

Satco, Inc.  
Damage Limits and Repair Procedures

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DAMAGE LIMITS AND REPAIR PROCEDURES  
FOR  
SATCO, INC.  
CERTIFIED CARGO PALLETS  
ALL MODELS

Satco, Inc.  
Damage Limits and Repair Procedures

**INTRODUCTION**

Satco, Inc. has developed this *Damage Limits and Repair Procedures –Cargo Pallets* manual in an effort to better organize and control information related to the inspection, evaluation and repair of damage to Satco, Inc. pallets.

Because this information has been replicated in all of the Component Maintenance Manuals Satco has produced, it has become extremely cumbersome to revise the basic damage limits and repair procedures without having to revise countless different manuals. By consolidating all of the basic damage limits and repair procedures that are common to all Satco pallets into one manual, Satco can now make necessary changes and revisions to basic procedures without having to revise individual Component Maintenance Manuals or issue Service Bulletins.

This manual should be thoroughly reviewed, kept in current revision status and used by certified repair stations performing work on Satco, Inc. cargo pallets. As individual Component Maintenance Manuals are revised from this date forward the information contained herein will be removed from the individual Component Maintenance Manual and the following statement will be inserted:

“For detailed information on the damage limits and repair procedures applicable to this ULD refer to Satco, Inc. Manual 25-51-02 – Damage Limits and Repair Procedures.”

Damage limits listed in this manual describe the most damage allowable without affecting the airworthiness of a pallet. Any owner or operator of any Satco pallet may impose damage limits more restrictive than those listed; however, under no circumstances may damage limits be issued that are less restrictive than those listed in this manual.

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**SERVICE BULLETIN LIST**

SERVICE BULLETIN	INCORPORATED	SERVICE BULLETIN	INCORPORATED
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**REVISION HISTORY**

REV NO.	DATE	CHANGES	BY
ORIG	September 7, 2007	New stand alone manual to better organize and control established damage limits and repair procedures for Satco, Inc. cargo pallets.	PFL
<b>A</b>	April 4, 2011	4.1 – Added General Visual Inspection frequency 4.2 – New “General Visual Inspection” heading Old 4.3 renumbered to 4.4 Final Inspection after Repair 4.3 – New section TSO/PMA Placards 4.5 – New FAR H25.1 Airworthiness Limitations paragraph	MPB
<b>B</b>	May 12, 2015	Changed SMAW to GTAW and added Min/Max to gas proportions per NOTE 2 of 31152 SATCO Welding Specification.	IK
<b>C</b>	August 26, 2015	Updated AWS specification and its section references.	IK
<b>D</b>	December 1, 2015	10.6 – Added SS(P or C)Q rivet to approved substitutes table.	IK
<b>E</b>	December 16, 2015	Added side restraint block paragraph to 6.2, renumbered pages.	TG
<b>F</b>	March 15, 2016	Added Countersink specifications for Blind/Pull Rivets, 7.4C	TG
<b>G</b>	October 3, 2019	Corrected 7.1 – Fig. 1 with updated drawings	CM
H	May 18, 2020	Added sections 10.7 and 10.8. Updated LEP pages for Section 10. Corrected note on Section 11 welding illustration.	LR

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1.0 General

A. Damage from accidents, rough usage, or excessive stress may be corrected by repairing the damaged area or by replacing the damaged component(s). The extent of the damage determines whether a component can be repaired or must be replaced.

B. **Allowable Damage** is defined as damage to a pallet that does not adversely affect the structural integrity and ultimate load bearing capacity of the pallet. However, allowable damage should be repaired as soon as possible in order to prevent injury to operators due to contact with sharp edges. Allowable damage usually consists of small cracks, holes, breaks or tears to the pallet assembly.

C. **Major Damage** is defined as damage beyond the limits of allowable damage that adversely affects the structural integrity of the pallet and renders it un-airworthy. A component with major damage must be either repaired or replaced using approved materials by a certified repair station in order to return the damaged pallet to service.

D. The pallets described in this manual are FAA certified Aircraft Appliances and may only be repaired by repair stations that hold current FAA certification or other equivalent National Aviation Authority Approval. Approval to perform repair work on a particular ULD must be evidenced by inclusion of the ULD on the repair station's current Capabilities List. Repair station personnel must have all equipment, tools, spare parts, and training required to meet all provisions of Federal Aviation Regulations (FAR) Part 43 and Part 145.

E. If the pallet is damaged severely enough to require replacement of a major component, disassemble only those portions necessary to remove the damaged part(s). Refer to the parts list in the back of the pallet's component maintenance manual to ascertain the correct part, replace the part using the proper hardware as called out in the parts list and reassemble.

2.0 Spare Parts and Repair Material

A. Only FAA approved parts are to be used to repair a Satco pallet. The approved parts and repair materials are specified on the Illustrated Parts List pages of the particular pallet.

B. Parts not manufactured by Satco are identified by a vendor code that immediately follows the description of that part in the Illustrated Parts List and may be procured directly from the supplier indicated on the "List of Vendors".

C. All parts originally manufactured by Satco that are on Satco ULD's are identified by a five-digit basic part number beginning with the numeral "3" and ending with a two or three-digit dash number (example: 34488-53, Edge Rail). Generally, a part number ending with a three-digit number after the dash is an assembly and a part number ending with a two-

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2.0 Spare Parts and Repair Material- (continued)

digit number after the dash is an individual part. It is acceptable to substitute a period (".") for a dash ("-") when referring to any Satco, Inc. part number. All Satco manufactured parts must be procured directly from Satco or from a source authorized by Satco in order to establish required tractability to Satco's records of material procurement and manufacturer.

