



DC Power Line Undergrounding

Technical Approach

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Agenda

- Safety Culture
- Technical Overview
- Planning and Design
- Construction Practices
- Permitting Activities
- Construction Inspection Activities
- Q & A

Safety Culture

Emphasis on Safety

- “0-0-0” Goal, Zero Fatalities, Zero Recordable Injuries, Zero Preventable Vehicle Accidents
- Contractors are required to meet or exceed OSHA safety procedures
- There is not a job or activity that is so important that it cannot be accomplished in a safe manner

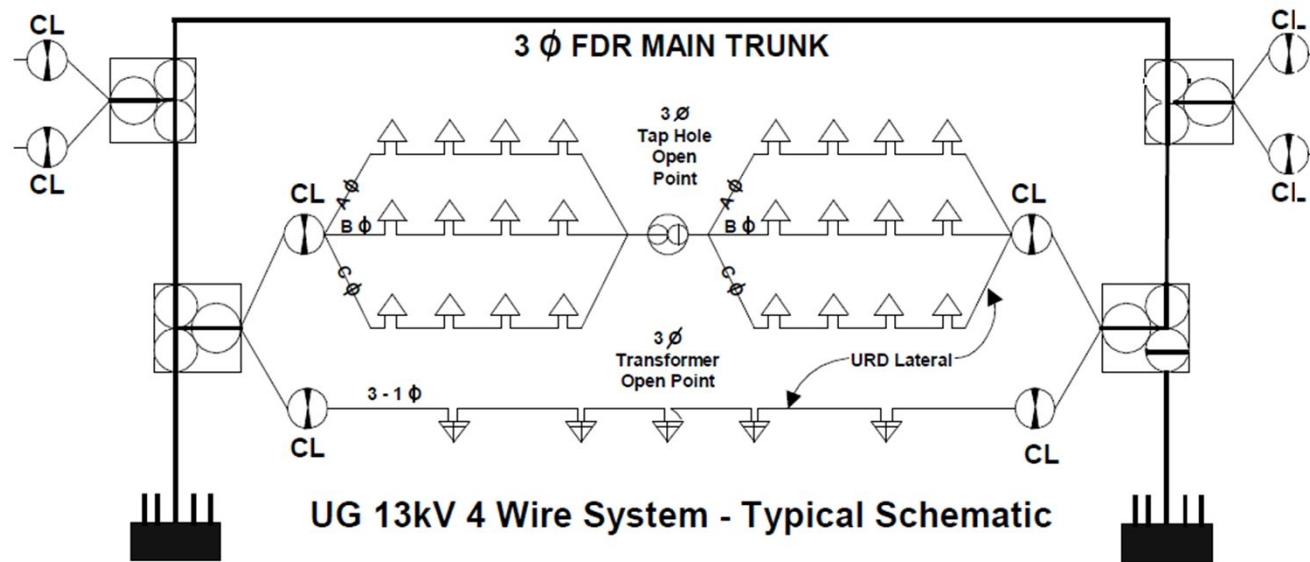


Technical Overview

- DDOT responsible for civil design and civil construction contracts
- Pepco responsible for structural and electrical materials, electrical design and electrical construction contracts
- 21 Feeders spread among Wards 3, 4, 5, 7, and 8 over first three years (2015-2017)
- The current project delivery method is Design-Bid-Build
- Preliminary Construction costs range from \$5.5 to \$41.2 Million per feeder
- Preliminary Construction scope ranges from 1.1 to 12.4 linear miles of conduit excavation per feeder
- Each feeder is scheduled to be designed and built within 12 months (two exceptions 15177 and 15707), *if relocation is not necessary*

Planning and Design – Underground Electrical System

- Overhead feeders are existing 13kV radial or 4kV network
- Underground design is double loop system
- Feeder main trunk primary is branched only through gang switches to adjacent feeders
- Load is supplied in fused lateral “half loops” that can be fully backed up at normally open tie points
- DC PLUG preliminary designs allow for potential load growth



