

Report Date: July 30, 2020

Client: ARE Telecom Incorporated

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

Mount Type: (1) ARE Universal Tri and Quad Mount

PJF Project: A00020-0279.001.7192

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: ΙΙ 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 Tri and Quad Mount is classified as follows:

Mount Model	Mount Rating
Universal Tri and Quad Mount	M3050R(5000)-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

Jared Forbes, E.I. Structural Designer jforbes@pauliford.com KYLE ANDREW THORPE E-81758

07/30/2020

Columbus

250 E Broad St, Suite 600 Columbus, OH 43215 Phone 614.221.6679



Orlando 1801 Lee Rd. Suite 230

Winter Park, FL 32789 Phone 407.898.9039

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 calculations to determine the mount classification of the Universal Tri and Quad Mount.

The Universal Tri and Quad Mounts are sectorized standoff mounts. The mount centerline is the midpoint between the two collar weldment assemblies. Equipment is considered to be installed directly onto the pipe mounts.

2) ANALYSIS CRITERIA

TIA Standard: TTA-222-H Structure Height: 400 ft Risk Category: II Ultimate Wind Speed: 180 mph Exposure Category: C Topographic Factor: 1.00 Design Ice Thickness: Wind Speed with Ice: 60 mph 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	Tri and Quad Mount Assemblies	PJF

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.

250 E Broad St, Suite 600 Columbus, OH 43215 Phone 614.221.6679



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, (Fzi)
- 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	50 ksi
c)	Bent Plate Members (3/16" to 1/2")	50 ksi
d)	Connection Bolts	ASTM A325
e)	Solid Round, Plate	50 ksi
f)	<i>U-Bolts</i>	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.

Columbus

250 E Broad St, Suite 600 Columbus, OH 43215 Phone 614.221.6679



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 Tri and Quad Mount	M3050R(5000)-1[6]	3050	3050	5000	

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 TIA-5053

Table 3 – Mount Classifications – Max Appurtenance EPA

			Max EPA (sqft)		
Mount Model	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 Tri and Quad Mount	11.3	16.4	21.8	30.5	44.9

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 (ft²)	Mount EPA _T w/ No Ice (ft²)	Mount EPA _N w/ ½" Ice (ft²)	Mount EPA _T w/ ½" Ice (ft²)	Weight (lbs)	Weight w/ ½" Ice (lbs)
Universal Tri Mount – 36" Standoff	13.81	14.32	17.41	17.91	989	1175
Universal Tri Mount – 24" Standoff		12.90	16.20	16.51	896	1064
Universal Tri Mount – 12" Standoff	11.36	11.48	14.99	15.11	795	854
Universal Quad Mount – 36" Standoff	18.16	18.16	22.93	22.93	1314	1561
Universal Quad Mount – 24" Standoff	16.58	16.58	21.37	21.37	1190	1414
Universal Quad Mount – 12" Standoff	14.99	14.99	19.81	19.81	1056	1266

^{* (1) 2.875&}quot; diameter x 168" long mount pipe per sector



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.

Columbus

250 E Broad St, Suite 600 Columbus, OH 43215 Phone 614.221.6679



APPENDIX A MANUFACTURER ASSEMBLY DRAWINGS

250 E Broad St, Suite 600 Columbus, OH 43215 Phone 614.221.6679



1801 Lee Rd, Suite 230 Winter Park, FL 32789 Phone 407.898.9039

FOR MATERIAL LIST SEE SHEET E-3 OR E-4

© Copyright 2020, by Paul J. Ford and Compar All Rights Reserved. This document and he data contained herein, is proprietary o Paul J. Ford and Company, issued in strict confidence and shall not, without the prior written permission of Paul J. Ford and Company, be reproduced, copied or used for any purpose other than the intended use for this specific project.

PAUL J. FORD & COMPANYod St, Ste 600: Columbus, OH 43215
4.221:6679 www.pauljford.com

