

GENERAL DYNAMICS

SATCOM Technologies

4096-349

March 27, 2012

REVISION J

ASSEMBLY MANUAL

6-1/2 FT. x 6-1/2 FT. NON-PENETRATING MAST MOUNT

**General Dynamics
SATCOM Technologies
1500 PRODELIN DRIVE
NEWTON, NC 28658**

6-1/2' x 6-1/2' NPMM INSTALLATION INSTRUCTIONS

| | | | |
|-------------|--|-------------|-----------------|
| J | Revised tool list, added metric dims (figure 2). | 03/27/12 | R.F. |
| I | Revised Company Name, Logo, and Part Tables | 7/14/09 | RAH |
| H | Revise Angles to 0225-693,695, & 696 | 7/12/05 | RAH |
| G | Del 0225-543 add 0225-694 | 5/9/05 | A.Hahn |
| F | Revised Address | 4/8/02 | A. Hahn |
| E | Added Metric Tables | 9/26/97 | PGW |
| D | Updated | 5-31-97 | PGW |
| C | Revised rubber pads & figures | 8-23-96 | R Frye |
| B | Revised Hardware size (item 9 Pg. 6) | 07-17-95 | R Frye |
| A | Revised qty & placement of rubber pads per ECN #1678 | 08/24/94 | R Frye |
| - | ORIGINAL RELEASE | 03/09/94 | R FRYE |
| REV. | DESCRIPTION | DATE | APPROVED |

ASSEMBLY MANUAL

NON-PENETRATING MAST MOUNT

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| 3.1 | BALLAST REQUIREMENTS INFORMATION |

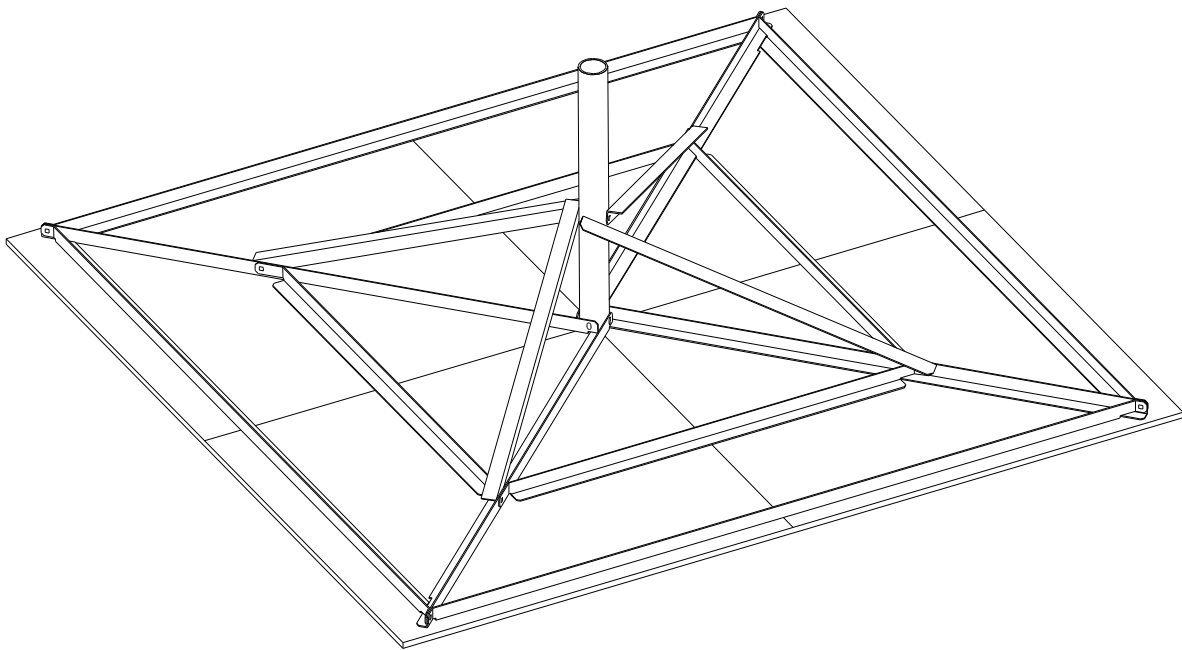


Figure 1

SECTION I

1.0 GENERAL INFORMATION

1. Prior to installation, verify that the installation site roof material and supporting structure have been investigated and found capable of withstanding all loads imposed by the proposed antenna system. Confirm that the supporting surfaces, anchors, and/or safety cables, if required, have been found to be adequate to resist the reactions from the antenna system and that the installation will be in accordance with all applicable local, state, and federal requirements.
2. All antenna installations should be grounded to meet all applicable codes.
3. Rubber pads are provided to protect the roof surface.
4. All necessary hardware is provided.
5. For assistance in determining ballast requirements refer to chart in section 3.
6. All metal parts are of galvanized construction to help prevent corrosion.