Planning and Design - Preliminary Underground Schematics

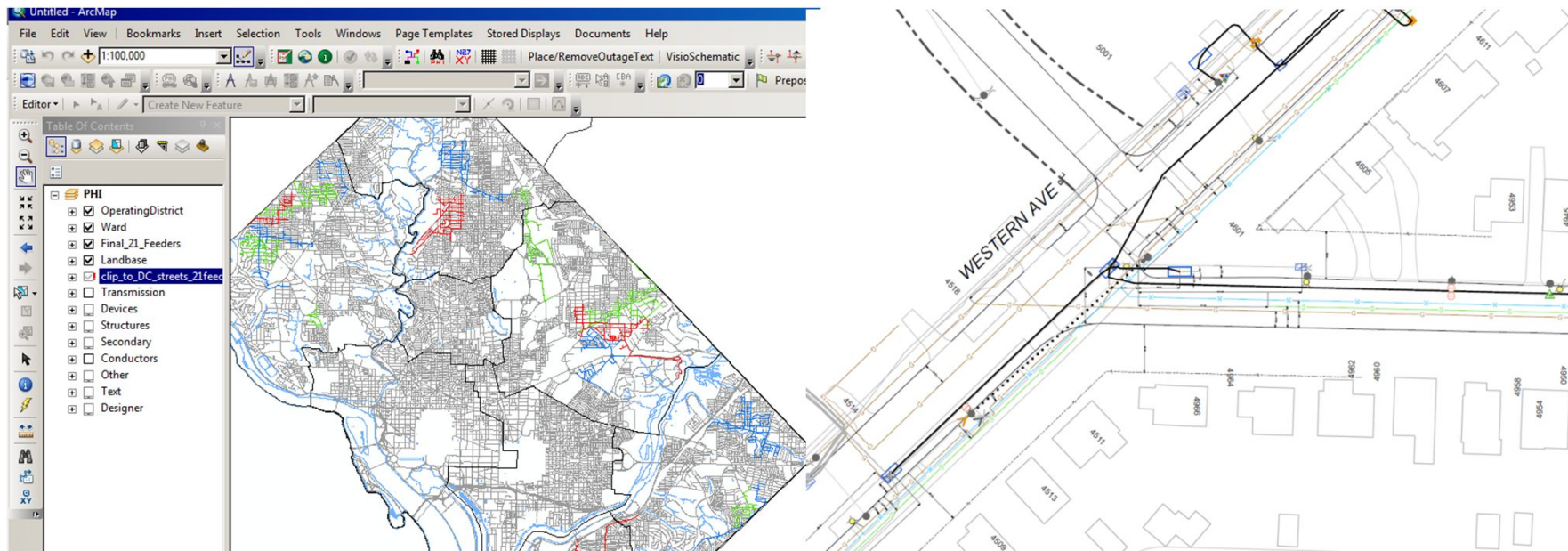
- Preliminary Electrical Schematics
 - Proposed underground lines closely follow existing overhead lines
 - Preliminary designs were done at a very high level
 - Reliability added to underground system by looping distribution transformers providing bilateral feed capability

- Preliminary Civil Schematics
 - Proposed civil facility locations designed from preliminary electrical schematics
 - Preliminary civil schematics were designed at a very high level
 - Underground mainline facilities and electrical equipment facilities proposed in public right-of-way

* Note: DC PLUG Preliminary Schematics are included in the Triennial Plan application

Planning and Design - GIS/GWD

- Pepco system is built in GIS/GWD ArcMap version 10.2
- Civil and electrical designs will be completed in GIS/GWD Workflow Manager
- Training specific to DC PLUG designs will be required and provided

