PJM Facilities Study Report

For

Network Upgrade N9267

Transition Cycle #1

June 2025

Introduction

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff and PJM Manuals. The Transmission Owner (TO) is Virginia Electric and Power Company (VEPCO or Dominion).

A. Project Description

The System Impact Study for PJM Interconnection Transition Cycle #1 has identified the need for PJM Network Upgrade N9267. The scope of this Network Upgrade includes the following:

- Construct new 10.21 Miles of 115kV transmission line from Northern Neck to Moon Corner.

B. Transmission Owner Facilities Study Results

1. Detailed Scope of work for Network Upgrade N9267:

The following is a detailed description of Transmission Owner Upgrades for Network Upgrade N9267. These facilities shall be designed according to the Transmission Owner's Applicable Technical Requirements and Standards. Once built the Transmission Owner will own, operate, and maintain these facilities.

See Preliminary Scoping Summaries located in the Appendices, Attachment #1, #2 and #3.

2. MILESTONE SCHEDULE FOR COMPLETION OF DOMINION WORK

Facilities outlined in this report are estimated to take 45 months to construct, from the time of full execution of the Generation Interconnection Agreement and completion of a construction kickoff call. This schedule may be impacted by the timeline for procurement and installation of long lead items and the ability to obtain outages to construct and test the proposed facilities.

Description	Start month	Finish month
Engineering	1	30
Permitting/Procurement	3	38
Construction	36	45

3. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

- The preliminary construction schedule is dependent on outage availability.
- See Attachment 1 and 2– Preliminary Scoping Summary – Substation for additional assumptions
- See Attachment 3 – Preliminary Scoping Summary – Transmission line for additional assumptions

4. LAND REQUIREMENTS

Dominion will be responsible for the following expectations in the area of Real Estate:

- Any additional land needed for Storm Water Management, Landscaping, and Wetlands/Wetlands Mitigation.
- Any other Land/Permitting requirements required by the Network Upgrade

5. ENVIRONMENTAL AND PERMITING

Dominion will be responsible for the following expectations in the area of Environmental and Permitting:

- Assessment of environmental impacts related to the Network Upgrade including:
    - Environmental Impact Study requirements
    - Environmental Permitting
- A stormwater easement and/or specific stormwater design BMP's to allow access to and use of the facilities, including a maintenance agreement for said stormwater facilities.
- Conditional Use Permit for Substation
- Any additional land needed for Storm Water Management, Landscaping, and Wetlands/Wetlands Mitigation
- Any other Permitting requirements required by the Network Upgrade

C. APPENDICES

Attachment #1: Preliminary Scoping Summary – Substation Northern Neck

Attachment #2: Preliminary Scoping Summary – Substation Moon Corner

Attachment #3: Preliminary Scoping Summary – Transmission

Attachment #1

Project Number: N9267 – Northern Neck

Project Description: Add 115kV Line Position to Moon Corner

SUBSTATION SCOPE OF WORK

Date: 7/1/2025

Revision Number: 0

Project Summary

Network upgrade N9267 provides the addition of one 115kV breaker in Northern Neck at Warsaw, Virginia, to allow the installation of a new 115kV line with destination to the Moon Corner substation.

Transmission line engineering is to provide a new number for the new line between Northern Neck and Moon Corner.

Assumptions & Clarifications:

1. *The scope of work depicted on the drawings assumes that there is no overlap with other designs and construction activities, except if mentioned in this Project Summary.*
2. *Due to time constraints, an estimated site work cost was included in the estimate based on similar past projects. If project moves forward a detailed site work estimate will be needed and total project estimate updated.*

Purchase and install substation material – Network Upgrade:

1. Approximately 100’ x 175’ site preparation and grading as required for the expansion of Northern Neck Substation (by Dominion)
2. Approximately 410 linear ft of 5/8” chain link perimeter fence around the station expansion
3. One (1), 115kV, 3000A, 40kAIC, SF-6 circuit breaker
4. Two (2), 115kV, 2000A, 3-phase center break gang operated switch
5. Three (3), 90kV, 74kV MCOV surge arrester
6. Three (3), 115kV, relaying accuracy CCVT
7. One (1), 115kV, heavy duty steel backbone (by Transmission)
8. Station stone as required

9. Station lighting as required
10. Steel structures as required, including switch stands, bus supports, and CCVT supports
11. Foundations as required, including equipment and bus support stands
12. Conductors, connectors, conduits, control cables, steel, foundations and grounding materials as per engineering standards

Relocate substation material – Network Upgrade:

1. Three (3), 115kV, relaying accuracy CCVT
2. Foundations as required, including equipment and bus support stands
3. Conductors, connectors, conduits, control cables, steel, foundations and grounding materials as per engineering standards

Purchase and install relay material – Network Upgrade:

1. One (1), 1510 – 24” dual SEL-351-7 transmission breaker with reclosing panel
2. One (1), 4510 – SEL-2411 breaker annunciator
3. One (1), 4526_A – circuit breaker fiber optic make-up box
4. One (1), 4506 – 3-phase CCVT potential make-up box
5. One (1), 1340 – 24” dual SEL-411L CD/Fiber line panel

Attachment #2

Project Number: N9267 - Moon Corner Substation

Project Description: Add 115kV Line Position to Northern Neck

SUBSTATION SCOPE OF WORK

Date: 7/1/2025

Revision Number: 0

Project Summary

Network upgrade N9267 provides the expansion of the 115kV Moon Corner Substation in Richmond County, Virginia, to allow the addition of two 115kV breakers for a new line with destination to the Northern Neck Substation. A CCVT will also be included off the bus, for relaying protection purposes.

Transmission line engineering is to provide a new number for the new line between Moon Corner and Northern Neck.