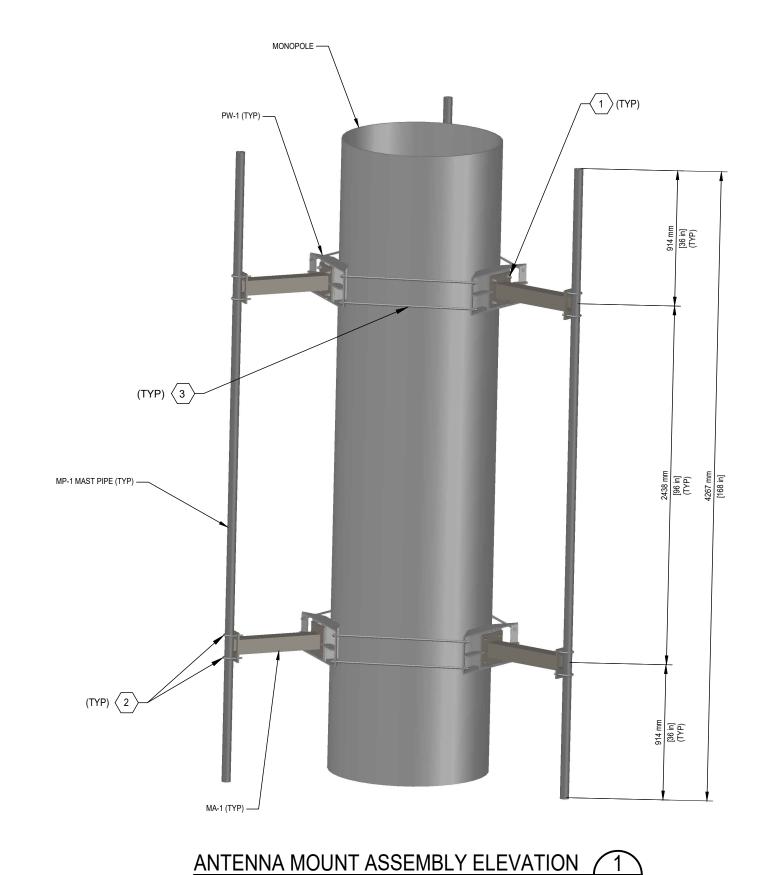
ARE TELECOM INCORPORATED 1043 GRANDAVE #213 ST. PAUL, MN 55105 PH: (651) 724-1322

STANDARD ANTENNA MOUNT TRI OR QUAD MOUNT

PROJECT No: 00020-0279.001.7192 RAWN BY: TAN/RMI ESIGNED BY: KAT JGF CHECKED BY:

> TRI MOUNT **ELEVATION ASSEMBLY**

> > E-1

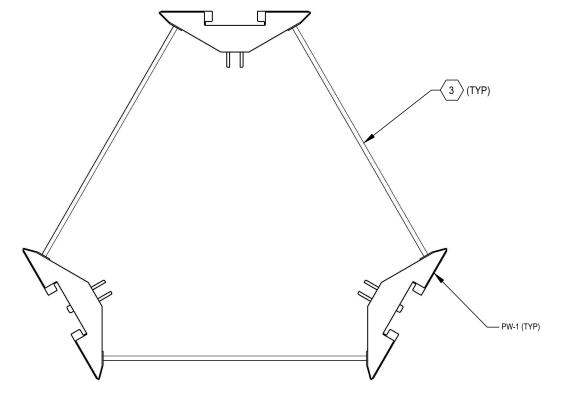


KYLE A KYLE A

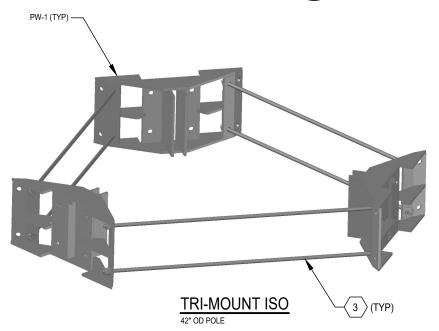
REV DATE DESCRIPTION

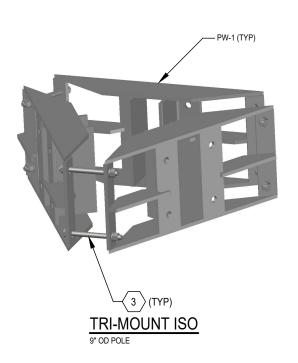
7-17-2020

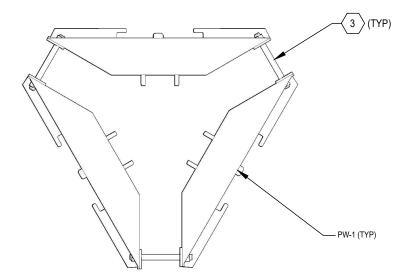
FOR MATERIAL LIST SEE SHEET E-3



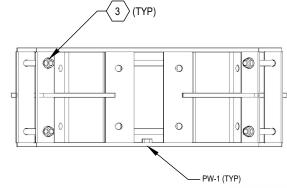












TRI-MOUNT FRONT
9" OD POLE

KYLE A KYLE A JONAL ENGLISH 07/3

REV DATE DESCRIPTION

© Copyright 2020, by Paul J. Ford and Compar All Rights Reserved. This document and he data contained herein, is proprietary Paul J. Ford and Company, issued in trict confidence and shall not, without the rior written permission of Paul J. Ford and Company, be reproduced, copied or used for any purpose other than the intended use for this specific project.