1.1 UNPACKING & INSPECTION

1. **UNPACKING & INSPECTING**
The mount should be unpacked and inspected at the earliest date to ensure that all material has been received and is in good condition. A complete packing list for each major component is supplied.
2. **FREIGHT DAMAGE**
Any damage to materials while in transit should be immediately directed to the freight carrier. He will instruct you on the matters regarding any freight damage claims.
3. **MATERIAL - MISSING OR DAMAGED**
Any questions regarding missing or damaged materials that is not due to freight carrier should be directed to General Dynamics' Customer Service Department at:

**General Dynamics SATCOM Technologies
1500 Prodelin Drive
Newton, NC 28658
USA**

(828) 464-4141

1.2 **SUGGESTED TOOL LIST**

1. SITE PREPARATION TOOLS

The following tools are suggested for site preparation.

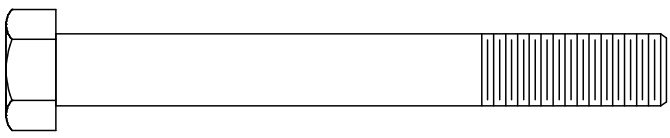
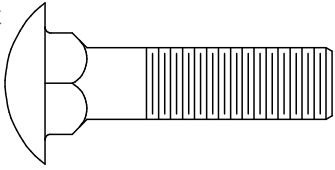
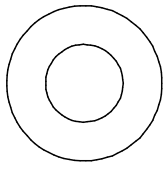
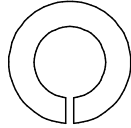
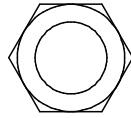
1. Shovel (for ground installation)
2. Broom

