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**Aluminum Tower Concrete Foundation**

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**Material Specification**

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**Transmission  
Engineering**

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Guillermo Nieves (Dec 6, 2024 16:04 AST)

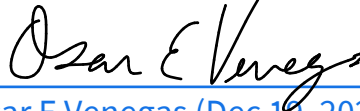
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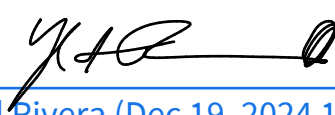
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**Management Approval (If apply)**

**Approver**

N/A  
N/A

Signature and Date

**Related/Referenced Documents**

Version	Date	Revision
00	Mar 30, 2023	First Issue
01	Dec 19, 2024	Changed cover page to new format. Modified sections 3 and 9. Moved drawings. Added Appendix, Table of Compliance and Compatible with section.

## **1. General**

### **1.1. Overview**

- 1.1.1. This is a general specification that covers the minimum requirements for the Precast Aluminum Tower Concrete Foundation to be used in the transmission system in Puerto Rico.
- 1.1.2. Further information will be provided by LUMA Energy at the time of order placement and will provide information on site conditions, quantity, and other requirements.
- 1.1.3. This document includes the general electrical and mechanical characteristics of the material.

## **2. Basic Use**

- 2.1. Used for the structural support of the Aluminum Lattice Tower Structures.

## **3. Specific Requirements**

- 3.1. Samples shall be furnished to LUMA.
- 3.2. LUMA requires One (1) unit properly labeled for testing and analysis.
- 3.3. Descriptive and technical literature must be supplied by vendor at time of bidding.
- 3.4. Containers shall be marked outside with LUMA's purchase order number and code number.
- 3.5. This literature may include, but it is not limited to details of material, drawings, documented testing, and instructions for use and installation.
- 3.6. Failure to submit documents on time will cause bidder disqualification. For products described in this specification as requiring qualification, awards will cause bidder disqualification.
- 3.7. For products described in this specification as requiring qualification, awards will be made only for such products that, prior to the time of opening bids, had been tested and/or approved by LUMA.
- 3.8. Evidence of LUMA's approval of the equipment or material shall be supplied by vendor.

## **4. Acceptance Criteria**

- 4.1. Latest applicable codes, standards, and other regulations: ANSI/ASTM.
- 4.2. Design, construction, and materials shall be in accordance with the following standards and codes unless stated otherwise.
  - 4.2.1. ACI 301 – Specifications for Structural Concrete for Buildings
  - 4.2.2. ACI 318 – Building Code Requirements for Structural Concrete
  - 4.2.3. ACI 304 – Guide for the Use of Preplaced Aggregate Concrete for Structural and Mass Concrete Applications
  - 4.2.4. ACI 305R – Guide to Hot Weather Concreting
  - 4.2.5. ACI 117 – Specification for Tolerances for Concrete Construction and Materials

- 4.2.6. ASTM C95 – Method of Test for Specific Gravity and Absorption of Course Aggregate
- 4.2.7. ASTM C150 – Standard Specification for Portland Cement
- 4.2.8. ASTM C33 – Standard Specification for Concrete Aggregates
- 4.2.9. ASTM A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- 4.2.10. ASTM 775 – Standard Specification for Epoxy-Coated Steel Reinforcing Bars
- 4.2.11. ASTM 934 – Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
- 4.2.12. ASTM C39 – Standard Test Methods for Compressive Strength of Cylindrical Concrete Specimen
- 4.2.13. ASCE/SEI 7-10 Minimum Design Loads for Buildings and Other Structures, American Society of Civil Engineers Structural Engineering Institute (2010).
- 4.2.14. IBC 2009 International Building Code, International Code Council, Inc. (2009).
- 4.2.15. 4751.023GS 230 kV – Aluminum Tower Concrete Foundation Detail-Guyed V Short
- 4.2.16. 4751.023GT 230 kV – Aluminum Tower Concrete Foundation Detail-Guyed V Tall
- 4.2.17. 4751.023SS 230 kV – Aluminum Tower Concrete Foundation Detail-Single Mast Short
- 4.2.18. 4751.023ST 230 kV – Aluminum Tower Concrete Foundation Detail-Single Mast Tall
- 4.3. Test required: certified by external laboratories

