

Report Date: June 1, 2021

Client: ARE Telecom Incorporated
1043 Grand Ave #213
St. Paul, MN 55105
Attn: Dion Johnson
(651) 724-1322

Mount Type: ARE T-Arm Standoff (20")

PJF Project: A21221-0011.001.7830

Paul J. Ford and Company is pleased to submit this "Mount Structural Rating Letter". The purpose of this assessment is to classify the above listed mount based on the mentioned criteria. Analysis of the existing supporting tower structure is to be completed by others and therefore is not part of this document. Analysis of the antenna mounting system as a tie-off point is not part of this document.

Analysis Criteria:

Structure Height:	400 ft
Risk Category:	II
Ultimate Wind Speed:	180 mph
Exposure Category:	C
Topographic Factor:	1.00
Ice Thickness:	2.0
Wind Speed with Ice:	60 mph
Gust Effect Factor (Gh):	1.0
Wind Direction Factor (Kd):	0.95
Maintenance Loading Wind Speed:	30 mph
Maintenance Load at Mid/End-Points, L _v :	0 lb
Maintenance Load at Mount Pipes, L _m :	0 lb

Based on the mount classification systems, the ARE T-Arm Standoff (20") is classified as follows:

Mount Model	Mount Rating
T-Arm Standoff (20")	M1950R(2350)-2[6]

*Refer to Table 3 for detailed information

We at Paul J. Ford and Company appreciate the opportunity of providing our continuing professional services to you and ARE Telecom Incorporated. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully Submitted by:
Paul J. Ford and Company



6/1/2021

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TABLE OF CONTENTS

1) INTRODUCTION

2) ANALYSIS CRITERIA

3) ANALYSIS PROCEDURE

- Table 1 – Documents Provided
- 3.1) Analysis Method
- 3.2) Modeling and Applied Appurtenance Loading
- 3.3) Structural Steel Material
- 3.4) Assumptions

4) ANALYSIS RESULTS

- Table 2 - Mount Classifications - Load
- Table 3 – Mount Classifications - EPA
- Table 4 - Mount Effective Projected Areas

5) STANDARD CONDITIONS

6) APPENDIX A

- Manufacturer Assembly Drawings

1) INTRODUCTION

At the request of ARE, Paul J. Ford & Company performed a mount structural analysis to determine the mount classification of the T-Arm Standoff (20").

The T-Arm Standoff (20") are sectorized standoff mounts. The mount centerline is aligned at the collar weldment assembly. Equipment is considered to be installed directly onto the pipe mounts.

2) ANALYSIS CRITERIA

Structure Height:	400 ft
Risk Category:	II
Ultimate Wind Speed:	180 mph
Exposure Category:	C
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Maintenance Load at Mount Pipes, L _m :	0 lb

For structures or locations that exceed the above limitations, the Mount Classification Specification allows for and requires mounts to be designed for the following maximum design values:

Maximum Factored Wind Pressure:	135 psf
Maximum Ice Thickness:	2 inches
Maximum Factored Wind Pressure w/ Ice:	15 psf

3) ANALYSIS PROCEDURE

Table 1 – Documents Provided

Document	Remarks	Reference	Source
Manufacturer Specs	ARE, 02/23/2021	T-Arm Standoff (20")	ARE

3.1) Analysis Method

RISA-3D (version 17.0.3), a commercially available analysis software package, was used to create a three-dimensional model of the mount and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix C. In addition, this analysis is in accordance with Verizon's NSTD-446 *Antenna Mount Analysis and Modification Process (dated 03/29/19)*.

3.2) Modeling and Applied Appurtenance Loading

The mount was analyzed for conditions with (2) antenna loads per sector. It is assumed that all antenna mounting arrangements are equal spacing with a maximum of 0" vertical offset from the centerline of the mount. There are three categories of mounts per the Mount Classification Specification: Categories R, A, and L. This mount was classified as a Category R mount. Category R mounts are intended to support mounting configurations where the effective projected areas (EPA) of the front and side faces at the mounting point are similar. For example, panel antennas that are mounted back-to-back or single panel antennas with radio equipment or other appurtenances mounted behind the antenna. Category R mounts are also intended to support heavier vertical loads.

