
THE SIDE WITH DOORS AND 3 FEET
FROM OTHER SIDES.**

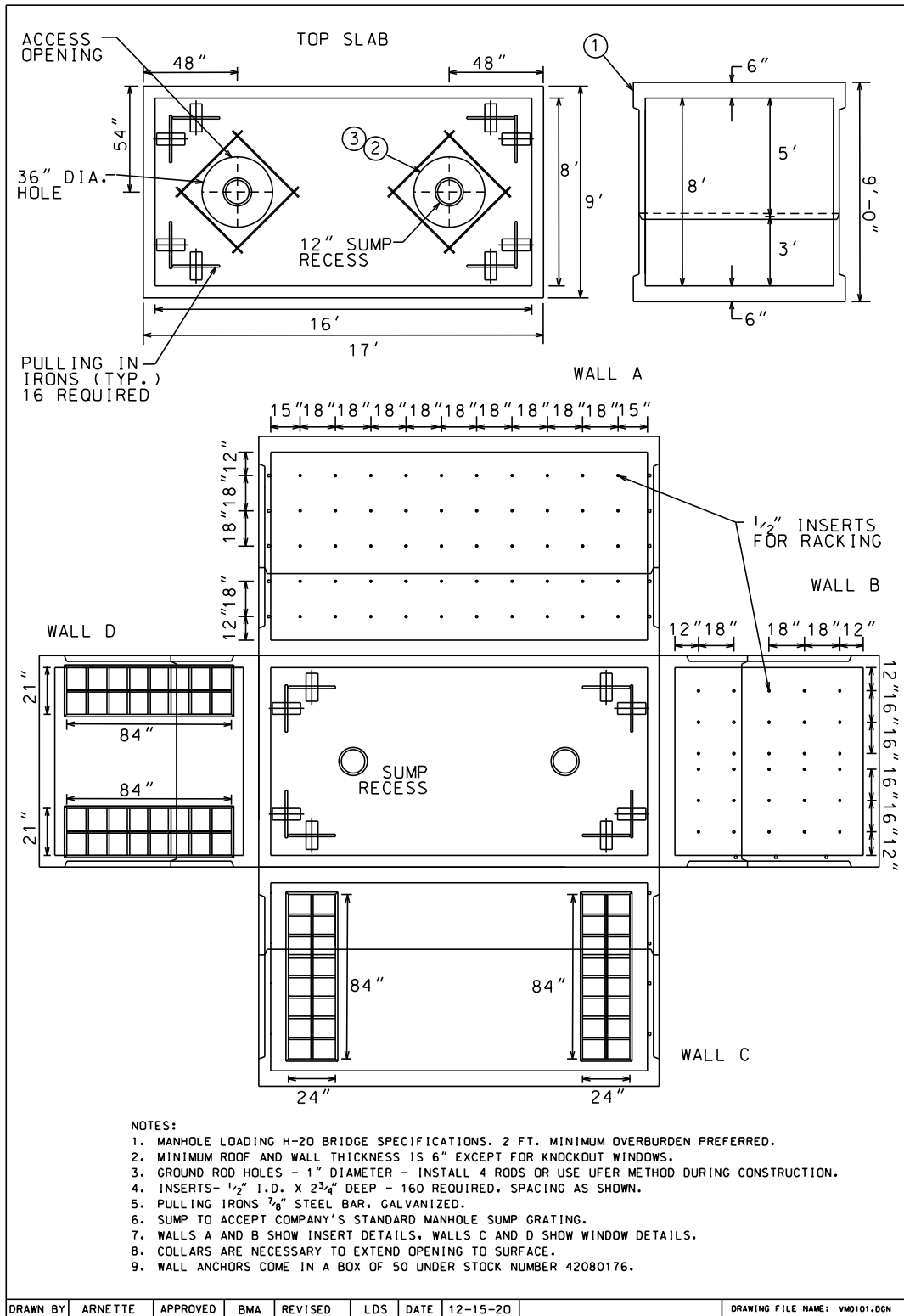
**OBSTRUCTIONS MAY BE DAMAGED
OR REMOVED DURING SERVICE
RESTORATION OR MAINTENANCE.**

PADMOUNT EQUIPMENT WORKING CLEARANCES



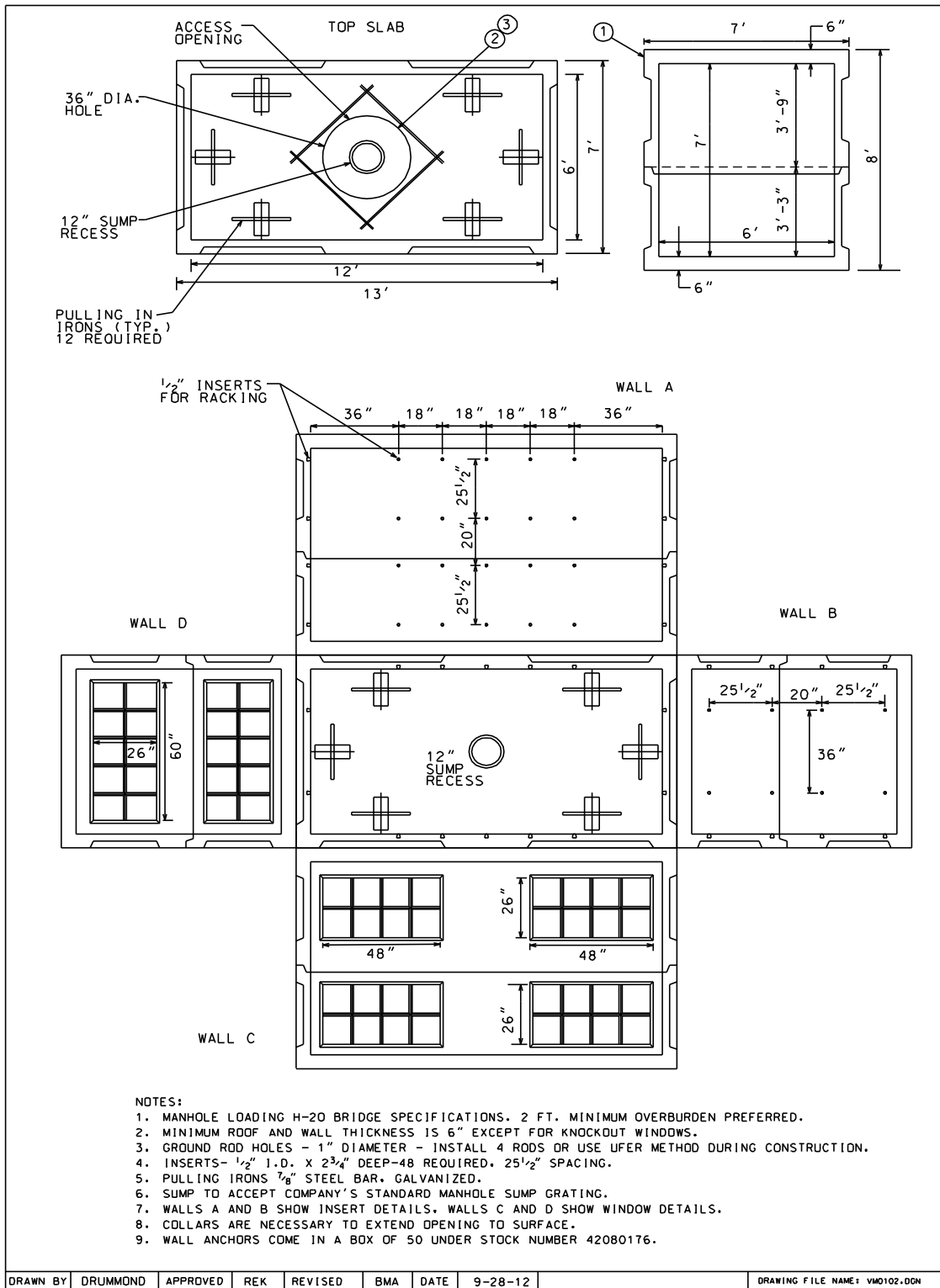
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PRECAST MANHOLE FOR UNDERGROUND CABLES I.D. 8' X 16' X 8'