## **5. Description**

- 5.1. Aluminum angle structural shapes shall be aluminum alloy 6061-T6 conforming to ASTM B308 and/or ASTM B221.
- 5.2. All sharp edges shall be avoided to have smooth surfaces.
- 5.3. Metric conversions as per the latest applicable ASTM Standard.

## **6. Concrete Mix**

- 6.1. Concrete shall have a minimum of 4000 psi compressive strength at 28 days.
- 6.2. Materials for concrete shall conform to standard ASTM C150.
- 6.3. The concrete used for production of the Aluminum Tower Concrete Foundation shall be fresh and first purpose production mix concrete.
- 6.4. Concrete shall be manufactured in accordance with the requirements of ASTM C95 and ASTM C39.
- 6.5. Reference ASTM C33 for gradation, proportions of aggregate to cement for any concrete mix shall be as to produce a mixture which, consistent with the method of placing, will work readily into corners and angles

of the forms and around reinforcement without permitting the materials to segregate or excess water to collect on the surface.

**7. Construction**

- 7.1. Placing concrete shall be in accordance with ACI 301 and ACI 304.
- 7.2. All exposed edges of concrete, including interior foundation walls and equipment foundations, shall have a ¾" chamfer at 45°.
- 7.3. All concrete placed in hot weather (above 80°F) shall conform to requirements of ACI 305R.
- 7.4. Construction tolerances shall be in accordance with ACI 117.

**8. Reinforcement**

- 8.1. Reinforcing steel shall be deformed bars conforming to ASTM A615 grade 60.
- 8.2. Foundation shall be cast as single, continuous monolithic unit complete with all structural reinforcement.
- 8.3. All reinforcement shall be bent cold, unless otherwise permitted by the building official reinforcing steel shall not be bent or displaced for the convenience of other trades unless approved by the structural engineer.
- 8.4. Provide a minimum cover of 3" for reinforcing steel when the concrete is cast against and permanently in contact with the earth.
- 8.5. Provide a minimum cover of 2" for bars larger than #5, and 1 ½" for #5 bars or smaller if after removal of forms the concrete is exposed to the weather.
- 8.6. The proper type and quantities of accessories shall be furnished to hold the reinforcing steel in place while the concrete is being placed. Reinforcement shall be tied off at a minimum of 50% of the intersections.
- 8.7. Splices shall be lapped 48 bar diameters unless detailed otherwise. Accordance with ASTM/ACI.

**9. Markings and Packaging**

- 9.1. The design of the precast aluminum tower concrete Foundation shall consider soil parameters appropriate to the project site conditions and the specific loading requirements for the aluminum towers to be supported in accordance with local building codes and manufacturer recommendations
- 9.2. Aluminum tower concrete foundation shall be used with Steel Anchor Rod (Warehouse ID No.: 002-82847).
- 10. Dimensions for the aluminum tower concrete foundation shall be as per Appendix 1 through Appendix 4.

Structure Type	Warehouse No.
Aluminum Tower Foundation – Guyed V Tall	026-82455
Aluminum Tower Foundation – Guyed V Short	026-82456
Aluminum Tower Foundation – Single Mast Short	026-82457
Aluminum Tower Foundation – Single Mast Tall	026-82458

