Revision of Damage Limits & Repair Manual

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The enclosed manual is complete and includes the following revision's:

- Updated Record of Revision
- Updated List of Effective Pages
- Major update of content
- Removed two chapters about welded pallets

DAMAGE LIMITS AND REPAIR MANUAL
FOR
AIR CARGO PALLETS

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Record of revisions

Rev.	Issued date	Description	Date inserted	By
A	05 Jan 2022	Initial Release	05 Jan 2022	RB
B	29 Aug 2022	Major revision	29 Aug 2022	HK

List of Effective Pages

Table of Contents

Introduction

A. The Nordisk CMM system consists of the “Damage Limits and Repair Manual” and a separate manual called CMM Illustrated Parts List (IPL). These two documents constitute a complete CMM.

B. Use this “Damage Limits and Repair Manual” in conjunction with the ULDs CMM IPL. For each individual CMM IPL where this “Damage Limits and Repair Manual” is referenced, the information kept within the check and repair chapters will be removed and the following statement will be inserted:

   Refer to manual no. 25-54-16. For detailed information on the check and repair procedures applicable to this ULD.

C. This “Damage Limits and Repair Manual” will replace both check and repair Chapters in the component maintenance manuals (CMM). It will function as a general check and repair document for all Nordisk ULDs where it is referenced in the CMM IPL.

D. Page numbering system in Parts 1 to 4 is 100 pages per Part. This is to allow for future changes to the text or procedures.

Abbreviations and acronyms

ATA	Air Transport Association
CMM	Component Maintenance Manual
DL & RM	Damage Limits and Repair Manual
EASA	European Aviation Safety Agency
EASA Part 145	European Maintenance Approval Regulation
ETSO	European Technical Standards Order
FAR Part 145	American Maintenance Approval Regulation
FAA	Federal Aviation Administration
IPL	Illustrated Parts List
LEP	List of Effective Pages
MOA	Maintenance Organisation Approval
MRO	Maintenance Repair Organisation
ODL	Operational Damage Limits
OEM	Original Equipment Manufacturer
P/N	Part Number
RFMS	Request for Manufacturers Sign
S/N	Nordisk OEM Serial Number
TOC	Table of Contents
TSO	Technical Standards Order
ULD	Unit Load Device
ULDR	ULD Regulations Manual
W & B	Weight & Balance Manual

Definitions

Air cargo pallet: an air cargo pallet when used in combination with a pallet net is defined as a Unit Load Device (ULD).

General Information

A. The air cargo pallet should be checked clearly for visible damage prior to each loading. In addition to this continuous control, it is advised to inspect the air cargo pallet thoroughly for damage each time it is in for repair. This manual applies only to Nordisk air cargo pallets. The pallet net delivered with the pallets uses a separate CMM that will be supplied by the OEM of that product.

B. Operational Damage Limit Notice attached to the air cargo pallet lists the individual damage limits.

C. Allowable damage is defined as damage that does not affect the structural integrity of the air cargo pallet. All damage should be subject to repair as it may interfere with transfer systems, or other equipment. It is recommended to repair allowable damage to prevent injury to personnel due to sharp edges and to prevent intrusion of water. Please note that the wording “should” indicate the manufacturers recommendation only, and it is left to the owner’s discretion to follow this recommendation or not.

D. Repairs shall be performed only by workshops holding Maintenance Organisation Approval (MOA) in accordance with FAR Part 145, EASA Part 145 or equivalent National Regulations.

E. If damage found exceeds limitations of allowable damage, the air cargo pallet shall be subject to repair.

General Inspection

A. Visual Inspection

The air cargo pallet 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.

B. General Visual Inspection

(1) Check the base sheet for holes, tears or cracks.
(2) Check the pallet assembly for any missing fasteners or broken hardware.
(3) Check the pallet assembly for any bent, broken or damaged edge rail extrusions.
(4) Check the base edges for any damage that might restrict the movement of the pallet or its interface with the aircraft restraint system. Check for loose or missing hardware.
(5) Check for deflection outside original contour.
(6) Check for any missing or damaged ID codes or logos.