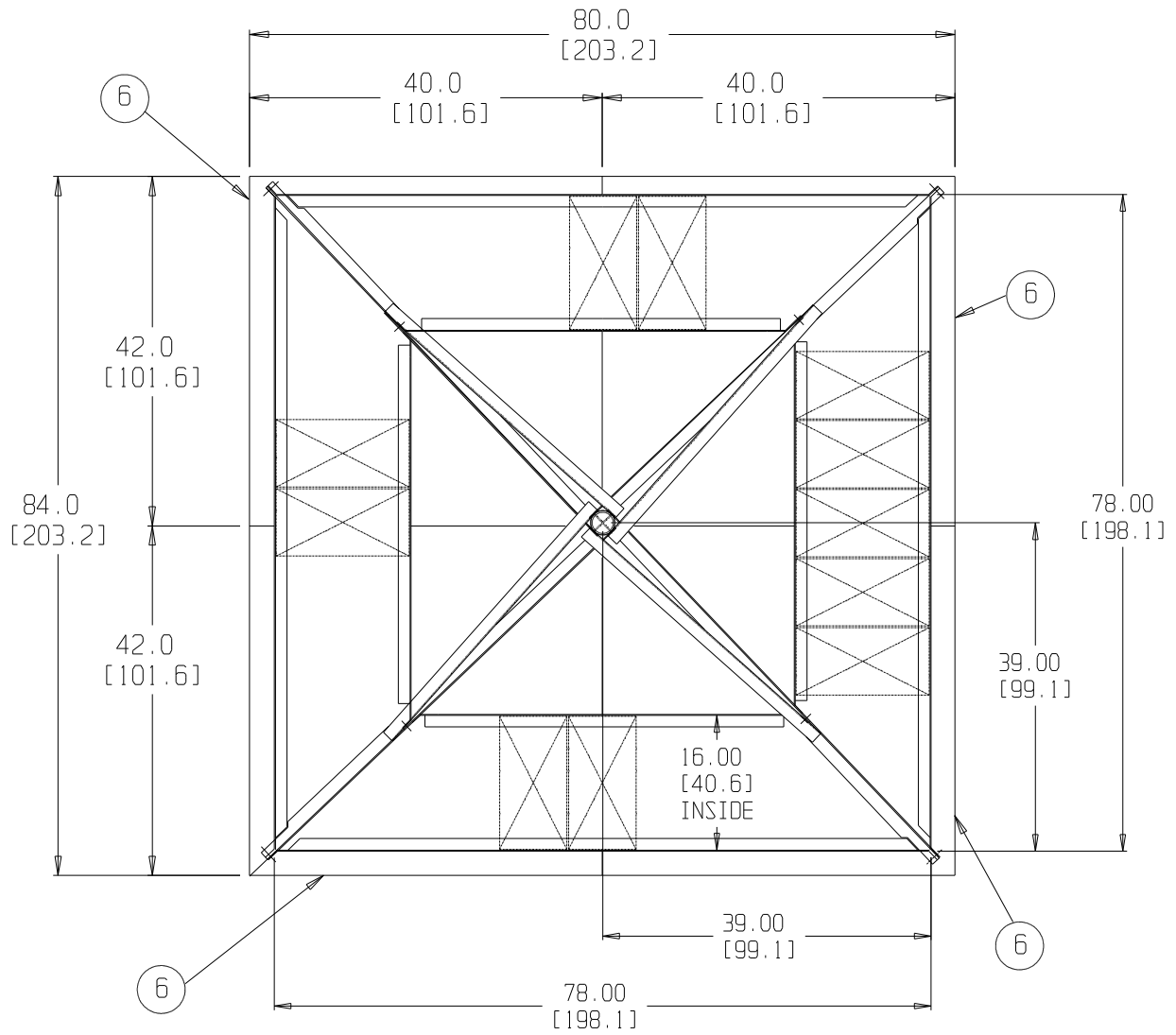
2. SUGGESTED TOOL LIST

The following tools are suggested for the NPMM installation.

1. Ratchet
2. Deep Well Socket, 9/16"
3. Wrench, combination 9/16"
4. Tape measure

1.3 PARTS LIST

| PARTS LIST - 6 1/2' x 6 1/2' NPMM | | | |
|--|-----------------|--|------------|
| ITEM NO. | PART NO. | DESCRIPTION | QTY |
| 1 | 0184-179 | Mast Pipe | 1 |
| 2 | 0225-693 | Outer Base Angle | 4 |
| 3 | 0225-695 | Inner Base Angle | 4 |
| 4 | 0225-696 | Diagonal Base Angle | 4 |
| 5 | 0225-694 | Mast Brace Angle | 4 |
| 6 | 5003-036 | 0.45" x 27" x 42" Pad | 6 |
| 7 | 8032-032 | 3 / 8" x 4.00" Bolt | 2 |
| 8 | 8032-036 | 3 / 8" x 4.50" Bolt  | 2 |
| 9 | 8039-012 | 3 / 8" x 1.50" Carriage Bolt  | 8 |
| 10 | 8201-042 | 3 / 8" Flat Washer  | 16 |
| 11 | 8202-042 | 3 / 8" Lock Washer  | 12 |
| 12 | 8102-007 | 3 / 8" Hex Nut  | 12 |



DIMENSIONS SHOWN ARE
IN INCHES. DIMENSIONS IN
BRACKETS [] ARE IN CM

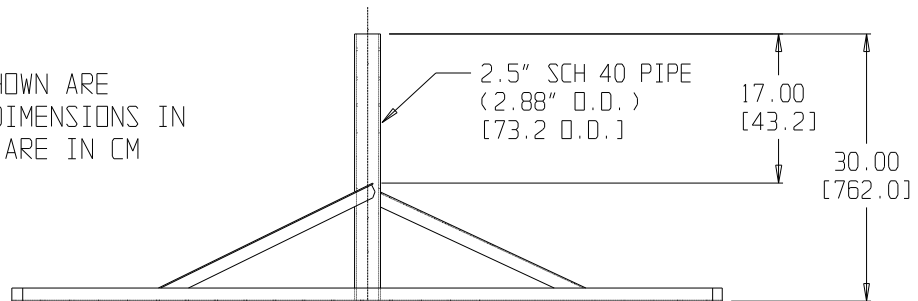
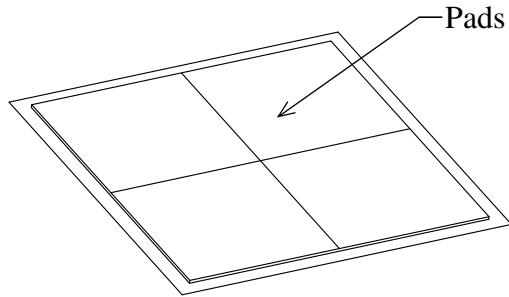