D. The use, quantity and location of bar codes on Satco pallet assemblies or components is solely a customer option, is non-structural and not controlled by Satco Engineering. Requirements for bar coding will be supplied by the pallet owner and will not be included in any Satco CMM.

3.0 Cleaning

3.1 Cleaning Metal Surfaces:

Metal surfaces of the pallet may be cleaned with any good commercial detergent. Care should be taken to rinse away all traces of detergent to prevent staining and spotting. Dry all parts thoroughly using a clean cloth or low-pressure, filtered compressed air.

3.2 Storage

Clean the pallet prior to prolonged storage. Pallets may be stacked and care should be taken to raise the pallet(s) off the ground to avoid the bottom of the pallet being in contact with water.

4.0 Inspection

4.1 General Inspection

The pallet assembly should undergo a General Visual Inspection prior to each use to verify its serviceability and to evaluate the degree of any damage to provide for continued airworthiness.

4.2 General Visual Inspection

- A. Check exterior of the pallet assembly for any evidence of loose or missing rivets, loose or damaged edge rail sections, missing corner castings and damaged pallet sheet.
- B. Check the base edges for damage that might restrict the movement of the pallet within its interface with the aircraft restraint system.

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4.0 Inspection– (continued)

- C. Check pallet sheet(s) for punctures, tears and loose or missing attach hardware. The pallet must be lifted or turned over in order to inspect the bottom of the pallet sheet(s)

4.3 TSO/PMA Placards

- A. Check for the existence of the original TSO or PMA (STC) placard. If placard is eligible or missing, contact Satco, Inc. to obtain a replacement placard with the correct ULD part number, certification identification and date of manufacture. Install the replacement placard where indicated on ULD's CMM
- B. It is allowable for a ULD owner to request that a secondary placard be installed. If the secondary placard is requested, use the existing placard as a template and transfer data from the existing placard to a new placard. Secondary TSO placards may only be obtained from Satco, Inc. and should be installed at location indicated in the CMM or where indicated by ULD owner. Eligible or missing secondary placards do not affect the airworthiness of the ULD.

4.4 Final Inspection After Repair

- A. It is the responsibility of each certified repair station to perform a thorough final inspection after a Satco pallet has been repaired in accordance with that station's Repair Station Manual/Quality Control Manual (RSM/QCM).
- B. TARE WEIGHT: Before a repaired pallet is returned to service it is recommended that the pallet be weighed on a certified scale to determine if the tare weight has changed as a result of the repair. If the tare weight has changed by more than 5 pounds (1.8 kg) over or under the tare weight displayed on the pallet, it is recommended the pallet be re-marked to reflect the new tare weight.

4.5 FAR H25.4 Airworthiness Limitations

There are no airworthiness limitations particular to FAR §H25.4 Airworthiness Limitations Section. The Airworthiness Limitations Section is FAA approved and specifies maintenance required under 14 CFR § 43.16 and 91.403, unless an alternative program has been FAA approved.



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5.0 Reports Of Malfunction

It is requested that the user of any part or parts exhibiting defects showing signs of service failure immediately notify the supplier of such findings. In reporting such findings the user is requested to identify the item or items as follows:

- (A) Model designation (e.g. NAS 3610–2M3P)
- (B) Serial number
- (C) Identification of the part or component part number
- (D) Nature of failure, malfunction or defect

6.0 Damage Limits

**Allowable damage** is defined as small holes, cracks, dents, scratches and tears that do not affect the structural integrity of the pallet. Pallets sustaining allowable damage are considered airworthy and may be flown at the maximum allowable load without restriction. However, it is recommended that allowable damage be repaired if the allowable damage interferes with the aircraft's cargo loading/restraint system or other equipment. The following are the limits of allowable damage to a pallet assembly:

6.1 Pallet Sheet(s):

- A. Within 3 inches (75 mm) of any adjoining edge extrusion:  
Tear or puncture must not exceed 3 inches (75 mm) in length by 1 inch (25mm) in width.
- B. Beyond 3 inches (75 mm) of any adjoining edge extrusion:  
Tear or puncture must not exceed 6 inches (150mm) in length by 2 inches (50mm) in width.

6.2 Edge Rails:

Damage to any extruded pallet edge rail must not exceed cracks of three 3 inches (75mm) longitudinally (lengthwise – with the grain) or one half (1/2) inch (12.7mm) laterally (crosswise – against the grain). Cracks, cuts or tears beyond these limits may not be welded and therefore, the entire edge rail must be replaced.

Distortion and/or indentation of the pallet assembly or edge rails must not exceed one-half (1/2) inch (12.7mm) up to the length of the edge rail.

There are no limitations to the quantity or location of damaged, broken or missing seat track lips provided that there are a minimum of 3 contiguous undamaged pairs of seat track lips immediately adjacent to any and all net tie

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6.0 Damage Limits- (continued)

down points. The 3 undamaged pairs of seat track lips may be on either side of the net tie down point.

16 ft. or 20 ft. pallet edge rails shall be considered to have allowable damage if side restraint block sets are broken or missing at any adjacent or any two (2) non-adjacent locations.

Due to prolonged contact with conveyor systems over time, single sheet pallet sheets tend to dish or cup which can raise the upper plane of the edge rails. It is allowable for an empty pallet to have such deflection up to a max allowable dimension of two (2) inches (50mm) provided that the edge rails themselves are not bent beyond the limits stated above.

6.3 Welded Corners:

Cracked or broken welded corners do not affect the airworthiness of the pallet and are considered allowable damage. Cracks are therefore permitted on all four corners of the pallet assembly with no reduction to the maximum gross load. Although corner cracks are acceptable, it is recommended that cracks be repaired as soon as possible due to the fact that broken corners could possibly damage the aircraft's cargo loading/restraint system or other equipment.

