



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 Virginia Power and Dominion North Carolina Power (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.



DOMINION CONDUIT SPECIFICATIONS

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 MISS UTILITY or North Carolina One Call Center prior to any excavation.
 - a. Miss Utility in Virginia: 811
 - b. North Carolina One Call Center: 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.



DOMINION CONDUIT SPECIFICATIONS

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 a mandrel having a diameter of $\frac{1}{4}$ " (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 $\frac{3}{4}$ " (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 $1\frac{1}{2}$ " (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. IN entering manholes, ducts are to have a vertical and horizontal separation of not less than $2\frac{1}{2}$ " (inch). Point of separation should begin a minimum of 8' (feet) from the manhole wall.
3. Standard spacers, located at 5' (feet) intervals shall be used in all conduit construction to be concrete encased. Direct buried conduits require standard spacer installation if the conduits installed are 4", 6" or 8" and consist of six or more conduits.
4. The conduit or concrete envelope shall have a minimum of 12" (inch) separation from all obstructions and existing utilities.
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 to be adhered to without exception. 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.



DOMINION CONDUIT SPECIFICATIONS

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. 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” 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” bed of gravel is to be placed in the bottom of the excavation holes prior to setting the manholes. Smaller composite type splice boxes do not require a gravel bed.
5. 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.

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 the above items should allow for a smoothly progressing inspection process.
2. It is the customer’s sole responsibility to notify the Company at least seven (7) day 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 be installed a minimum 24” below final grade.



DOMINION CONDUIT SPECIFICATIONS

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.

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. 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.



DOMINION CONDUIT SPECIFICATIONS

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 site 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.



DOMINION CONDUIT SPECIFICATIONS

LETTER OF AGREEMENT

WR#:

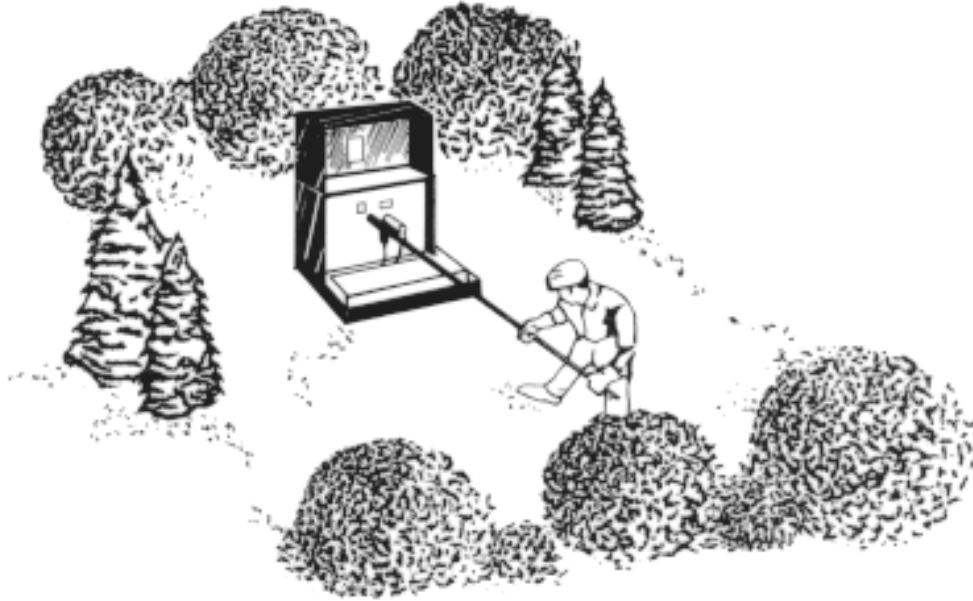
We understand and agree with your requirements as submitted. All conduit work and inspection coordination will comply fully with these specifications. It is further agreed that all appropriate subcontractors have been made aware of Company requirements. Compliance by all parties is guaranteed. Any questions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