**11. Compatible with:**

11.1. LUMA will evaluate equally any model not listed here during any acquisition event.

**12. Proposal Information**

12.1. Submitted proposals must include:

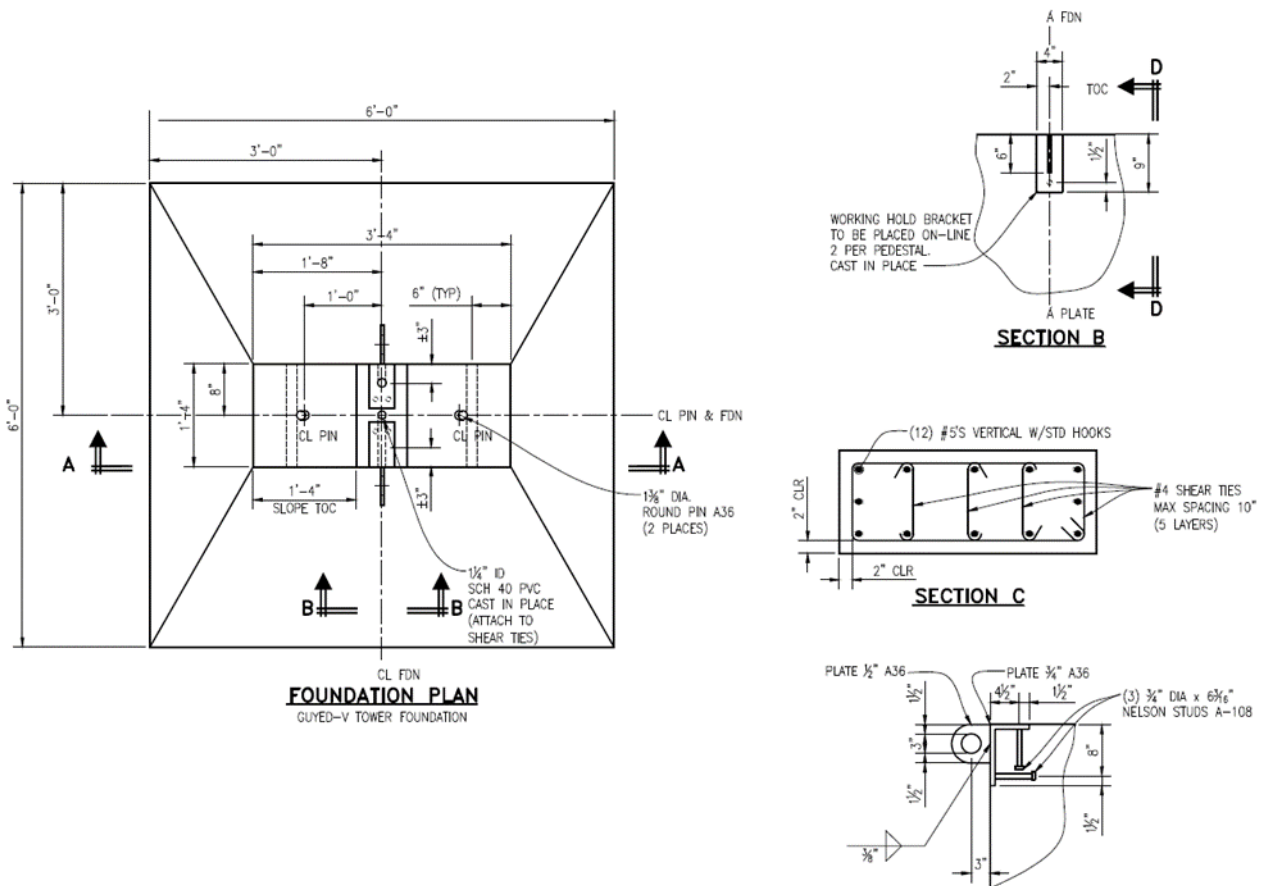
- a. Technical Information
- b. Table of Compliance completed by the bidder with reference

**13. Inspection**

13.1. The acceptance of any material or equipment shall in no way relieve the vendor from his responsibility to meet all the requirements of this specification, and it shall not prevent subsequent rejection if such material is found to be defective later