Assumptions & Clarifications:

1. *The scope of work depicted on the drawings assumes that there is no overlap with other designs and construction activities, except if mentioned in this Project Summary.*
2. *Due to time constraints, an estimated site work cost was included in the estimate based on similar past projects. If project moves forward a detailed site work estimate will be needed and total project estimate updated.*

Purchase and install substation material – Network Upgrade:

1. Approximately 55’ x 175’ site preparation and grading as required for the expansion of Moon Corner Substation (by Dominion)
2. Approximately 280’ linear ft of 5/8” chain link perimeter fence around the station expansion, along with the security cameras and integrators as per existing fence standards.
3. Two (2), 115kV, 3000A, 40kAIC, SF-6 circuit breaker
4. Four (4), 115kV, 3000A, 3-phase center break gang operated switch
5. Three (3), 90kV, 74kV MCOV surge arrester
6. Four (4), 115kV, relaying accuracy CCVT
7. One (1), 115kV, 3000A wave trap

8. One (1), line tuner
9. One (1), 230kV, double circuit heavy duty steel backbone (by Transmission)
10. Station stone as required
11. Station lighting as required
12. Steel structures as required including switch stands, bus supports, CCVT and wave trap supports
13. Foundations as required including equipment and bus support stands
14. Conductors, connectors, conduits, control cables, steel, foundations and grounding materials as per engineering standards

Relocate substation material – Network Upgrade:

1. One (1), 115kV, 100kVA power voltage transformer (pending AC Load Calculation from Standards)
2. One (1), 115kV, 2000A, 2-pole center break disconnect switch
3. Steel structures as required including switch stands and bus supports
4. Foundations as required including equipment and bus support stands

Remove substation material – Network Upgrade:

1. Approximately 440 ft of 115kV bus
2. Foundations as required, including equipment and bus support stands
3. Conductors, connectors, conduits, control cables, steel, foundations and grounding materials as per engineering standards

Purchase and install relay material – Network Upgrade:

1. Two (2), 1510 – dual SEL-351-7 transmission breaker with reclosing panel
2. Two (2), 4510 – SEL-2411 breaker annunciator
3. Two (2), 4526_A – circuit breaker fiber optic make-up box
4. One (1), 4506 – 3-phase CCVT potential make-up box
5. One (1), 1340 – dual SEL-411L DCB/PLC line panel
6. One (1), 4507 – 1-phase CCVT potential make-up box

Attachment #3

115 kV LINE #1XX1

Northern Neck – Moon Corner

PROJECT N9267

PRELIMINARY SCOPING SUMMARY

This project serves to build a new 115 kV Line #1XX1 from Northern Neck substation to Moon Corner substation for approximately 10.21 miles, and a new strain bus span in Northern Neck substation. The entire project is in Richmond County, VA. See **Figure 1** for the project location. This new Line #1XX1 will be adjacent to 115 kV Line #1059. Line #1059 has an existing right of way of 100'; additional land will be needed to accommodate the installation of Line #1XX1. The resulting right of ways includes 100' for Line #1XX1 around Northern Neck substation, and 170' when Line #1XX1 is in parallel with Line #1059. The project will install a total of 93 new structures. Since Line #1XX1 will be 115 kV, a CPCN filing will not be expected for this project.

The proposed structures to be installed are 115 kV engineered steel H-Frames, engineered steel 3-poles, and direct embed "DOM" H-frame structures. Line #1XX1 will use single (1) 768.2 ACSS/TW/HS "Maumee" conductor wire, dual (2) DNO-11410 OPGW, and 7#7 Alumoweld shield wire. Outages may be required on Line #1073 or Line #1059 based on the line entry at Moon Corner substation. Line #1XX1 is not reliant on the completion of other projects.

Design Considerations:

MODIFICATIONS TO EXISTING FACILITIES

1. Cut and transfer single (1) 768.2 ACSS/TW/HS "Maumee" conductor wire for Line #1073 from the existing backbone 1073/1 to the back side of proposed backbone 1XX1/90 (top circuit) in Moon Corner substation.
    a. Transfer remaining conductor span so it is from the ahead side of proposed backbone 1XX1/90 (top circuit) to the existing backbone 1073/1.

2. Cut and transfer single (1) DNO-11410 OPGW from the existing backbone 1073/1 to the back side of proposed backbone 1XX1/90.

3. Cut and transfer single (1) 7#7 Alumoweld shield wire from the existing backbone 1073/1 to the back side of proposed backbone 1XX1/90.
    a. Transfer remaining shield span so it is from the ahead side of proposed backbone 1XX1/90 to the existing backbone 1073/1.

PERMANENT FACILITIES TO BE INSTALLED:

1. Install seventy-seven (77) 115 kV single circuit direct embed suspension "DOM" steel H-Frames [Reference Drawing 11.655] as follows:
    a. Proposed structures 1XX1/7-1XX1/18, 1XX1/20-1XX1/32, 1XX1/34-1XX1/46, 1XX1/48-1XX1/61, 1XX1/63-1XX1/76, & 1XX1/78-1XX1/88.
    b. See **Figure 2** for a visual of the proposed structure design.

2. Install six (6) 115 kV single circuit engineered steel 3-pole double dead-end structures [Reference Drawing 12.158] on foundations as follows:
    a. Proposed structures 1XX1/2-1XX1/6 & 1XX1/77.
    b. See **Figure 3** for a visual of the proposed structure design.

3. Install four (4) 115 kV single circuit engineered steel double dead-end H-Frames [Reference Drawing 12.165] on foundations as follows:
    a. Proposed structures 1XX1/19, 1XX1/33, 1XX1/47, & 1XX1/62.
    b. See **Figure 4** for a visual of the proposed structure design.

4. Install one (1) 115 kV single circuit engineered steel double dead-end monopole [Reference Drawing 12.425] on a foundation as follows:
    a. Proposed structure 1XX1/89.
    b. See **Figure 5** for a visual of the proposed structure design.