C. TSO / ETSO Sign

TSO / ETSO marking shall be in place and legible.

D. Final Inspection After Repair

Each maintenance repair organisation (MRO) is responsible for preforming a final inspection after the repair of a Nordisk air cargo pallet. The air cargo pallet shall be repaired according to the DL & RM and CMM IPL manuals. Repairs shall be performed only by workshops holding Maintenance Organisation Approval (MOA) in accordance with FAR Part 145, EASA Part 145 or equivalent National Regulations.

General Repair

Repair materials
All materials used in the repairs shall be identical to materials as given in the customer specific illustrated parts list (IPL).

Caution: **Only parts and materials from or approved by Nordisk Aviation shall be used.**

Weld repair and heat straightening
See applicable chapter for information on welding method for repair of damaged parts.
Not all alloys are suitable for repair by welding, see the table below for guidance.

Alloy	Weldable	Non-weldable
7003	x	
7021	x	
7108	x	
7075		x

When straightening bent extrusions, heat may be applied provided that maximum temperature in the heat affected zone does not exceed 200°C (392°F) and that heat is not applied for more than 10 minutes.

Caution: **If higher temperature is applied over a longer period, mechanical properties will be drastically reduced.**

Brackets, angles or corners must not be welded under any circumstances. Any bracket, angle or corner that are cracked, broken or deformed significantly from original shape are to be replaced.

Cleaning
Normally, cleaning of the air cargo pallet is not necessary. If cleaning is required to improve appearance, contaminated surface should be cleaned with a 50 / 50 isopropyl alcohol or other compatible non-oily solvents (test on a small area first).

NOTE: Some solvents may damage or un-stick decals.

DAMAGE LIMITS AND REPAIR MANUAL
AIR CARGO PALLETS

1 Standard Non-Welded Pallets

1.1 Inspection of Standard Non-Welded pallets

1.1.1 **[SB] Sheet Base**

There shall be no cracks or holes (other than drain holes).
Maximum convex or concave indentation is 5 mm depth or height, see Figure 100.
Maximum 25 mm convex or concave dishing of the entire base plate when unloaded.
Maximum repairable damage is defined as holes or cracks in the base sheetless than 300 mm.