PAUL J. FORD & COMPANYod St, Ste 600: Columbus, OH 43215
4.221:6679 www.pauljford.com

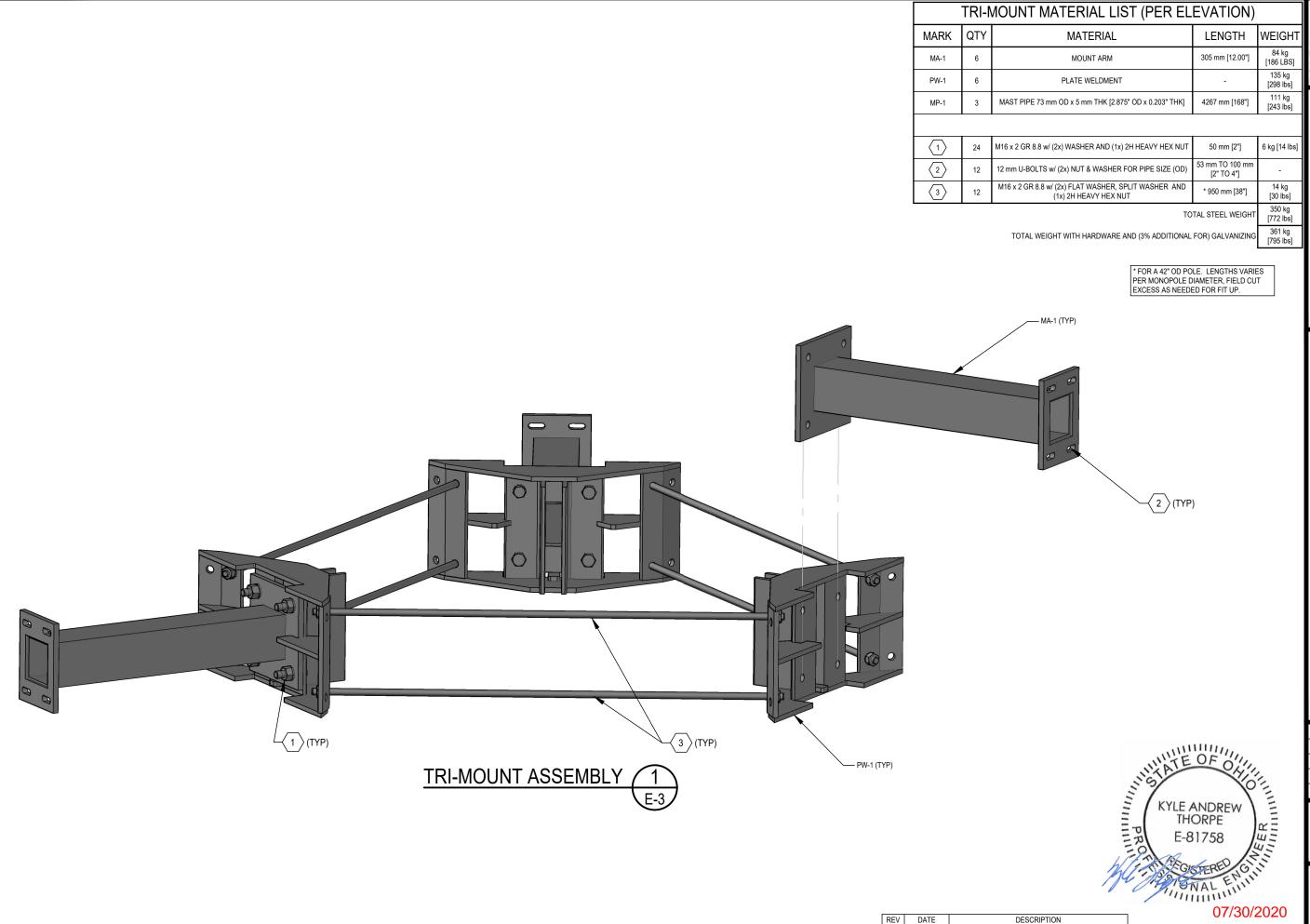
ARE TELECOM INCORPORATED 1043 GRANDAVE #213 ST. PAUL, MN 55105 PH: (651) 724-1322