Firm Name: _____

Signature: _____

Print Name: _____

Date: _____

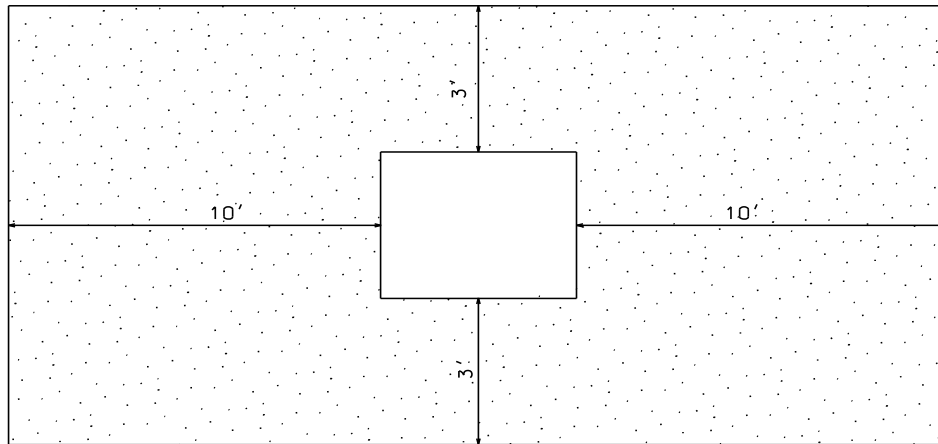


**WE NEED ROOM TO WORK SAFELY
ON THIS DEVICE.**

**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.**

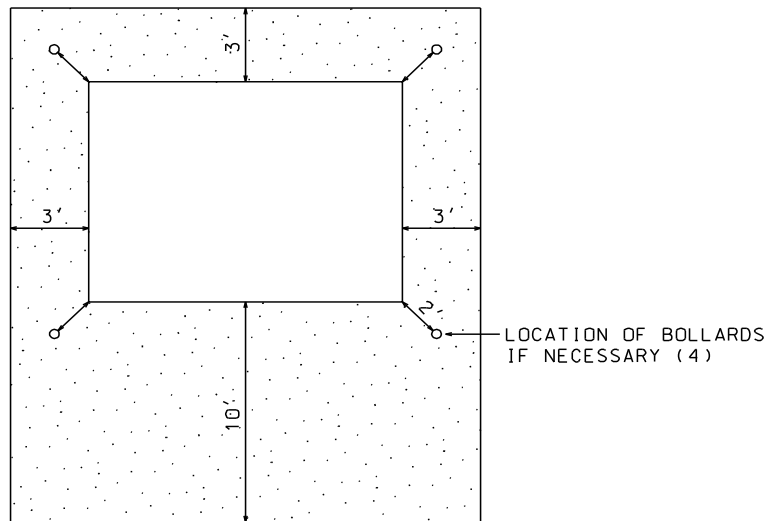
PADMOUNT EQUIPMENT WORKING CLEARANCES



SWITCH
CLEAR WORK AREA

NOTE: ALL DIMENSIONS ARE TAKEN FROM SWITCH PAD. PAD DIMENSIONS FOR THE SWITCH TO BE INSTALLED MUST BE ADDED TO THESE DIMENSIONS. (SEE GENERAL NOTE 1)

PADMOUNT EQUIPMENT WORKING CLEARANCES



PADMOUNTED TRANSFORMER
CLEAR WORK AREA

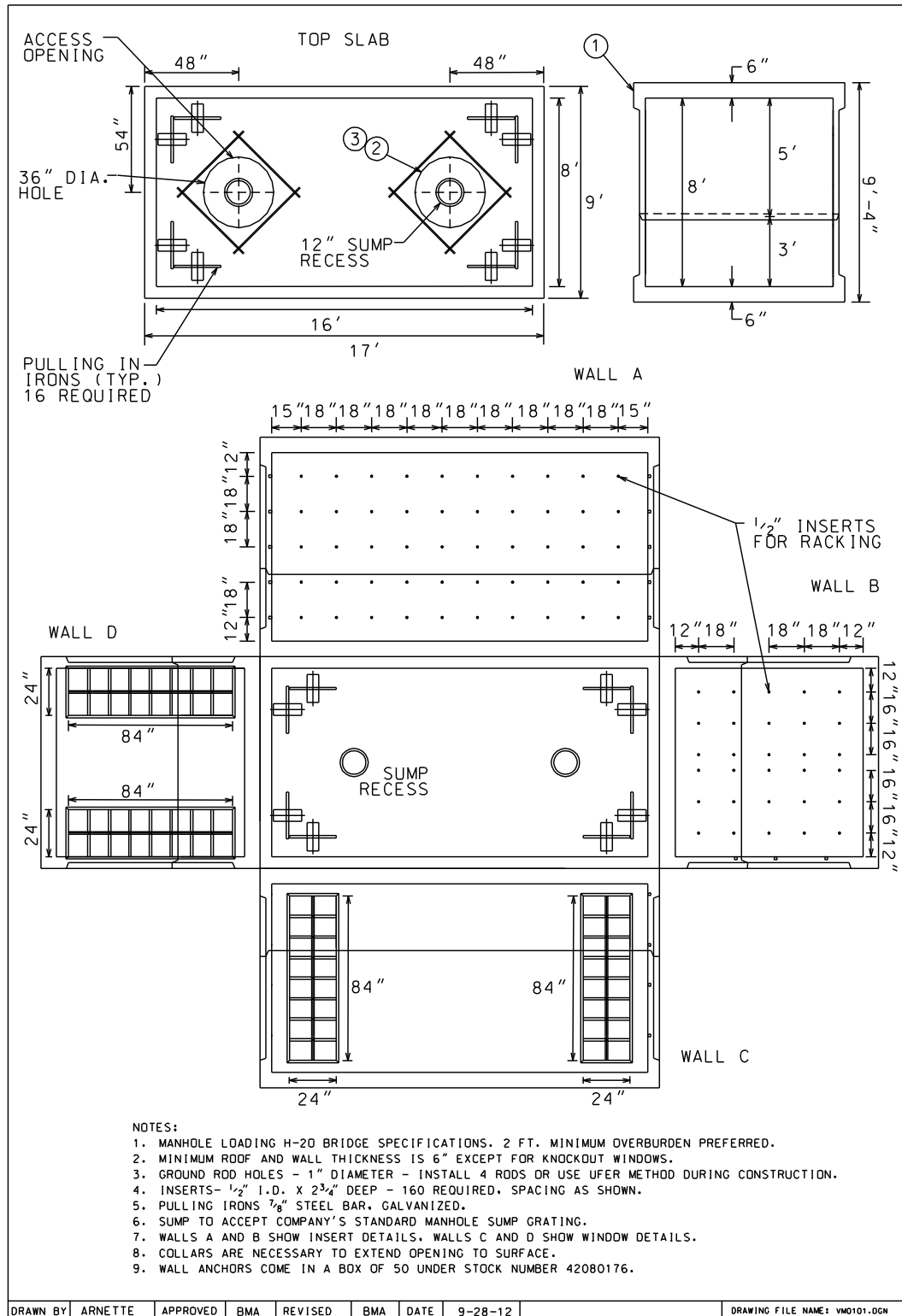
NOTES: ALL DIMENSIONS ARE FROM THE TRANSFORMER PAD.
PAD DIMENSIONS FOR THE TRANSFORMER TO BE INSTALLED WILL BE ADDED TO THESE DIMENSIONS. (SEE FIRST GENERAL NOTE)
BOLLARDS CAN BE INSTALLED IF THERE IS A RISK OF INCIDENTAL VEHICLE CONTACT. BOLLARDS MUST BE INSTALLED SO AS TO ALLOW EQUIPMENT DOORS TO OPEN PAST 90 DEGREES AND LOCK IN PLACE.