6.4 Corner Ties/Caps:

Minor damage (chips and/or dents) to corner ties/caps do not affect the airworthiness of the pallet and a pallet with minor damage to corner ties/caps is considered airworthy.

6.5 Corner Castings:

Cracked or broken iron corner castings do not affect the airworthiness of the pallet and are considered allowable damage. Missing or broken corner castings are therefore permitted on all four corners of the pallet assembly with no reduction on the rated maximum gross load. Although missing or broken corner castings are acceptable, it is highly recommended that they be repaired or replaced as soon as possible in that broken or missing cast corners could possibly damage the aircraft's cargo loading/restraint system or other equipment.

6.6 Missing Fasteners:

A maximum of five (5) missing edge rail to pallet sheet attach rivets total around perimeter of a pallet assembly are allowed provided that there are a minimum of five (5) good rivets between any two missing rivets.

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6.0 Damage Limits – (continued)

6.7 Drain Holes

A maximum of five (5) drain holes are permitted on a single sheet pallet assembly or the bottom sheet of a double sheet pallet assembly and are provided only at the request of the customer. For best drainage results, it is recommended that one hole be drilled in each corner and one hole at the center of the pallet assembly. Size of any drain hole shall not exceed three-eighths (3/8) of an inch (9.5 mm) diameter. Location of drain holes must be a minimum of three (3) inches (75mm) from any edge rail.

Drain holes are permitted within the edge rail profiles of certain pallet assemblies. Refer to the individual component maintenance manual for any and all size and location restrictions for drain holes that are located within the edge rail profile and pass through the pallet sheet.

**Major damage** consists of damage exceeding allowable damage and/or allowable damage in more than three locations. A cargo pallet classified with major damage is considered non-airworthy and must be repaired by a certified repair station prior to return to service. Major damage must be repaired as described in Section 7 – Repair Procedures.

7.0 Repair Procedures

7.1 Single Sheet Repair Patch

If damage to the single pallet sheet is within allowable limits as defined in paragraph 6.1, the sheet may be patched rather than replaced. Use Satco Part Number 34983-(Series) patch as illustrated below. Maximum damaged cut out area: Nine (9) inches (228mm) by nine (9) inches (228mm). It is suggested that no more than five (5) patches be used per pallet sheet.

*Note: Under no circumstances may welding be used to repair cracks, tears or punctures to pallet sheets.*

7.2 Procedure to Patch a Single Sheet:

- A. Part number 34938-501 will patch a 9" square area, -503 will patch a 7" square area and -505 will patch a 5" square area. Each patch assembly consists of 2 sheets (top and bottom) the top sheet will always be the larger sheet. These sheets come riveted together.
- B. Draw a (5" X 5", 7" X 7" or 9" X 9") square around the area of the damage where the patch will be located.

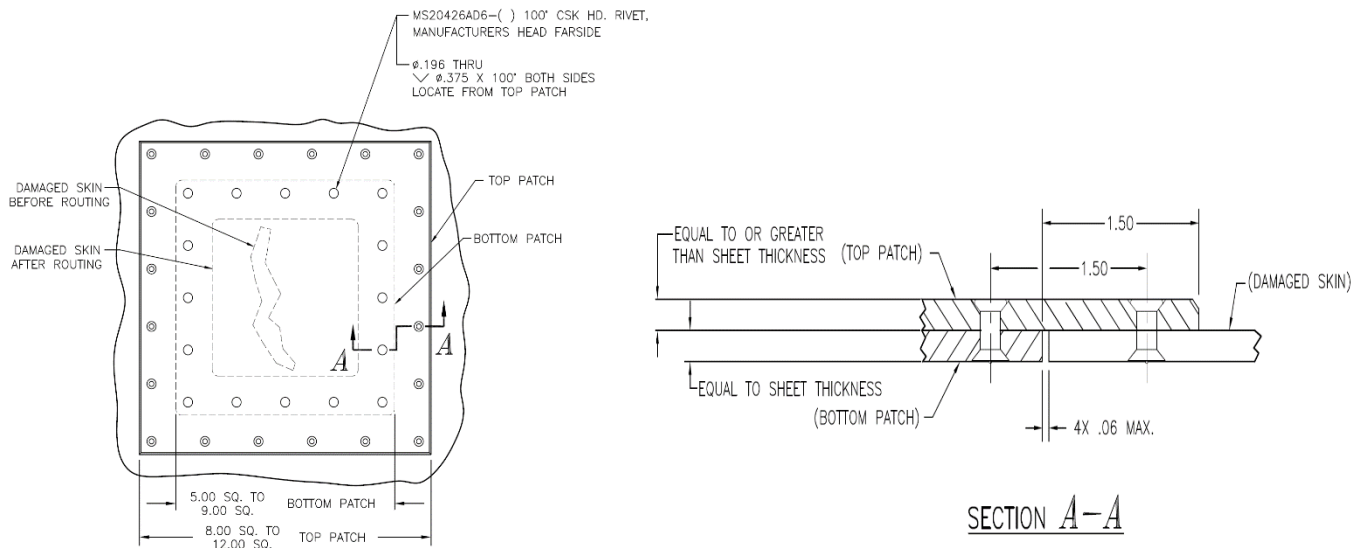
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7.0 Repair Procedures- (continued)

- C. Cut out the damaged area (to the drawn dimension + .06) using a saw or router. File any rough edges.
- D. Using the correct size patch assembly, insert the patch assembly with the bottom sheet (smaller sheet) fitted into the cut out area. The top sheet (larger sheet) will overlap the damaged pallet sheet by 1.5" on all 4 sides.
- E. Using the pre-drilled holes in the top sheet as a template, transfer drill  $\varnothing.196$  through the existing top pallet sheet.
- F. Flip the pallet sheet over and from the bottom side of the pallet sheet countersink the holes using a  $\varnothing.375$  by  $100^\circ$  countersink. Please note that the top sheet of the patch is also countersunk.
- G. Using MS20426AD6-8 insert the rivet from the bottom of the pallet sheet upward through the patch. Using bucking bar and air hammer buck the rivet flush from the top of the patch.