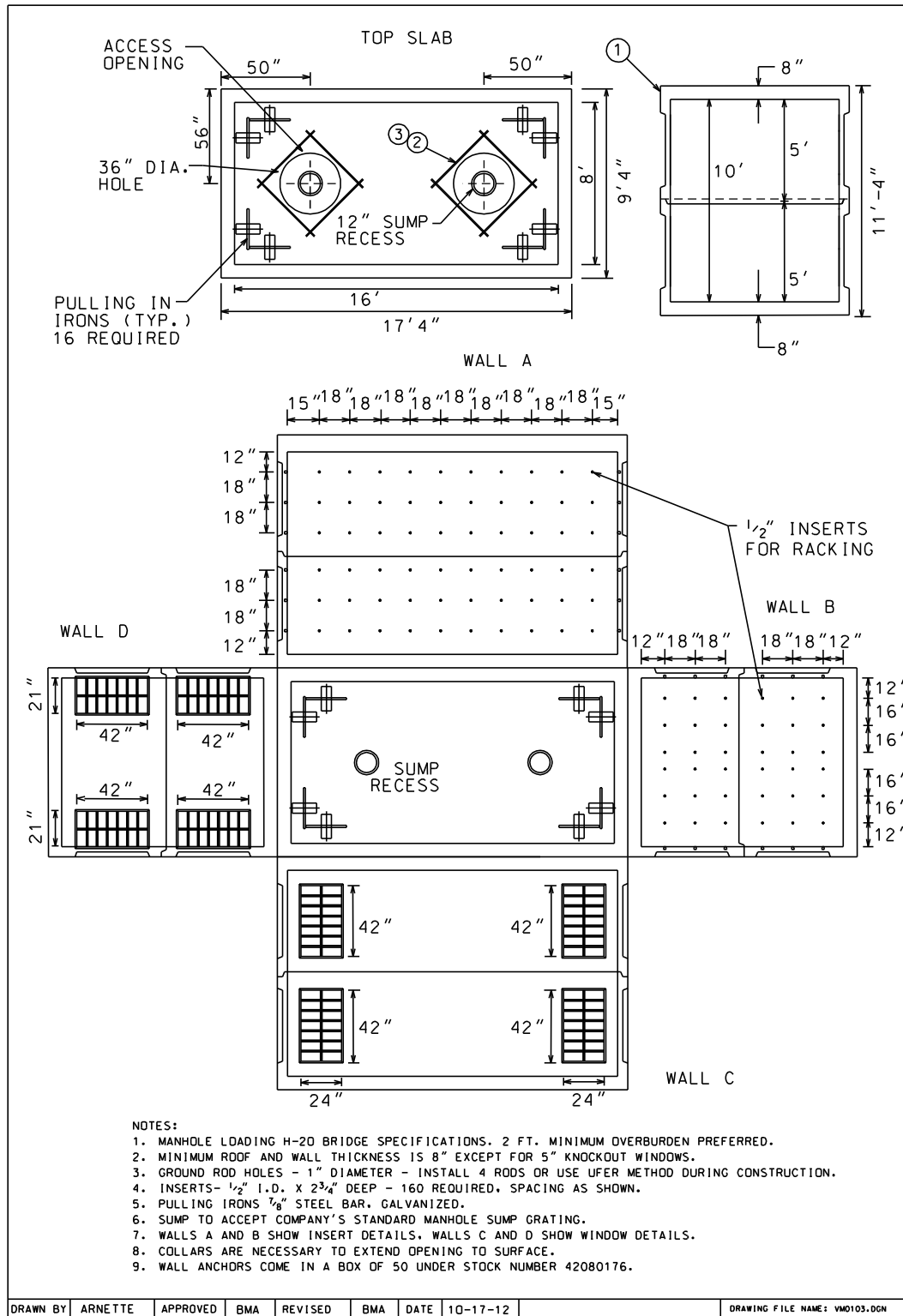
DOMINION CONDUIT SPECIFICATIONS

PRECAST MANHOLES FOR UNDERGROUND CABLE I.D. 6' X 12' X 7'