STANDARD ANTENNA MOUNT TRI OR QUAD MOUNT

PROJECT No: 00020-0279.001.7192 RAWN BY: TAN/RMI DESIGNED BY: KAT JGF CHECKED BY: DATE: 7-17-2020

> TRI MOUNT ARM

> > E-2



Copyright 2020, by Paul J. Ford and Compar All Rights Reserved. This document and ne data contained herein, is proprietary Paul J. Ford and Company, issued in rict confidence and shall not, without the ior written permission of Paul J. Ford and Company, be reproduced, copied or used for any purpose other than the ntended use for this specific project.

us, OH 43215 pauljford.com ORD

PAUL J. F & COMPA! St, Ste 600 Columbus

ARE TELECOM INCORPORATED 1043 GRANDAVE #213 ST. PAUL, MN 55105 PH: (651) 724-1322

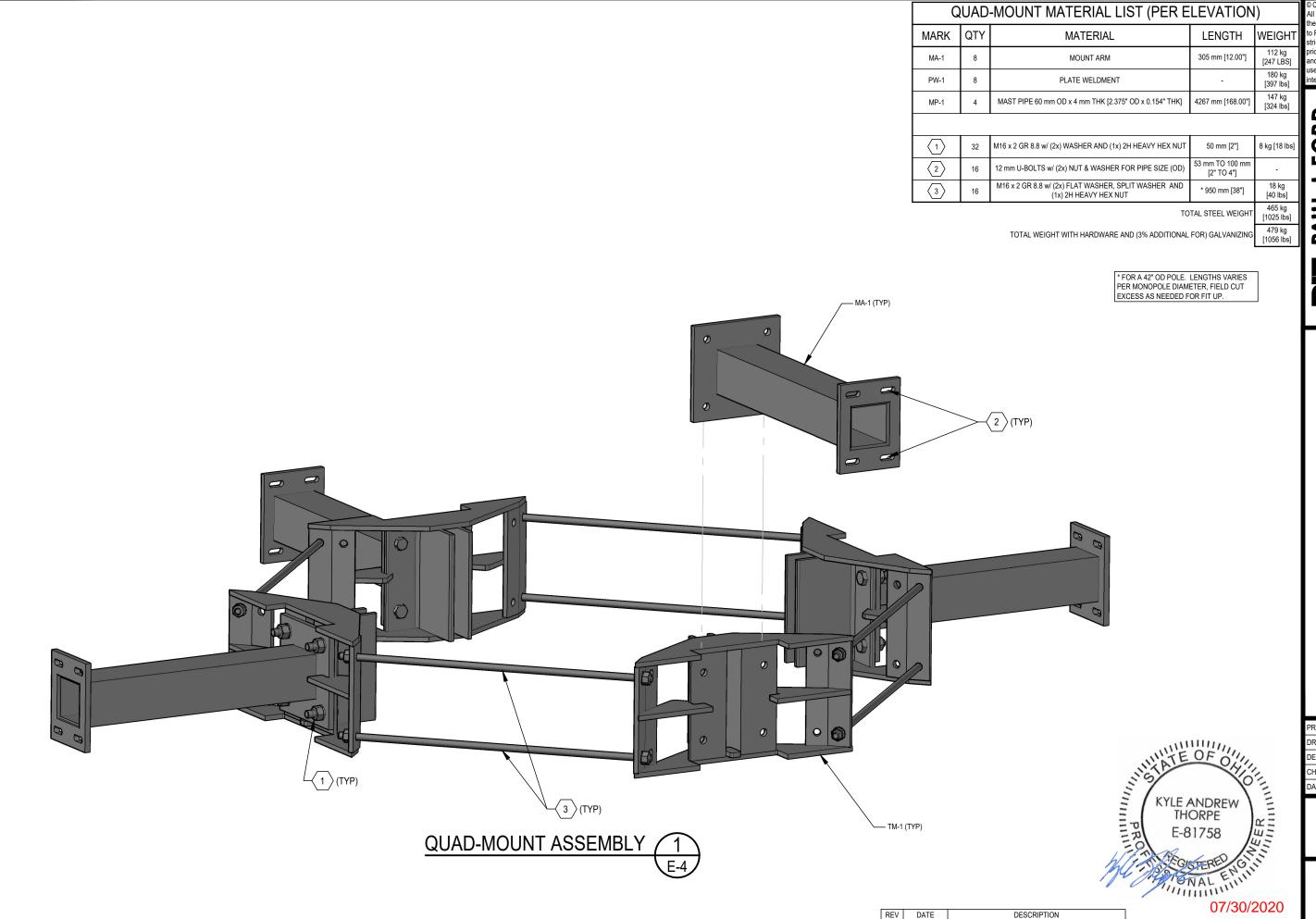
STANDARD ANTENNA MOUNT

TRI OR QUAD MOUNT

PROJECT No: 00020-0279.001.7192 TAN/RMI RAWN BY: KAT ESIGNED BY: JGF CHECKED BY: DATE: 7-17-2020

TRI MOUNT STAND OFF ARM **ASSEMBLY**

E-3



Copyright 2020, by Paul J. Ford and Compa All Rights Reserved. This document and ne data contained herein, is proprietary Paul J. Ford and Company, issued in rict confidence and shall not, without the ior written permission of Paul J. Ford and Company, be reproduced, copied or used for any purpose other than the tended use for this specific project.

ORD us, OH 43215 pauljford.com

PAUL J. & COMP. St. Ste 600. Columi

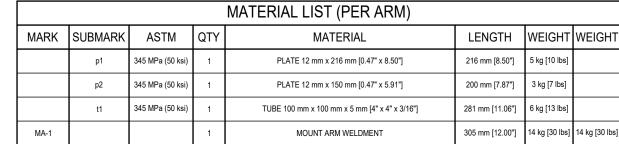
ARE TELECOM INCORPORATED 1043 GRANDAVE #213 ST. PAUL, MN 55105 PH: (651) 724-1322

