KSC-PLN-1904
REV: BASIC
August 6, 2001

TRAILER/EQUIPMENT TIEDOWN PLAN

FOR THE

JOHN F. KENNEDY SPACE CENTER

National Aeronautics and
Space Administration

John F. Kennedy Space Center

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Approved:

(original signed by)

_____

J. Chris Fairey
Spaceport Services Director

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STANDARD FOR TRAILER/EQUIPMENT TIEDOWNS

1. SCOPE

This document establishes minimum requirements for leveling and anchorage of office trailers and other mobile and temporary structures, such as semitrailers and skid-mounted sheds and equipment units [not including propellant mobile equipment (PME)], at the John F. Kennedy Space Center (KSC).

2. APPLICABLE DOCUMENTS

The following documents form a part of this document to the extent specified herein. When this document is used for procurement, including solicitations, or is added to an existing contract, the specific revision levels, amendments, and approval dates of said documents shall be specified in an attachment to the Solicitation/Statement of Work/Contract.

2.1 Governmental.

2.1.1 Specifications.

Federal

FF-C-450	Clamps, Wire Rope
FF-T-276	Thimbles, Rope
RR-W-410	Wire Rope and Strand
TT-W-572	Fungicide: Pentachlorophenol

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specified procurement functions should be obtained from the procuring activity or as directed by the Contracting Officer.)

2.2 Non-Governmental.

American Society for Testing and Materials (ASTM)

ASTM D1272	Standard Specification for Pentachlorophenol
ASTM D3953	Standard Specification for Strapping, Flat Steel and Seals
ASTM F1145	Standard Specification for Turnbuckles, Swaged, Welded, Forged

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3. REQUIREMENTS

3.1 General - The general requirement for anchorage of trailers and equipment at KSC shall be a correctly designed and installed system that provides adequate protection for the structure in high winds in accordance with ASCE 7 wind criteria. A factor of safety of 2.5 shall be used against overturning. A properly designed and installed system will prevent overturning or appreciable translation movement of the trailer from its frame or foundation. However, damage may result from other wind and water effects on the sheathing, windows, doors, floors, and contents. Proper anchorage should prevent total damage or destruction of a trailer or nearby trailers, structures, or equipment and may prevent injury or loss of life.

All carbon steel anchorage components in contact with the ground shall be protected against corrosion by galvanizing per ASTM A123, Grade 60.

The anchorage system shall consist of:

a. A number of eyes fastened to the trailer frame.

b. A number of cables or straps over the top of the trailer with eyes or loops at each end.

c. Auger-type anchors at each corner and at intermediate points with connecting cables and turnbuckles in accordance with the Federal specifications listed herein (see figure 1).

d. Stabilizing devices for anchors shall have a minimum of 180 square inches and shall be installed flush with the soil to prevent the anchor from deflecting. Stabilizing devices are not required at the centerline locations of the trailer or equipment.

As an alternative, galvanized steel strapping 30 by 1 millimeters (1.25 by 0.035 inches) and commercially available hurricane anchors may be used (see figure 2).

Trailers shall be tied down within one week after placement on the site. Also, trailers shall be tied down if they are to be in a particular location more than two weeks.

3.2 Siting - Trailers shall be sited according to a given plan and procedure. Siting shall be preapproved with consideration given to underground utilities (i.e., power, gas, and fuel lines). A dig permit shall be obtained, if required. If the trailer is to be parked in an unimproved location where unstable soil may exist, a determination of soil conditions shall be made by soil tests. [Anchors must withstand 16 700 newtons (3,750 pounds) of pull per 3 meters (10 feet) of trailer length.] Footings shall be set on firm soil capable of resisting 72-kilopascal (1,500 pounds per square foot) compression.