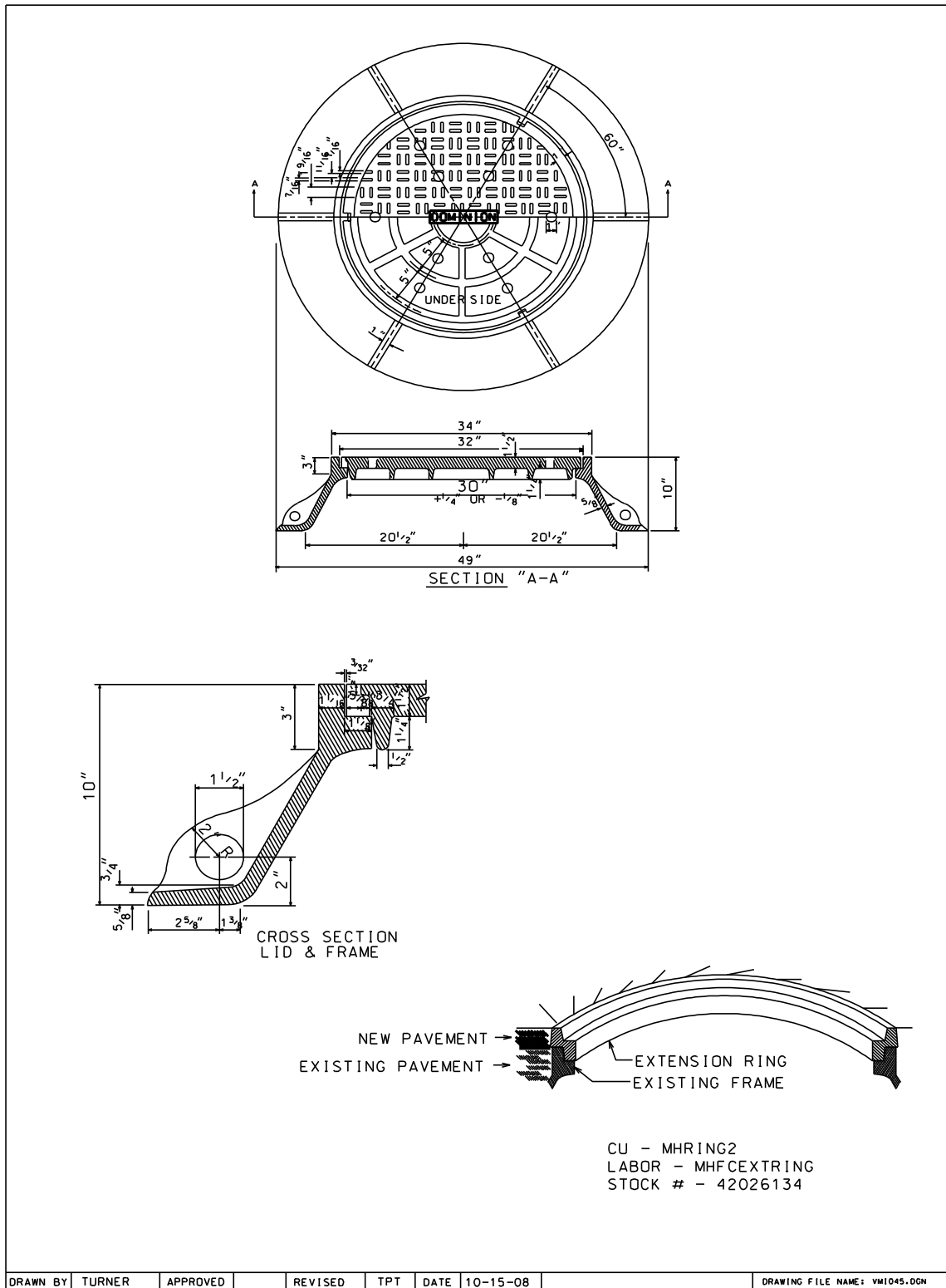
DOMINION CONDUIT SPECIFICATIONS

PRECAST MANHOLES FOR UNDERGROUND CABLE I.D. 8' X 16' X 10'