5. Install three (3) 115 kV single circuit steel backbones [Reference Drawing 11.955] on foundations as follows:
    a. Proposed backbones 1XX1/1 and the two (2) strain bus backbones in Northern Neck substation.
    b. See **Figure 6** for a visual of the proposed structure design.

6. Install one (1) 230 kV double circuit steel backbone [Reference Drawing 12.903] on foundations as follows:
    a. Proposed backbone 1XX1/90 in Moon Corner substation.
    b. See **Figure 7** for a visual of the proposed structure design.

7. Install one (1) steel static pole [Reference Drawing 9.008] on a foundation as follows:
    a. Proposed structure 1XX1/90A in Moon Corner substation.
    b. See **Figure 8** for a visual of the proposed structure design.

8. Install the spans of 3-phase single (1) 768.2 ACSS/TW/HS “Maumee” conductor as follows:
    a. Approximately 10.21 miles for Line #1XX1 from proposed backbone 1XX1/1 in Northern Neck substation to bottom circuit of proposed backbone 1XX1/90 in Moon Corner substation.

9. Install the spans of 3-phase single (1) 2500 ACAR (84/7) conductor as follows:
    a. Approximately 0.02 miles for the strain bus span from the two (2) proposed backbones in Northern Neck substation.

10. Install the spans of two (2) DNO-11410 OPGW as follows:
    a. Approximately 10.17 miles for Line #1XX1 from proposed backbone 1XX1/1 in Northern Neck substation to proposed monopole 1XX1/89.

11. Install the spans of single (1) DNO-11410 OPGW as follows:

a. Approximately 0.01 miles from proposed backbone 1XX1/90 to existing backbone 1073/1 in Moon Corner substation.

12. Install the spans of underground fiber as follows:
    a. Approximately 230 feet of two (2) runs from proposed structure 1XX1/89 to proposed backbone 1XX1/90 inside of Moon Corner substation.

13. Install the spans of single (1) 7#7 Alumoweld shield wire as follows:
    a. Approximately 0.07 miles from existing backbone 1073/1, to proposed structure 1XX1/90A, to existing static pole in Moon Corner substation.

14. Install the spans of two (2) 7#7 Alumoweld shield wire as follows:
    a. Approximately 0.02 miles for the strain bus span backbones in Northern Neck substation.

15. Install two (2) new OPGW Splices per structure on the following structures:
    a. New backbone structure 1XX1/1 in Northern Neck substation.
    b. New 3-pole structures 1XX1/2, 1XX1/3, 1XX1/6 & 1XX1/77.
    c. New H-frames 1XX1/19, 1XX1/33, 1XX1/47 & 1XX1/62.
    d. New backbone structure 1XX1/90 in Moon Corner Substation.
    e. New monopole structure 1XX1/89.

CONCEPTUAL SCOPE NOTES:

1. No PLS-CADD modeling was done for this project. Structures were designed like for like using Line #1059's existing structures and estimated using typical transmission right of way characteristics.

2. Structures are designed based off the following NESC code parameters: NESC Heavy, 90 mph wind, ¾" Ice & 30 mph wind regardless of project location.

3. Substation arrangement and proposed structure locations are subject to change. This design is based on conceptual substation arrangements for Northern Neck and Moon Corner provided on 6/19/25. This scope may need to be revised if there are any changes to the conceptual substation designs.

4. It is assumed for detailed engineering that a LiDAR survey will be required.

5. Any potential height restrictions were not accounted for in this design. There is an airpark approximately 1.5 miles from Northern Neck substation.

6. On the north side of Moon Corner substation, there is a new 115 kV developer line called Line #1073 that is being constructed as part of AF2-120C. Clearances between future Line

#1XX1 and Lines #1059/1073 were not checked, and existing structures may need to be relocated to connect Line #1XX1 into Moon Corner. No costs have been included in this scope for any relocations.

7. An existing right of way width of 100' for Line #1059 is assumed based on map viewer.
    a. For approximately 9.88 miles between Northern Neck and Moon Corner, an additional ROW width of 70-ft is needed, resulting in a ROW width of 170-ft.
    b. For approximately 0.33 miles near Northern Neck, a new ROW width of 100-ft is required.
    c. Due to constraints between the Northern Neck substation perimeter and Richmond Road, it may not be feasible to acquire a ROW width of 100-ft near proposed structure 1XX1/3. This is to be determined during detailed design.

8. A wetland delineation has not been completed as part of this conceptual package.

9. Wire reel lengths were not accounted for this line design. The assumed pull pad locations to avoid tension splices will be determined during detailed design.

10. Intermediate double dead-end structures are included in this scope to avoid tension splices. This is subject to change in detailed engineering.

11. A new double circuit 230 kV backbone is scoped to be installed in Moon Corner since there is no standard 115 kV double circuit backbone. This is subject to change in detailed engineering.

12. Line 1XX1 will not cross any highways, rivers, or other lines.

CONCEPTUAL ESTIMATE NOTES:

1. Engineered steel pole costs were determined based off typical wind and weight spans, line angles, and average structure heights in the typical right of way associated with the structure type.

2. Steel pole foundation costs were based off the projects' location and structure type in the regional soil profile map. The regional soil profile map used for this project is Coastal Plains East.

3. The conceptual estimate assumes that a laydown yard is required for this project.

4. The new right of way of 170' is assumed to be acquired by the developer and transferred to Dominion. As such, the costs for acquiring the land rights are not included in this estimate.

5. Prior to detailed engineering, a full land rights review would be required. A desktop review was completed to estimate the project cost.