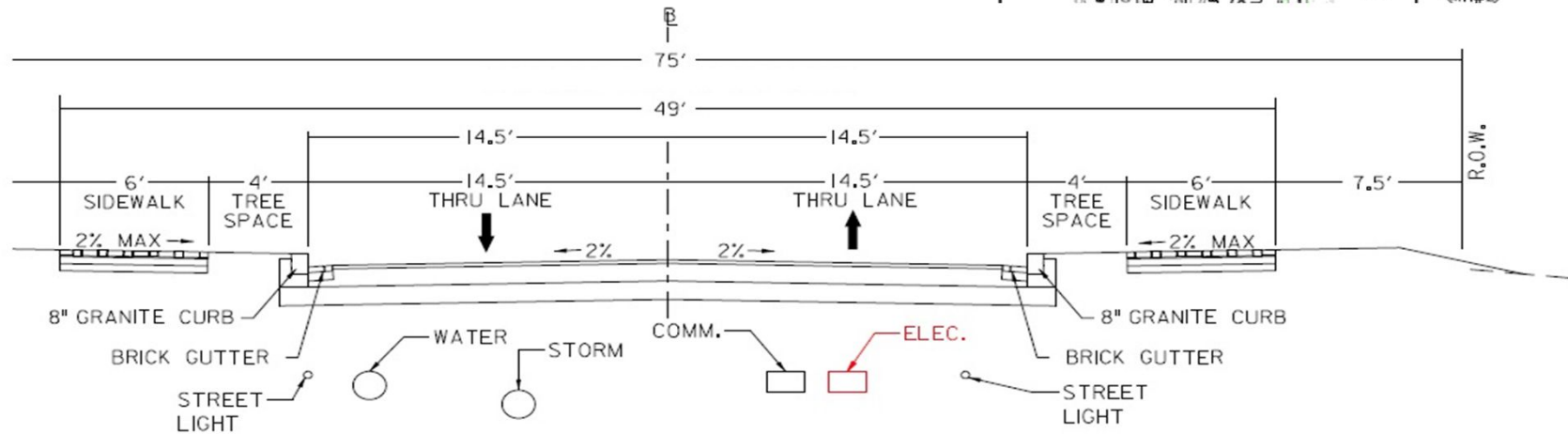
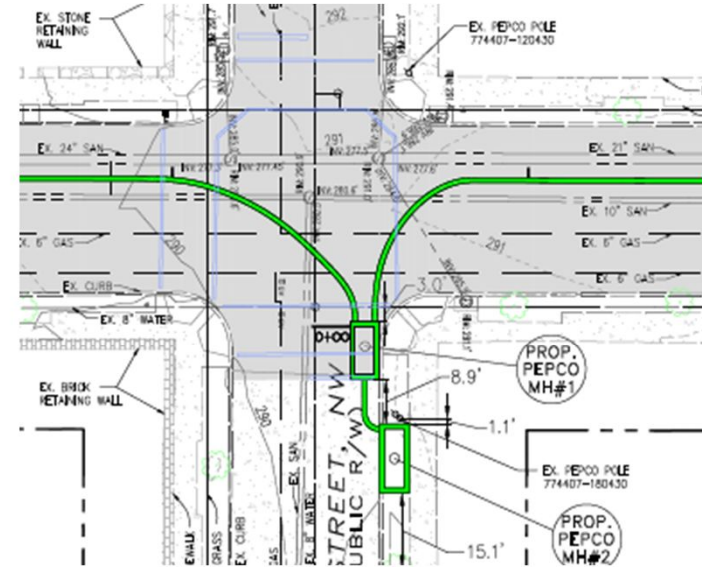


Planning and Design - Field Survey

- Detail field surveys required for detail design placement of facilities
- Existing underground facility records from Washington Gas, DC Water, and Verizon have been obtained
- Will need to locate the following in the field:
 - Existing Utilities:
 - Water facilities
 - Sewer facilities
 - Gas facilities
 - Communication (Verizon, Comcast, RCN, etc.) facilities
 - Existing Pepco overhead transformer/cable poles
 - Existing Pepco underground facilities
 - Right of Way:
 - Alleys
 - Parking lanes
 - Sidewalk dimensions
 - Tree space/existing trees
 - Public Parking
 - Other:
 - Traffic control
 - Geographical challenges to underground construction
 - DC government properties
 - Padmount facility opportunities