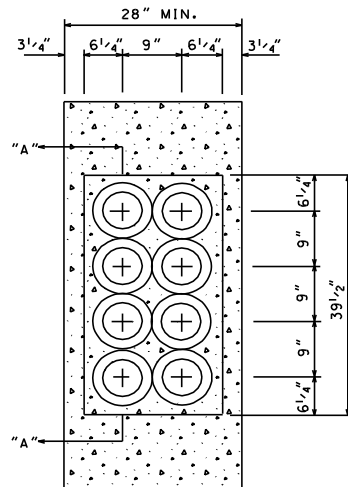


DOMINION CONDUIT SPECIFICATIONS

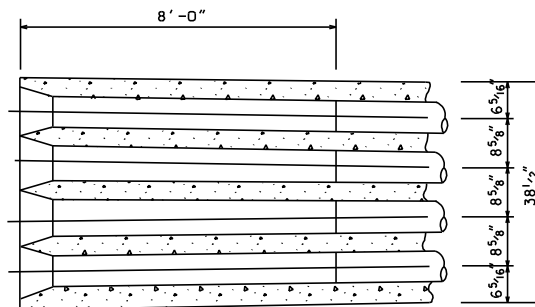
STANDARD 30 INCH MANHOLE FRAME COVER AND EXTENSION RING



STANDARD DUCT FACE CONSTRUCTION



DETAIL OF DUCT FACE
IN MANHOLE WALL

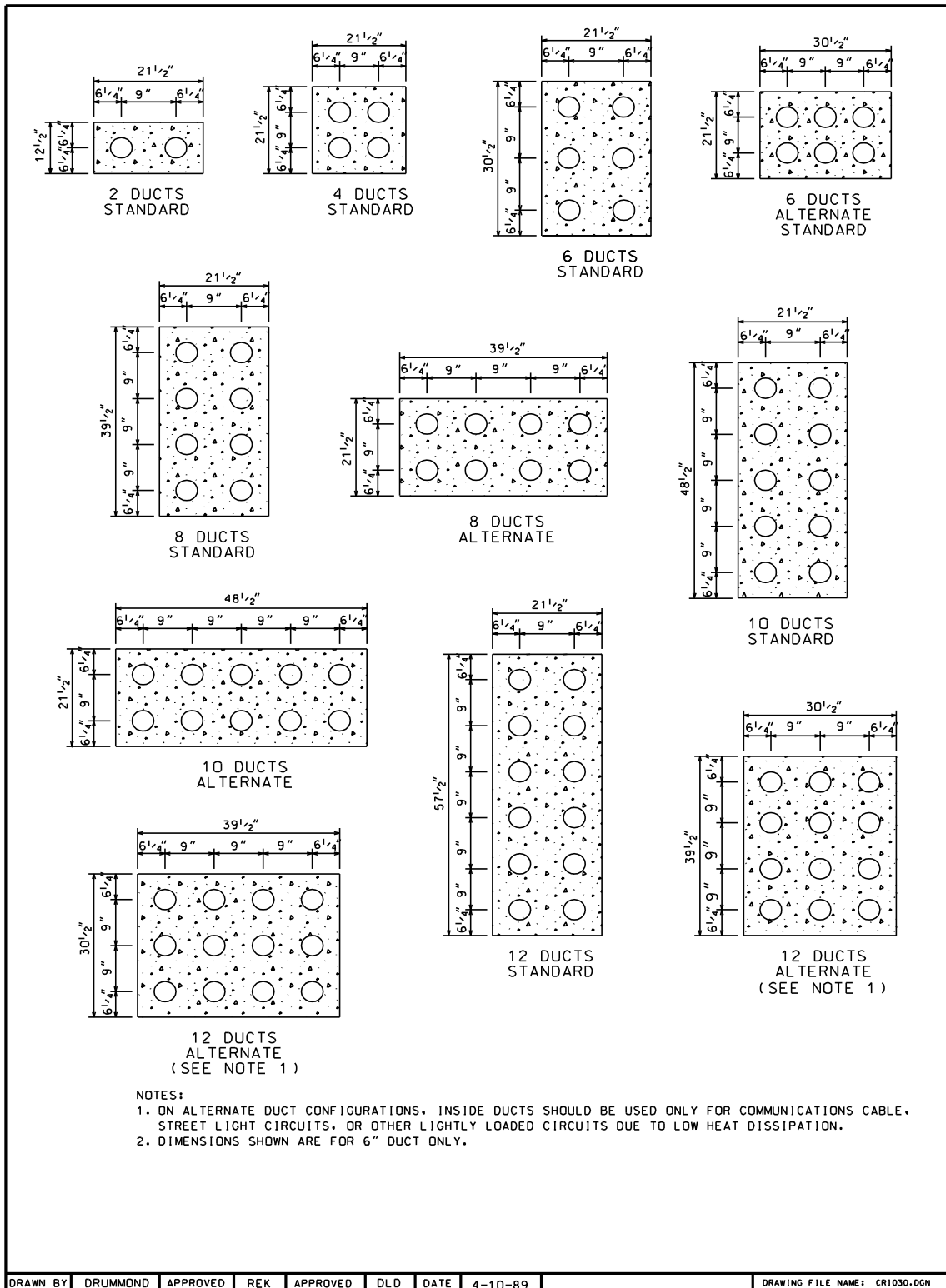


SECTION "A-A"

NOTE:
DIMENSIONS SHOWN ARE FOR 6" DUCT ONLY.

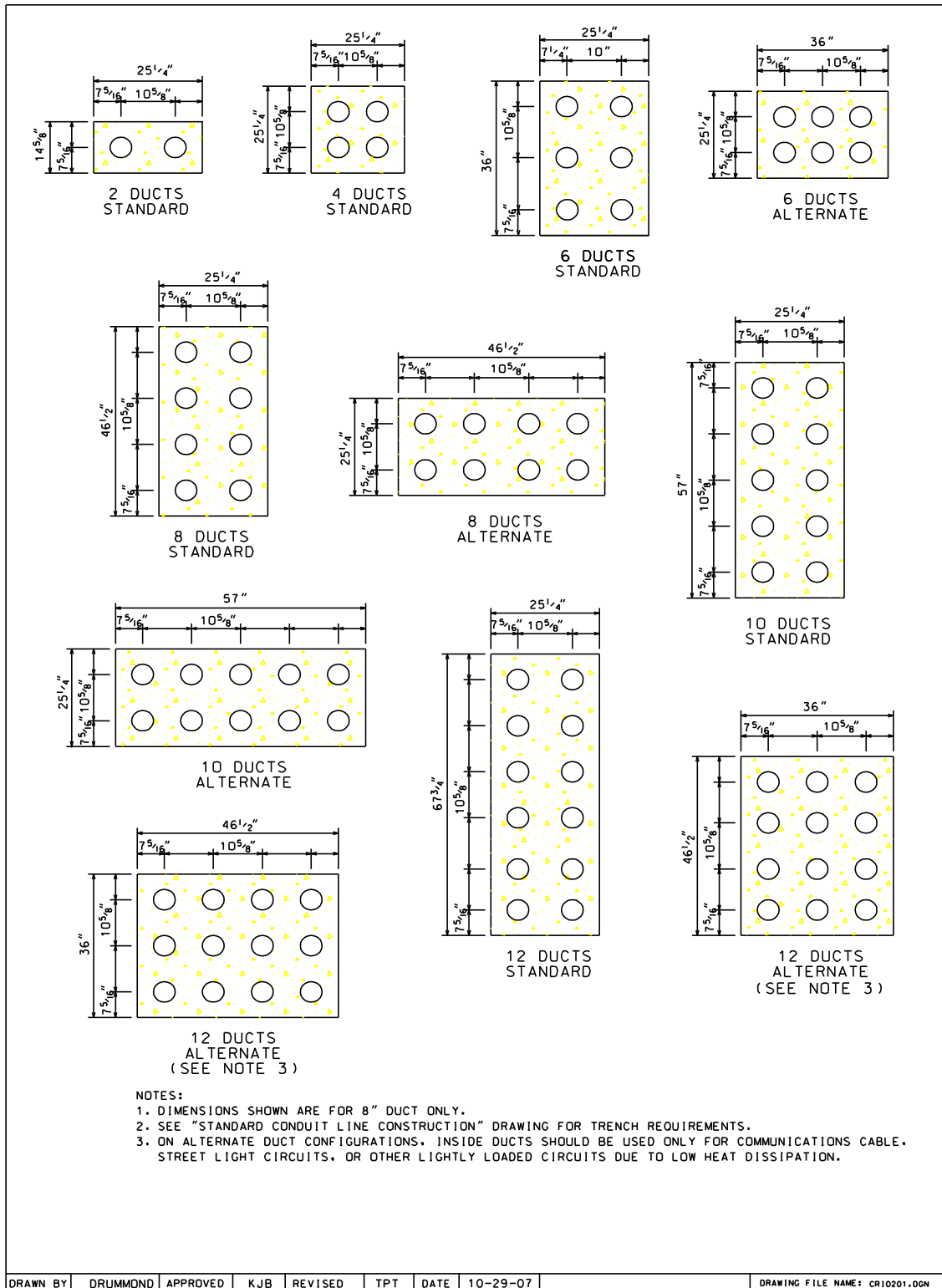
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STANDARD 6" DUCT FACE FORMATION IN MANHOLE