**14. Drawings**

**Figure 1: Aluminum Tower Concrete Foundation, Guyed V Short (026-82456)**



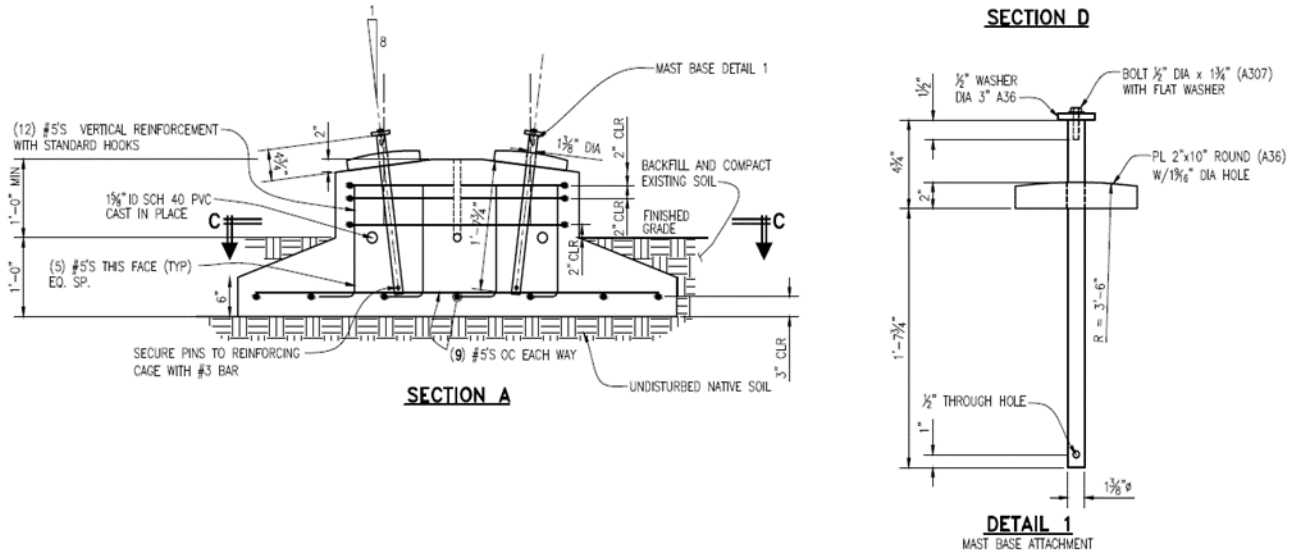
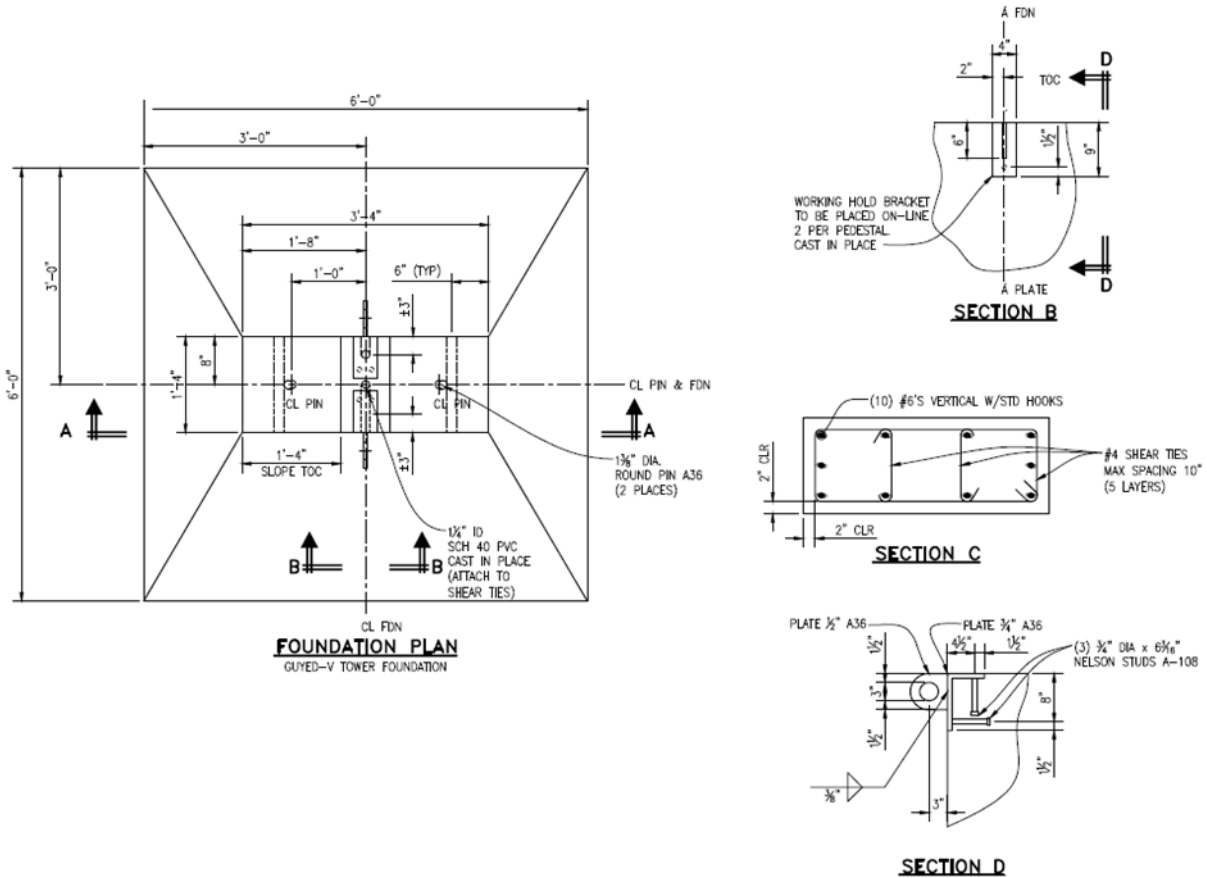