Per the Mount Classification Specification, a mount is classified by designating a letter M followed by the following:

- The factored maximum horizontal concentrated force, F, supported on each mounting pipe location
- The mount category, R, A, or L based on the intended usage.
- The factored maximum vertical force due to ice, (F_{zi})
- The number of antenna mounting pipes
- The allowable vertical centerline offset from the mount
- The forces shall be designed in 50 lbs increments

3.3) Structural Steel Material

ARE has provided the following material grades:

Steel shall be galvanized per ASTM A123 and conform to the following specs:

- | | |
|---------------------------------------|----------------|
| a) HSS (Rectangular) | A500 GR. B |
| b) Bent Plate Members (3/16" to 1/2") | 50 ksi |
| c) Connection Bolts | ASTM A325 |
| d) Solid Round, Plate | 50 ksi |
| e) U-Bolts | SAE J429 (GR2) |

3.4) Assumptions

- 1) *The mount attachment to the structure/tower is not within the current scope of work.*
- 2) *All member connections have been designed to meet or exceed the load carrying capacity of the connected member unless otherwise specified in this report. All U-Bolt connections have been properly tightened.*
- 3) *All welded connections on the mount shall conform to the latest revised code of the American Welding Society, AWS D1.1.*

This analysis may be affected if any assumptions are not valid or have been made in error. Paul J Ford and Company should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 2 – Mount Classifications

Mount Model	Mount Classification	Max Normal Horizontal Load (lbs)	Max Transverse Horizontal Load (lbs)	Max Vertical Load w/ Ice (lbs)
T-Arm Standoff (20")	M1950R(2350)-2[6]	1950	1950	2350

Note: The max normal and transverse loads are representative of an extreme wind condition. The max vertical load with ice is representative of an extreme ice condition. The maximum loads listed are factored loads applied at (2) mount pipe locations per sector in accordance with NSTD-445 (TIA/TSB-5053).

Table 3 – Mount Classifications – Max Appurtenance EPA

Mount Model	Max EPA (sqft)				
	180 mph Ult Wind Speed	150 mph Ult Wind Speed	130 mph Ult Wind Speed	110 mph Ult Wind Speed	90 mph Ult Wind Speed
T-Arm Standoff (20")	14.60	21.03	28.0	39.11	58.42

Note: The max appurtenance EPA following analysis criteria in Section 2 of this report with varying ultimate wind speeds assuming a Force Coefficient (Ca) of 2.0.

Table 4 – Mount Effective Projected Areas and Weights

Mount Model	Mount EPA _N w/ No Ice (ft ²)	Mount EPA _T w/ No Ice (ft ²)	Mount EPA _N w/ 1/2" Ice (ft ²)	Mount EPA _T w/ 1/2" Ice (ft ²)	Weight (lbs)	Weight w/ 1/2" Ice (lbs)
T-Arm Standoff (20") [Mount Pipes Included*]	7.20	6.22	8.61	7.64	201.47	339.68
T-Arm Standoff (20") [Mount Pipes Excluded]	2.08	1.10	2.14	1.17	51.75	189.95

* (2) 4" diameter x 96" long mount pipes

STANDARD CONDITIONS FOR FURNISHING OF PROFESSIONAL ENGINEERING SERVICES ON EXISTING MOUNTS BY PAUL J. FORD AND COMPANY

- 1) It is the responsibility of the client to ensure that the information provided to Paul J. Ford and Company is accurate and complete. Paul J. Ford and Company will rely on the accuracy and completeness of such information in performing or furnishing services under this project.
- 2) If the existing conditions are not as represented on the referenced drawings and/or documents, Paul J. Ford and Company should be contacted immediately to evaluate the significance of the deviation.
- 3) The mount has been analyzed according to the minimum design loads recommended by the Reference Standard. If additional design loads are required, Paul J. Ford and Company should be made aware of this prior to the start of the project.
- 4) The standard of care for all Professional Engineering Services performed or furnished by Paul J. Ford and Company under this project will be the skill and care used by members of the Consultant's profession practicing under similar circumstances at the same time and in the same locality.
- 5) All Services are performed, results obtained, and recommendations made in accordance with generally accepted engineering principles and practices. Paul J. Ford and Company is not responsible for the conclusions, opinions and/or recommendations made by others based on the information supplied herein.

