

**Report Date:** July 2, 2020

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

**Mount Type:** (1) ARE Universal Adjustable Mount

**PJF Project:** A00020-0256.001.7190

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

**Analysis Criteria:**

TIA Standard:	TIA-222-H
Structure Height:	400 ft
Risk Category:	II
Ultimate Wind Speed:	180 mph
Exposure Category:	C
Topographic Factor:	1.00
Design Ice Thickness:	2
Wind Speed with Ice:	60 mph
Gust Effect Factor (Gh):	1.0
Wind Direction Factor (Kd):	0.95

Based on the mount classification systems, the ARE Universal Adjustable Mount is classified as follows:

Mount Model	Mount Rating
Universal Adjustable Mount	M700R(900)-1[6]

\*Refer to Table 3 for detailed information

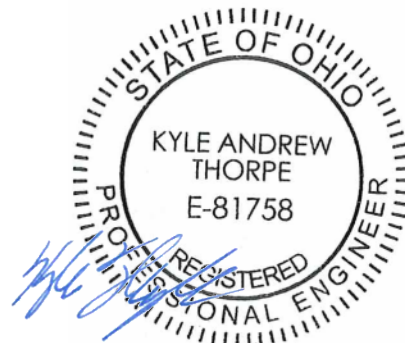
We at Paul J. Ford and Company appreciate the opportunity of providing our continuing professional services to you and ARE Telecom Incorporated. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully Submitted by:  
Paul J. Ford and Company

*Angela Sage*

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Structural Designer  
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KAT



07/02/2020

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## 1) INTRODUCTION

At the request of ARE, Paul J. Ford & Company performed calculations to determine the mount classification of the Universal Adjustable Mount.

The Universal Adjustable Mount is a curved pipe mount. The mount centerline is the elevation of the mount collar supporting the primary standoff member. Equipment is considered to be installed directly onto the pipe mount.

## 2) ANALYSIS CRITERIA

TIA Standard:	TIA-222-H
Structure Height:	400 ft
Risk Category:	II
Ultimate Wind Speed:	180 mph
Exposure Category:	C
Topographic Factor:	1.00
Design Ice Thickness:	2
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Gust Effect Factor (Gh):	1.0
Wind Direction Factor (Kd):	0.95

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 Escalated Ice Thickness ( $T_{iz}$ ):	2.75 inches
Maximum Factored Wind Pressure w/ Ice:	15 psf

## 3) ANALYSIS PROCEDURE

**Table 1 – Documents Provided**

Document	Remarks	Reference	Source
Mount Manufacturer Drawings	ARE	Quad Mount Arm rev A	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.

### 3.2) Modeling and Applied Appurtenance Loading

The mount was analyzed for conditions with (1) antenna load per sector. It is assumed that all antenna mounting arrangements are equal spacing with a maximum of 6" 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<sub>zi</sub>)
- 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)                  | 50 ksi           |
| b) Pipe                               | ASTM A53 (GR 35) |
| c) Bent Plate Members (3/16" to 1/2") | ASTM A36 (GR 36) |
| d) Connection Bolts                   | ASTM A325        |
| e) Solid Round, Plate, Unistrut       | ASTM A36 (GR 36) |
| f) 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 assessment 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 - Max Appurtenance Load**

Mount Model	Mount Classification	Max Normal Horizontal Load (lbs)	Max Transverse Horizontal Load (lbs)	Max Vertical Load w/ Ice (lbs)
Universal Adjustable Mount	M700R(900)-1[6]	700	700	900

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 (1) mast pipe location 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
Universal Adjustable Mount	2.6	3.7	5.0	7.0	10.5

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 <sub>N</sub> w/ No Ice (ft <sup>2</sup> )	Mount EPA <sub>T</sub> w/ No Ice (ft <sup>2</sup> )	Mount EPA <sub>N</sub> w/ 1/2" Ice (ft <sup>2</sup> )	Mount EPA <sub>T</sub> w/ 1/2" Ice (ft <sup>2</sup> )	Weight (lbs)	Weight w/ 1/2" Ice (lbs)
Universal Adjustable Mount	0.58	0.67	1.16	1.26	11.7	41.5