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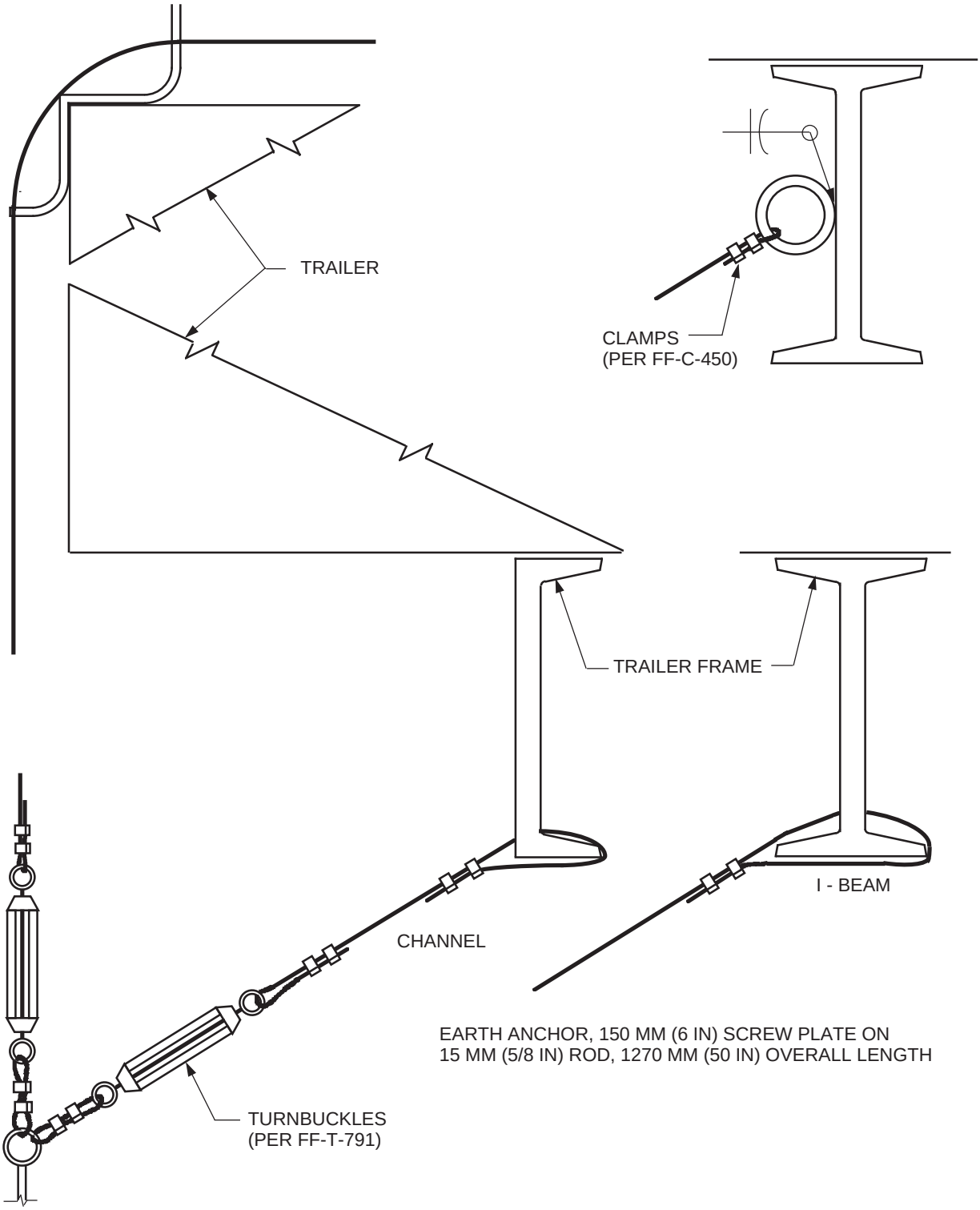