6. Forestry estimate cost inputs include the following assumptions:
    a. Work pad totals based on provided SOW and assumptions from KMZ file. Assume 15 mats for tangents and 30 mats for angles at each work pad for reconductor work and 50 mats per pull pad.
    b. DDE structures assumed based off wire reel lengths - based off pull pad locations.
    c. Pull pad locations based on location of major road/water crossings and line mileage.
    d. Assuming that existing stone in Substations will be used for access per SOW and that access is existing or will be built by others before the start of construction. Assuming that the substations will be constructed with access roads built to and from Substations and work from inside the substations for Backbone installation.
    e. Assumes no delays due to permitting or real estate issues after work begins. Assume no schedule compressions from SOC/PJM.
    f. Assumes all clearing and forestry costs have been captured by others. No access costs for forestry activities included in this pricing.
    g. Stream crossing based on estimates from aerial imagery.
    h. Assuming that all existing roads may be dressed in stone that can remain at the end of the project. Assuming existing two track roads in many locations will be impermeable. No costs for stone road removal are included.

7. Due to the time allotted to create an estimate, stakeholders were not consulted for their respective costs. Stakeholder costs were derived as follows:
    a. DEES Permitting costs were based on a cost per mile based off comparable projects in the TC#1 Phase 3 Cycle. Project N9112, which is rebuilding approximately 12.4 miles of 230 kV line 259 from Basin Sub to Chesterfield Sub, was used to develop the DEES cost per mile due to similar project scope and location.
    b. Siting and Permitting costs were derived using the permitting spreadsheet but not verified by the permitting team.
    c. Real Estate acquisition costs are based on typical cost per acre in the Central region of Virginia as provided by the real estate team in 2025.
    d. Right of Way Management (Encroachment) costs were based on a cost per mile based off comparable projects in the TC#1 Phase 3 Cycle. Project N9112 was used to develop the ROW Management cost per mile due to similar project scope and location.
    e. Forestry, Rehab, and Access costs were based on a cost per mile based off comparable projects in the TC#1 Phase 3 Cycle. Project N9112 was used to develop the Forestry and Access cost per mile due to similar project scope and location.
    f. Surveying costs were based on the typical cost to acquire approximately ten miles of survey and acquire new right of way. These costs were provided by the surveying team as part of the TC#1 Phase 3 process.
    g. Communications (Marketing Manager) costs are assumed to be Tier 4 - $300K due to similar scope of work for project N9112.

h. Telecommunications costs were based on a cost per mile based off comparable projects in the TC#1 Phase 3 Cycle. Project N9112 was used to develop the Telecommunications cost per mile due to similar length of the lines.