Figure 2

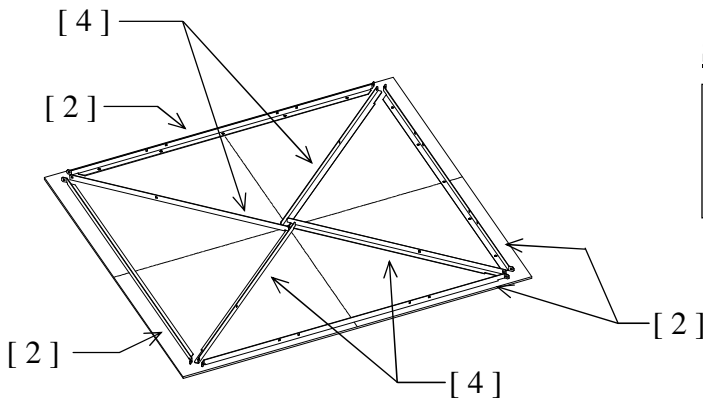
SECTION II

ASSEMBLY INSTRUCTIONS



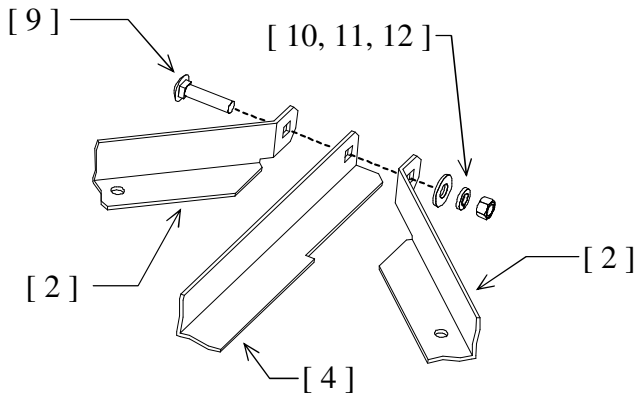
STEP 1:

- A). Locate site of installation and clear an area of 7 x 7 square feet of all debris.
- B). Place rubber pads (item 6) within the cleared area to form a square.
(See Figure 2)



STEP 2:

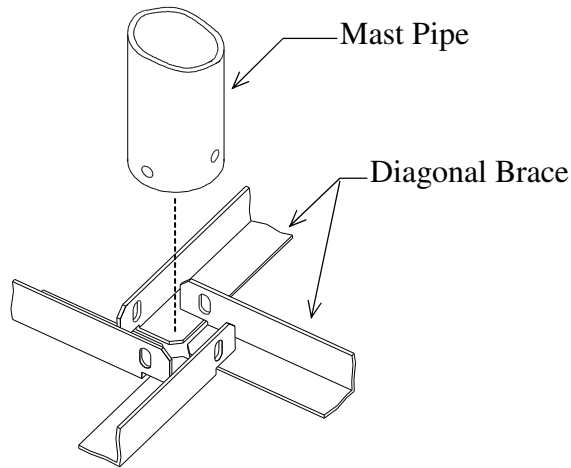
- A). On the rubber pad, layout the (4) outer base angles (item 2) and the (4) diagonal base angles (item 4).



STEP 3:

- A). Attach the four outer corners as shown using 3 / 8" hardware (items 9, 10, 11 & 12) Snug only.

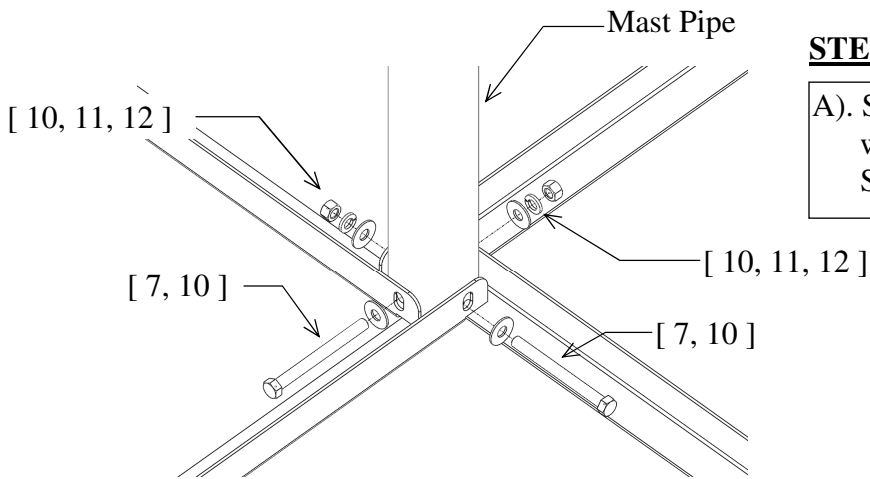
(Note the orientation of the angles)



STEP 4:

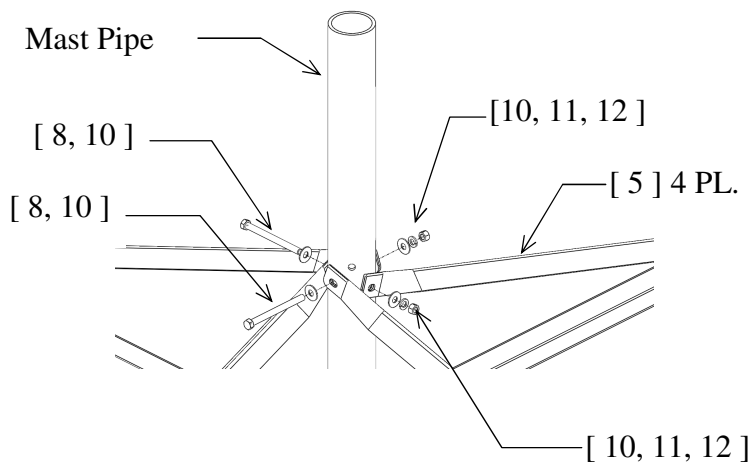
A). Place the mast pipe (item 1) at the center of the diagonal braces and align holes.