Figure 1. Cable Anchorage System

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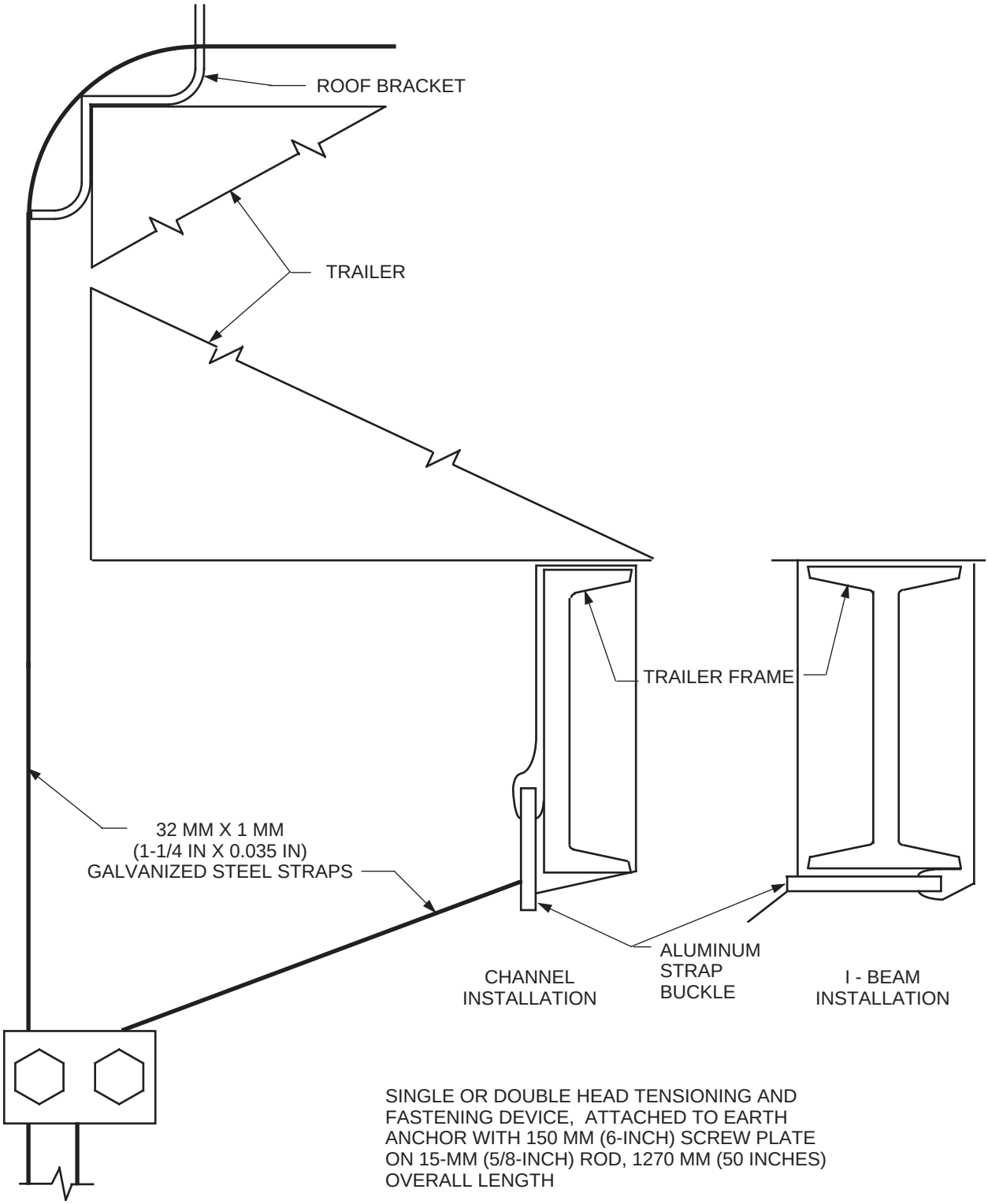

Figure 2. Strap Anchorage System

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3.3 Blocking - After a trailer has been located (sited) properly, it shall be leveled and jacked in such a manner that the frame or skin of the trailer will not be distorted and the wheels are lifted off the ground. Jacks shall be placed as close to wheels as possible. Trailers shall be blocked so deflection of the floor between the supports does not exceed the manufacturer's limits or 25 millimeters (1 inch), whichever is less.

Piers consisting of concrete blocks 400 by 200 by 200 millimeters (16 by 8 by 8 inches) on a cast-in-place concrete base plate 600 by 600 by 100 millimeters (24 by 24 by 4 inches) shall be placed at intervals not exceeding 3 meters (10 feet) on both sides of the trailer. Wood blocks and shims shall be used between the top of the piers and the trailer frame (see figure 3). Piers built from 75-millimeter (3-inch) standard pipe may be used as an alternative system for blocking up trailers or equipment units (see figure 3). When standard concrete blocks are used, they shall be free from cracks and defects. Inspectors shall check for cracked and defective blocks and reject them.