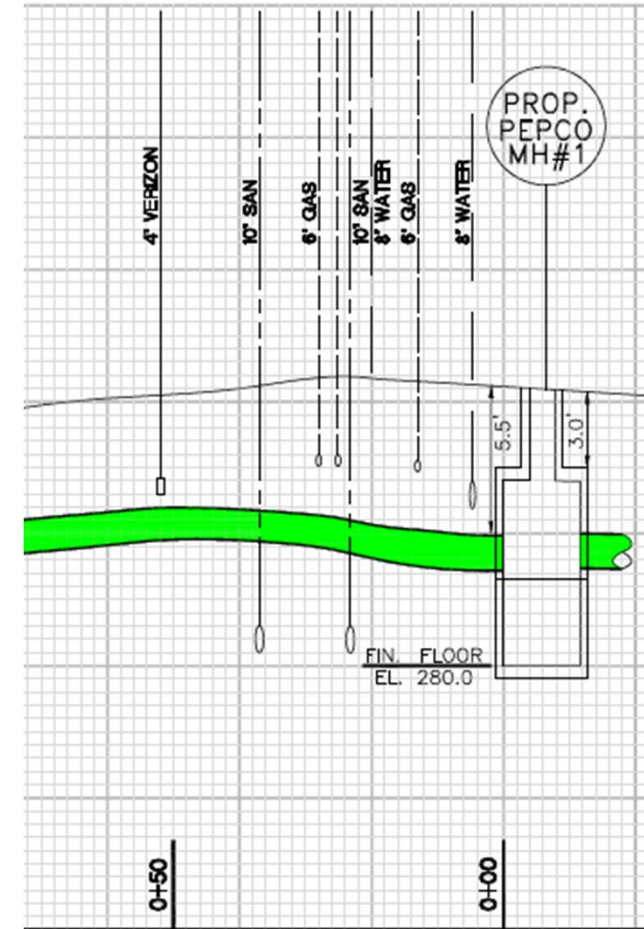
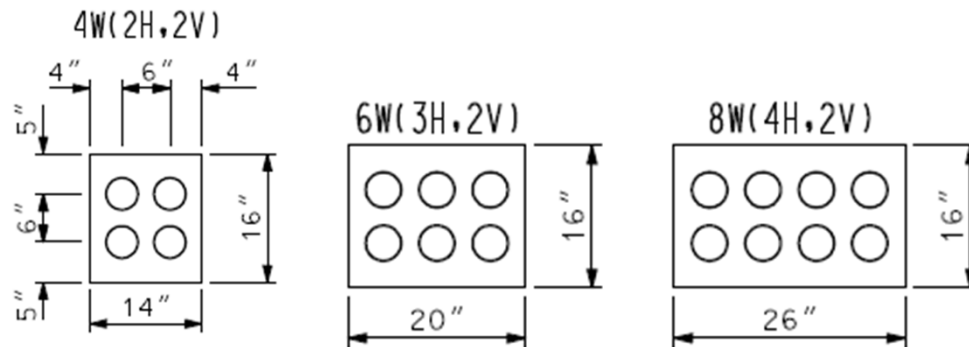
Planning and Design - Civil Design

- Field survey – to observe, measure and record topography and delineate underground features
- As-built survey



Planning and Design - Civil Design

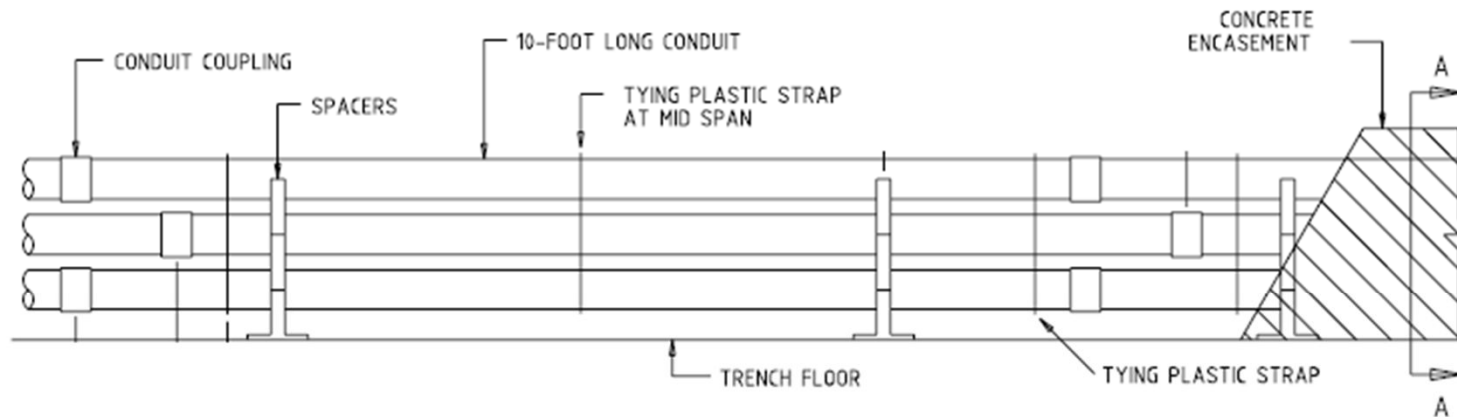
- Civil engineering design – finding the optimum locations for manholes, conduits and padmounted transformers - based on civil schematics, existing utilities and field conditions