7.1 – Fig. 1

7.3 Double Sheet Repair Patch

If any damage to the top or bottom pallet sheets of a double sheet pallet assembly as evidenced by cracking or puncture is less than 22 inches (559mm) in any direction, then the damaged sheets may be patched and not replaced.

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7.0 Repair Procedures- (continued)

While it is permissible to use this procedure to install a flush patch to the top sheet, it is not required. Surface mounted patching as described in Section 7.4 is acceptable for cracks or punctures to the top sheet of a double base; however, flush patches are required for the bottom sheet of a double sheet pallet.

7.4 Procedure to Install a Flush Patch to a Double Sheet Pallet is as Follows:

- A. Draw a square or rectangle around the area of the damage where the patch will be located.
- B. Cut out the damaged area from stringer to stringer around the crack or puncture by using a saw with the depth set no deeper than the thickness of the sheet itself.
- C. Straighten or remove/replace any damaged stringers. Install new stringers around the perimeter of the hole, back-to-back with the existing stringers, riveting the new stringers opposite from the damaged sheet. Drill through the sheet and stringers using a  $\text{Ø}.257\text{-}.261$  drill. Countersink the holes  $\text{Ø}.500 \times 100^\circ$  for "Monobolt" style or equivalent blind rivets or  $\text{Ø}.500 \times 120^\circ$  for "Q" style or equivalent blind rivets.
- D. Cut a replacement patch from 7075-T6 aluminum sheet to the size of the hole cut in the pallet sheet. Thickness of the patch should match that of the section being repaired. Drill through the patch and stringers using a  $\text{Ø}.257\text{-}.261$  drill. Countersink the holes using a  $120^\circ$  countersink. Rivet the patch to the stringers using SSCQ-84 or equivalent blind rivets. Use minimum rivet spacing as shown in Section 7.5.

7.5 Procedure to Install a Surface Patch to a Double Sheet Pallet is as Follows:

- A. Cut away torn metal and stop drill all cracks using a number 28 ( $\text{Ø}.141$ ) drill.
- B. With a hammer and bucking tool, remove dents and creases in the damaged area.
- C. From material stock of like thickness and alloy, cut a piece large enough to extend a minimum of one and three quarters ( $1\text{-}3/4$ ) inch ( $44.5\text{mm}$ ) on all sides beyond the damaged area. With a fine file or emery cloth smooth patch edges and round all corners.
- D. Fit patch over damaged area.

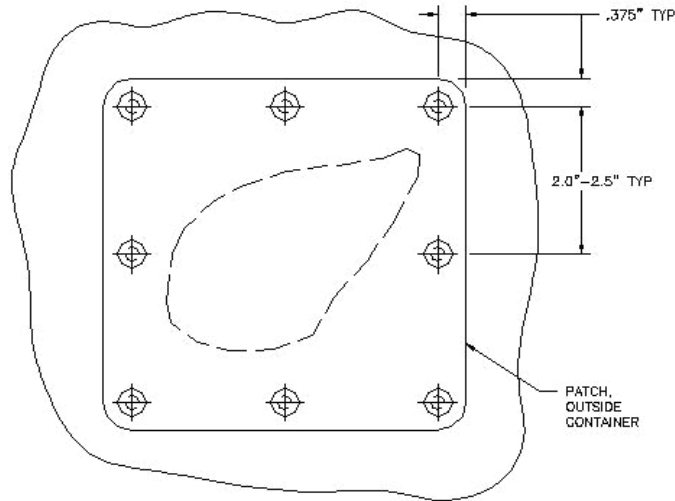
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7.0 Repair Procedures– (continued)

- E. Match drill the patch and the panel. Holes should be drilled between two and one half (2-1/2") inches (63.5mm) and two (2") inches (50mm) on centers with a minimum edge distance of three eighths (3/8") inch (9.5mm) from the edge of the patch.
- G. Install SSCQ-84 or equivalent blind rivets as required.



ALUMINUM PATCH– TYPICAL

7.5 – Fig. 1

7.6 Welded Corner Repair

In the event of a damaged or broken welded corner, the corner shall be prepared and welded as outlined in Satco, Inc. Welding Specification 31152.

7.7 Corner Tie Repair

In the event of a damaged or missing corner tie, the corner tie should be removed and replaced in the following matter:

- (A) Removed damaged corner tie by drilling out the existing attach rivets.
- (B) Prior to replacement of the damaged corner tie, clean and inspect the pallet edge rail sections in the area of the corner for breaks and cracks that may have occurred at the time of the initial damage.

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7.0 Repair Procedures– (continued)

- (C) Using the damaged corner as a template, transfer the rivet hole locations to the new corner tie.
- (D) Rivet the new corner tie in position.

7.8 Corner Cap Repair

In the event of a damaged or missing corner cap, the corner cap should be removed and replaced in the following matter:

- (A) Removed damaged corner cap by drilling out the existing attach rivets.
- (B) Prior to replacement of the damaged corner cap, clean and inspect the pallet edge rail sections in the area of the corner for breaks and cracks that may have occurred at the time of the initial damage.
- (C) Using the damaged corner as a template, transfer the rivet hole locations to the new corner.
- (D) Rivet the new corner in position.

7.9 Corner Casting Repair

In the event of a damaged or missing corner casting, the corner casting shall be replaced by removing each of the two edge rails adjacent to the corner, inserting a new corner casting into the hollow portion of the edge rail and re-attaching the edge rails. See Section 8.2 Edge Rail Replacement for details of edge rail replacement.