SECONDARY PEDESTALS

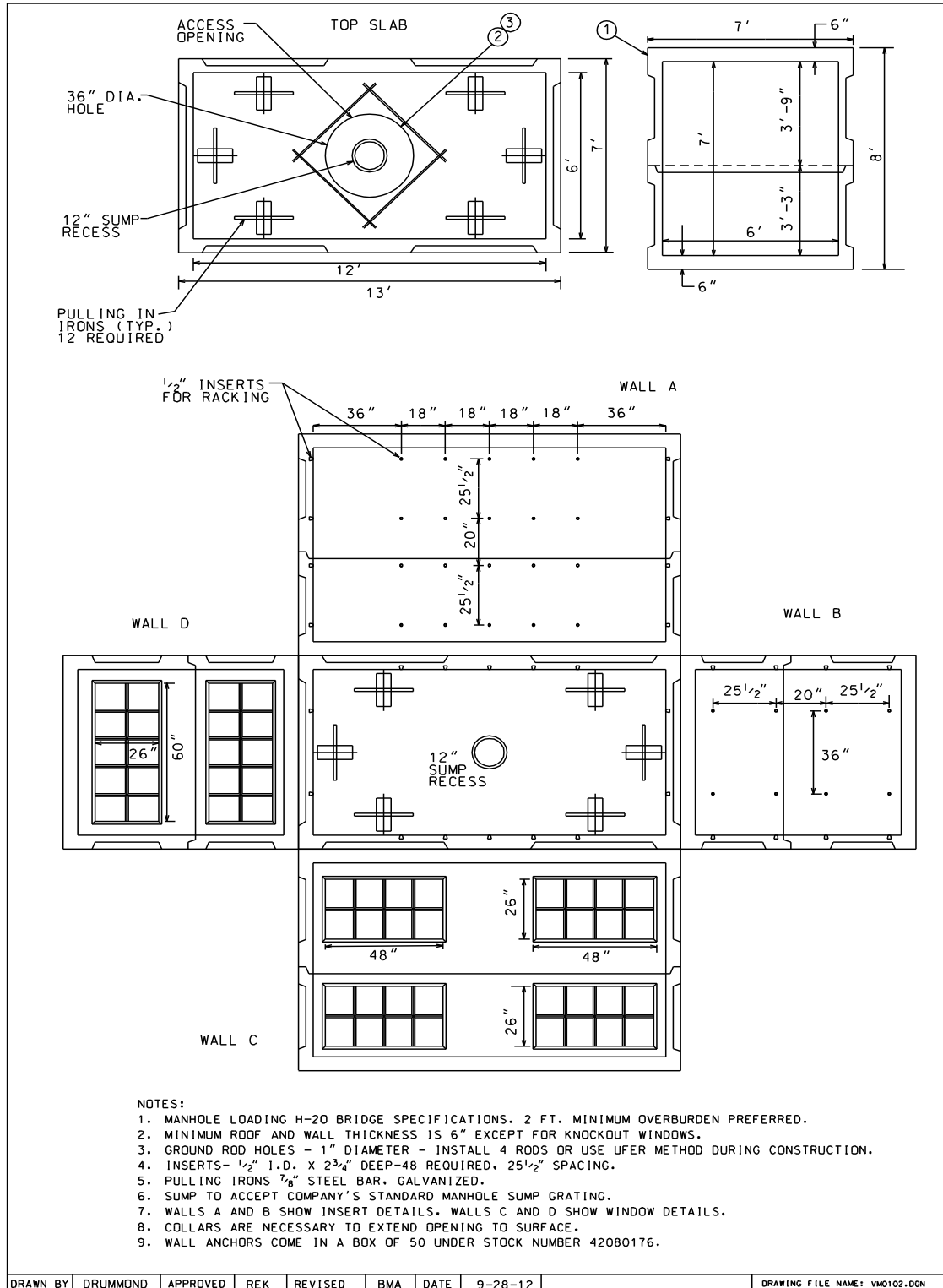
SECONDARY PEDESTALS REQUIRE A CLEARANCE OF FIVE (5) FEET ON ALL SIDES.