Figure 2: Aluminum Tower Concrete Foundation, Guyed V Tall (026-82455)



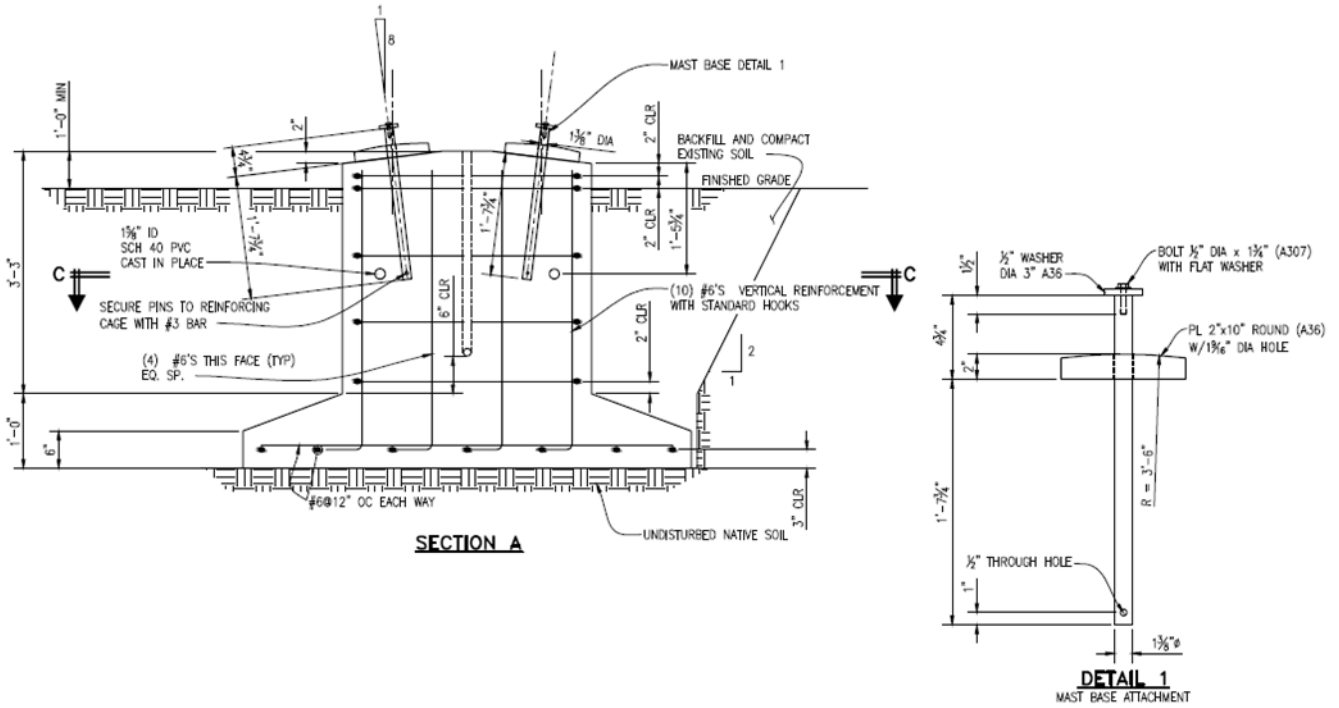
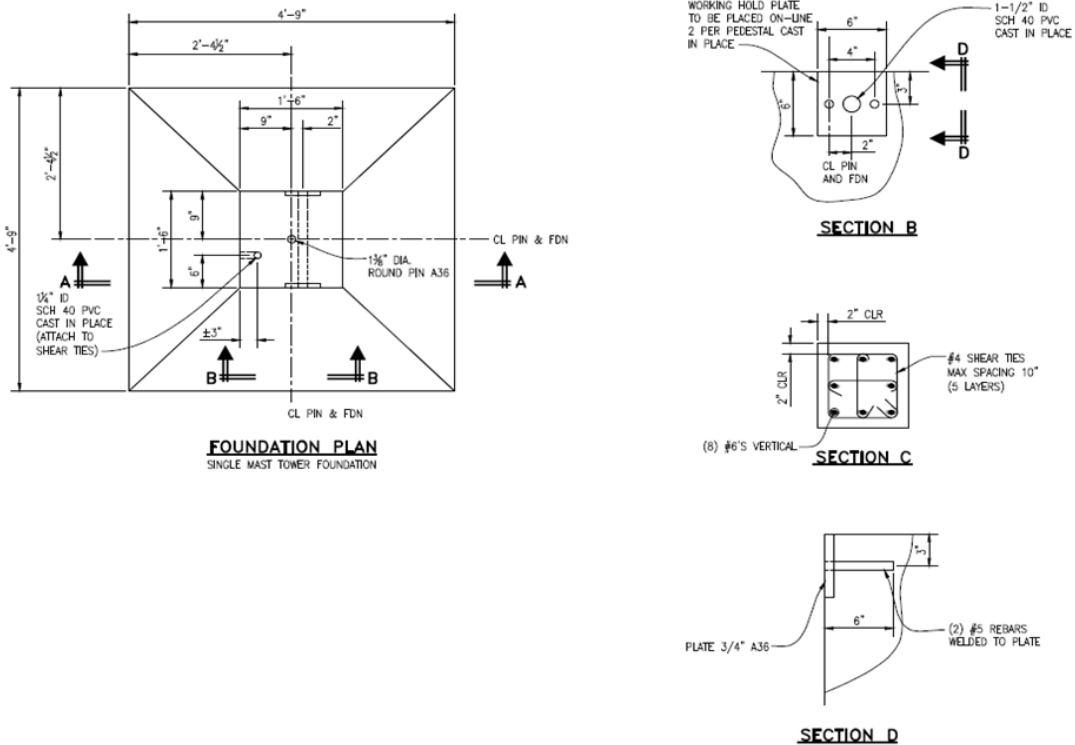


Figure 3: Aluminum Tower Foundation Single Mast Tall (026-82458)