PROFILE SCALE: HORIZ. 1" = 20'
VERT. 1" = 5'

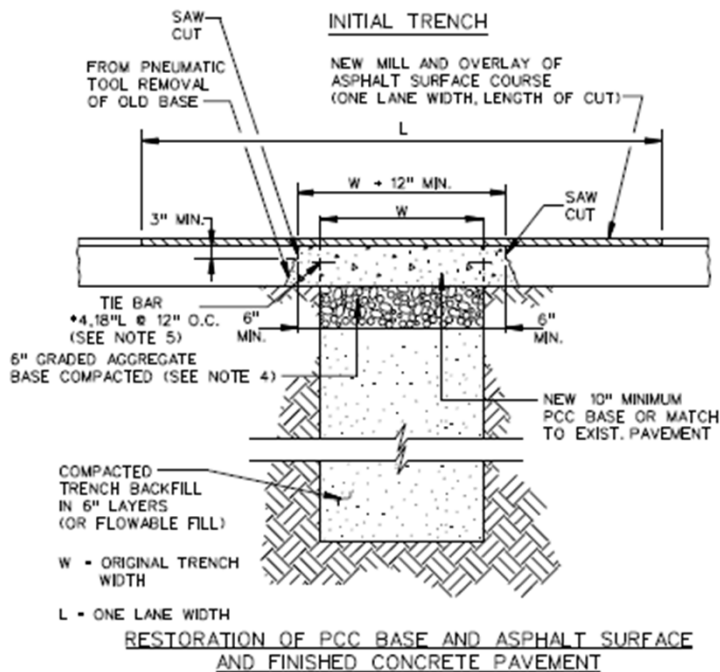
Construction Practices - Civil Construction

- Manhole Construction
 - 6'x12'x6.5' line manholes for mainline primary cable splices
 - 6'x14'x10' vented vaults for subsurface switches and three phase transformers
 - 4.5'x6'x6.5' line manholes for lateral primary cable splices
- Conduit Construction
 - 5" fiberglass concrete encased conduit for mainline primary cable
 - 4" PVC schedule 40 concrete encased conduit for lateral primary cable



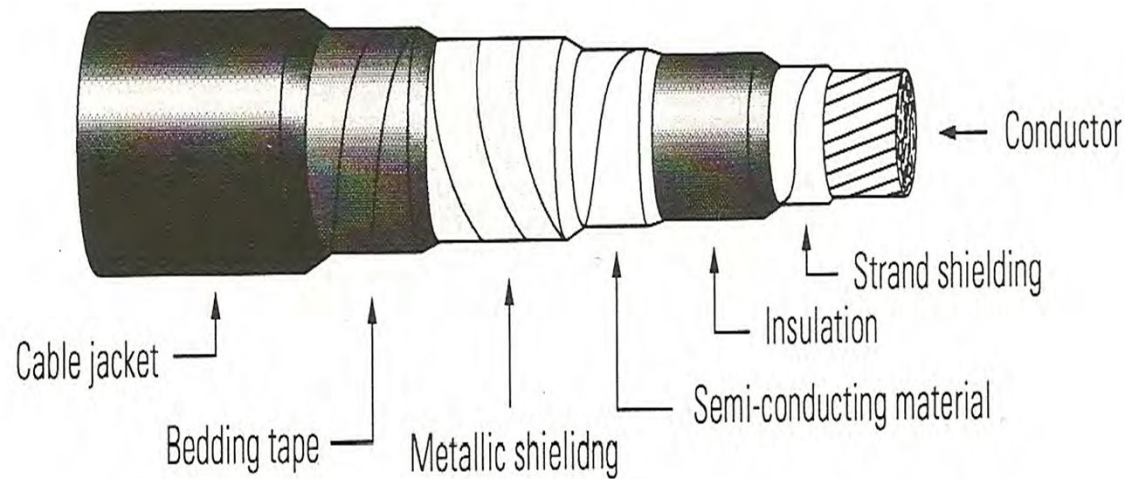
Construction Practices - Civil Construction

- Final Surface Restoration
 - Replacement of base course
 - Mill and overlay entire width of the affected lane
 - Pavement Marking
- Landscape Restoration
 - Restoration of green spaces (trees, grass, etc.)