DRAWN BY	DRUMMOND	APPROVED	PAR	REVISED	BMA	DATE	9-12-12	DRAWING FILE NAME:	CE10104.DGN
----------	----------	----------	-----	---------	-----	------	---------	--------------------	-------------

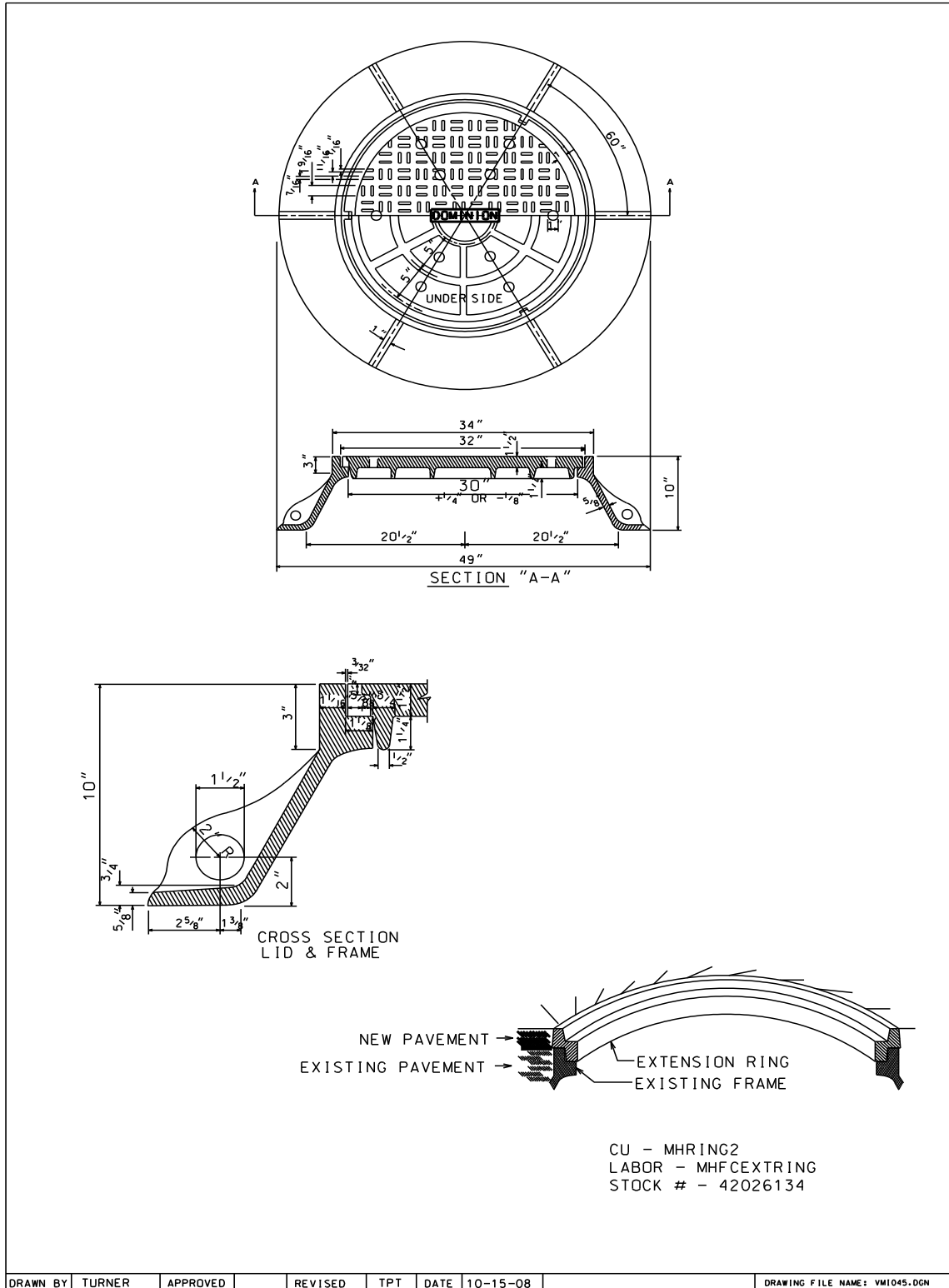
PRECAST MANHOLE FOR UNDERGROUND CABLES I.D. 8' X 16' X 8'