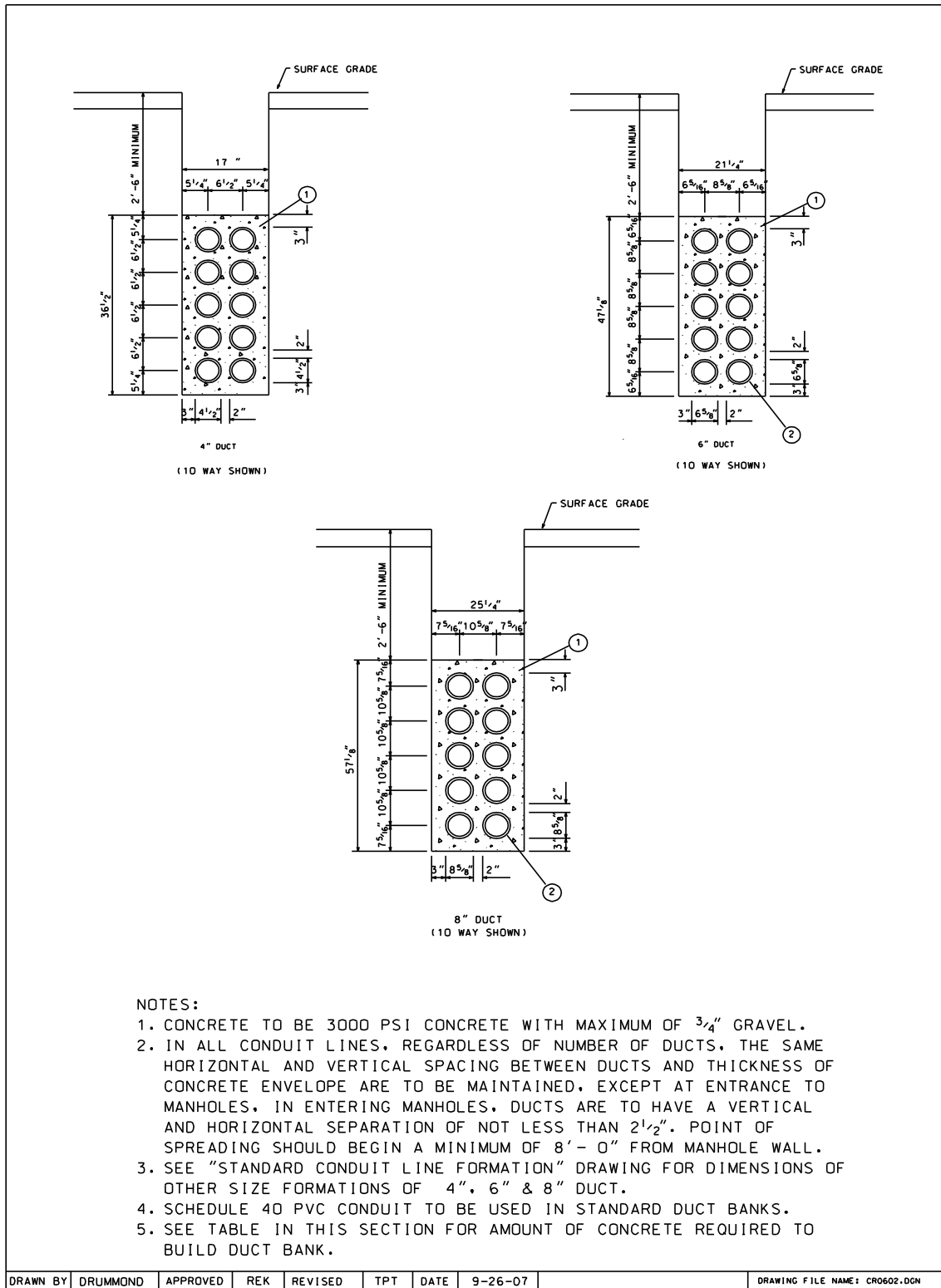


DOMINION CONDUIT SPECIFICATIONS

STANDARD CONDUIT LINE FORMATION – 8" DUCT

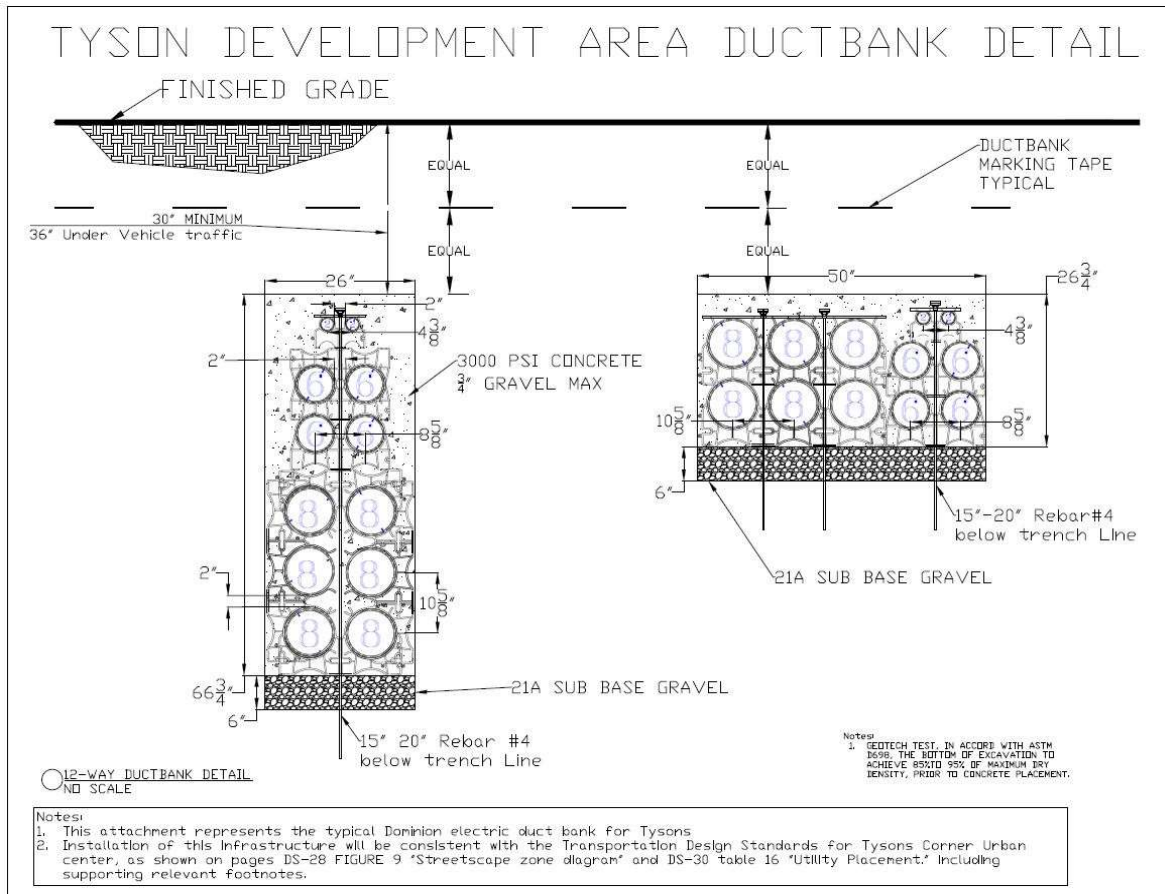


STANDARD CONDUIT LINE CONSTRUCTION

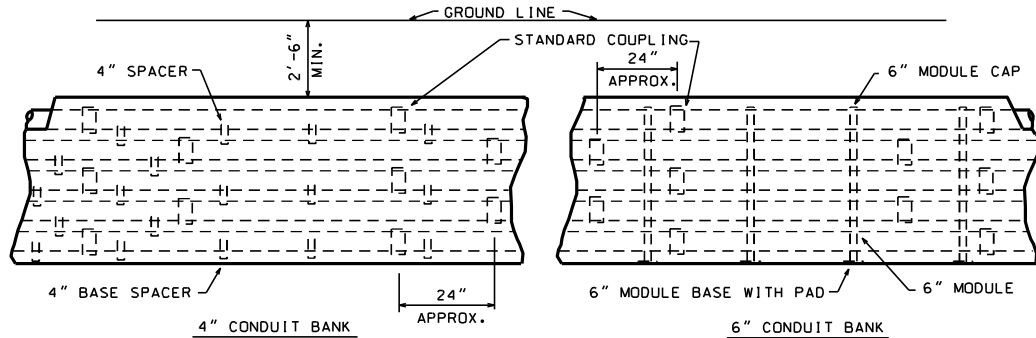


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TYSON AREA DUCTBANK CONSTRUCTION