Thin-gauge galvanized or aluminum sheet metal, no less than 22 gauge, shall be placed on top of the concrete blocks. If the alternate blocking method is used, the sheet metal shall be placed on top of the steel cap. This sheet metal shall extend 50 millimeters (2 inches) beyond each side of the blocks and shall bend down at a 45-degree angle.

Blocks and wedges shall be pressure treated or brush applied with an approved wood preservative in accordance with TT-W-572.

In some cases, it may be necessary to increase the height of piers with half-size or cut concrete blocks.

NOTE

Piers shall be designated and constructed to evenly distribute the loads. If the loading should exceed 22 000 newtons (5,000 pounds) per pier, the pier spacing shall be reduced or the piers designed to carry the heavier loads.

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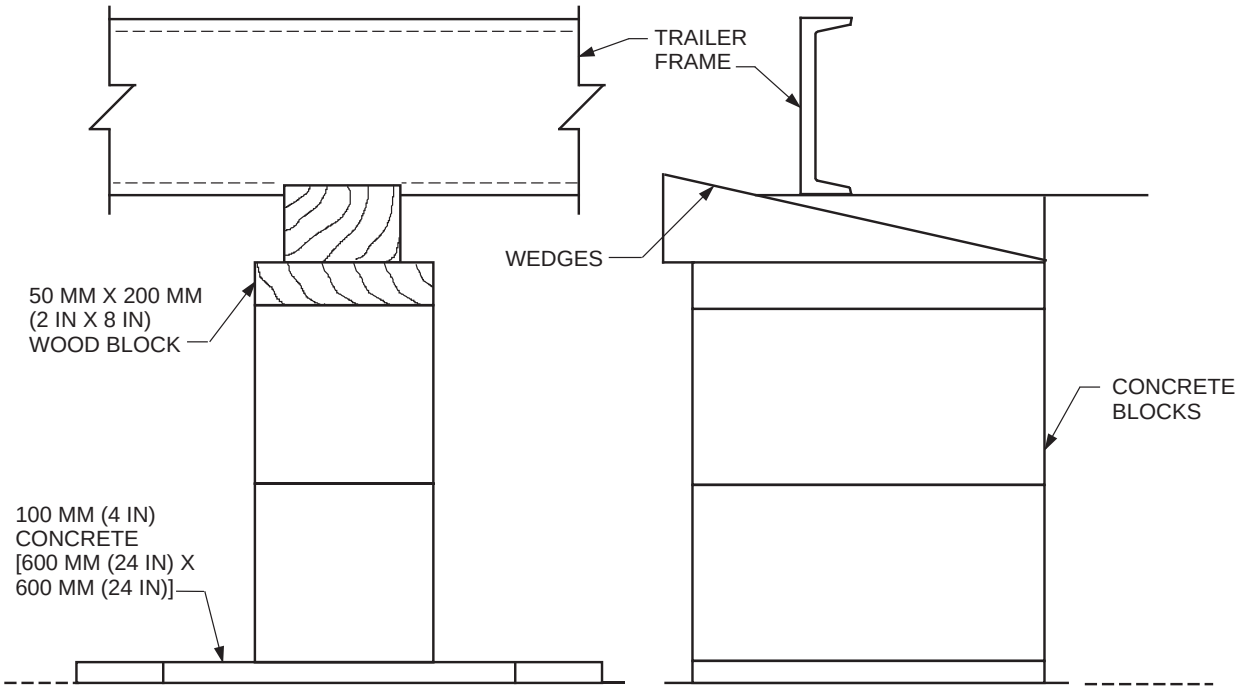
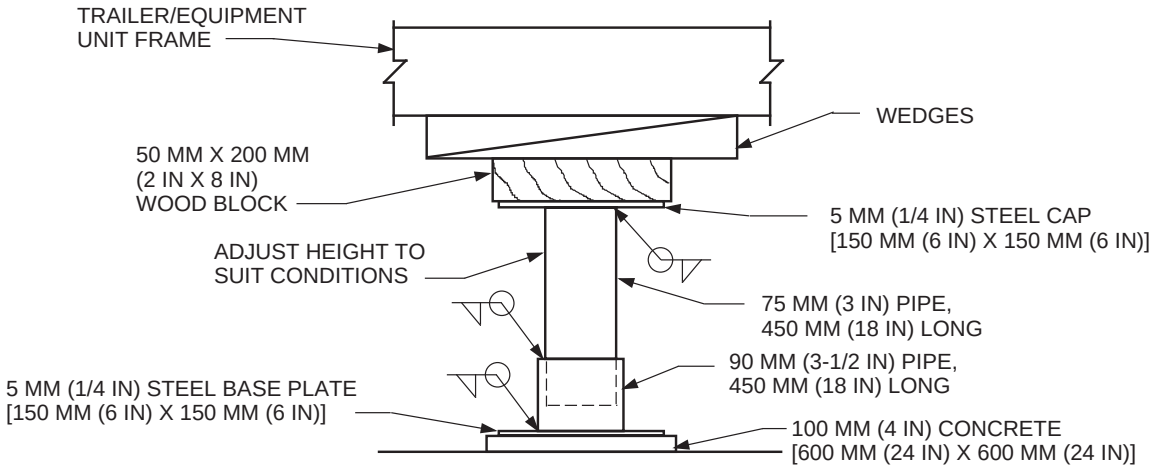