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

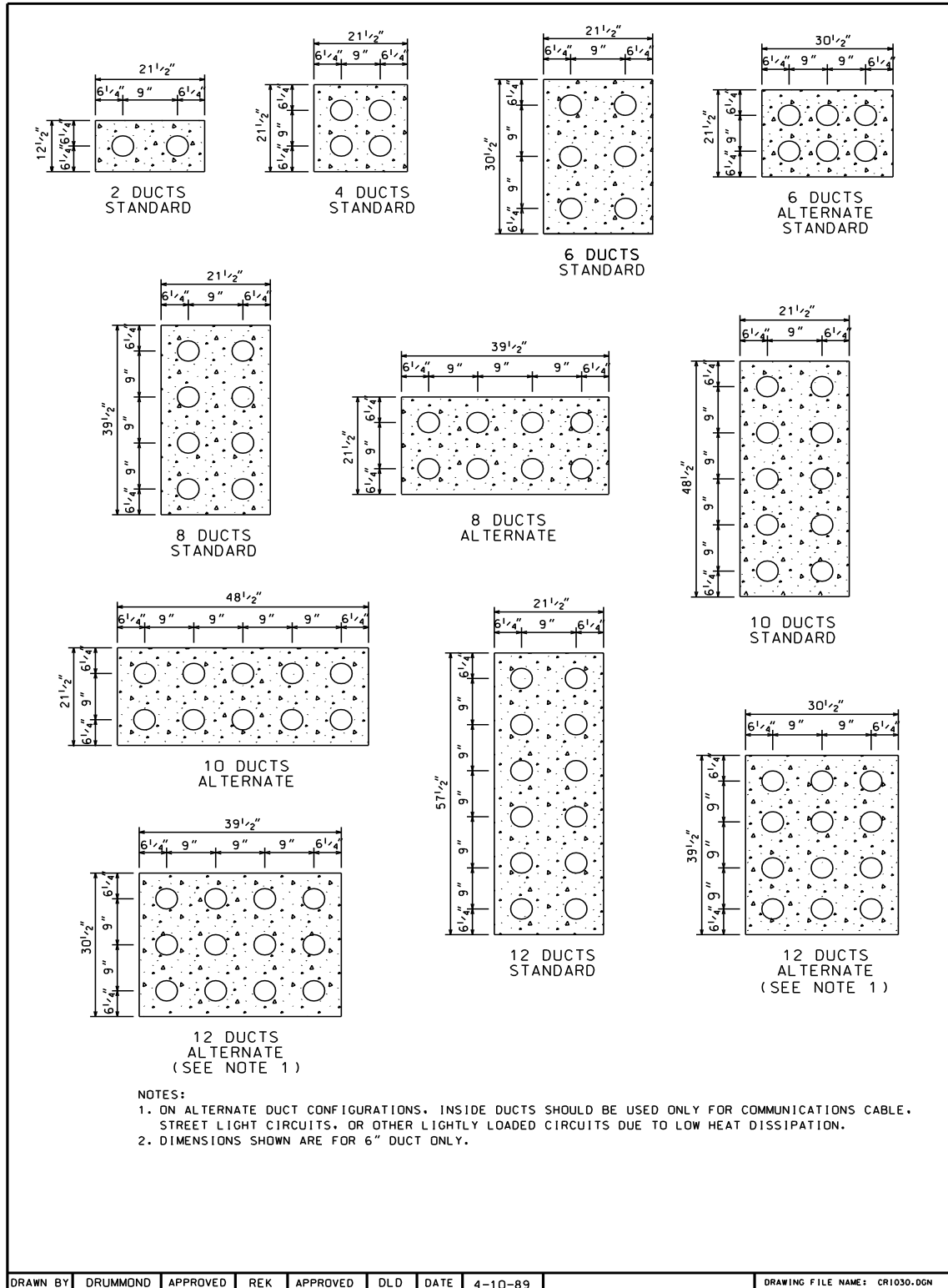


STANDARD 30 INCH MANHOLE FRAME COVER AND EXTENSION RING