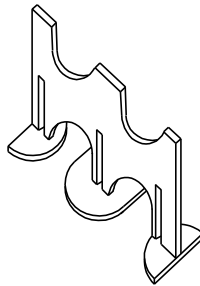
DOMINION CONDUIT SPECIFICATIONS



- NOTES:**
1. WHEN REINFORCING STEEL IS REQUIRED THE BASE SHALL BE 4" OF CONCRETE.
 2. USE PLASTIC SPACERS APPROXIMATELY EVERY 5 FEET.
 3. STAGGER COUPLINGS/JOINTS BY APPROXIMATELY 2 FEET.

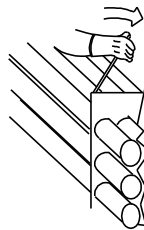
6" MODULE BASE WITH PAD

(A)



- (A) USE BASE MODULE ONLY IN SANDY OR SOFT SOIL CONDITIONS, OR WHERE THE NUMBER OF VERTICAL TIERS IS GREATER THAN 4. USE REGULAR MODULE AS BASE UNIT IN GOOD SOIL, AND IN CONDUIT BANKS OF 4 TIERS OR LESS.

(B)



- (B) STEEL REINFORCING RODS CAN BE DRIVEN DOWN THROUGH VERTICAL CHANNELS ON BOTH SIDE EDGES OF THE SPACERS AND INTO TRENCH FLOOR (#3 ROD NORMALLY USED). A SHORT LENGTH OF PIPE CAN THEN BE USED TO BEND RODS INWARD TO PREVENT FLOTATION.

INNOVATIONS

(C)

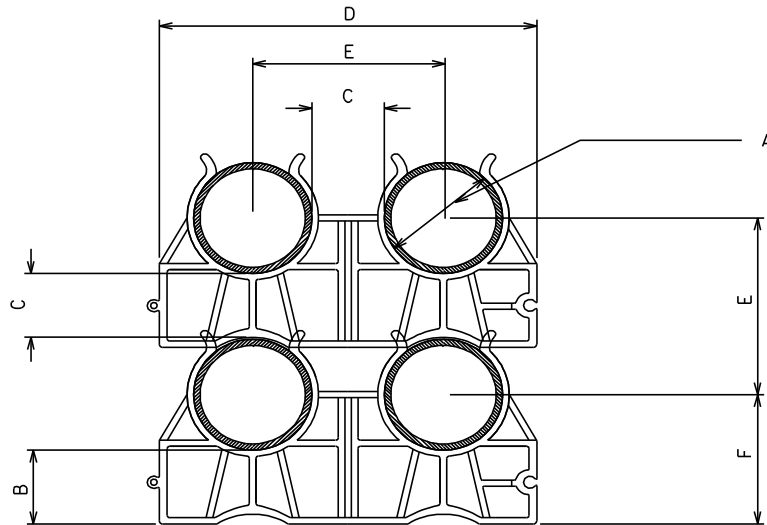


- (C) VERTICAL SPREADS CAN BE MADE TO GET OVER OBSTRUCTIONS OR INTO MULTI-LEVEL KNOCKOUTS IN MANHOLE WALLS BY THE FOLLOWING METHOD:
- 1) BASE OR MODULE SPACERS ARE PLACED INTO POSITION AND STEEL REINFORCING RODS DRIVEN DOWN THROUGH VERTICAL OPENINGS IN BOTH OUTER EDGES OF THE SPACER.
 - 2) AFTER DUCTS ARE LAID IN, PLASTIC MODULE CAP LOCKS ONTO BASE OR MODULE SPACER.
 - 3) METAL COLLAR WITH LOCKING THUMB SCREW FASTENS AT TOP OF MODULE CAP PREVENTING TIER FROM FLOATING AND AT BOTTOM OF INTERMEDIATE SPACER TO SUPPORT SECOND DUCT TIER AT DESIRED ELEVATION. THEN PROCESS IS REPEATED.

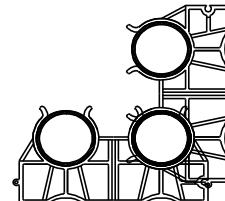
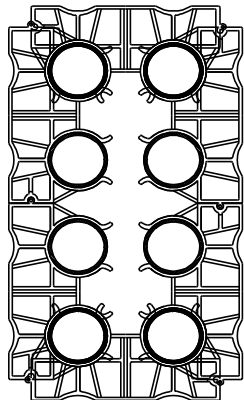
INSTALLATION OF 6" SPACERS

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STANDARD CONDUIT SPACER



STOCK NUMBER	CONDUIT SIZE	A	B	C	D	E	F
42111053	4	4.500	3.00	2.00	13.00	6.50	5.25
42111054	6	6.625	3.00	2.00	17.25	8.625	6.312
42111055	8	8.625	3.00	2.00	21.25	10.625	7.312