STANDARD ANTENNA MOUNT TRI OR QUAD MOUNT

PROJECT No: 00020-0279.001.7192 TAN/RMI RAWN BY: KAT ESIGNED BY: JGF CHECKED BY: DATE: 7-17-2020

QUAD MOUNT STAND OFF ARM **ASSEMBLY**

E-4



FORD

LN Y us, OH 43215 .pauljford.com **PAUL J. F & COMPA**Ad St, Ste 600 Columbus, 1.221.6679 www.pa

© Copyright 2020, by Paul J. Ford and Compar All Rights Reserved. This document and

he data contained herein, is proprietary

Paul J. Ford and Company, issued in

rict confidence and shall not, without th ior written permission of Paul J. Ford

and Company, be reproduced, copied or used for any purpose other than the intended use for this specific project.

ARE TELECOM INCORPORATED 1043 GRANDAVE #213 ST. PAUL, MN 55105 PH: (651) 724-1322

STANDARD ANTENNA MOUNT TRI OR QUAD MOUNT

PROJECT No: 00020-0279.001.719 RAWN BY: TAN/RMI ESIGNED BY: KAT JGF CHECKED BY:

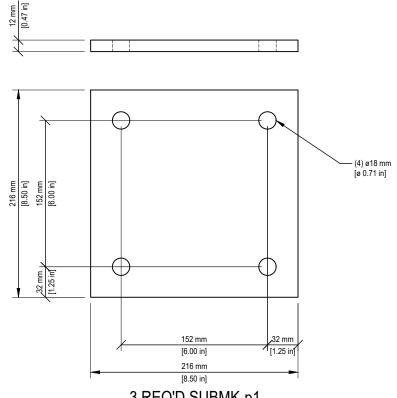
7-17-2020

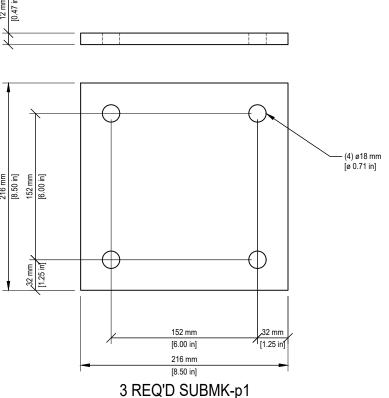
TRI MOUNT ARM

DATE:

S-1

14 kg [30 lb TOTAL STEEL WEIGHT TOTAL WEIGHT AND (3% ADDITIONAL FOR) GALVANIZING 15 kg [31 lb:





3 REQ'D MOUNT ARM MARK MA-1

100 mm

[3.94 in]

217 mm [8.53 in]

[2.28 in] '

100 mm

[3.94 in]

150 mm [5.91 in]

150 mm [5.91 in] 25 mm

[0.98 in]

5 mm [0.1875 in]

5 mm [0.1875 in]

 \bigcirc

[2.28 in]

25 mm

[0.98 in]

KYLE A' TH 758

WHERE GILLING

O7/2

(4) R7 mm SLOTS

[R0.25 in]

19 mm [0.75 in]

[0.93 in]

REV DATE DESCRIPTION

200 mm [7.87 in] 152 mm [6.00 in]

24 mm [0.94 in]