7.10 Edge Rail Repair

In the event of a damaged edge rail classified with allowable damage, the rail may be welded in order to prevent water intrusion, reduce sharp edges and improve the appearance of the pallet. Welding shall be performed in the following manner:

- (A) Welding is defined per Satco, Inc. Welding Specification 31152.
- (B) Material to be welded is 6061 or 6351 aluminum alloy.
- (C) Weld using a gas tungsten arc process (GTAW) consisting of 75% Min. argon gas and 25% Max. helium gas.
- (D) Filler material to be .060 - .125 diameter 4043 or 5356 aluminum alloy welding rod.

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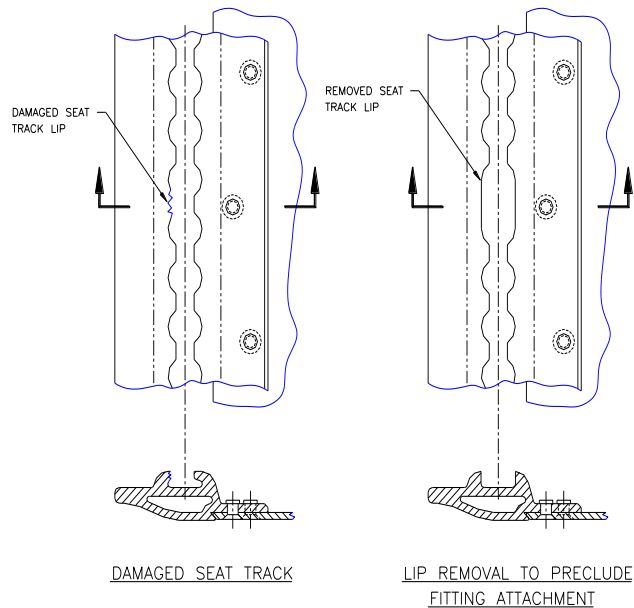
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7.0 Repair Procedures– (continued)

- (E) Full penetration welds are required unless otherwise specified in repair manuals.

If there is not a minimum of 3 contiguous undamaged pairs of seat track lips immediately adjacent to either side of any net tie down point, the damaged edge rail must be replaced. If, however, there is a minimum of 3 contiguous undamaged pairs of seat track lips immediately adjacent to either side of any or all tie down points, the pallet is considered airworthy and can be used without load restriction.

It is recommended that damaged or broken seat track lips be removed by means of commercial cutting to preclude the attempted use of the damaged section(s) as a net attach point. See 7.10 Figure 1 for details.



7.10- Fig. 1

8.0 Replacement Procedures

8.1 Pallet Sheet Replacement

If the damage to the center section is beyond the allowable limits and classified as major then the center section cannot be repaired and the entire center section must be replaced. Under no conditions may the center skin section be welded. The replacement procedure is as follows:



8.0 Replacement Procedures- (continued)

- (A) Remove the entire center section by drilling out all rivets on the center section.
- (B) Replace the center section with a new center section. Reinstall all fasteners using MS20426AD8-11 or equivalent solid rivets, SSCQ-84 blind rivets or Ø1/4 inch x 7/16 semi-tubular rivets (53102), ¼-28UNF-3A Countersunk Head Screws and MS20365-428 Self-Locking Nuts.

8.2 Edge Rail Replacement

In the event of a broken or severely damaged edge rail beyond the limits of allowable damage and classified with major damage, the rail may not be welded and must be removed and replaced in the following manner:

- (A) Remove the damaged edge rail by drilling out the existing edge rail attach rivets holding the rail in place and removing the rail and each of the two corner castings on either end of the rail.
- (B) Prior to replacement of the damaged edge rail, clean and inspect the pallet center section adjacent to the damaged rail for cracks or breaks that may have occurred at the time of the initial damage.
- (C) Attach the corner castings to the ends of the replacement edge rail, position the new edge rail on the pallet assembly and secure it to the center section by means of "C" clamps or other industrial clamping devices.
- (D) Using the pallet sheet as a template drill through the edge rail using a .257 diameter drill (F). Fasten the new edge rail in position using MS20426AD8-11 or equivalent solid rivets, SSCQ-84 blind rivets or Ø1/4 inch x 7/16 semi-tubular rivets (53102), ¼-28UNF-3A Countersunk Head Screws and MS20365-428 Self-Locking Nuts.

All replacement edge rails must be marked identical to the ones that they are replacing. The following information is the minimum required per TSO-C90c and must be legibly and permanently marked on the replacement edge rail in an area clearly visible after the pallet assembly is loaded with cargo:

- (A) Satco, Inc., El Segundo, CA.,
- (B) Tare Wt. (lbs./kgs.),
- (C) Serial Number and/or Date of Manufacture,

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8.0 Replacement Procedures- (continued)

- (D) Name, Type, Part Number or Model Designation
- (E) NAS3610 Identification Code Number,
- (F) Burn Rate,
- (G) Applicable TSO Number

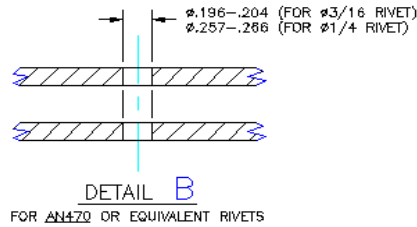
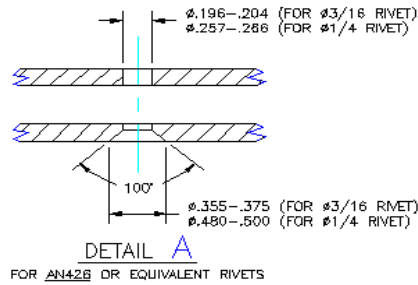
9.0 Riveting

This section covers the installation of solid steel and/or aluminum rivets.