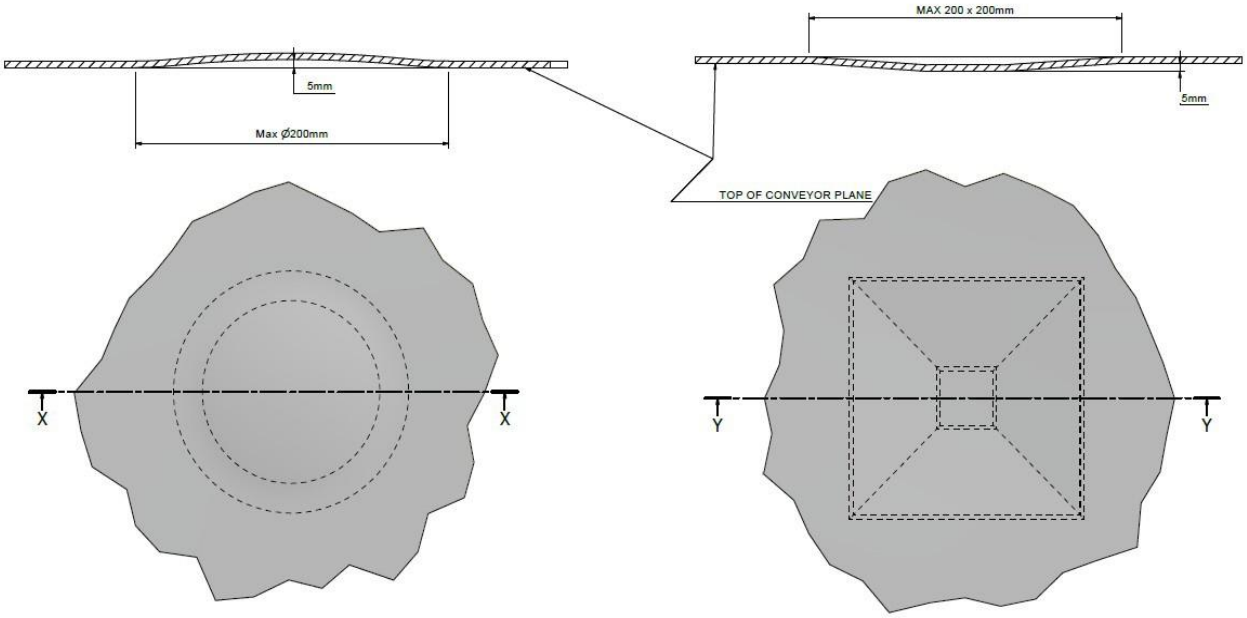


Figure 100

1.1.2 **[EB] Extrusion Base**

There shall be no broken or missing parts. Maximum two 25 mm sized cracks in longitudinal direction, minimum 500 mm apart.-Maximum 28 mm sized bowed, warped or deflected extrusion. If these limits are exceeded, interference with aircraft floor locks may occur.

For L- and K-sizes – no cracks in any directions allowed.

1.1.3 **[TB] Tie-down points Base**

1.1.3.1 Continuous seat track

There shall be at least 4 undamaged adjacent pairs of seat track lips at each attachment point. There shall be no clogging with dirt or other contaminant.

1.1.3.2 Single stud attachment

For single stud attachments there should be 1 pair of adjacent seat track lips at each net attachment point.

1.1.4 **[FB] Fasteners Base**

There shall be no more than 3 broken, loose or missing fasteners per edge rail minimum 300 mm apart.

1.1.5 **[CB] Corner Base connection**

There shall be no deformed, broken or missing corner connections.

1.1.6 **[TM] TSO / ETSO**

TSO / ETSO marking shall be in place and legible.

1.1.7 **Special Requirements**

No damage, loose or missing parts that can result in ULD or its cargo becoming a hazard to personnel, the airplane structure, or systems.

1.2 Repair of Standard Non-Welded Pallets

1.2.1 **[SB] Sheet Base**

1.2.1.1 Warped plate

When limitation is exceeded, the plate should be flattened either by a big hammer and wooden planks or by roller bending. After flattening, check that external dimensions of base are correct. If the plate cannot be flattened, the base should be replaced.

1.2.1.2 Plate indentation

Holes or cracks in the plate less than 300 mm should be repaired as follows: Cut out a circular or rectangular section around the damaged area. Make a new plate, with the same thickness or thicker, in alloy AA 7075-T6 or AA7021-T6 that will fit into the cut out with max. 3 mm clearance. Make a doubler plate, with the same thickness or thicker, in alloy AA 7075-T6 or AA 7021-T6, which will overlap hole by 30 mm on each side. Fit pre-made patching plate and attach doubler plate to pallet plate with fasteners P/N 113343-307, using edge distance 15 mm and inter fastener spacing 35 mm. Use 5 mm dia. drill bit and 90-degree countersink drill bit. Standard precut and predrilled patching sheets in various sizes are available from the manufacturer; see Figure 102, Table 1.