**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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# APPENDIX A

## MANUFACTURER ASSEMBLY DRAWINGS

**Columbus**  
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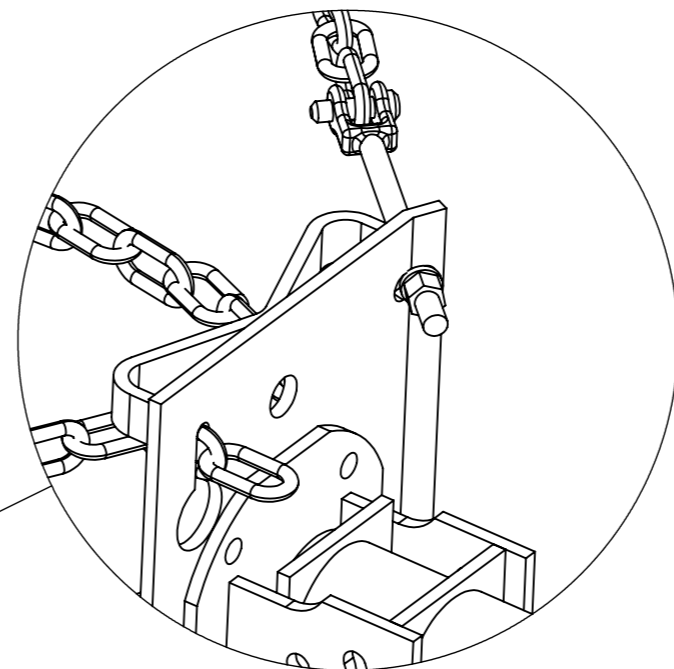


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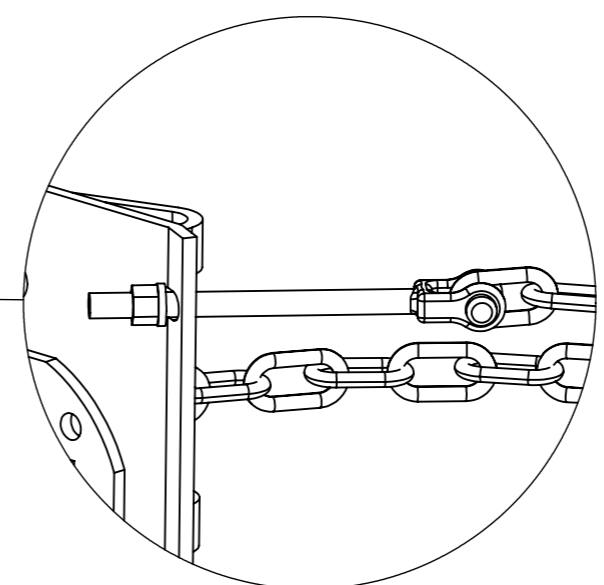
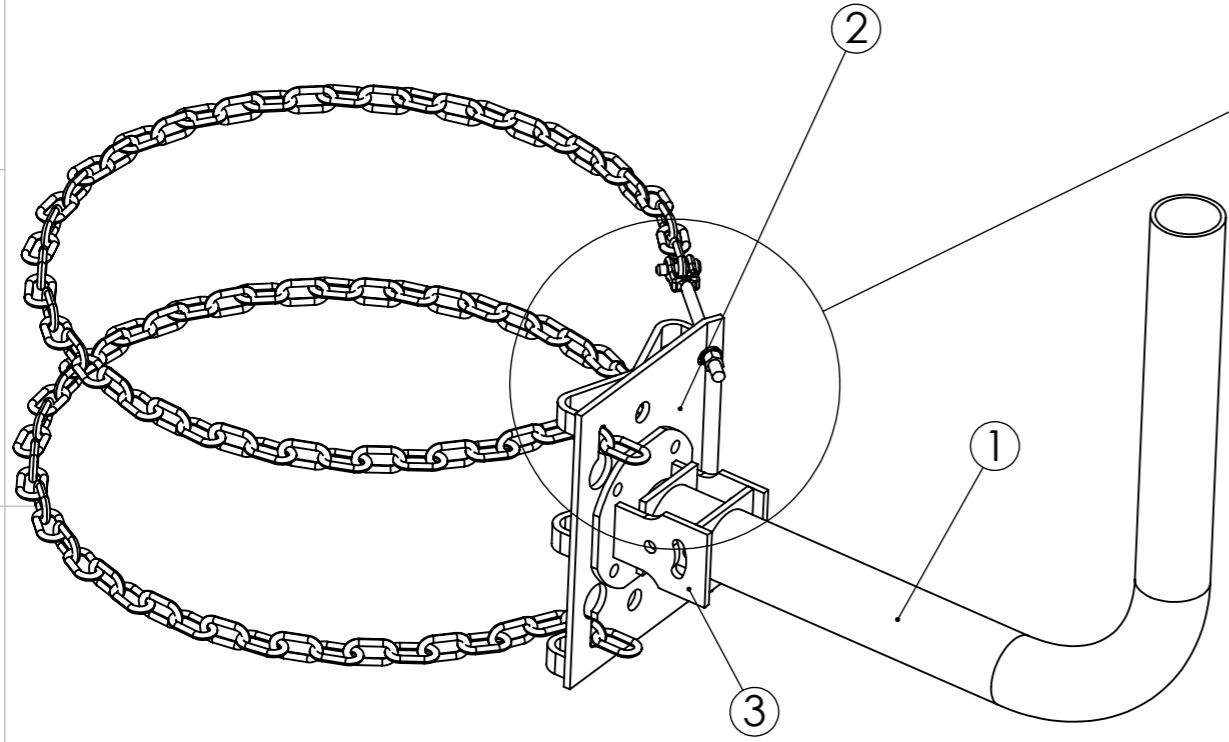
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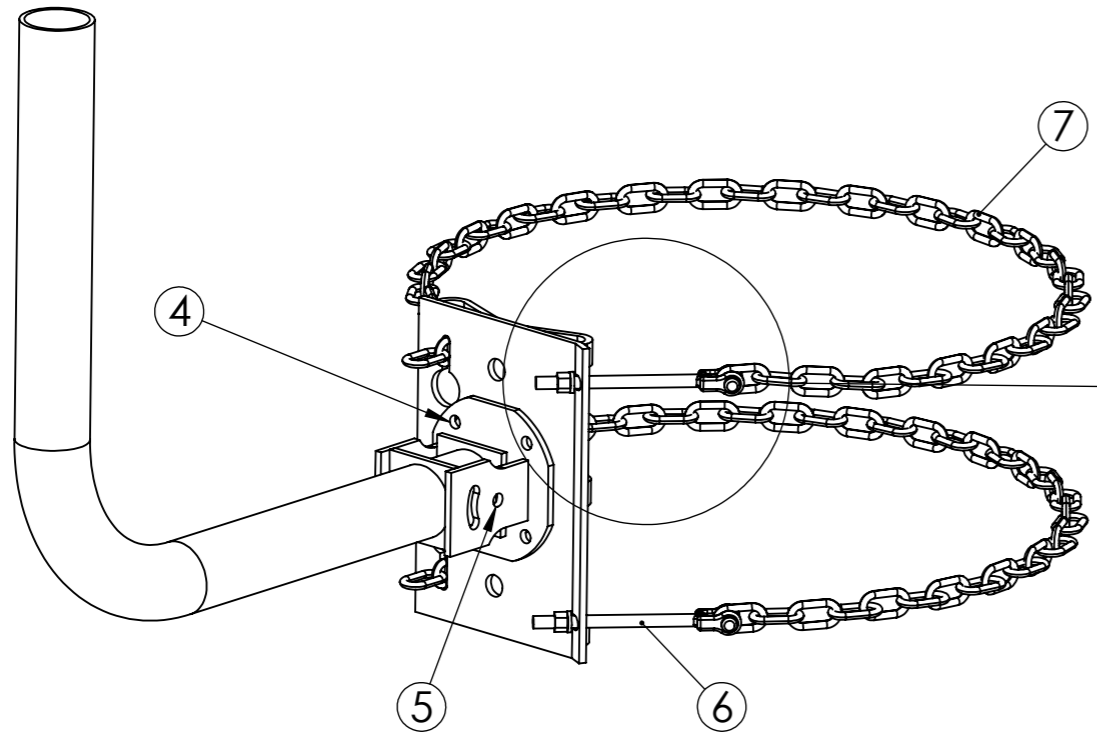


DETAIL A

No.	Description	Weight	Qty.
1	2" Sch. 40 Pipe-90deg. Bend (or equivalent)		1
2	Mounting Plate		1
3	Pipe Swivel		1
4	M10x1.5 x 30mm gr 8.8 or equivalent		4
5	M10x1.5 x 100mm gr 8.8 or equivalent		2
4-5	M10 Nut		6
4-5	M10 Washer		12
6	3/8"x6" Jaw End Fitting, Right w/ Nut, Washer and 3/8" Cotter		
7	1/4" x 5' 30 Proof HDG Chain		2



DETAIL B



ARE Telecom & Wind  
 1043 Grand Avenue, # 213  
 St. Paul, MN 55105  
 (651) 330-1263

**Antenna Chain Mount**

Part # AMM-500-CM  
 scale NA rev. A-2 size NA sheet 5 of 5