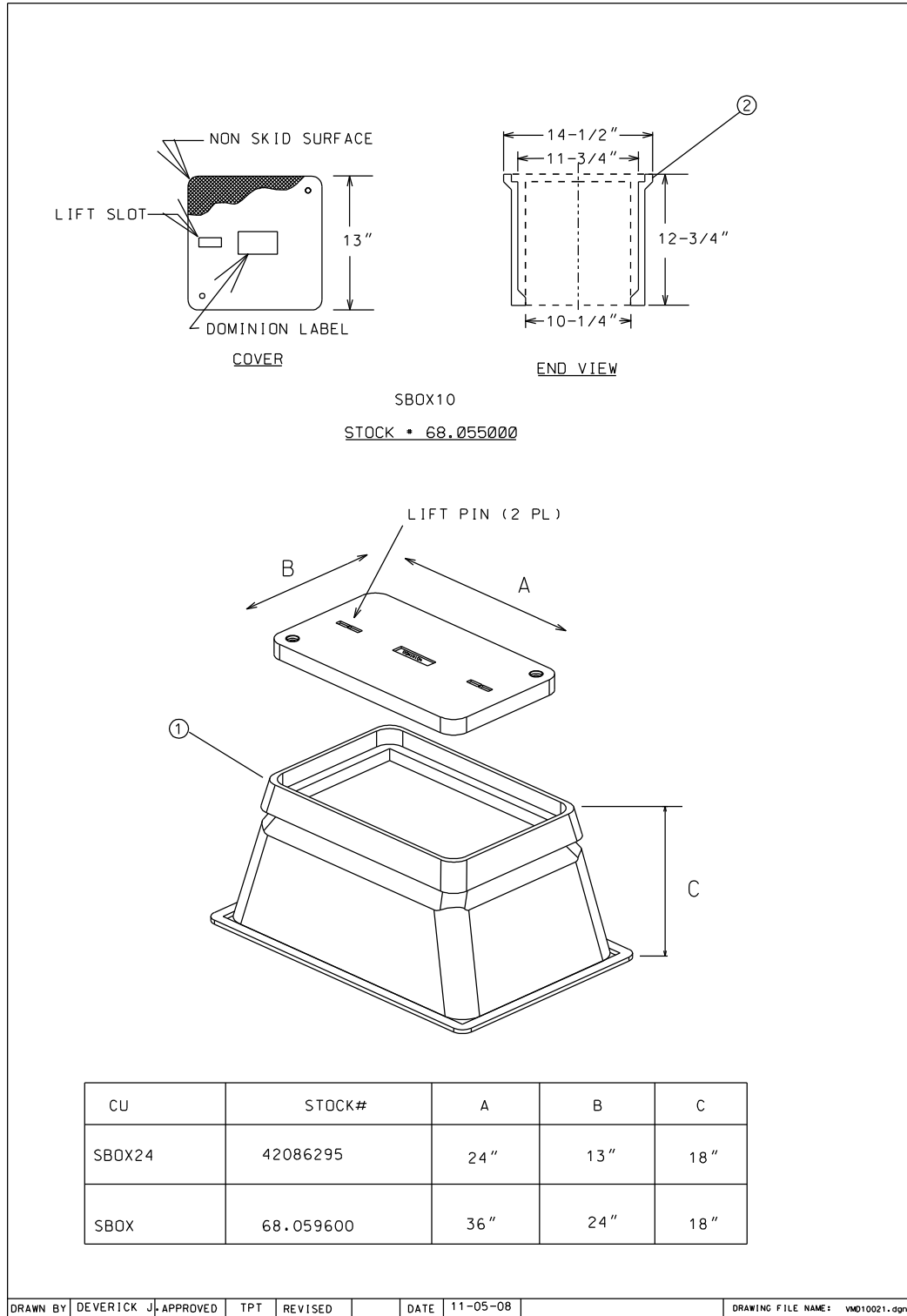


ALTERNATE VARIATIONS

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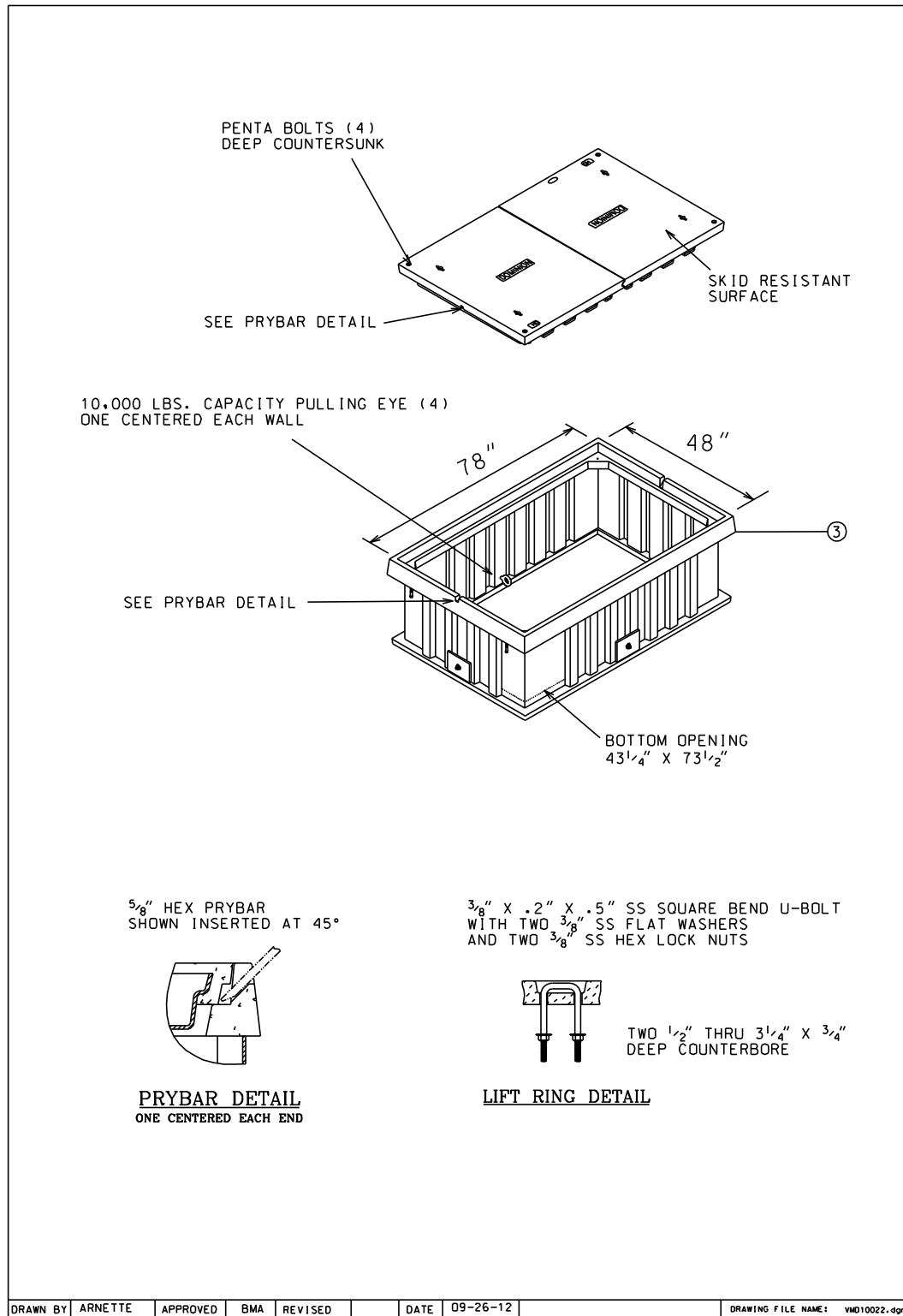
DOMINION CONDUIT SPECIFICATIONS