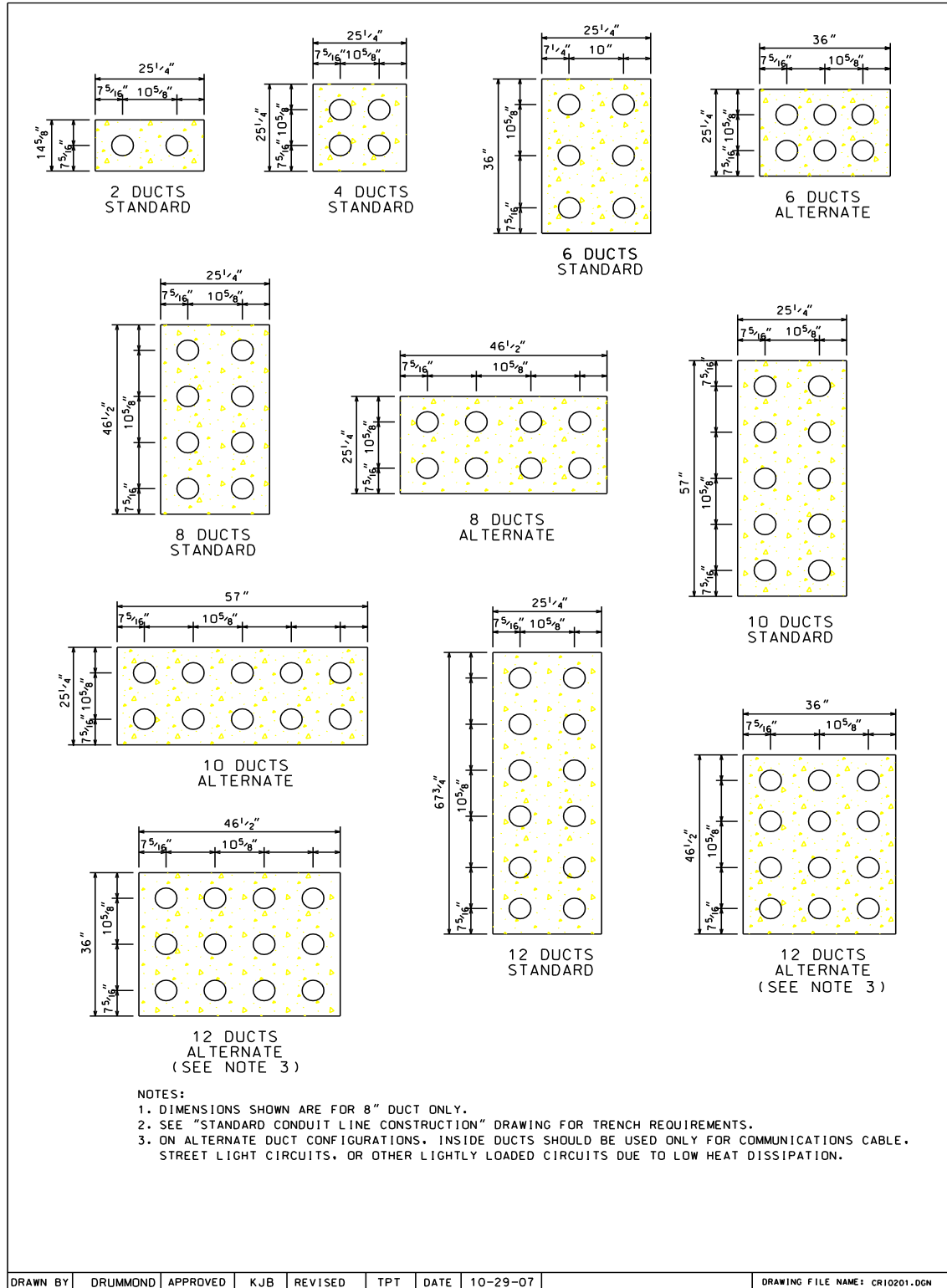




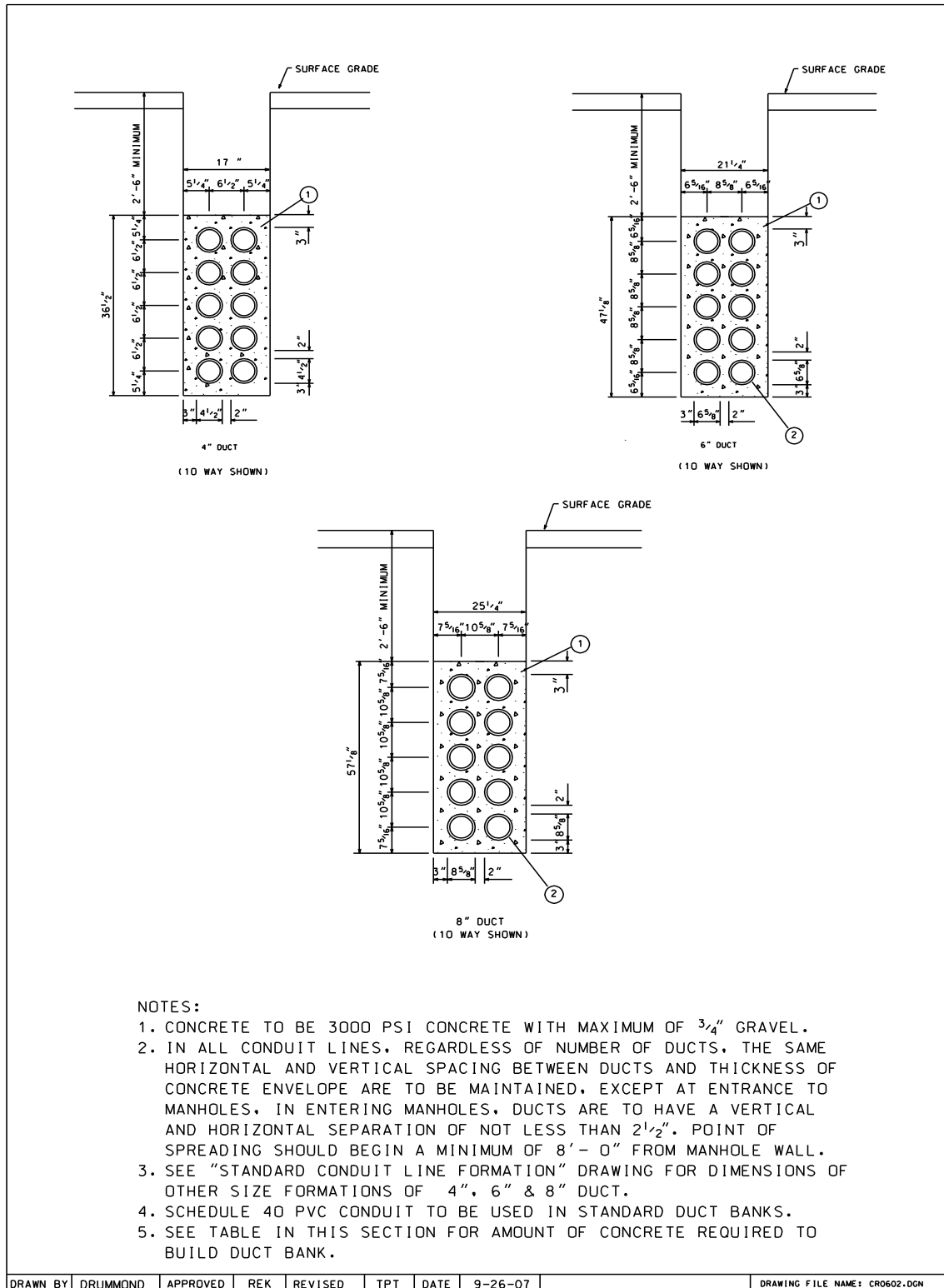
STANDARD 6" DUCT FACE FORMATION IN MANHOLE