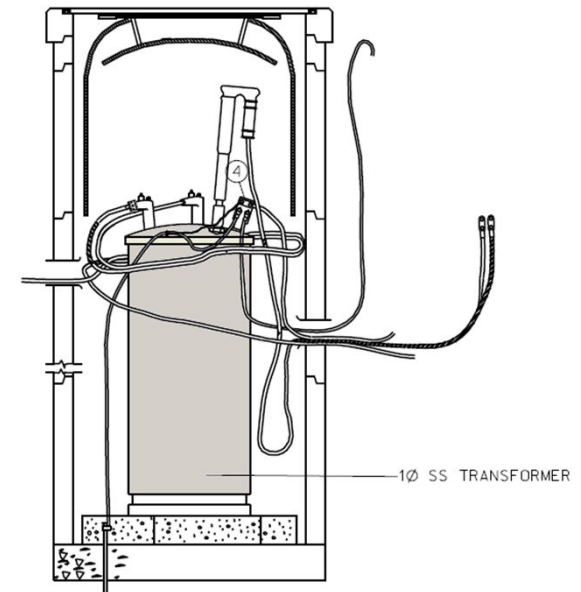
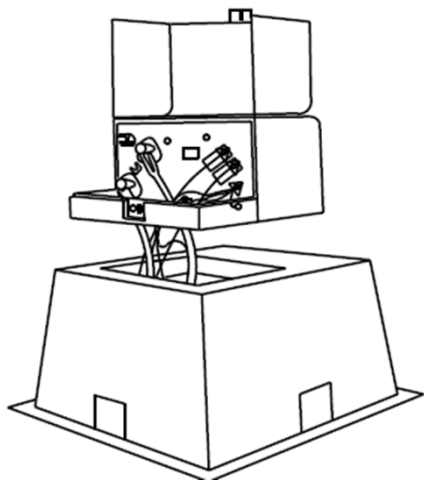
Construction Practices - Electrical Construction

- Three phase primary main trunk conductors
 - 600 kcmil EPR insulated, rubber neoprene jacketed, shielded copper conductors with 4/0 bare copper neutral in conduit
- Three phase and single phase primary lateral conductors
 - #2 AWG EPR insulated, rubber neoprene jacketed, shielded copper conductor with #2 AWG equivalent concentric strand neutral in conduit



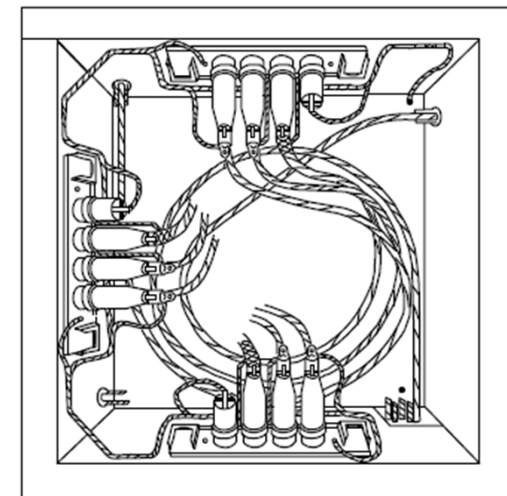
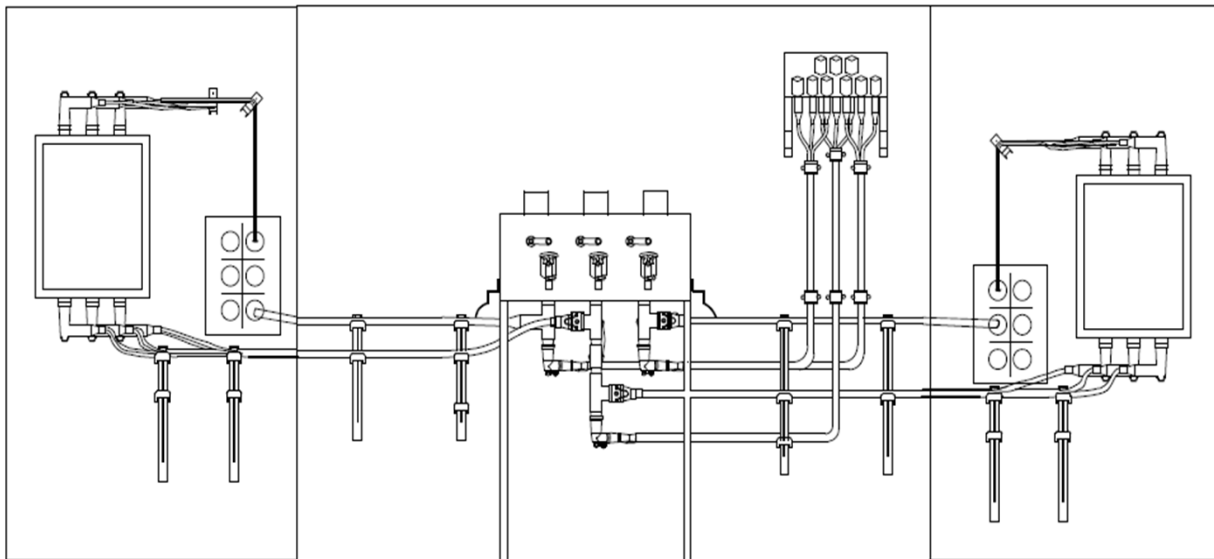
Construction Practices - Electrical Construction