POLYMER CONCRETE SPLICING BOX (SMALL)



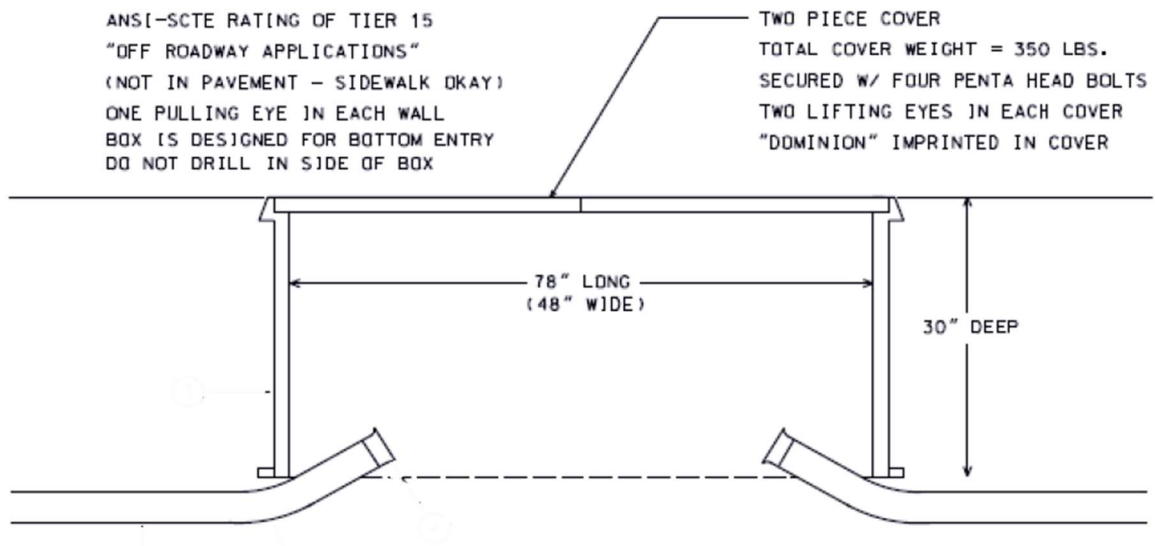
DOMINION CONDUIT SPECIFICATIONS

POLYMER CONCRETE SPLICING BOX (LARGE)



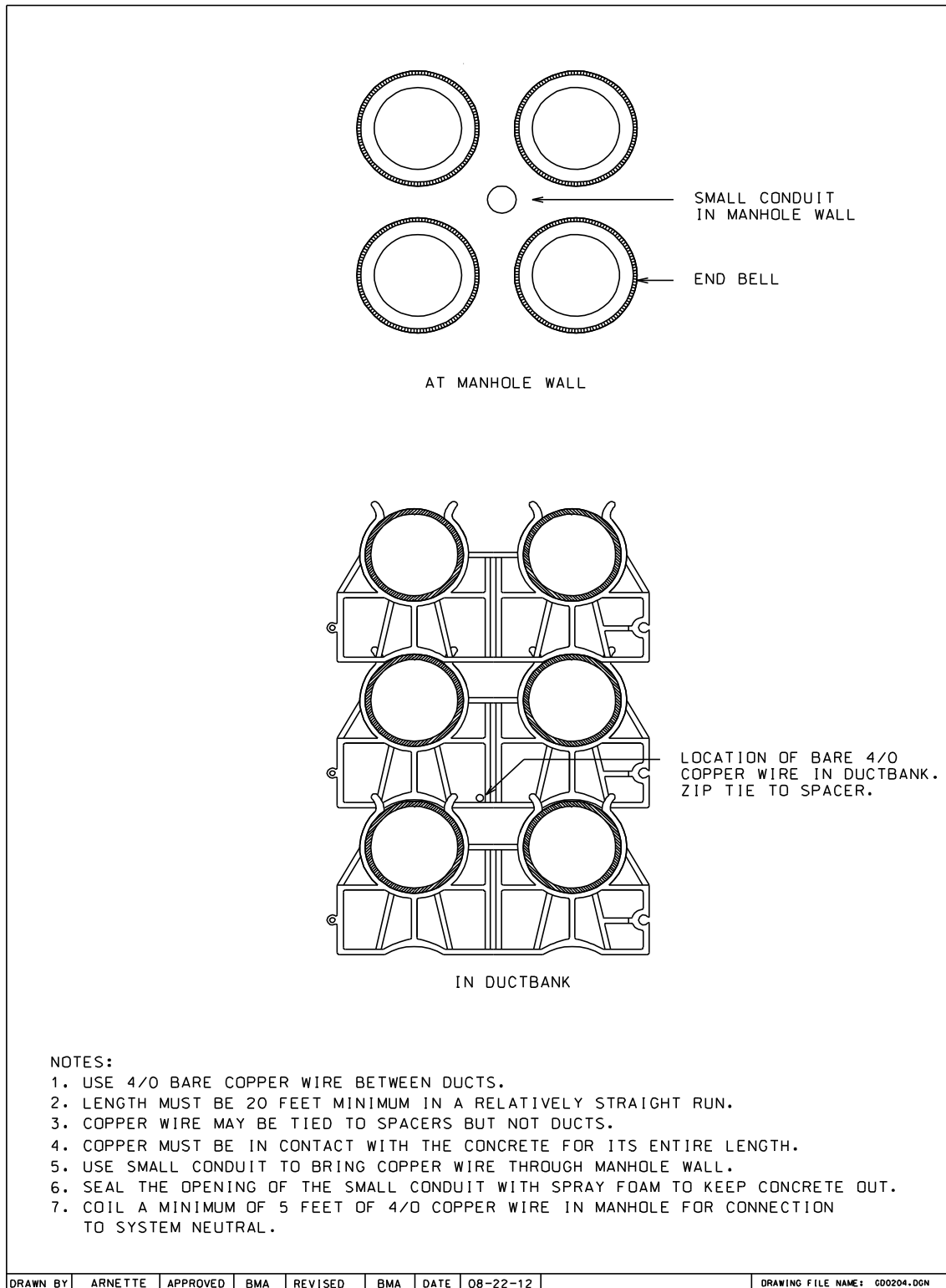
DOMINION CONDUIT SPECIFICATIONS

CONDUIT ENTRY FOR LARGE POLYMER CONCRETE SPLICING BOX



DOMINION CONDUIT SPECIFICATIONS

UFER GROUNDING



COUNTERPOISE GROUNDING