TYPICAL TRAILER BLOCKING



ALTERNATE TRAILER/EQUIPMENT UNIT
BLOCKING PIERS

Figure 3. Trailer Blocking

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3.4 Ties and Straps - Ties shall be provided as follows:

a. Frame ties (intermediate):

Trailer Length	Number of Ties Per Side
Up to 12 meters (40 feet)	4
12 to 18 meters (40 to 60 feet)	6
18 to 25 meters (60 to 82 feet)	8

b. Tie spacing: maximum 3 meters (10 feet)

c. Over-the-top ties:

Trailer Length	Number of Ties Per Side
Up to 18 meters (60 feet)	1 tie at each end
Over 18 meters (60 feet)	1 tie at each end and 1 tie in the middle

Over-the-top ties shall be located at a panel point, stud, or rafter as near the end as possible (see figure 4).

Ties shall be 10-millimeter (3/8-inch) diameter galvanized cable with turnbuckles or 30 by 1 millimeter (1.25 by 0.035 inch) galvanized steel straps cut to length as required for wrapping and tensioning. Straps shall conform to ASTM D3953, type 1, class B, grade I. Cables shall conform to RR-W-410 6x7 galvanized cable. Suitable roof brackets shall be used at the corners of the roof. Strap buckles shall be used for tensioning steel straps. Cables and straps shall be tightened until they are snug with no droop. Care must be exercised to avoid excessive tension that could damage the trailer.

3.5 New Equipment - When trailers, vans, or equipment units are purchased (or built) for use at KSC, they shall be equipped with provisions for tiedowns and hurricane anchorage in accordance with this standard. Provisions for new equipment shall consist of eyes welded to the frame of the trailer or unit and/or a framing system designed to provide for over-the-top cables or straps with panel points indicated so over-the-top cables or straps can be installed at these panel points (see figures 4 and 5).