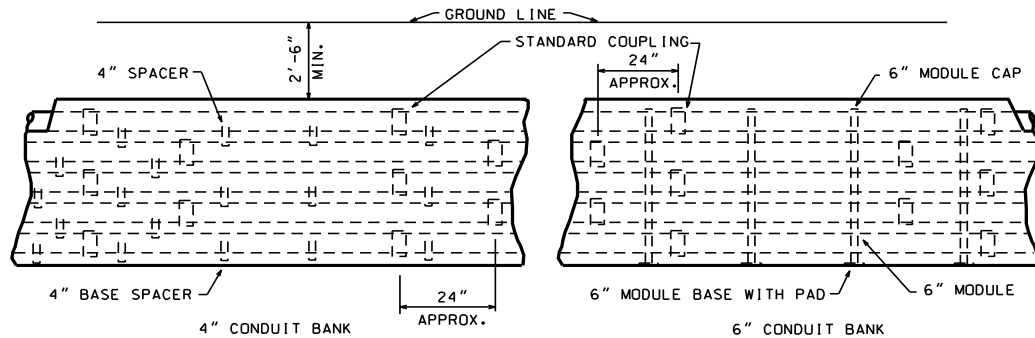


STANDARD CONDUIT LINE FORMATION – 8" DUCT



STANDARD CONDUIT LINE CONSTRUCTION



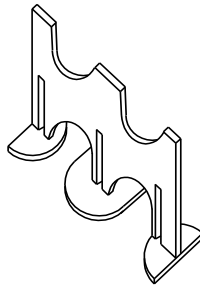


NOTES:

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.

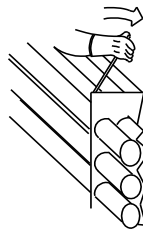
6" MODULE BASE WITH PAD

(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

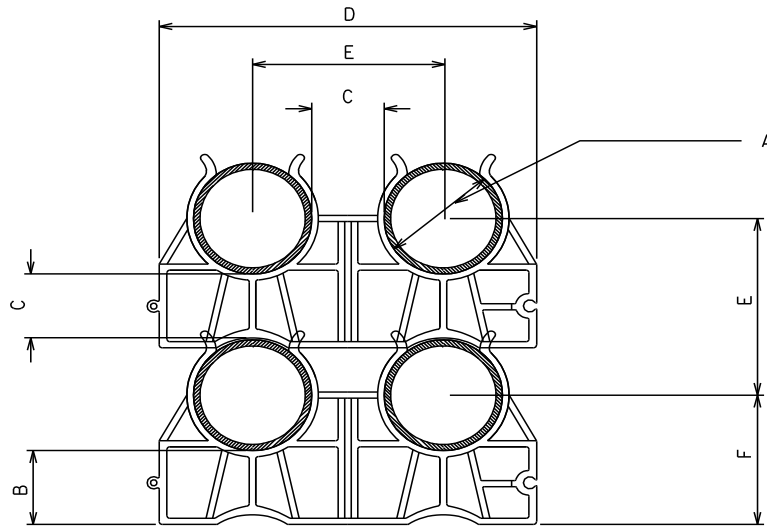
(C)



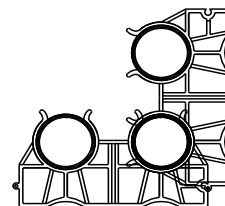
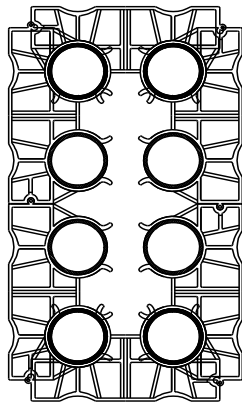
- (C) VERTICAL SPREADS CAN BE MADE TO GET OVER OBSTRUCTIONS OR INTO MULTI-LEVEL KNOCKOUTS IN MANHOLE WALLS BY THE FOLLOWING METHOD:
- 1) BASE OR MODULE SPACERS ARE PLACED INTO POSITION AND STEEL REINFORCING RODS DRIVEN DOWN THROUGH VERTICAL OPENINGS IN BOTH OUTER EDGES OF THE SPACER.
 - 2) AFTER DUCTS 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