- A. Allowable rivets: AN426 (counter-sunk), AN470 (round head), or MS20426 (countersunk), MS20470 (round head).
- B. Each rivet hole shall be prepared per illustration below unless otherwise noted on an engineering drawing and/or engineering order.
- C. Prior to rivet installation, all chips, dirt and burrs shall be removed from material being riveted.
- D. Rivets shall be squeezed or driven with a die conforming to the contour of the manufactured head of the rivet.
- E. All  $\text{Ø}1/4$  inch rivets shall be driven to a minimum head diameter of .312 and a maximum head diameter of .400, maximum height shall be .280 and minimum height shall be .100. All  $\text{Ø}3/16$  inch rivets shall be driven to a minimum head diameter of .250 and a maximum head diameter of .350, maximum height shall be .220 and a minimum height shall be .070.
- F. The driven head shall exhibit a firm seat against the material being riveted. The formed head of the rivet shall not contain more than two minor splits. A minor split is a crack extending  $1/4$  the distance from the outer edge to the center of the rivet.

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9.0 Riveting- (continued)



SOLID RIVET INSTALLATION

9.0- Fig. 1

10.0 Fastener Specifications

Care must be taken to use fasteners with the proper length based on the thickness of the material to be fastened. See Section 10.1 for additional information about fastener length selection and Section 10.2 for proper rivet head forming.

10.1 34700 SPECIFICATION- FASTENER LENGTH SELECTION

10.1.1 Purpose

This specification sets guidelines for fastener length selection based on material thickness and the type of fastener specified on Satco Engineering drawings.

The engineering drawing specifies the fastener type and size, such as "AN3", "MS20426B6", etc., without giving a length code. Manufacturing will use this document to select the correct fastener length for the application.

10.1.2 Bolts and Screws

Bolt and screw lengths are selected to insure proper thread extension beyond locking elements of MS20364 and MS20365 nuts. MS20365 nuts are to be used unless drawings specify otherwise. See Tables 1 and 2 for bolt protrusion limits.

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10.0 Fastener Specifications- (continued)

10.1.3 Solid Rivets

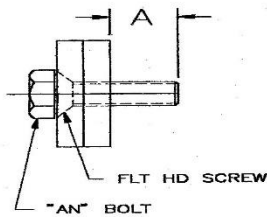
Solid rivet length is selected to insure sufficient material is available to form a full head when the rivet is upset by bucking or squeezing. See Table 3 for rivet length limits.

10.1.4 Blind/Pull Rivets

Rivet length for pull type fasteners is determined from manufacturer's data based on thickness of material being fastened.

Cherry's Monobolt and "Q" rivets use a 4 letter code to indicate rivet type and material, such as "CCPV" or "SSCQ". A 2 or 3 digit dash number is added to specify diameter and grip range. Table 4 gives appropriate Monobolt dash number vs. material thickness. Table 6 gives appropriate "Q" rivet dash number vs. material thickness.

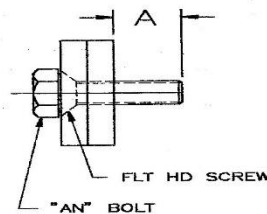
Cherry's "N" series rivets use a 3 letter code such as "BSP" or "AAC" to determine rivet style and material. A 2 or 3 digit dash number is added to specify diameter and grip. Table 5 gives dash number vs. material thickness.



BOLT PROTRUSION LIMITS FOR MS20365 NUTS

TABLE 1

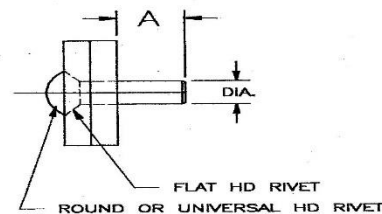
BOLT SIZE	SCREW SIZE	DIM "A" LIMITS	
		MIN.	MAX.
AN3	10-32	.25	.38
AN4	1/4-28	.33	.47
AN5	5/16-24	.36	.53
AN6	3/8-24	.47	.64
AN7	7/16-20	.48	.68
AN8	1/2-20	.62	.82



BOLT PROTRUSION LIMITS FOR MS20364 NUTS

TABLE 2

BOLT SIZE	SCREW SIZE	DIM "A" LIMITS	
		MIN.	MAX.
AN3	10-32	.19	.32
AN4	1/4-28	.22	.36
AN5	5/16-24	.27	.44
AN6	3/8-24	.29	.45
AN7	7/16-20	.34	.54
AN8	1/2-20	.34	.54



RIVET PROTRUSION FOR PROPER UPSET  
SOLID RIVETS, FLAT & ROUND HEADS

TABLE 3

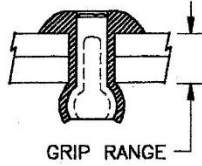
RIVET SIZE	DIM "A" LIMITS	
	MIN.	MAX.
.125	.15	.19
.187	.23	.30
.250	.30	.38

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10.0 Fastener Specifications- (continued)

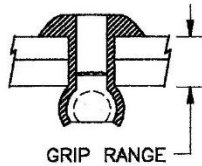
TABLE 4  
AVDEL & CHERRY "MONOBOLT" RIVETS  
PROTRUDING HEAD



RIVET DIA	GRIP RANGE	LENGTH REF.	CHERRY PART NO.	AVDEL PART NO.
3/16	.062-.270	.72	SSPV-64	2771-0613
	.125-.331	.80	SSPV-66	2771-0617
	.214-.420	.85	SSPV-67	2771-0615
1/4	.080-.375	.92	SSPV-86	2771-0817
	.125-.475	1.03	SSPV-88	2771-0824
	.350-.625	1.17	SSPV-810	*2761-0821