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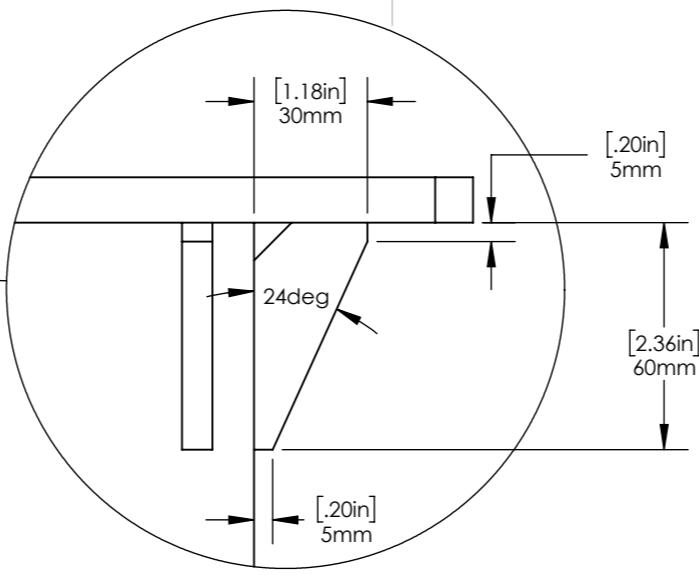
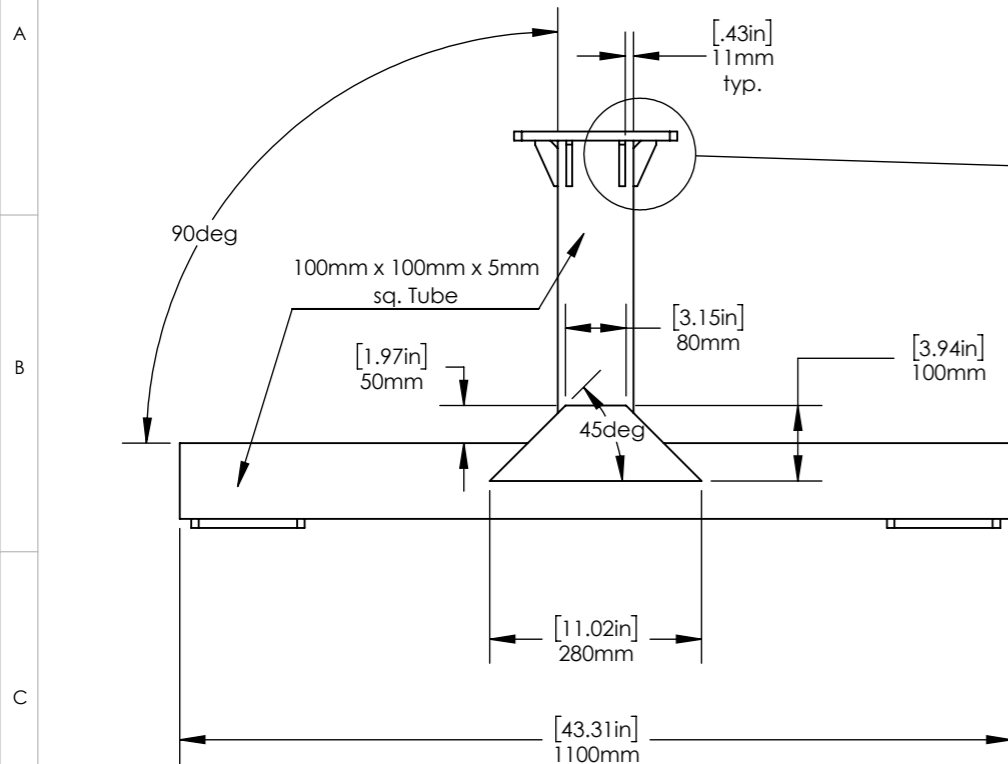
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