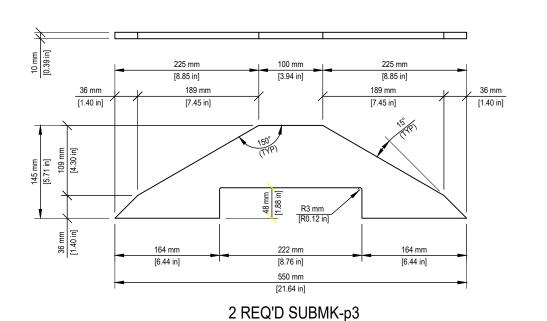
65 mm

[2.56 in]

150 mm

[5.91 in]

3 REQ'D SUBMK-p2



[3.82 in]

10 mm

[0.41 in]

[R0.12 in] (TYP)

160 mm

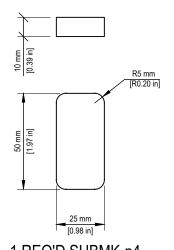
[6.30 in] 186 mm [7.31 in] 2 REQ'D SUBMK-p5

[1.19 in]

13 mm

[0.50 in]

26 mm [1.01 in]



	MATERIAL LIST (PER WELDMENT)						
MARK	SUBMARK	ASTM	QTY	MATERIAL LENGTH WEIGHT WE		WEIGHT	
	р3	345 MPa (50 ksi)	2	PLATE 10 mm x 145 mm [0.39" x 5.71"]	PLATE 10 mm x 145 mm [0.39" x 5.71"] 550 mm [21.64"] 12 kg [27 lbs]		
	p4	345 MPa (50 ksi)	1	PLATE 10 mm x 25 mm [0.39" x 0.98"]	50 mm [1.97"]	.5 kg [1 lbs]	
	р5	345 MPa (50 ksi)	2	PLATE 10 mm x 91 mm [0.39" x 3.60"]	186 mm [7.31"]	3 kg [6 lbs]	
	р6	345 MPa (50 ksi)	2	PLATE 10 mm x 50 mm [0.39" x 1.97"] 240 mm [9.45"] 2 kg [4 lbs]			
	р7	345 MPa (50 ksi)	2	L152 x 89 x 9.5 [L6 x 3 1/2 x 3/8]	240 mm [9.45"]	5 kg [10 lbs]	
PW-1			1	PLATE WELDMENT		22.5 kg [50 lbs]	22.5 kg [50 lbs)
TOTAL STEEL WEIGHT				22.5 kg [50 lbs]			

TOTAL WEIGHT AND (3% ADDITIONAL FOR) GALVANIZING

KYLE AND THO

23 kg [51 lbs]

© Copyright 2020, by Paul J. Ford and Company All Rights Reserved. This document and the data contained herein, is proprietary to Paul J. Ford and Company, issued in strict confidence and shall not, without the prior written permission of Paul J. Ford and Company, be reproduced, copied or used for any purpose other than the intended use for this specific project.

PAUL J. FORD & COMPANY St. Ste 600: Columbus, OH 43215 N Y Vus, OH 43215

ARE TELECOM INCORPORATED 1043 GRANDAVE #213 ST. PAUL, MN 55105 PH: (651) 724-1322

TRI OR QUAD MOUNT

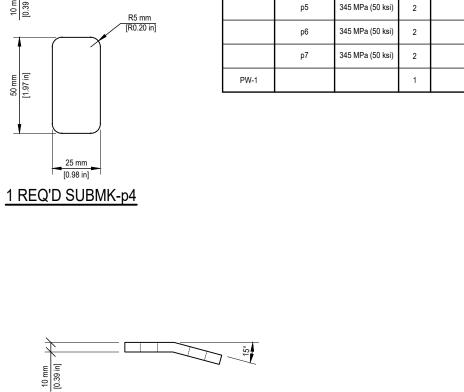
STANDARD ANTENNA MOUNT

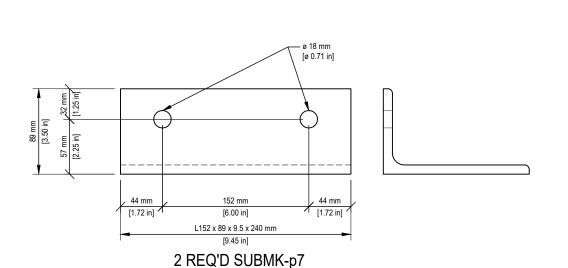
PROJECT No: 00020-0279.001.7192 TAN/RMI RAWN BY: ESIGNED BY: KAT JGF CHECKED BY:

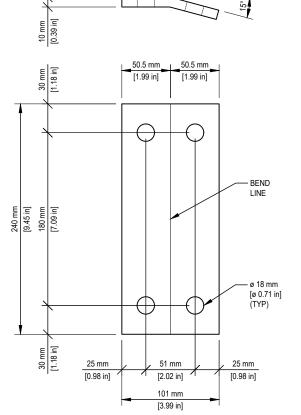
> MOUNT PLATE **DETAILS**

7-17-2020

S-2



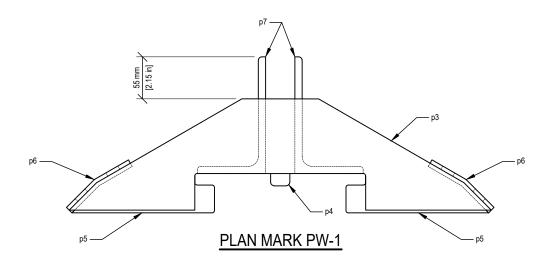




2 REQ'D SUBMK-p6

REV DATE DESCRIPTION

PATE OT/3



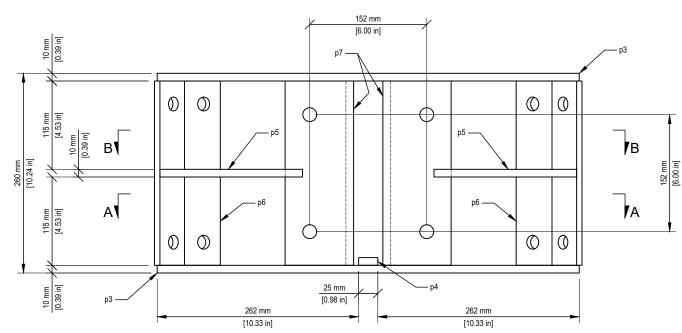
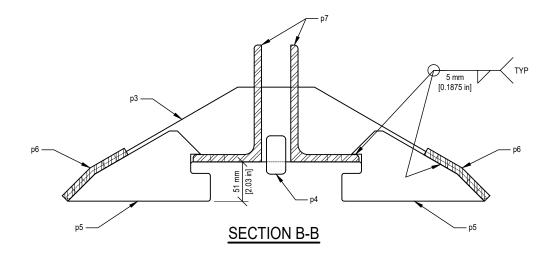
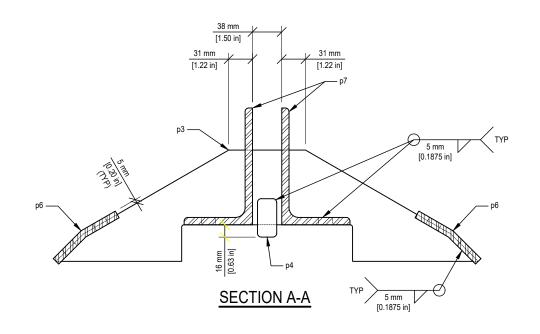
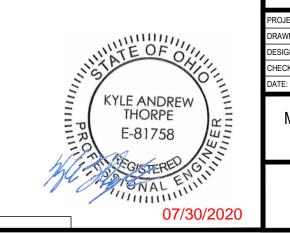


PLATE WELDMENT MARK PW-1







© Copyright 2020, by Paul J. Ford and Compar All Rights Reserved. This document and he data contained herein, is proprietary o Paul J. Ford and Company, issued in trict confidence and shall not, without the and Company, be reproduced, copied or used for any purpose other than the intended use for this specific project.

PAUL J. FORD & COMPANYod St, Ste 600: Columbus, OH 43215
4.221:6679 www.pauljford.com

ARE TELECOM INCORPORATED 1043 GRANDAVE #213 ST. PAUL, MN 55105 PH: (651) 724-1322

STANDARD ANTENNA MOUNT TRI OR QUAD MOUNT

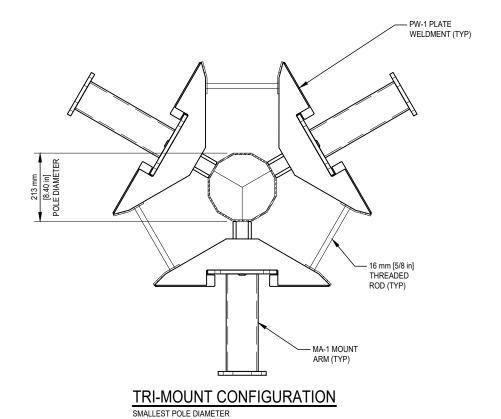
PROJECT No: 00020-0279.001.7192 RAWN BY: TAN/RMI ESIGNED BY: KAT JGF CHECKED BY: DATE: 7-17-2020

> MOUNT PLATE WELDMENT

> > S-3

REV DATE DESCRIPTION

TRI-MOUNT CONFIGURATION LARGEST POLE DIAMETER



© Copyright 2020, by Paul J. Ford and Company All Rights Reserved. This document and the data contained herein, is proprietary to Paul J. Ford and Company, issued in strict confidence and shall not, without the orior written permission of Paul J. Ford and Company, be reproduced, copied or used for any purpose other than the intended use for this specific project.