\* COUNTERSUNK HEAD ONLY

TABLE 5  
CHERRY "N" RIVETS



RIVET DIA	GRIP RANGE	LENGTH REF.	USE DASH NO.
3/16	.020-.125	.32	-62
	.126-.250	.45	-64
	.251-.375	.57	-66
	.376-.500	.70	-68
	.501-.625	.85	-610
	.626-.750	.98	-612
1/4	.020-.125	.37	-82
	.126-.250	.50	-84
	.251-.375	.62	-86
	.376-.500	.75	-88
	.501-.625	.90	-810
	.626-.750	1.03	-812

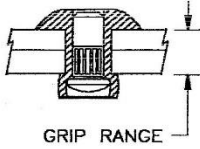
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10.0 Fastener Specifications- (continued)

TABLE 6  
CHERRY "Q" RIVETS



RIVET DIA	GRIP RANGE	LENGTH REF.	USE DASH NO.
3/16	.062-.125	.32	-62
	.126-.250	.45	-64
	.251-.375	.57	-66
	.376-.500	.70	-68
	.501-.625	.85	-610
	.626-.750	.98	-612
1/4	.062-.125	.37	-82
	.126-.250	.50	-84
	.251-.375	.62	-86
	.376-.500	.75	-88
	.501-.625	.90	-810
	.626-.750	1.03	-812

IDENTIFICATION CODE-

FIRST LETTER IS RIVET MATERIAL;  
A = 5052 ALUM. B = 5056 ALUM. C = STAIN. STL S = STEEL

SECOND LETTER IS MANDREL MATERIAL;  
A = 7178 ALUM. S = STEEL C = STAIN. STL

THIRD LETTER IS HEAD STYLE;  
P = PROTRUDING L = LARGE FLANGE C = COUNTERSUNK

FOURTH LETTER IS RIVET TYPE CODE;  
Q = CHERRY "Q" RIVET, STRUCTURAL, SELF-PLUGGING

FIRST NUMBER IS RIVET DIA. IN 32NDS.  
SECOND NUMBER IS MAXIMUM GRIP IN 16THS.

S S C Q - 8 6

Countersink dimensions for the various Blind/Pull Rivets are as follows:

Monobolt-Ø3/16,	Ø.375 X 100°
Ø1/4,	Ø.500 X 100°
"Q"/"N"- Ø3/16,	Ø.375 X 120°
Ø1/4,	Ø.500 X 120°

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10.0 Fastener Specifications- (continued)

10.2 36630 SPECIFICATION- RIVET FORMING

10.2.1 Purpose

This specification sets guidelines for proper rivet head forming based on the rivet diameter and the type of rivet specified on Satco Engineering drawings.

The engineering drawing specifies the rivet type and size, such as "MS20426B6", "BSP-3", etc., without giving the typical height and diameter dimensions after forming.

10.2.2 Solid Rivets

Formed solid rivet minimum height and diameter dimensions are selected to insure sufficient strength after the rivet is upset by bucking. See Table 1 for formed solid rivet minimum height and diameter dimensions.

10.2.3 Semi-Tubular Rivets

Formed semi-tubular rivet minimum height and diameter dimensions are selected to insure sufficient strength after the rivet is upset by bucking. See Table 1 for formed semi-tubular rivet minimum height and diameter dimensions.

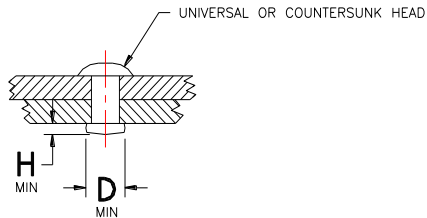


TABLE 1		
FOR SOLID AND SEMI-TUBULAR RIVETS		
NOMINAL DIAMETER	D MIN	H MIN
3/32	.132	.033
1/8	.175	.045
5/32	.219	.057
3/16	.264	.070
7/32	.307	.083
1/4	.350	.095
9/32	.394	.107
5/16	.438	.125

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10.0 Fastener Specifications- (continued)

10.3 Self Threading Screws

When installed thru all layers of material, the self-threading screw must extend at least flush with the last layer of material to insure full thread engagement.

10.4 Fastener Head Orientation

Unless otherwise specifically indicated on engineering documents, there is no restriction as to which side of the material the fastener head is located except when using self-threaded fasteners to attach aluminum sheet. In this application, the manufacturer's head must be installed on the aluminum sheet side.

10.5 Unusable Fastener Holes

In keeping with established sheet metal repair practices, if a fastener hole is deemed to be unusable (i.e.: elongated beyond established tolerances), it is permitted to abandon the hole and install new fasteners of equal or greater diameter on either side of the abandoned hole.

10.6 Fastener Substitutions

The following specific fastener substitutions have been accepted and approved by Satco Engineering and may be utilized by repair stations performing maintenance of Satco, Inc. products.

- A. The use of ¼ inch MS24694S-( ) screws with MS21083N4 nuts in place of ¼ inch AN426B8-( ) solid aluminum rivets on all Satco pallets or container bases is approved.
- B. The use of ¼ inch semi-tubular steel rivets in place of ¼ inch AN426B8-( ) solid aluminum rivets on all Satco pallets or container bases is approved.
- C. The use of countersunk steel pull rivets (either 3/16 inch diameter or ¼ inch diameter) in lieu of similar diameter and countersink thread-forming screws on double skinned pallets or container bases is approved.

The substitution of fasteners that are specified by various nomenclatures with equivalent fasteners when circumstances such as manufacturer's discontinuance of a product, manufacturer's change of identification or Satco product improvement occur is approved.

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10.0 Fastener Specifications- (continued)

In addition to the specific fastener substitutions listed above and in keeping with established sheet metal practices, Satco authorizes certified repair stations to use the following table as an approved guide for all fastener substitutions on Satco products.

