Proprietary rights are included in the information disclosed herein. This information is DATE APPROVED submitted in confidence and neither the document nor the information disclosed here-**DESCRIPTION** 11/11/17 MGC in shall be reproduced or transferred to other documents for manufacturing or for any other purpose except as specifically authorized in writing by ARE Telecom & Wind. **ARE Telecom & Wind AFS-2000** Above/ Below-Grade Ballasted Foundation Manual TELECOM & WIND 1043 Grand Ave., #213 St. Paul, MN 55105 (651) 330-1263 www.arételecom.com 1043 Grand Ave., #213 St. Paul, MN 55105 (651) 330-1263 CAD-generated drawing do not manually update AFS-2000 CHECKED US Patent # 9428877 RESP ENG Int. Patent # ZL201490000869.X MFG ENG DO NOT SCALE DRAWING QUALENG scale NA rev. A-2 size NA sheet 1 of 8

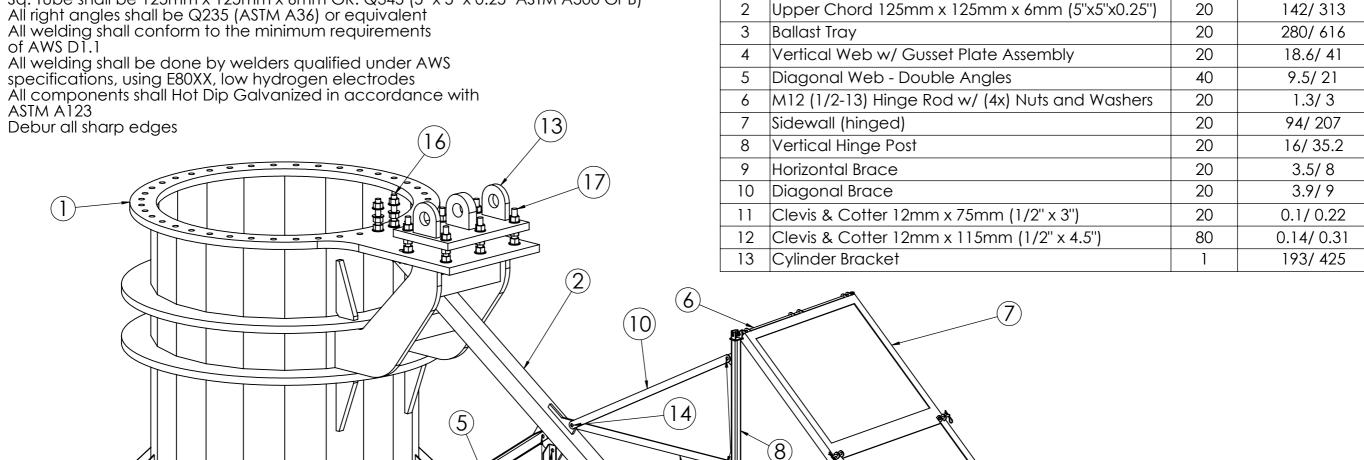
Proprietary rights are included in the information disclosed herein. This information is REVISIONS DATE APPROVED submitted in confidence and neither the document nor the information disclosed here-DESCRIPTION in shall be reproduced or transferred to other documents for manufacturing or for any other purpose except as specifically authorized in writing by ARE Telecom & Wind. **AFS 2000 Bill of Materials**

Notes 3:

- A 1. All plate material shall shall have a minimum yield strength of 345 MPa (50 ksi)
 - Sq. Tube shall be 125mm x 125mm x 6mm GR. Q345 (5" x 5" x 0.25" ASTM A500 Gr B) All right angles shall be Q235 (ASTM A36) or equivalent

 - of AWS D1.1

 - All components shall Hot Dip Galvanized in accordance with ASTM A123



#

Kingpost

(3)

DESCRIPTION

	AFS 2000 Bolts, Nuts & Washers (other equivalent grades acceptable)											
#	Unit	Bolt Size	Length	Width Across Flats	Thread Length	Grade	Coating	Nut Qty.	Washer Qty.	Bolt Qty.		
14	Metric	M16x2	65mm	24mm	Full Thread	8.8	Hot Dip Galv.	120	240	120		
14	Imperial	5/8-11	2.5"	15/16"	Full Thread	A325	Hot Dip Galv.	120	240	120		
15	Metric	M24x3	75mm	36mm	Full Thread	8.8	Hot Dip Galv.	140	280	140		
15	Imperial	1-8	3"	1-1/2"	Full Thread	A325	Hot Dip Galv.	140	280	140		
16	Metric	M36x4	300mm	55mm	250mm	8.8	Hot Dip Galv.	138	184	46		
16	Imperial	1 3/8-6	12"	2-1/16"	10"	A325	Hot Dip Galv.	138	184	46		
17	Metric	M42x4.5	300mm	65mm	250mm	8.8	Hot Dip Galv.	18	24	6		
17	Imperial	1 1/2-6	12"	2 3/8"	10"	A325	Hot Dip Galv.	18	24	6		
	1			2	3		4		5			

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QTY. Weight (kg/lbs)

20

3450/7590

	CAD-generated drawing do not manually update			A ARE	ARE Telecom & Wind 413 Wacouta St. Suite #440 St Paul, MN 55101 (651) 330 1263			
	APPROV	/ALS	DATE		AFS-2000			
	DRAWN M	GC	11/11/17		BOM			
	CHECKED				DOM			
MATERIAL	RESP ENG							
FINISH	MFG ENG							
DO NOT SCALE DRAWING	QUAL ENG			scale NA	rev. A-2 size NA 2 of 8			