(Note the orientation of diagonal braces)



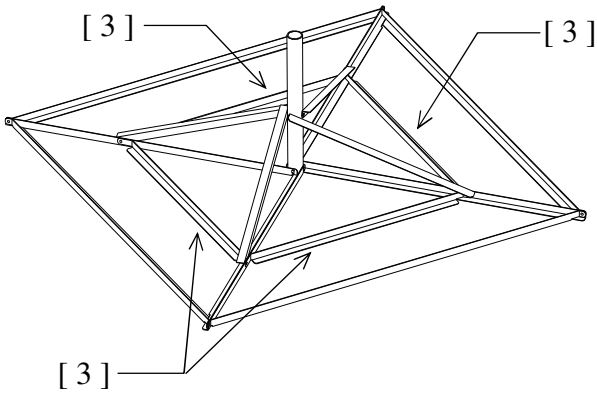
STEP 5:

A). Secure the mast pipe to the diagonal angles with 3 / 8" hardware (items 7, 10, 11, & 12). Snug only.



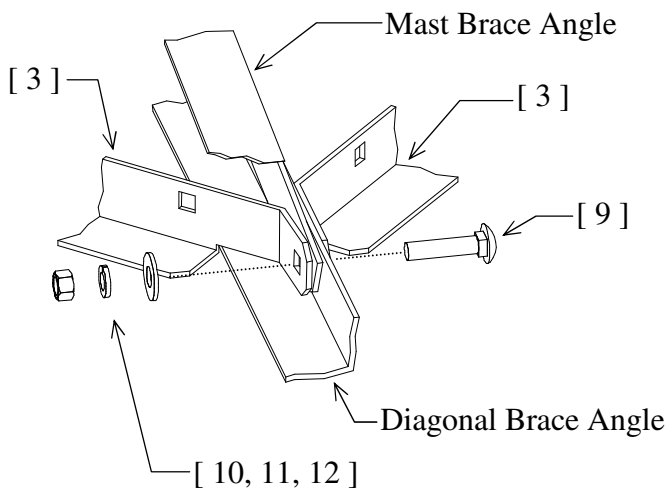
STEP 6:

A). Attach the (4) mast brace angles (item 5) to the mast pipe with 3 / 8" hardware (items 8, 10, 11 & 12). Each brace must attach to the side of the mast pipe opposite its corresponding diagonal brace. Refer figures 1 and 2. Snug only.



STEP 7:

- A). Position the (4) inner brace angles (item 3) as shown. Use Step 8 below for reference to the angle orientation.



STEP 8:

- A). Attach the inner brace angle (item 3) to the mast brace angle and diagonal base angle with 3 / 8" hardware (items 9, 10 , 11& 12). Note the orientation of the angles.
- B). Tighten all hardware. The suggested torque is 20 ft-lbs dry or 15 ft-lbs lubricated.
- C). Add ballast and then install antenna system. See section 3 for the ballast requirements.

SECTION III

3.0 **BALLAST REQUIREMENTS**

EXPOSURE:

1. Exposure B is urban or suburban areas, wooded areas, or other terrain with numerous, closely spaced obstructions having the size of single family dwellings or larger. Obstructions must extend 1500 feet in all directions from the antenna.
2. Exposure C is open terrain with widely scattered obstructions having heights generally less than 30 feet. Includes flat open country and grass lands.

BALLAST:

1. Ballast tables are based on an overturning design with a 1.5 safety factor. Values shown provide sliding resistance to the wind speed shown with a 1.0 safety factor when used with a rubber friction pad (coefficient of friction = .64).
2. Recommended ballast material is concrete cap block, nominal dimensions of 4 x 8 x 16 inches. These blocks will weigh between 25 and 30 lbs each, depending on local variation. Average weight of blocks should be determined for correct ballast amount.
3. Place ballast equally on all frames beginning at opposite corners of each side and working inward. If more than 20 blocks are needed, begin a second layer on top of the first.