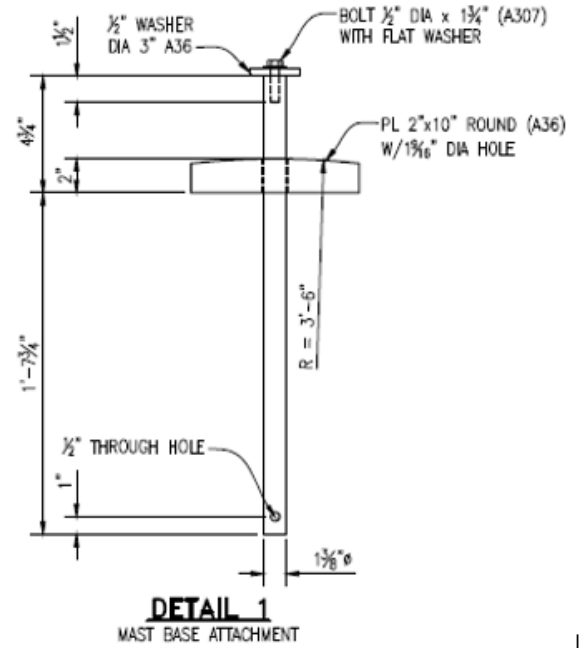
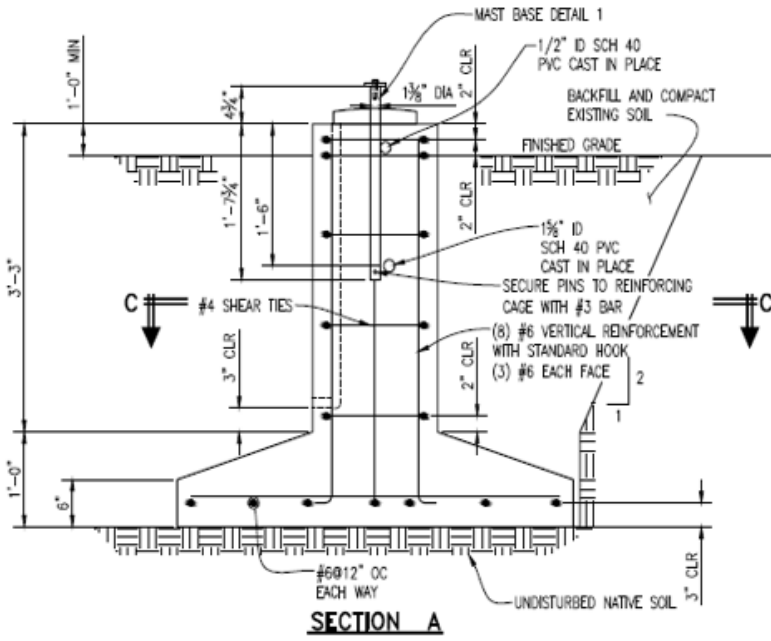
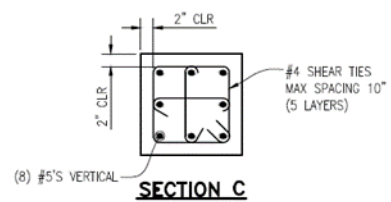
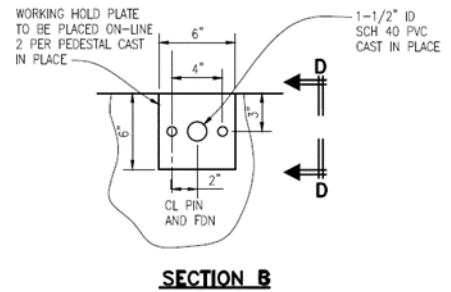