Figure 1 – Project Location

Figure 2 – Proposed Structure Configuration

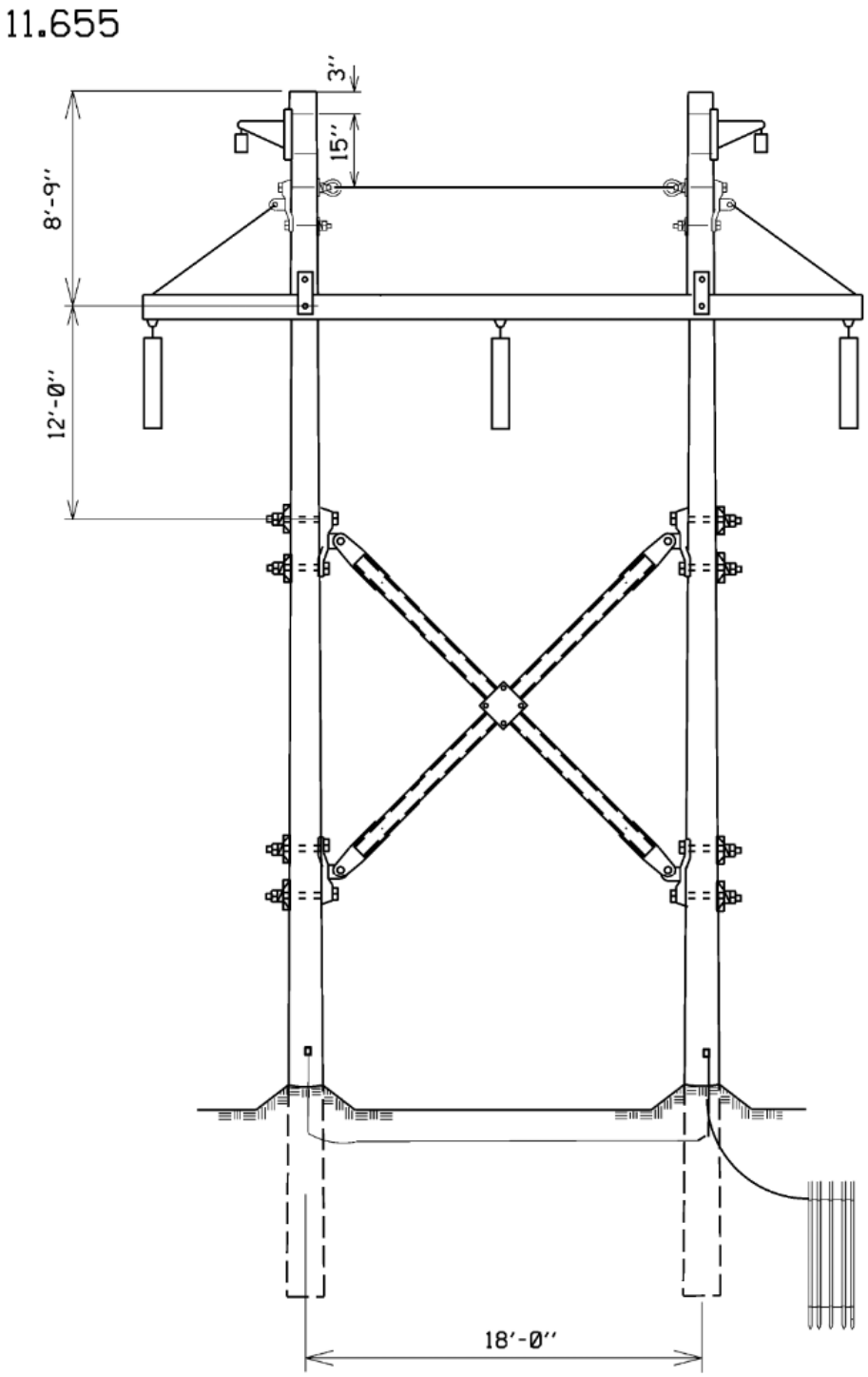


Figure 3 – Proposed Structure Configuration

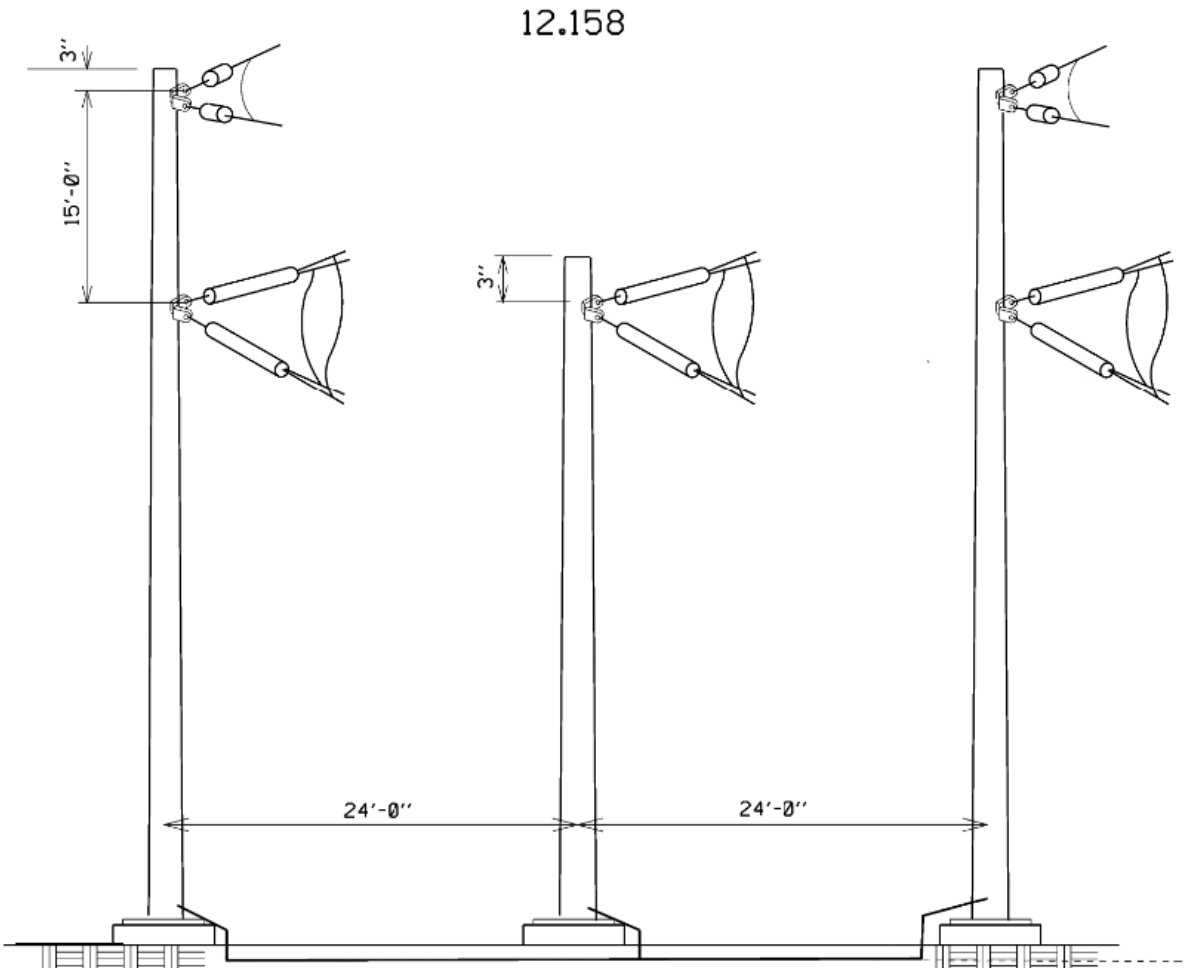