TABLE 3.0-1 - 1.0M OR SMALLER SHAPED VSAT ANTENNA
BALLAST REQUIREMENTS - EXPOSURE B - 30 FT. ABOVE GROUND

| | | | | | | |
|-----------------------------|-----|-----|-----|-----|-----|-----|
| WIND SPEED (M.P.H.) | 70 | 80 | 90 | 100 | 110 | 125 |
| TOTAL BALLAST (LBS.) | 235 | 285 | 385 | 460 | 560 | 710 |
| STATIC ROOF LOAD (LB./FT.2) | 6 | 7 | 9 | 11 | 13 | 17 |
| ANTENNA & NPMM WT. (LBS.) | 160 | 160 | 160 | 160 | 160 | 160 |
| NET BALLAST REQUIRED (LBS.) | 75 | 125 | 225 | 300 | 400 | 550 |

TABLE 3.0-2 - 1.0M OR SMALLER SHAPED VSAT ANTENNA
BALLAST REQUIREMENTS - EXPOSURE B - 50 FT. ABOVE GROUND

| | | | | | | |
|-----------------------------|-----|-----|-----|-----|-----|-----|
| WIND SPEED (M.P.H.) | 70 | 80 | 90 | 100 | 110 | 125 |
| TOTAL BALLAST (LBS.) | 260 | 335 | 410 | 535 | 610 | 785 |
| STATIC ROOF LOAD (LB./FT.2) | 6 | 8 | 10 | 12 | 14 | 19 |
| ANTENNA & NPMM WT. (LBS.) | 160 | 160 | 160 | 160 | 160 | 160 |
| NET BALLAST REQUIRED (LBS.) | 100 | 175 | 250 | 375 | 450 | 625 |

TABLE 3.0-3 - 1.0M OR SMALLER SHAPED VSAT ANTENNA
BALLAST REQUIREMENTS - EXPOSURE C - 30 FT. ABOVE GROUND

| | | | | | | |
|-----------------------------|-----|-----|-----|-----|-----|------|
| WIND SPEED (M.P.H.) | 70 | 80 | 90 | 100 | 110 | 125 |
| TOTAL BALLAST (LBS.) | 335 | 435 | 560 | 685 | 885 | 1060 |
| STATIC ROOF LOAD (LB./FT.2) | 8 | 10 | 13 | 16 | 21 | 25 |
| ANTENNA & NPMM WT. (LBS.) | 160 | 160 | 160 | 160 | 160 | 160 |
| NET BALLAST REQUIRED (LBS.) | 175 | 275 | 400 | 525 | 725 | 900 |

TABLE 3.0-4 - 1.0M OR SMALLER SHAPED VSAT ANTENNA
BALLAST REQUIREMENTS - EXPOSURE C - 50 FT. ABOVE GROUND

| | | | | | | |
|-----------------------------|-----|-----|-----|-----|-----|------|
| WIND SPEED (M.P.H.) | 70 | 80 | 90 | 100 | 110 | 125 |
| TOTAL BALLAST (LBS.) | 410 | 510 | 635 | 810 | 935 | 1210 |
| STATIC ROOF LOAD (LB./FT.2) | 10 | 12 | 15 | 19 | 22 | 29 |
| ANTENNA & NPMM WT. (LBS.) | 160 | 160 | 160 | 160 | 160 | 160 |
| NET BALLAST REQUIRED (LBS.) | 250 | 350 | 475 | 650 | 775 | 1050 |

**TABLE 3.0-5 - 1.2M CIRCULAR VSAT ANTENNA
BALLAST REQUIREMENTS - EXPOSURE B - 30 FT. ABOVE GROUND**

| | | | | | | |
|-----------------------------|-----|-----|-----|-----|-----|------|
| WIND SPEED (M.P.H.) | 70 | 80 | 90 | 100 | 110 | 125 |
| TOTAL BALLAST (LBS.) | 365 | 465 | 615 | 715 | 890 | 1140 |
| STATIC ROOF LOAD (LB./FT.2) | 9 | 11 | 15 | 17 | 21 | 27 |
| ANTENNA & NPMM WT. (LBS.) | 165 | 165 | 165 | 165 | 165 | 165 |
| NET BALLAST REQUIRED (LBS.) | 200 | 300 | 450 | 550 | 725 | 975 |

**TABLE 3.0-6 - 1.2M CIRCULAR VSAT ANTENNA
BALLAST REQUIREMENTS - EXPOSURE B - 50 FT. ABOVE GROUND**

| | | | | | | |
|-----------------------------|-----|-----|-----|-----|------|------|
| WIND SPEED (M.P.H.) | 70 | 80 | 90 | 100 | 110 | 125 |
| TOTAL BALLAST (LBS.) | 415 | 540 | 690 | 840 | 1015 | 1290 |
| STATIC ROOF LOAD (LB./FT.2) | 10 | 13 | 16 | 20 | 24 | 31 |
| ANTENNA & NPMM WT. (LBS.) | 165 | 165 | 165 | 165 | 165 | 165 |
| NET BALLAST REQUIRED (LBS.) | 250 | 375 | 525 | 675 | 850 | 1125 |