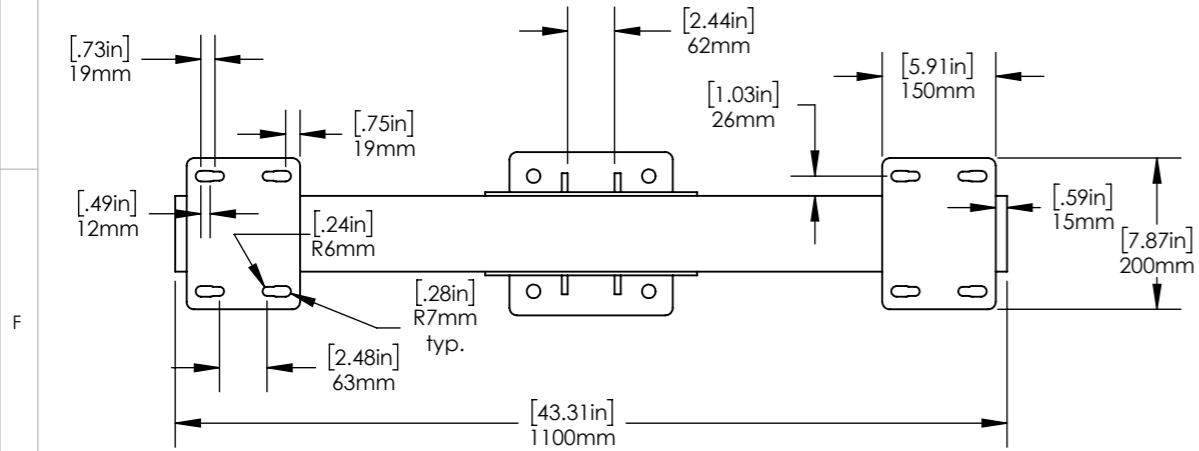
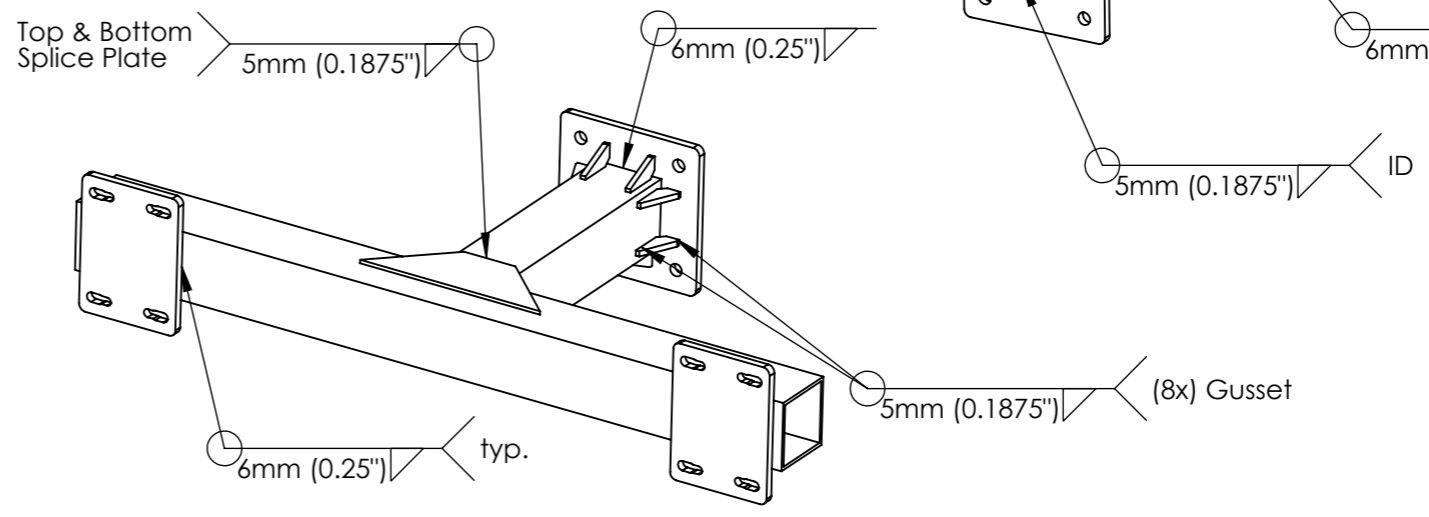
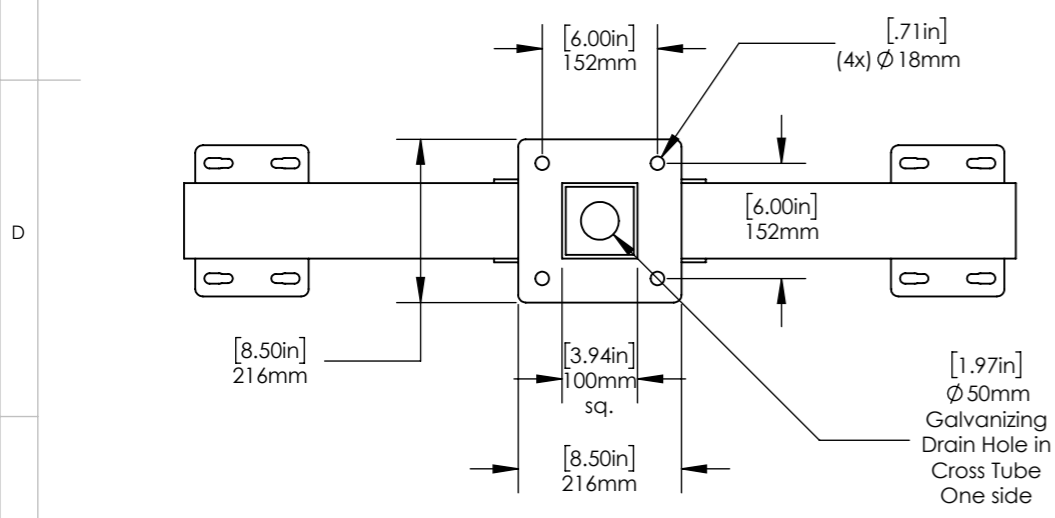
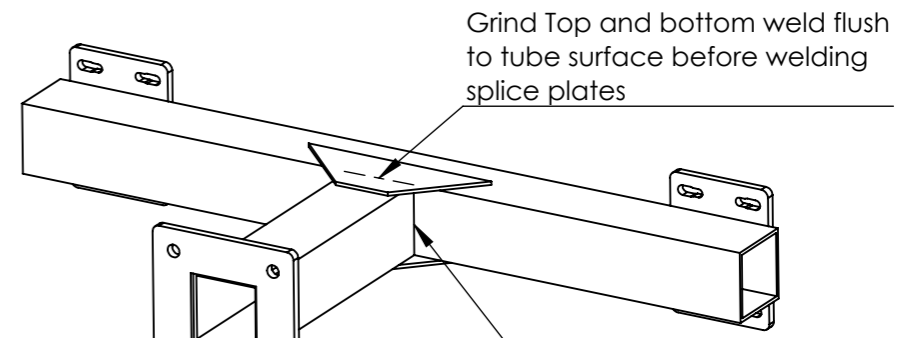