Original Fastener	Approved Substitutes
Thread-Forming Screw- 10-32	<ol style="list-style-type: none"> <li>1. Bolt: AN3 with AN365-1032A nut or AN364-1032A nut.</li> <li>2. Bolt: ¼-28 Grade 5 (or better), plated, with AN365-428A nut or AN364-428A nut.</li> <li>3. Cherry "Q" Rivet: SS(P or C)Q-6(length) or SS(P or C)Q-8(length)</li> <li>4. Avdel/Cherry Monobolt: SS(P or C)V-6(length) or SS(P or C)V-8(length)</li> </ol>
Cherry"Q" Rivet: SS(PorC)Q	<ol style="list-style-type: none"> <li>1. Bolt: AN3 with AN365-1032A nut or AN364-1032A nut.</li> <li>2. Bolt: ¼-28 Grade 5 (or better), plated, with AN365-428A nut or AN364-428A nut.</li> </ol>
Cherry"Q" Rivet: BS(PorC)Q	<ol style="list-style-type: none"> <li>1. SS(P or C)Q.</li> </ol>
Avdel/Cherry Monobolt	<ol style="list-style-type: none"> <li>1. Bolt: AN3 with AN365-1032A nut or AN364-1032A nut.</li> <li>2. Bolt: ¼-28 Grade 5 (or better), plated, with AN365-428A nut or AN364-428A nut.</li> </ol>

Note: Diameter of substitute fastener must meet or can exceed diameter of original fastener. If hole of original fastener has been elongated, a larger diameter must be used.

10.7 Identification of Commercial Lock Nuts and Thread Forming Screws

**LOCKNUTS:** Unless specifically called out to the contrary, all locknuts may be commercial grade nylon insert lock nuts provided that they are dimensionally in accordance with MS20365 or MS20364 Specifications and are in accordance with ANSI Fastener standards.

**THREAD FORMING SCREWS:** All thread forming screws must be commercial grade, 1018-1022 steel, core hardness: HRC 28-38, case hardness: HRC 45 MI, case depth: .004-.009, Zinc pated per ASTM B633, Type III, Class FE/ZN 8. Head dimensions based on ANSI B186.3 machine screw and B18-6-4 tapping screw. Threads to be tri-lobular in shape.

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10.0 Fastener Specifications- (continued)

10.8 Bolt and Nut Minimum Torque Requirement

Install all bolts and nuts to hand tightness (all components in contact) and then tighten with a wrench a minimum of 1/8th of a turn (45 degrees).

11.0 Welding Specification

11.1 31152 WELDING SPECIFICATION

11.1.1 Purpose

This specification contains requirements for fusion welding of aerospace “non-flight hardware” which includes non-flight hardware, tooling and ground support equipment.

This section establishes the minimum requirements for the design and fusion welding of heat treatable aluminum alloys with the exclusion of pressure vessels using the following requirements:

American National Standard Specification for Fusion Welding for Aerospace Applications AWS D17.1:2010, Sections 4, 5, 6, 7, 9.1(3), 9.2, 9.2.1 (Class C), 9.2.2.1, 9.2.3, 9.2.4.3, 9.2.4.4(3) and 9.2.5.

- (A) Material to be welded is 6061 or 6351 aluminum alloy.
- (B) Weld using a gas tungsten arc process (GTAW) consisting of 75% Min. argon gas and 25% Max. Helium gas.
- (C) Filler material to be Ø.060-Ø.125 4043 or 5356 aluminum alloy welding rod.
- (D) Full penetration welds are required unless otherwise specified on engineering drawings.
- (E) Pallet corner joints must have 3” minimum of weld total, top and bottom. (1.5” top + 1.5” bottom= 3.0” minimum weld unless otherwise specified on engineering drawings.)
- (F) Non-critical welds: to prevent water intrusion, reduce sharp edges or improve the appearance of the article, allowable cracks, punctures and tears may be repaired by welding.

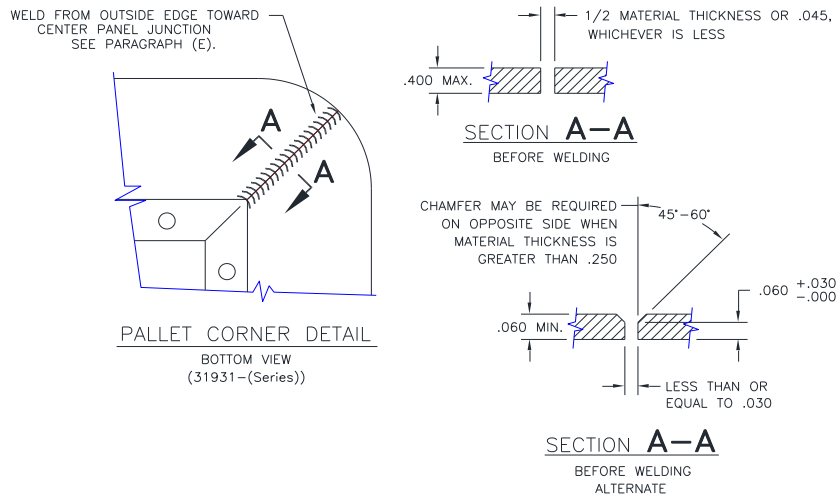
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11.0 Welding Specification- (continued)

- (1) Damage to extrusions other than the door bar extrusions may be welded if the damage does not exceed cracks of 3.0 inches longitudinally or .50 inches laterally.
- (2) Damage to door bar extrusions may be welded if the damage does not exceed cracks of 1.0 inch longitudinally or .375 inches laterally.
- (3) If an extrusion is damaged beyond the allowable limits listed above, it may not be welded and must be replaced.



11.0- Fig. 1