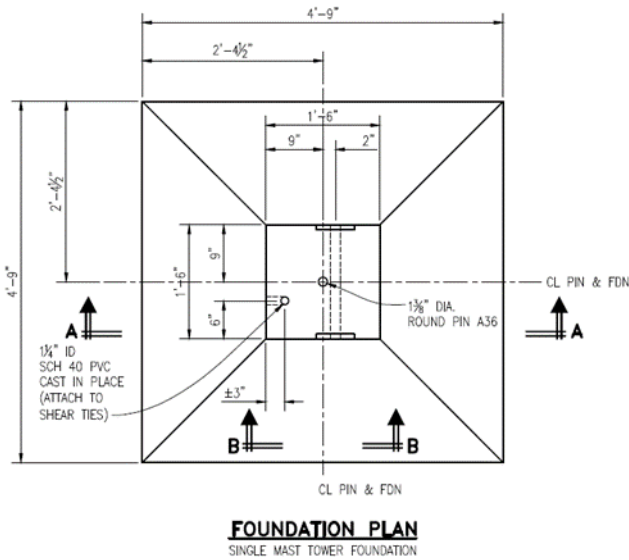
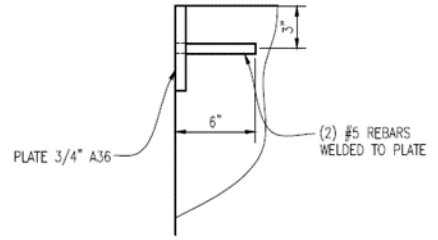
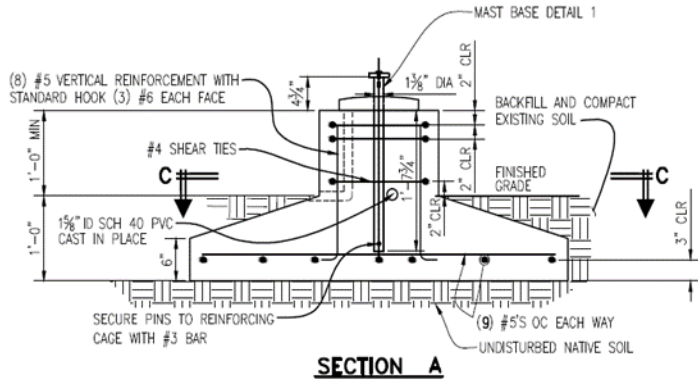