Figure 4 – Proposed Structure Configuration

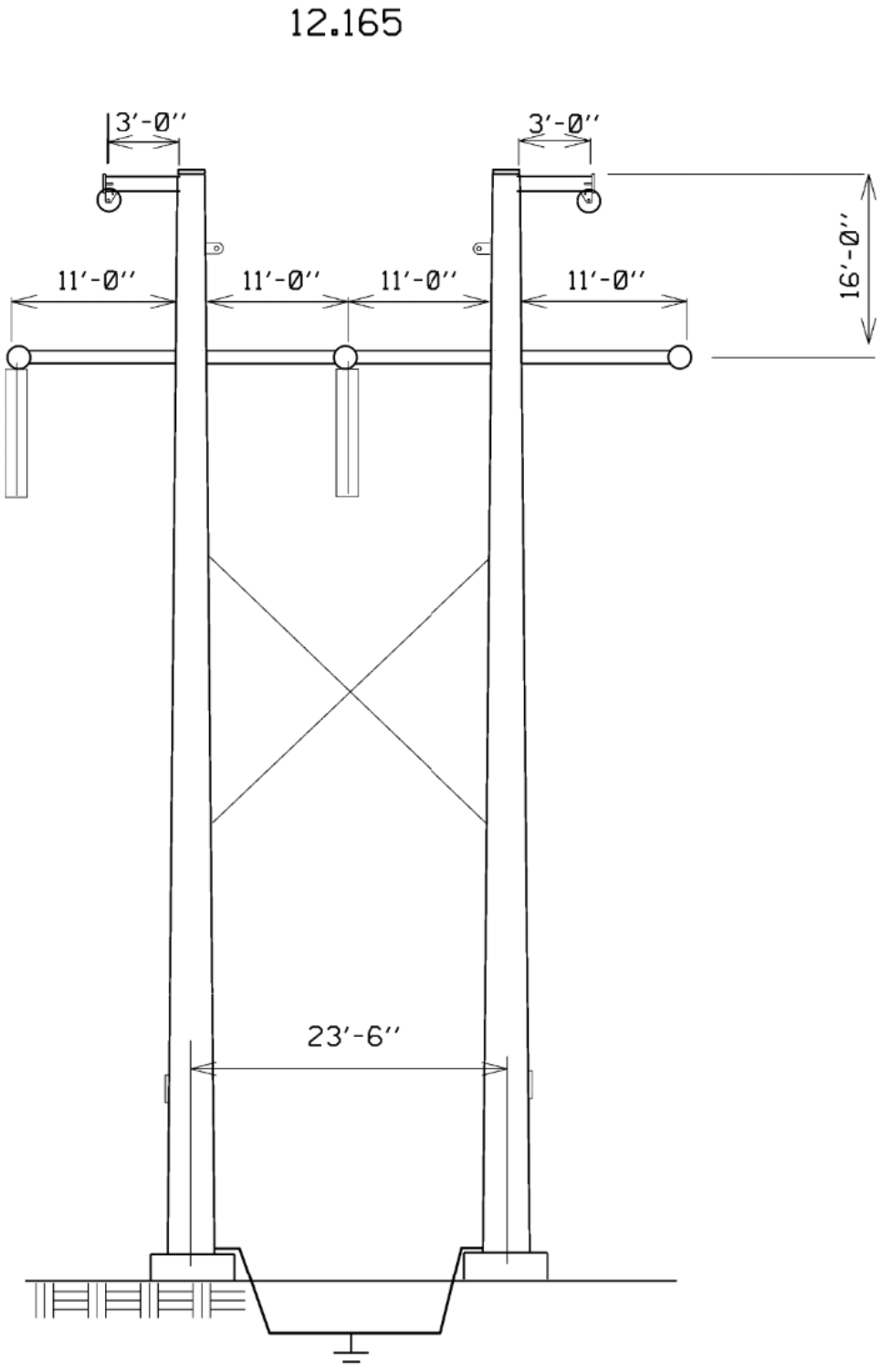


Figure 5 – Proposed Structure Configuration

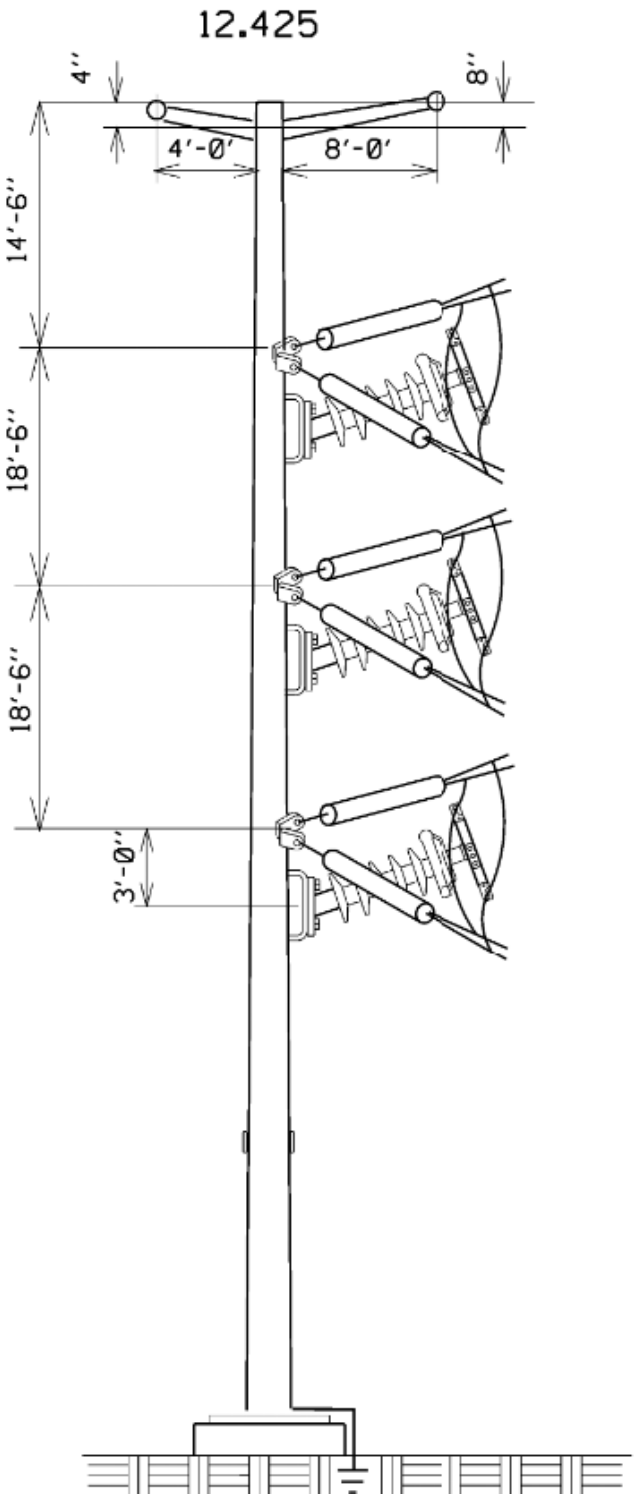


Figure 6 – Proposed Structure Configuration