PAUL J. FORD & COMPANYod St, Ste 600: Columbus, OH 43215
4.221:6679 www.pauljford.com

ARE TELECOM INCORPORATED 1043 GRANDAVE #213 ST. PAUL, MN 55105 PH: (651) 724-1322

TRI OR QUAD MOUNT

STANDARD ANTENNA MOUNT

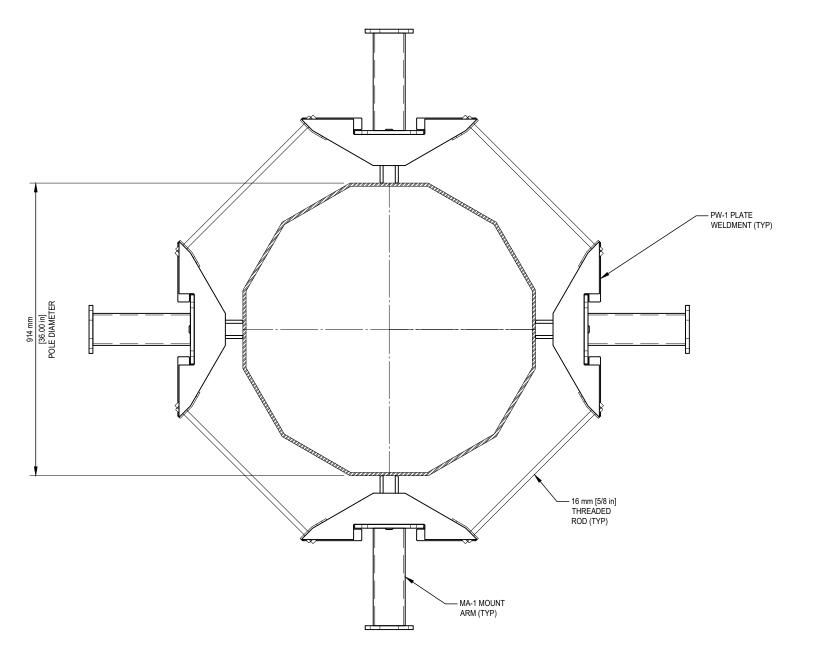
PROJECT No:	00020-0279.001.7192
DRAWN BY:	TAN/RMK
DESIGNED BY:	KAT
CHECKED BY:	JGF
DATE:	7-17-2020

TRI-MOUNT **CONFIGURATION**

S-4

KYLE A' TH'

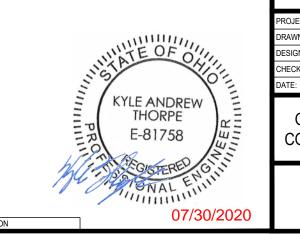
REV DATE DESCRIPTION



QUAD-MOUNT CONFIGURATION LARGEST POLE DIAMETER

– PW-1 PLATE WELDMENT (TYP) - 16 mm [5/8 in] THREADED - MA-1 MOUNT ARM (TYP)

QUAD-MOUNT CONFIGURATION SMALLEST POLE DIAMETER



© Copyright 2020, by Paul J. Ford and Company All Rights Reserved. This document and the data contained herein, is proprietary to Paul J. Ford and Company, issued in strict confidence and shall not, without the orior written permission of Paul J. Ford and Company, be reproduced, copied or used for any purpose other than the intended use for this specific project.

PAUL J. FORD & COMPANYod St, Ste 600: Columbus, OH 43215
4.221:6679 www.pauljford.com

ARE TELECOM INCORPORATED 1043 GRANDAVE #213 ST. PAUL, MN 55105 PH: (651) 724-1322

STANDARD ANTENNA MOUNT TRI OR QUAD MOUNT

PROJECT No: 00020-0279.001.7192 RAWN BY: TAN/RMI DESIGNED BY: KAT JGF CHECKED BY: 7-17-2020

> **QUAD-MOUNT CONFIGURATION**

> > S-5

REV DATE DESCRIPTION