**TABLE 3.0-7 - 1.2M CIRCULAR VSAT ANTENNA
BALLAST REQUIREMENTS - EXPOSURE C - 30 FT. ABOVE GROUND**

| | | | | | | |
|-----------------------------|-----|-----|-----|------|------|------|
| WIND SPEED (M.P.H.) | 70 | 80 | 90 | 100 | 110 | 125 |
| TOTAL BALLAST (LBS.) | 540 | 740 | 890 | 1115 | 1315 | 1690 |
| STATIC ROOF LOAD (LB./FT.2) | 13 | 18 | 21 | 26 | 31 | 40 |
| ANTENNA & NPMM WT. (LBS.) | 165 | 165 | 165 | 165 | 165 | 165 |
| NET BALLAST REQUIRED (LBS.) | 375 | 575 | 725 | 950 | 1150 | 1525 |

**TABLE 3.0-8 - 1.2M CIRCULAR VSAT ANTENNA
BALLAST REQUIREMENTS - EXPOSURE C - 50 FT. ABOVE GROUND**

| | | | | | | |
|-----------------------------|-----|-----|------|------|------|------|
| WIND SPEED (M.P.H.) | 70 | 80 | 90 | 100 | 110 | 125 |
| TOTAL BALLAST (LBS.) | 640 | 840 | 1065 | 1290 | 1515 | 1990 |
| STATIC ROOF LOAD (LB./FT.2) | 15 | 20 | 25 | 31 | 36 | 47 |
| ANTENNA & NPMM WT. (LBS.) | 165 | 165 | 165 | 165 | 165 | 165 |
| NET BALLAST REQUIRED (LBS.) | 475 | 675 | 900 | 1125 | 1350 | 1825 |

TABLE 3.0-9 - 1.0M OR SMALLER SHAPED VSAT ANTENNA
BALLAST REQUIREMENTS - EXPOSURE B - 9M ABOVE GROUND

| | | | | | | |
|--|-----|-----|-----|-----|-----|-----|
| WIND SPEED (K.P.H.) | 113 | 129 | 145 | 161 | 177 | 201 |
| TOTAL BALLAST (KG.) | 107 | 129 | 175 | 209 | 254 | 322 |
| STATIC ROOF LOAD (KG./M ²) | 29 | 34 | 44 | 54 | 63 | 83 |
| ANTENNA & NPMM WT. (KG.) | 73 | 73 | 73 | 73 | 73 | 73 |
| NET BALLAST REQUIRED (KG.) | 34 | 57 | 102 | 136 | 181 | 249 |

TABLE 3.0-10 - 1.0M OR SMALLER SHAPED VSAT ANTENNA
BALLAST REQUIREMENTS - EXPOSURE B - 15M. ABOVE GROUND

| | | | | | | |
|--|-----|-----|-----|-----|-----|-----|
| WIND SPEED (K.P.H.) | 113 | 129 | 145 | 161 | 177 | 201 |
| TOTAL BALLAST (KG.) | 118 | 152 | 186 | 243 | 277 | 356 |
| STATIC ROOF LOAD (KG./M ²) | 29 | 39 | 49 | 58 | 68 | 93 |
| ANTENNA & NPMM WT. (KG.) | 73 | 73 | 73 | 73 | 73 | 73 |
| NET BALLAST REQUIRED (KG.) | 45 | 79 | 113 | 170 | 204 | 284 |

TABLE 3.0-11 - 1.0M OR SMALLER SHAPED VSAT ANTENNA
BALLAST REQUIREMENTS - EXPOSURE C - 9M. ABOVE GROUND

| | | | | | | |
|--|-----|-----|-----|-----|-----|-----|
| WIND SPEED (K.P.H.) | 113 | 129 | 145 | 161 | 177 | 201 |
| TOTAL BALLAST (KG.) | 152 | 197 | 254 | 311 | 401 | 481 |
| STATIC ROOF LOAD (KG./M ²) | 39 | 49 | 63 | 78 | 102 | 122 |
| ANTENNA & NPMM WT. (KG) | 73 | 73 | 73 | 73 | 73 | 73 |
| NET BALLAST REQUIRED (KG) | 79 | 125 | 181 | 238 | 329 | 408 |

TABLE 3.0-12 - 1.0M OR SMALLER SHAPED VSAT ANTENNA
BALLAST REQUIREMENTS - EXPOSURE C - 15M ABOVE GROUND

| | | | | | | |
|--|-----|-----|-----|-----|-----|-----|
| WIND SPEED (K.P.H.) | 113 | 129 | 145 | 161 | 177 | 201 |
| TOTAL BALLAST (KG) | 186 | 231 | 288 | 367 | 424 | 549 |
| STATIC ROOF LOAD (KG./M ²) | 49 | 58 | 73 | 93 | 107 | 141 |
| ANTENNA & NPMM WT. (KG) | 73 | 73 | 73 | 73 | 73 | 73 |
| NET BALLAST REQUIRED (KG) | 113 | 159 | 215 | 295 | 352 | 478 |