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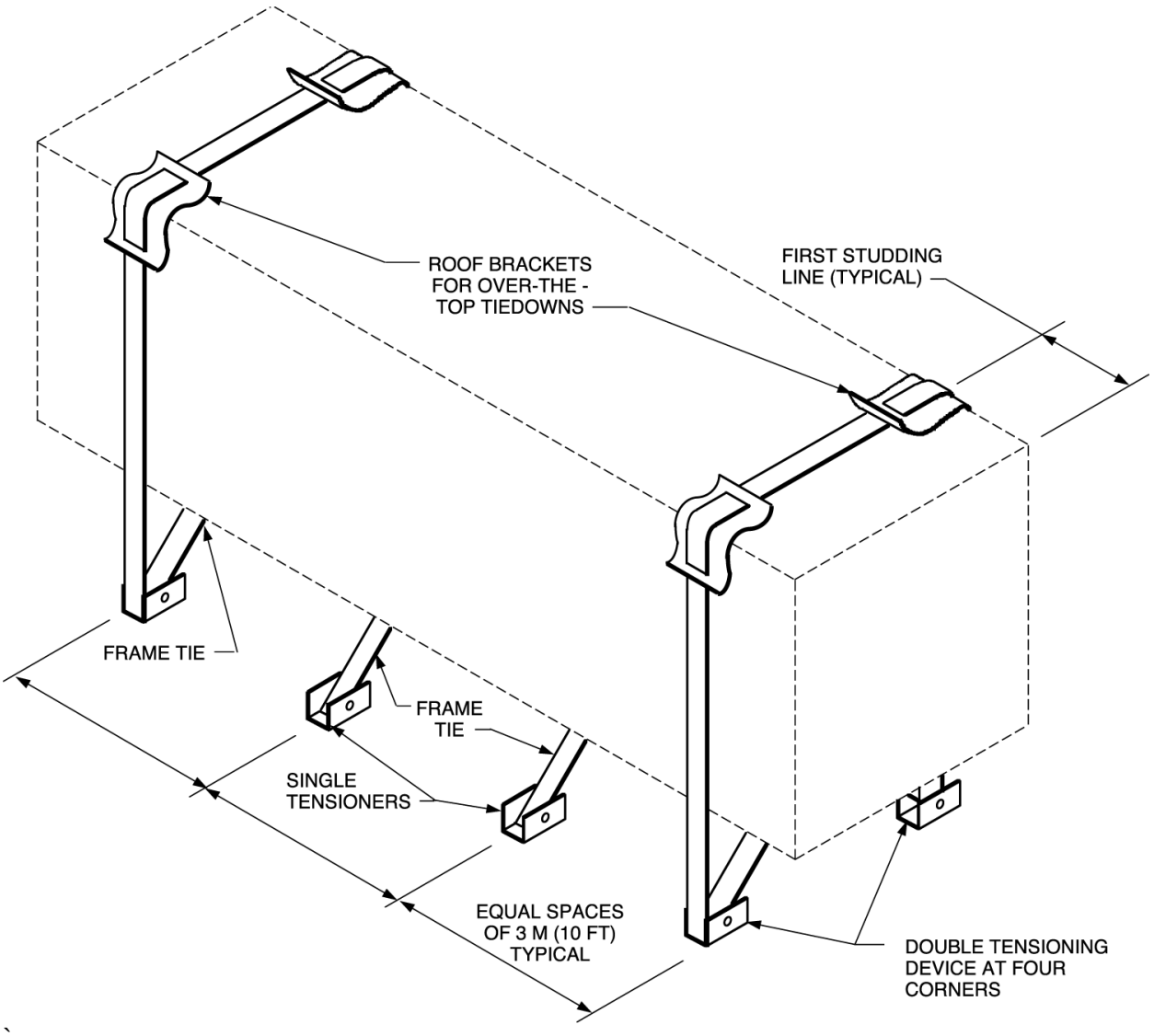