For repair of lower sheet on forkliftable bases, see section *2.2.1.3*

1.2.2 **[EB] Extrusion Base**

1.2.2.1 Bent edge rails

Straighten by pressing edge rail in opposite direction to bend. Heat may be applied as described in *General Repair.*

If edge rail needs to be replaced use the following procedure:

(1) Remove all fasteners attaching damaged edge rail to base plate.
(2) Use 5 mm dia. drill bit and detach rail.
(3) Insert corners in ends of new edge rail. It may be necessary to coax the corners into the rails with a nylon / soft faced hammer.
(4) Position a new edge rail and check that external dimensions are correct.
(5) Drill dia. 5 mm holes through edge rail using the holes in plate as templates.
(6) Install new fasteners using suitable tubular fastener forming equipment.

1.2.2.2 Broken or cracked edge rails

Broken or cracked edge rails. Broken or cracked edge rails may be replaced as described in section *1.2.2.1* above or repaired by welding using TIG or MIG equipment and welding wire in alloy AA5356 (AlMg5) or equivalent. The limits of the repair by welding are equivalent to the damage limits.
Welding transversal on the edge rails is not allowed.
Patches on the edge rails are not allowed.

1.2.3 **[TB] Tie-down points**

1.2.3.1 Damaged tie down brackets

All damaged internal tie down bracket shall be replaced as follows: Remove damaged bracket by removing 2 fasteners and snap bracket out of base extrusion. Insert a new bracket in base extrusion with 2 new fasteners as per customer CMM IPL.

1.2.3.2 Damaged continuous seat track

Nordisk air cargo pallets with damage to continuous seat tracks can be made serviceable by removing damaged lip sets. See Figure 101. There shall be at least 4 undamaged adjacent pairs of seat track lips at each net attachment point. In order to avoid inadvertent attachment of net fittings, any damaged seat track lip should be removed. Broken or permanently deformed seat track lips should be removed by using a chisel hammer or a 20 mm dia. milling cutter. Note that lip opposite to damaged lip should also be removed. Damaged seat track shall be removed to avoid inadvertent use.

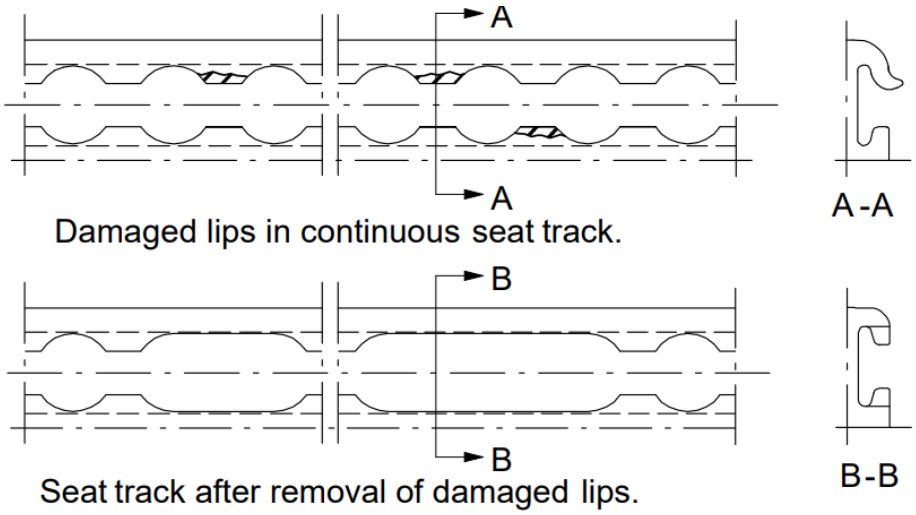


Figure 101 - Removal of damaged seat track lip sets

1.2.4 **[FB] Fastener Base**

1.2.4.1 Loose or missing fasteners

See section *1.1.4* for limitations. If limitations are exceeded, loose or missing base fasteners shall be replaced according to instructions in section *1.2.2.1*.

1.2.4.2 Repair of enlarged fastener holes

When fastener holes in edge rails or sheets are enlarged (e.g. result from removal of fasteners) to more than 6 mm diameter, new holes should be drilled in 2 staggered rows approx. half way between the old fastener holes.