Proprietary rights are included in the information disclosed herein. This information is submitted in confidence and neither the document nor the information disclosed herein shall be reproduced or transferred to other documents for manufacturing or for any other purpose except as specifically authorized in writing by ARE Telecom & Wind. Design Codes ANSI/ TIA-222-G, Structural Standard for Antenna Supporting Structures and Antennas ASCE/ SEI 7-05, Minimum Design Loads for Building and Other Structures IBC 2009, International Building Code AISC and RCSC, Specification for Structural Joints using ASTMA325-A490 Bolts or equivalent AWS D1.1 IEC 61400-2 Eurocode 3, 1-9 **Design Loadings** Design Wind Speed - 133 mph (59.5 m/s) Deflection based on - 60 mph (27 m/s) Basic wind speed w/ 0.75" (19 mm) ice - 50 mph (22.4 m/s) Classification of Structure - Class II Exposure- C Topographic - Category 1 Ballast Backfill / Ballast Material - Bulk Dry Density shall be 2700 lb/ yd3 (16 kN/m3) Ballast Volume - 150 yd3 (115 m3) Allowable soil bearing pressure at max capacity 4000 psf (192 kPa) Minimum allowable soil bearing pressure 1500 psf (72 kPa) Steel Structure Self Weight • Foundation - 28270 lb (12850 kg) Sidewalls - **5200 lb (2360 kg)** Aluminum tape works well to fill gaps in sidewall when using fine grain materials for ballast Design Load Combinations. Dead: Tower Self Weight + Steel Structure Self Weight + Backfill Material Self Wt Wind: Tower Horizontal Reaction + Tower Moment Reaction Service: 0.9 Dead + 1.35 Wind Ultimate: 0.9 Dead +1.35 Wind Geotechnical Investigation • It is recommended that a site study be conducted to verify that the soil parameters equal or exceed the requirements shown above. **Important Note:** Please contact ARE directly with questions or concerns, or if just unsure about the aforementioned details and requirements. US Patent # 9428877 Int. Patent # ZL201490000869.X

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Proprietary rights are included in the information disclosed herein. This information is submitted in confidence and neither the document nor the information disclosed herein shall be reproduced or transferred to other documents for manufacturing or for any other purpose except as specifically authorized in writing by ARE Telecom & Wind. General Installation Steps: Level and compact base soil where foundation will rest. Make sure to remove all organic materials. Set king-post in center of compacted base soil. Position ballast trays around Kingpost and bolt together loosely. 3. Attach large diagonal cords to kingpost and outer tray rim, including vertical and diagonal web braces. Loosely bolt together all structural members. Snug tighten all outside perimeter bolts first then work inward toward Kingpost tightening all remaining bolts. 6. Torque all bolts to specified value or use "Turn of the Nut Method." 7. If foundation is above grade, install hinged side-walls. Fill with specified ballast material. **Tools** 185 cfm compressor (100' hose, Chicago fittings) 3/4 " drive air impact (1500 lb. torque min.) 3/4 " drive universal 3/4 " drive battery impact (if you have one) 3/4 " drive ratchet & breaker bar (handle length minimum 12" 3/4 " sockets, deep & shallow 24mm, 36mm, 55mm, 65mm Combination wrenches 24mm, 36mm, 55mm, 65mm Adjustable wrench (crescent wrench) 18" to 24" Pipe wrench to fit up to 55mm Sleever bar, 24 " Johnson bar (long pry bar) Beater 8 # long handle (sledge hammer) Beater 3 # short handle (sledge hammer) Bull pins, drift pins, couple of em Crow Bars 12" & 18" Rigging Continuous straps 1 " x 8 ' 6,000 # x 4 Shackles (2x) 3 1/4 ton (5/8) & (2x) 4 3/4 ton (3/4) Telehandler - 12,000 lb capacity Optional - 28,600 lb crane Preloaded High Strength Structural bolts The bolts shall be in accordance with AISC and RCSC (DIN 6914 / ISO 7412). The bolts shall be installed and preloaded in accordance with AISC and RCSC (BS EN 1090-2:2008) The slip resistances of the structural bolts were calculated in accordance with AISC and RCSC (EN 1993-8: 2005). It is understood that the steel will be hot dipped galvanized after fabrication and a bitumen coating will be applied on direct burial only. The bitumen coating is not suitable on the surface of these joints and therefore it is necessary to mask the faying areas prior to the application of the bitumen paint. The friction coefficient factor is taken as **0.2** which is recommended for hot dipped galvanized surfaces. Preloaded bolt installation The contact surfaces shall be free from all contaminants, such as oil, dirt or paint. Burrs that would prevent solid seating of the connecting parts shall be removed. US Patent # 9428877 Torque control method Int. Patent # ZL201490000869.X In the torque control method the torque is applied in two steps. The first step, after bedding of the joint, is to apply a torque of up to 75% of the required torque value to all the bolts. The second step is to apply an additional torque to each bolt such that the total applied to the bolt is up to 110% of the required nominal torque value. The extra 10% is to offset the subsequent torsional relaxation of preload in the connection when the tightening wrench is removed.

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