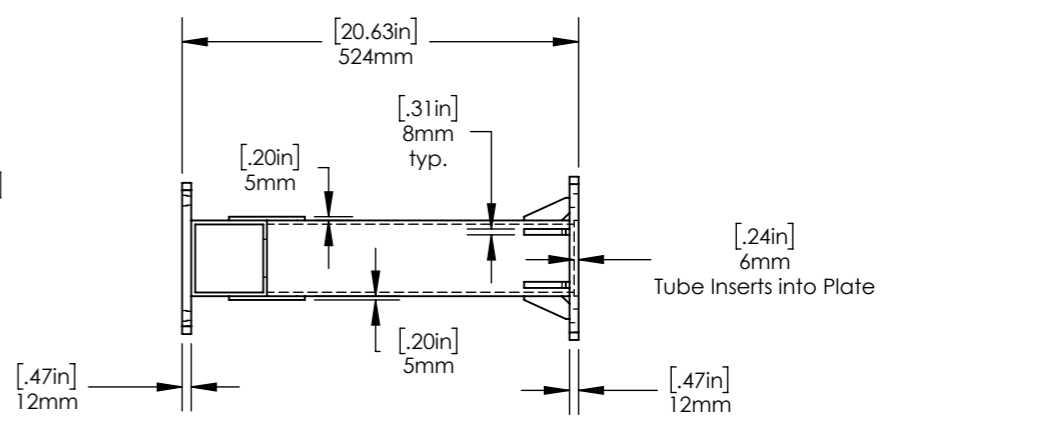
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REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	initial release	2/23/21	MGC
B			
C			