1.2.4.3 Corner base connection

Broken corners, see Figure 103.

Broken corners shall be replaced as follows:

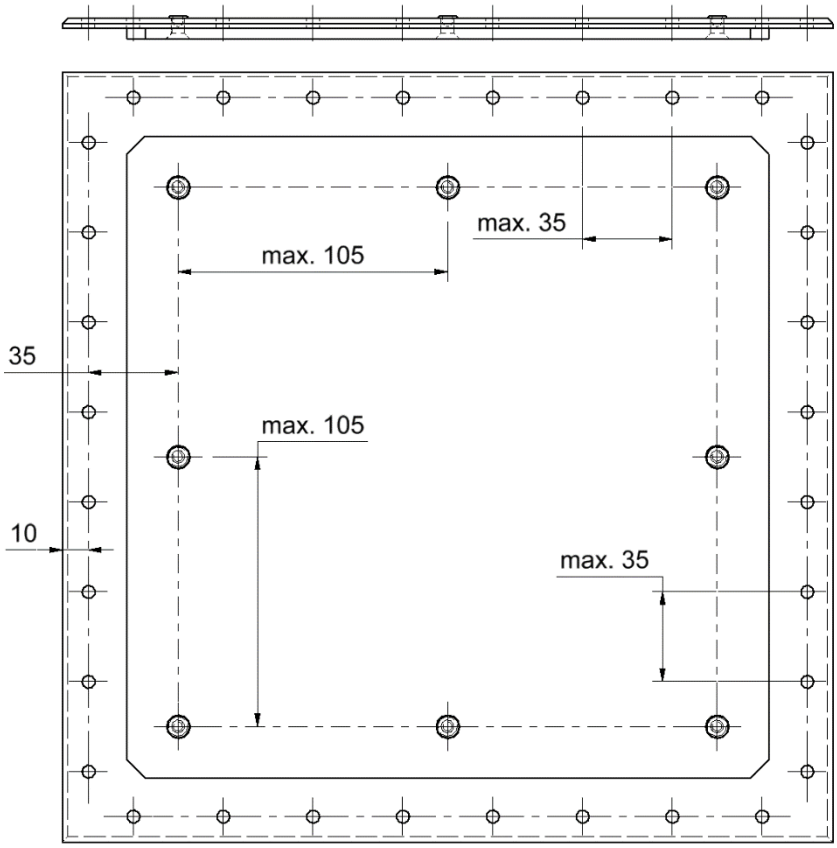
(1) Remove all fasteners attaching an adjacent edge rail to base plate. Use 5,1 mm dia. drill bit.
(2) Replace broken corner in end of the loose edge rail.
(3) It may be necessary to coax the corner into the rails with a nylon / soft faced hammer.
(4) Position the edge rail and install new fasteners as per Customer CMM IPL using suitable tubular fastener forming equipment.

1.2.4.4 [TM] TSO / ETSO

Damaged or missing identification and TSO / ETSO marking shall be repaired.

Ref. section *1.2.1.2*.
Pre-made base doubler patches available - cross reference doubler patch thickness to the base thickness in Customer CMM IPL.

Figure 102



Part Number	Hole size [mm]	Patch size [mm]	Thickness [mm]	Number of fastener holes
811935	75 x 75	125 x 125	2.5	12
811939	125 x 125	300 x 300	2.5	32
813805	300 x 300	360 x 360	2.5	40
811944	75 x 75	125 x 125	2.8	12
811947	125 x 125	300 x 300	2.8	32
813808	300 x 300	360 x 360	2.8	40
811950	75 x 75	125 x 125	3.0	12
811954	125 x 125	300 x 300	3.0	32
813811	300 x 300	360 x 360	3.0	40
121650-304	75 x 75	125 x 125	3.8	12
121650-305	125 x 125	300 x 300	3.8	32
813814	300 x 300	360 x 360	3.8	40
812036	75 x 75	125 x 125	4.0	12
812039	125 x 125	300 x 300	4.0	32
813817	300 x 300	360 x 360	4.0	40

Table 1

Ref. section *1.2.4.3*.