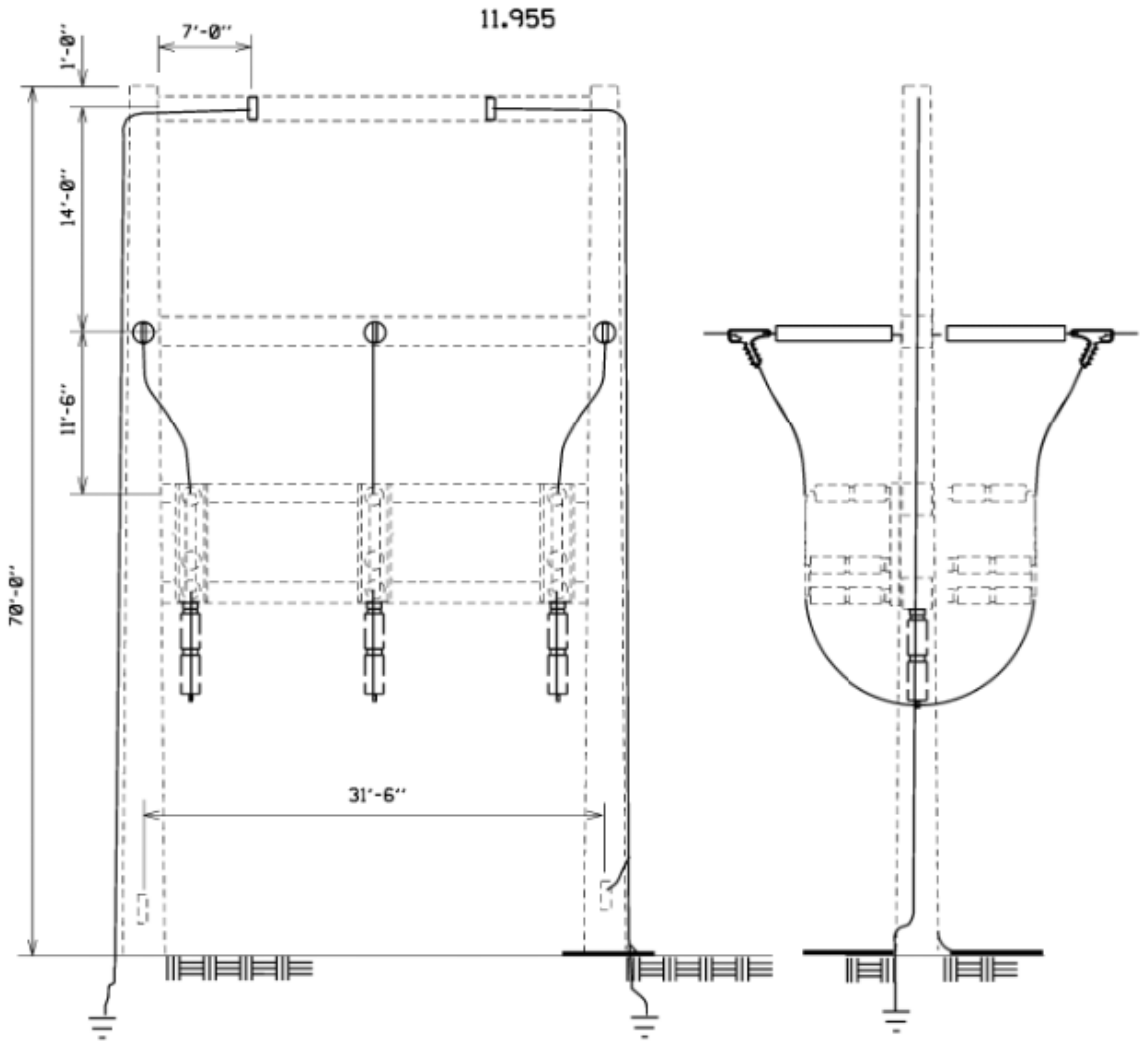


Figure 7 – Proposed Structure Configuration

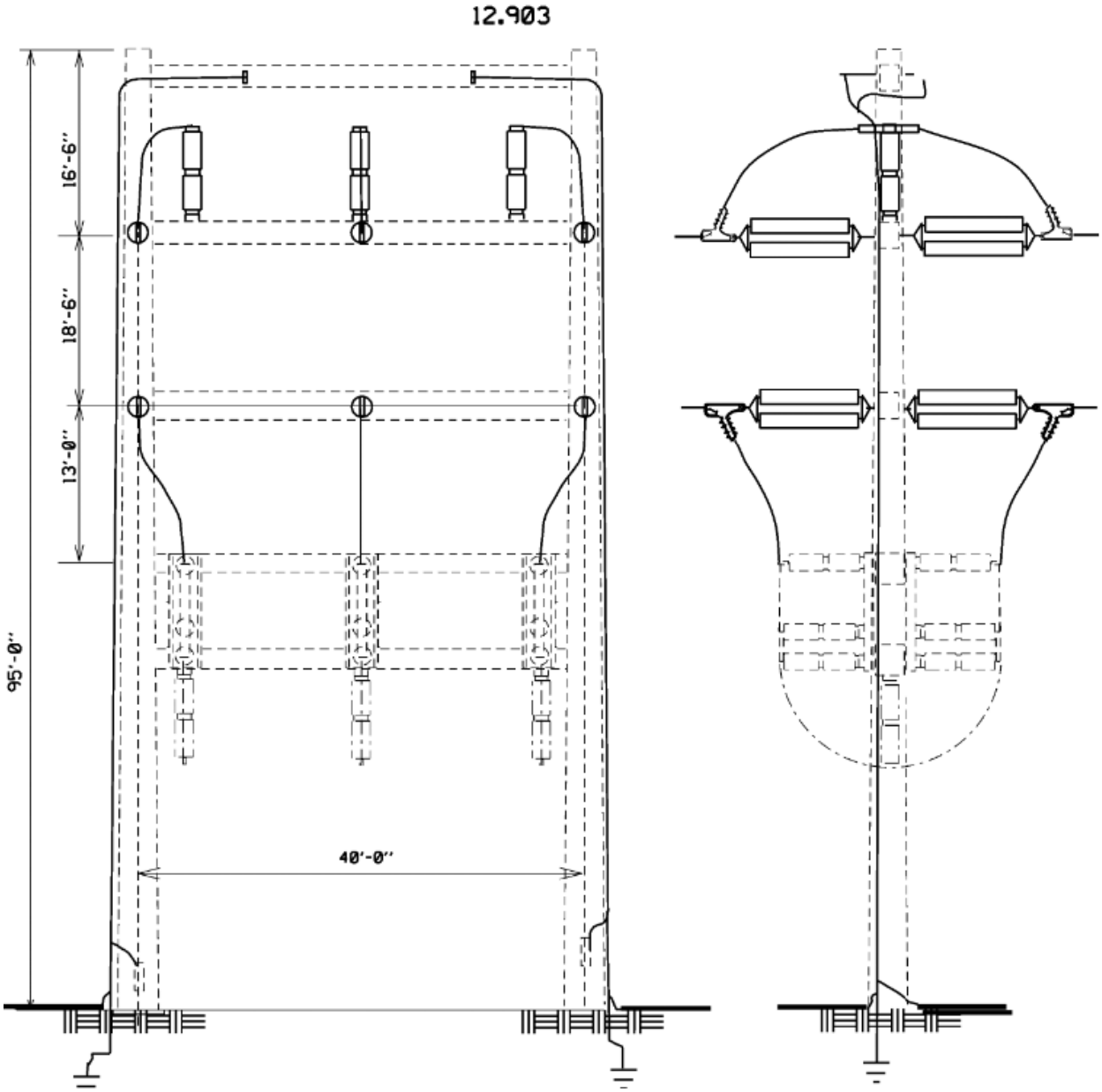
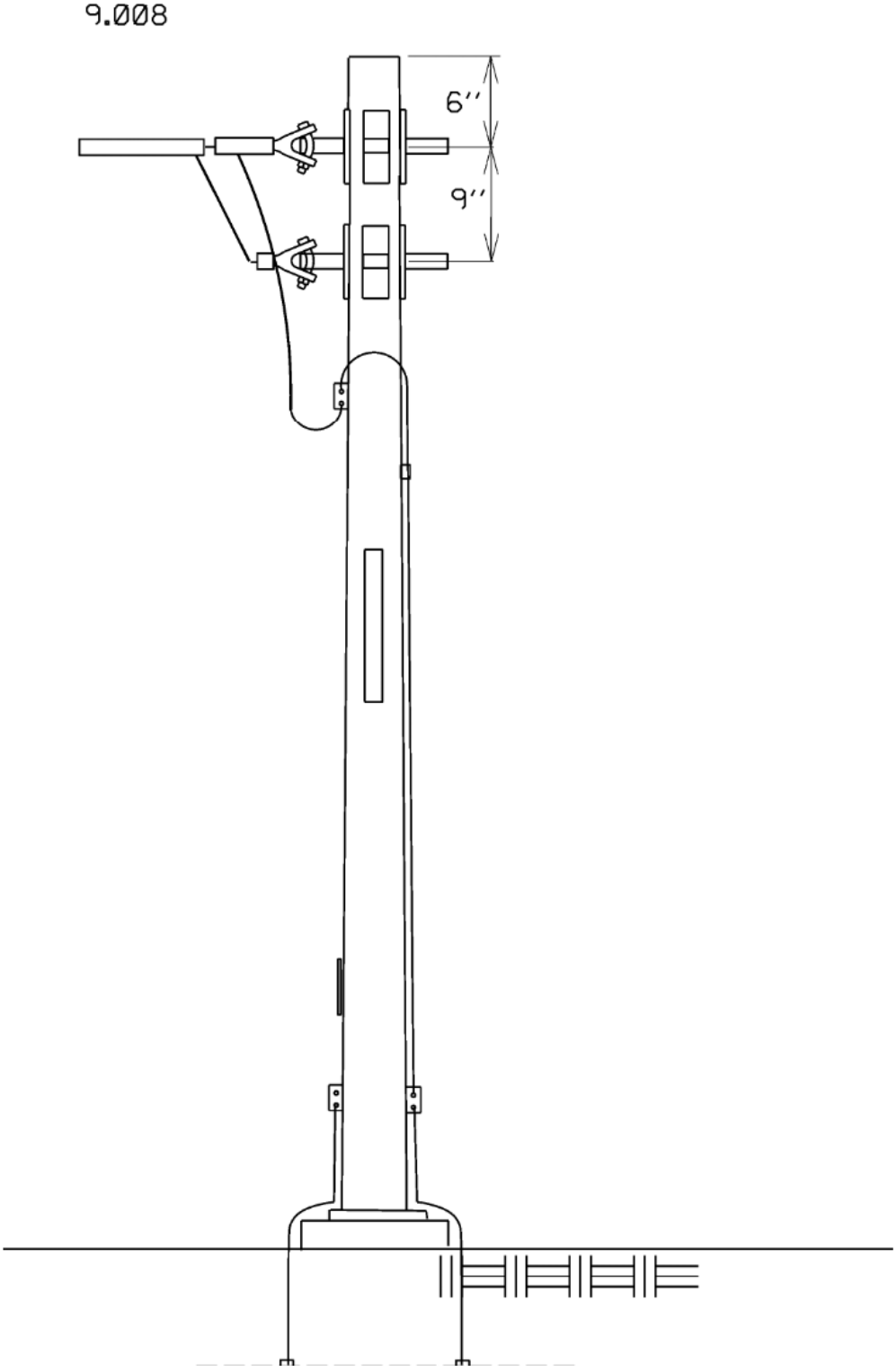


Figure 8 – Proposed Structure Configuration



Required Material Summary

Item	Qty
Backbones	4
Static Poles	1
Engineered Structures	11
DOM Poles	77
7,100-Ft Static Reels	1
12,000-Ft OPGW Reels	11
12,000-Ft Conductor Reels	16