DETAIL A
(8x) GUSSET



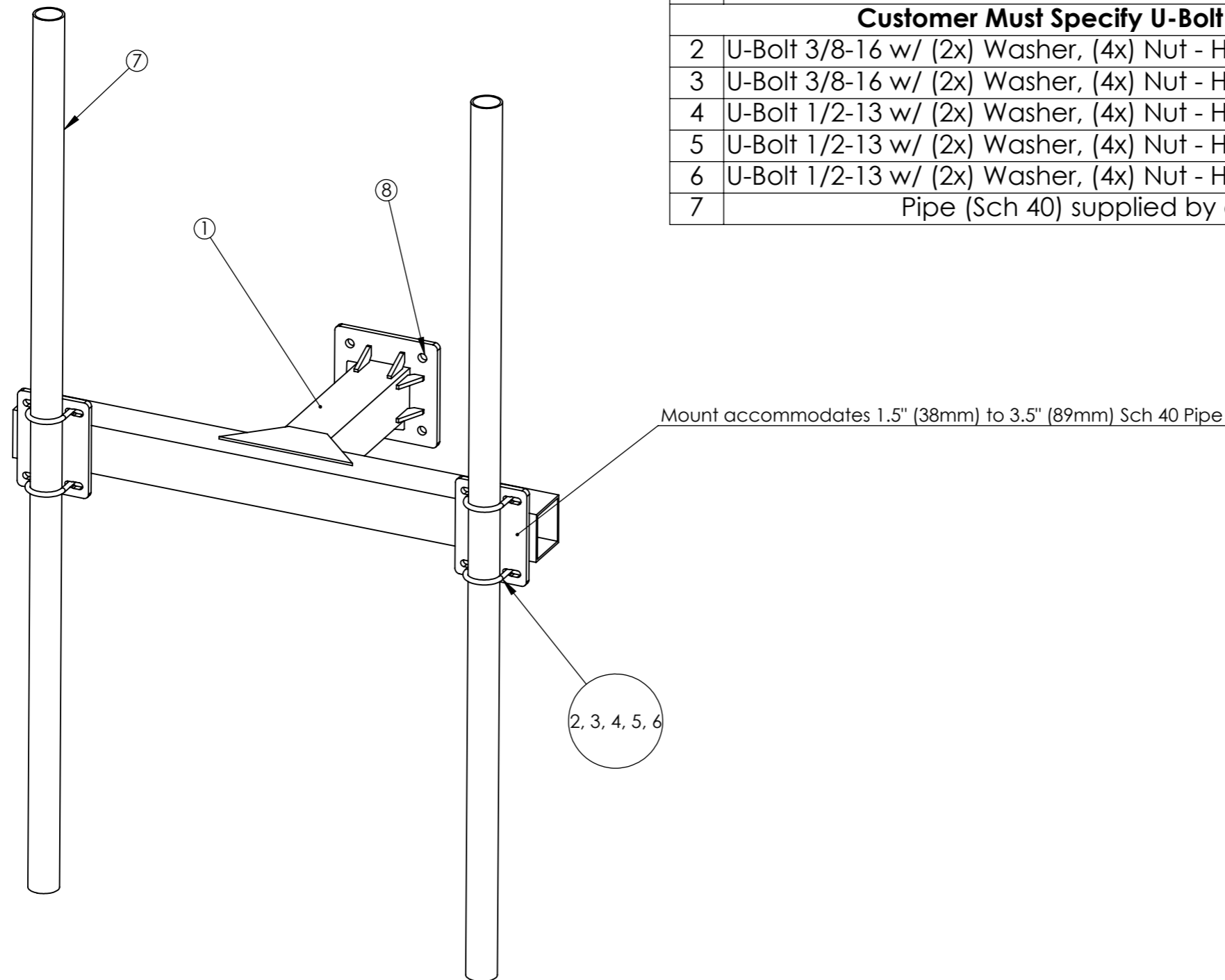
- Notes:**
- All plate material shall have a minimum yield strength of 355 MPa (50 ksi)
 - Tube shall be Q355 (ASTM A500 Gr B) or equivalent
 - All welding shall conform to the minimum requirements of AWS D1.1
 - All welding shall be done by welders qualified under AWS specifications, using E70XX, low hydrogen electrodes
 - All components shall Hot Dip Galvanized in accordance with ASTM A123
 - Debur all sharp edges