Figure 4: Aluminum Tower Concrete Foundation Single Mast Short (026-82457)

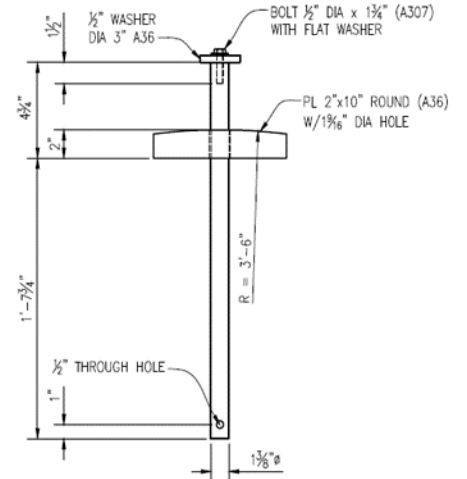




**SECTION D**



**SECTION A**



**DETAIL 1**  
MAST BASE ATTACHMENT

— End of Specification —

## Appendix

Appendix 1. Table of Compliance

Line	Criteria	Description	Pass/Fail (P / F)	Comments
1	Specification	The Proponent complies with the corresponding specification document (4752.312)		
2	Industry Standards	The Proponent complies with the industry standards established in the specification document (ANSI, ASTM, ACI, IBC)		
3	Dimensions	Complies with measurements in the Drawings section.		
4	Requirements	<ul style="list-style-type: none"> <li>• Samples shall be furnished to LUMA.</li> <li>• LUMA requires One (1) unit properly labeled for testing and analysis.</li> <li>• Descriptive and technical literature shall be supplied to LUMA.</li> <li>• Required to be certified by external laboratories.</li> <li>• All sharp edges shall be avoided to have smooth surfaces.</li> <li>• Bullets under the <b>Concrete Mix, Reinforcements,</b> and <b>Construction</b> sections are met.</li> </ul>		











# 4752.312 Aluminum Tower Concrete Foundation

Final Audit Report

2024-12-19

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By:	Guillermo Nieves (guillermoj.nievesdia@lumapr.com)
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