STANDARD CONDUIT SPACER

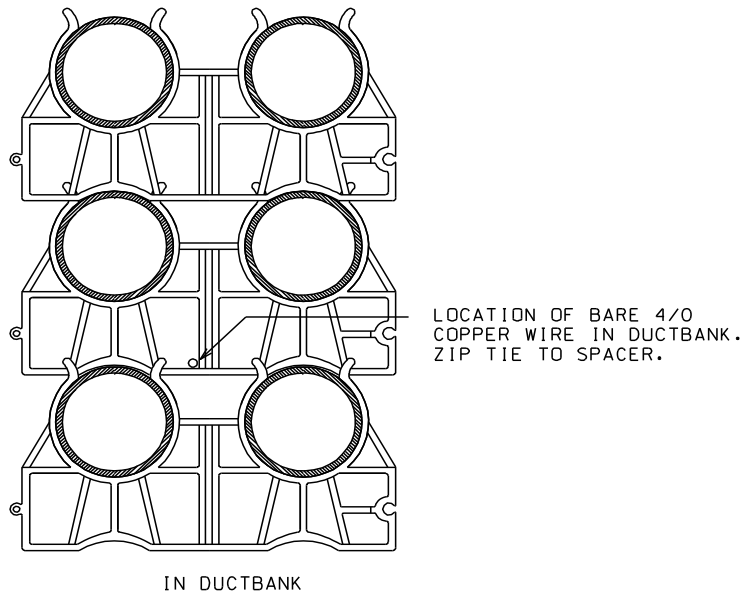
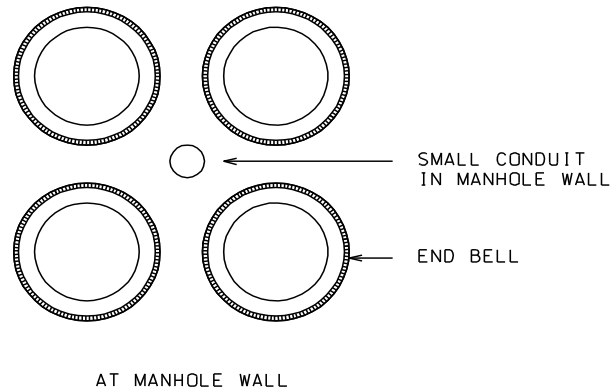


STOCK NUMBER	CONDUIT SIZE	A	B	C	D	E	F
42111053	4	4.500	3.00	2.00	13.00	6.50	5.25
42111054	6	6.625	3.00	2.00	17.25	8.625	6.312
42111055	8	8.625	3.00	2.00	21.25	10.625	7.312



ALTERNATE VARIATIONS

UFER GROUNDING

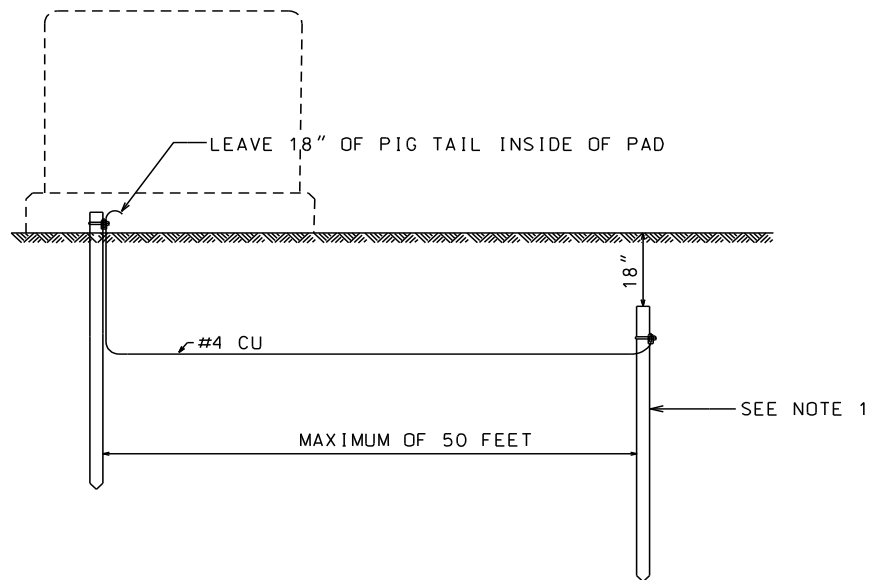


NOTES:

1. USE 4/0 BARE COPPER WIRE BETWEEN DUCTS.
2. LENGTH MUST BE 20 FEET MINIMUM IN A RELATIVELY STRAIGHT RUN.
3. COPPER WIRE MAY BE TIED TO SPACERS BUT NOT DUCTS.
4. COPPER MUST BE IN CONTACT WITH THE CONCRETE FOR ITS ENTIRE LENGTH.
5. USE SMALL CONDUIT TO BRING COPPER WIRE THROUGH MANHOLE WALL.
6. SEAL THE OPENING OF THE SMALL CONDUIT WITH SPRAY FOAM TO KEEP CONCRETE OUT.
7. COIL A MINIMUM OF 5 FEET OF 4/0 COPPER WIRE IN MANHOLE FOR CONNECTION TO SYSTEM NEUTRAL.

DRAWN BY	ARNETTE	APPROVED	BMA	REVISED	BMA	DATE	08-22-12	DRAWING FILE NAME:	GD0204.DGN
----------	---------	----------	-----	---------	-----	------	----------	--------------------	------------

COUNTERPOISE GROUNDING



NOTES:

1. IF TRENCH IS LESS THAN 18" WIDE, INSTALL ROD IN CAVITY ON SIDE OF TRENCH. IF TRENCH IS 18" OR GREATER, INSTALL GROUND ROD 6 INCHES ABOVE TRENCH FLOOR ON SIDE OF TRENCH WALL.
2. ADDITIONAL RODS MAY BE DRIVEN IN TANDEM AT PAD IF REQUIRED.
3. COUNTERPOISE IS MOST COST EFFECTIVE WHEN INSTALLED IN CONJUNCTION WITH UNDERGROUND CABLE.
4. ADDITIONAL LEGS MAY BE INSTALLED IF SEPARATE TRENCHES ARE AVAILABLE.

DRAWN BY	BRUCE	APPROVED	DOC	REVISED	JDB	DATE	08-25-02	DRAWING FILE NAME:	GD0203.DGN
----------	-------	----------	-----	---------	-----	------	----------	--------------------	------------