CAD-generated drawing do not manually update				1041 Grand Ave., #213 St. Paul, MN 55105 (651) 330-1263 www.aretelcom.com
Total Weight 33.5kg (74lb) Does not include fasteners	APPROVALS	DATE	T-Arm Standoff (20") CAD file : Details and dimensions not shown on this drawing can be found in CAD file.	
MATERIAL See Notes	DRAWN MGC	2/23/21		
FINISH See Notes	CHECKED			
DO NOT SCALE DRAWING	RESP ENG		scale NA rev. A size NA sheet 1 of 2	
	MFG ENG			
	QUAL ENG			

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20" (524mm) T-Arm Standoff Bill of Materials

#	Description	Qty	Weight ea. kg/ (lb)
1	T-Arm Standoff	1	33.5/ 74
Customer Must Specify U-Bolt (1.5" to 3.5" Schedule 40 Pipe)			
2	U-Bolt 3/8-16 w/ (2x) Washer, (4x) Nut - HDG (1.5" sch. 40 Pipe)	4	
3	U-Bolt 3/8-16 w/ (2x) Washer, (4x) Nut - HDG (2" sch. 40 Pipe)	4	
4	U-Bolt 1/2-13 w/ (2x) Washer, (4x) Nut - HDG (2.5" sch. 40 Pipe)	4	
5	U-Bolt 1/2-13 w/ (2x) Washer, (4x) Nut - HDG (3" sch. 40 Pipe)	4	
6	U-Bolt 1/2-13 w/ (2x) Washer, (4x) Nut - HDG (3.5" sch. 40 Pipe)	4	
7	Pipe (Sch 40) supplied by customer		



T-Arm Mounting Bolts, Nuts & Washers (other equivalent grades acceptable)

#	Unit	Bolt Size	Length	Width Across Flats	Thread Length	Grade	Coating	Nut Qty.	Washer Qty.	Bolt Qty.
8	Metric	M16x2	65mm	24mm	Full Thread	8.8	Hot Dip Galv.	8	8	4
8	Imperial	5/8-11	2-1/2"	15/16"	Full Thread	A325	Hot Dip Galv.	8	8	4


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T-Arm Standoff 20" BOM

Part # 

scale NA rev. A size NA sheet 2 of 2