Corner Base Connection

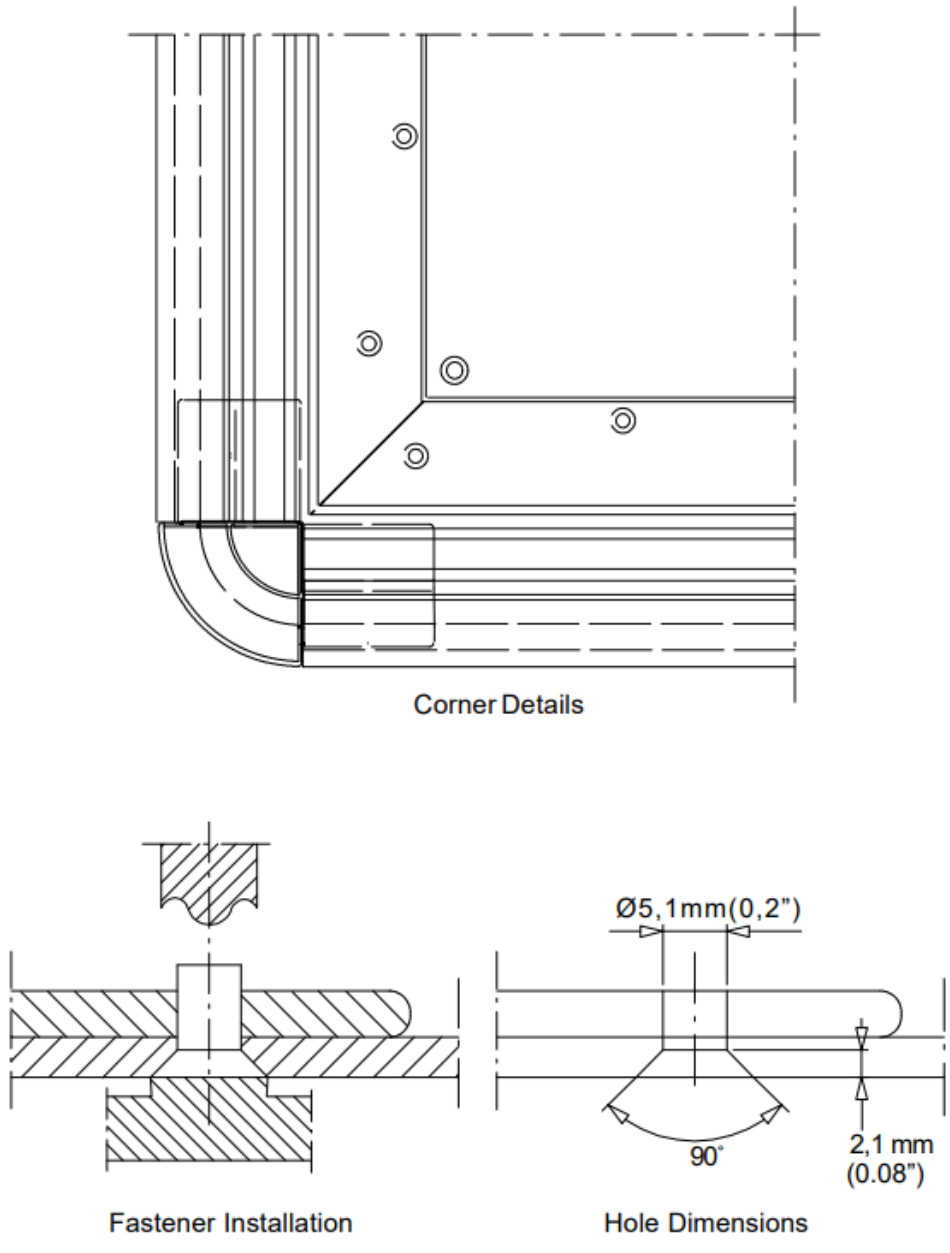


Figure 103

2 Standard Non-Welded Heavy Duty Pallets

2.1 Inspection of Standard Non-Welded Heavy Duty Pallets

2.1.1 **[SB] Sheet Base**
See section *1.1.1*.