TABLE 3.0-13 - 1.2M CIRCULAR VSAT ANTENNA
BALLAST REQUIREMENTS - EXPOSURE B - 9M ABOVE GROUND

| | | | | | | |
|--|-----|-----|-----|-----|-----|-----|
| WIND SPEED (K.P.H.) | 113 | 129 | 145 | 161 | 177 | 201 |
| TOTAL BALLAST (KG.) | 166 | 211 | 279 | 324 | 404 | 517 |
| STATIC ROOF LOAD (KG./M ²) | 44 | 54 | 73 | 83 | 102 | 132 |
| ANTENNA & NPMM WT. (KG.) | 75 | 75 | 75 | 75 | 75 | 75 |
| NET BALLAST REQUIRED (KG.) | 91 | 136 | 204 | 249 | 329 | 442 |

TABLE 3.0-14 - 1.2M CIRCULAR VSAT ANTENNA
BALLAST REQUIREMENTS - EXPOSURE B - 15M ABOVE GROUND

| | | | | | | |
|--|-----|-----|-----|-----|-----|-----|
| WIND SPEED (K.P.H.) | 113 | 129 | 145 | 161 | 177 | 201 |
| TOTAL BALLAST (KG.) | 188 | 245 | 313 | 381 | 460 | 585 |
| STATIC ROOF LOAD (KG./M ²) | 49 | 63 | 78 | 97 | 117 | 151 |
| ANTENNA & NPMM WT. (KG.) | 75 | 75 | 75 | 75 | 75 | 75 |
| NET BALLAST REQUIRED (KG.) | 113 | 170 | 238 | 306 | 386 | 510 |

TABLE 3.0-15 - 1.2M CIRCULAR VSAT ANTENNA
BALLAST REQUIREMENTS - EXPOSURE C - 9M ABOVE GROUND

| | | | | | | |
|--|-----|-----|-----|-----|-----|-----|
| WIND SPEED (K.P.H.) | 113 | 129 | 145 | 161 | 177 | 201 |
| TOTAL BALLAST (KG.) | 245 | 336 | 404 | 506 | 596 | 767 |
| STATIC ROOF LOAD (KG./M ²) | 63 | 88 | 102 | 127 | 151 | 195 |
| ANTENNA & NPMM WT. (KG.) | 75 | 75 | 75 | 75 | 75 | 75 |
| NET BALLAST REQUIRED (KG.) | 170 | 261 | 329 | 431 | 522 | 692 |

TABLE 3.0-16 - 1.2M CIRCULAR VSAT ANTENNA
BALLAST REQUIREMENTS - EXPOSURE C - 15M ABOVE GROUND

| | | | | | | |
|--|-----|-----|-----|-----|-----|-----|
| WIND SPEED (K.P.H.) | 113 | 129 | 145 | 161 | 177 | 201 |
| TOTAL BALLAST (KG.) | 290 | 381 | 483 | 585 | 687 | 903 |
| STATIC ROOF LOAD (KG./M ²) | 73 | 97 | 122 | 151 | 175 | 229 |
| ANTENNA & NPMM WT. (KG.) | 75 | 75 | 75 | 75 | 75 | 75 |
| NET BALLAST REQUIRED (KG.) | 215 | 306 | 408 | 510 | 612 | 828 |

3.1 **BALLAST REQUIREMENT INFORMATION**

- 3.1-1. Ballast requirements are provided to assist in determining the applicability of the NPMM for an antenna installation. The ballast data should not be relied upon without competent local professional examination and verification of its accuracy and suitability for a specific site or application.
- 3.1-2. Specific antenna types may require more strength and ballast requirements and must be investigated for each installation. The load carrying requirements of the supporting surface, the mast, the antenna and the antenna's connection to the mast must also be investigated for each installation.
- 3.1-3. Roof pads are recommended to prevent damage to roof membranes. Pads should be placed under all ballast and under the mast pipe. When roof pads are utilized, the minimum coefficient of friction between the ballast pans and roof pad or between the roof pads and the supporting surface must be used to calculate the wind speeds resulting in sliding.
- 3.1-4. When adhesive, sealant or pads are utilized, they must be compatible with the supporting surface. They must also be durable and have adequate strength. Precautions should also be taken to insure that damage to the supporting surface will not occur upon wind loading. Adhesives and sealants must be capable of resisting shear; otherwise, they may act as a lubricant and decrease the effective coefficient of friction between the ballast and the supporting structure.
- 3.1-5. The installation, roof materials and supporting structure must be capable of withstanding all loads imposed by the antenna system. Supporting structure, anchors and/or safety cables must be sufficient to resist the reactions from the antenna system. The installation must meet all applicable, local, state and federal requirements. ***Due to the many variables involved, General Dynamics does not accept responsibility for verifying the applicability of the NPMM for specific installation.***