Figure 4. Typical Trailer Tiedown

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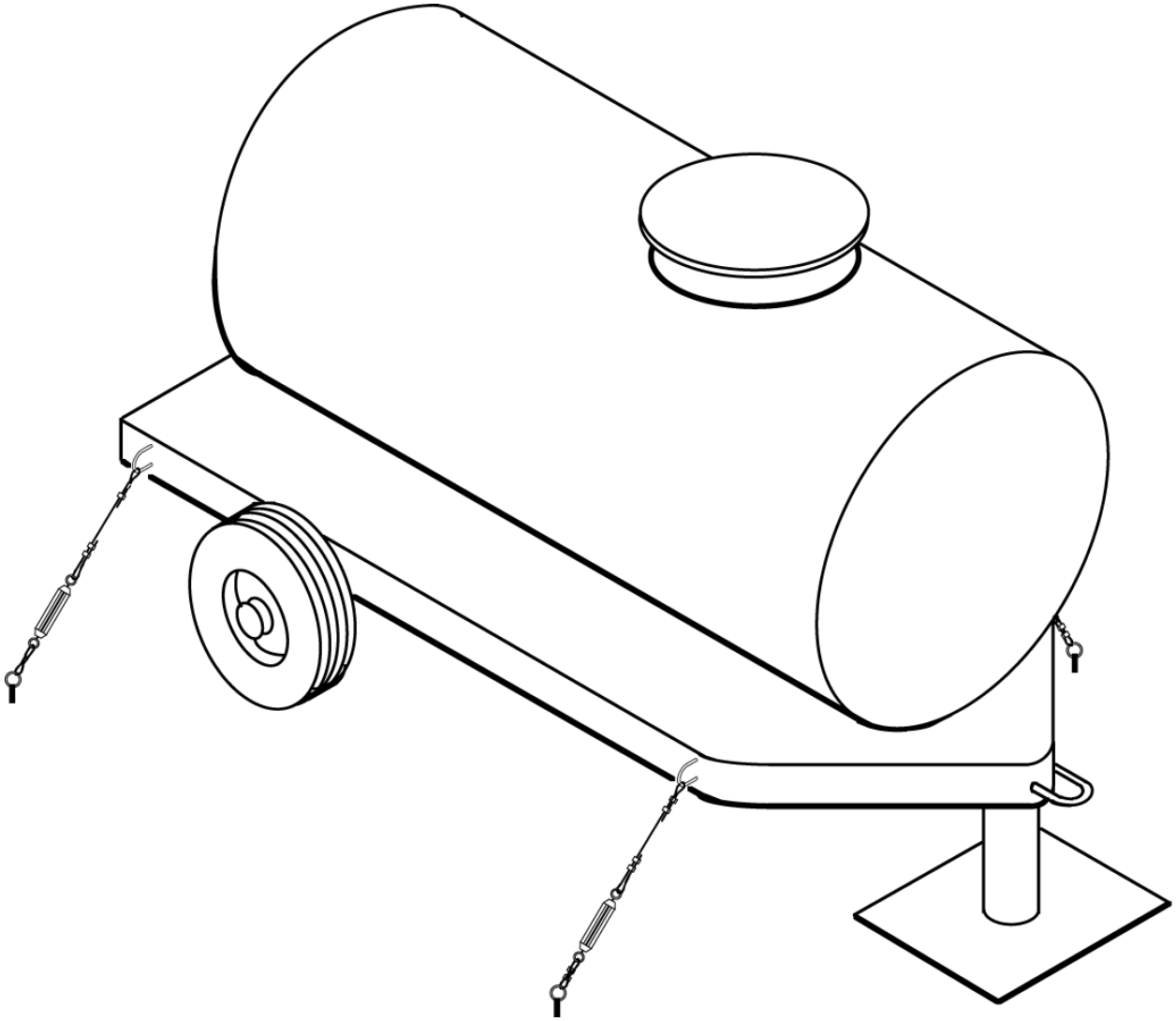

Figure 5. Typical Mobile Unit Tie Anchors to Main Frame at Four Corners

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3.6 Drawing Review - Review of engineering drawings for trailers, vans, and equipment units shall include a review of tiedown and framing systems to ensure adequate provisions for tiedown and anchorage as specified herein. Federal specifications listed herein shall be adhered to and made a part of all designs for mobile units covered by this standard.

4. QUALITY ASSURANCE PROVISIONS

Inspection - The Quality Surveillance organization having cognizance over leveling and anchoring of trailers/equipment shall perform inspections to ensure leveling and anchoring operations conform to the requirements of this standard.

5. PREPARATION FOR DELIVERY

Not applicable.

6. NOTES

6.1 Intended Use - This specification is intended to be used whenever a trailer, van, or equipment unit is found to be insufficiently tied down, is relocated, or is newly purchased for use at KSC. No attempt will be made to pinpoint every trailer, shed, or skid-mounted unit that requires additional anchorage. Each case shall be evaluated individually considering use, costs, availability of material and manpower, and short- and long-range weather predictions. Since the hurricane season extends from June through November, greater effort to have everything tied down during this period is warranted.

NOTICE: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Custodian:	Preparing Activity:
NASA - John F. Kennedy Space Center Kennedy Space Center, Florida 32899 Spaceport Services Directorate	John F. Kennedy Space Center Facilities Division

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