- Single phase low-profile padmounted transformers
 - Capacity sizes range from 25-167 KVA
 - Mounted on a 48”x48” fiberglass box pad
- Single phase subsurface transformers
 - Capacity sizes range from 25-100 KVA
 - Installed in 36” diameter grated manhole well
- Three phase subsurface transformers
 - Capacity sizes range from 75-1000 KVA
 - Installed in minimum 6’x14’x10’ vented vault



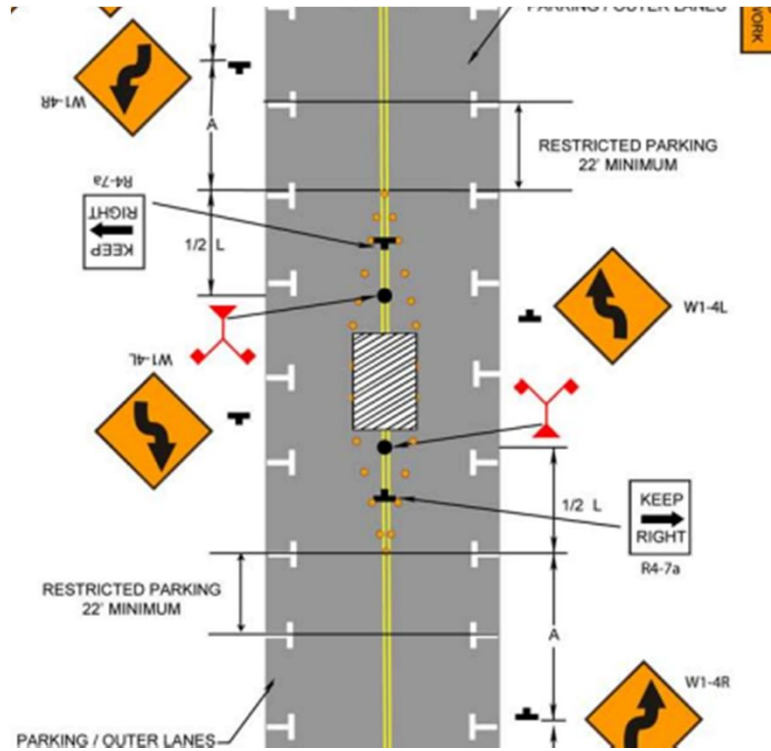
Construction Practices - Electrical Construction

- Three phase subsurface oil switch
 - 600A deadbreak elbows for main trunk primary
 - 200A fuse boxes for lateral primary loops
 - Installed in minimum 6'x14'x10' vented vault
- Three phase subsurface taphole
 - 200A loadbreak elbows for fused lateral primary
 - Installed in 3.5'x3.5'x3.5' rectangular casing with surface access door



Permitting Activities

- Permitting Liaison
- Traffic Control Plans



Construction Inspection Activities

- Pepco and DDOT inspectors will be on site to inspect construction activities
- DDOT inspectors will monitor maintenance of traffic, excavation, embankment material, backfill compaction and safety
- Pepco inspectors will monitor conduit installation, electrical work and safety

Q & A