2.1.2 **[EB] Extrusion Base**
No broken or missing parts. No cracks in any direction. No more than 28 mm bowed, warped or deflected extrusion.

2.1.3 **[TB] Tie-down points Base**
See section *1.1.3*.

2.1.4 **[FB] Fasteners Base**
See section *1.1.4*.
The same damage limit also applies for the stiffeners in the middle of the pallet.

2.1.5 **[CB] Corner Base connection**
See section *1.1.5*.

2.1.6 **[TM] TSO / ETSO**
See section *1.1.6*.

2.1.7 **Special Requirements**
See section *1.1.7*.

2.2 Repair of Standard Non-Welded Heavy Duty Pallets

2.2.1 **[SB] Sheet Base**

2.2.1.1 Warped plate
See section *1.2.1.1*

2.2.1.2 Plate indentation – upper sheet
See section *1.2.1.2*

2.2.1.3 Plate indentation – lower sheet
Holes or cracks in the lower sheet less than 300 mm, should be repaired as follows:

(1) Cut a rectangular hole around the damaged part of the sheet and welding in a new piece of sheet, provided sheet cutout is less than 40” x 40” (1016 x 1016 mm.
(2) Remove a rectangular area around the sheet damage by drilling dia. 10mm holes in the corners of the rectangle, removing all blind rivets inside this area, and cutting the sheet between the drilled holes using a grinder or similar equipment. Make sure core extrusions are not damaged.
(3) Cut a piece of the sheet that fits into the hole cut in the sheet. Grind a groove between existing sheet and patch to allow proper welding.
(4) Use TIG or MIG equipment and welding wire in alloy AA5356 (AlMg5. Make sure weld has full penetration.
(5) If the welding causes unacceptable warping in the sheet, the whole sheet needs to be replaced.
(6) Attach new countersunk blind rivets P/N 113270-358 by drilling dia. 6.5-7.0 mm holes in patch, with 90 mm column spacing and one row for each core extrusion.

2.2.2 **[EB] Extrusion Base**

2.2.2.1 Bent edge rails
See section *1.2.2.1*

2.2.2.2 Broken or cracked edge rails
See section *1.2.2.2*.

2.2.3 **[TB] Tie-down points**

2.2.3.1 Damaged tie down brackets
See section *1.2.3.1*.

2.2.3.2 Damaged continuous seat track
See section *1.2.3.2*.

If damaged seat track is located on vertical side of heavy-duty pallet edge extrusion, damaged seat track shall be removed according to Figure 101 to avoid inadvertent use. Adjacent seat track on top (horizontal) of pallet edge extrusions must be used.

2.2.4 **[FB] Fastener Base**

2.2.4.1 Loose or missing fasteners
See section *1.2.4.1*.

2.2.4.2 Repair of enlarged fastener holes
See section *1.2.4.2*.

2.2.5 **Corner base connection**

Broken corners, see Figures 104 and 105.
Broken corners shall be replaced as follows:

(1) Remove all fasteners attaching an adjacent edge rail to base plate. Use 5 mm dia. drill bit.
(2) Replace broken corner in end of the loose edge rail.
(3) It may be necessary to coax the corner into the rails with a nylon / soft faced hammer.
(4) Position the edge rail and install new fasteners as per CMM IPL using suitable tubular fastener forming equipment.

2.2.6 **[TM] TSO / ETSO**

See section *1.2.4.4*.

Ref. Section *2.2.5*.

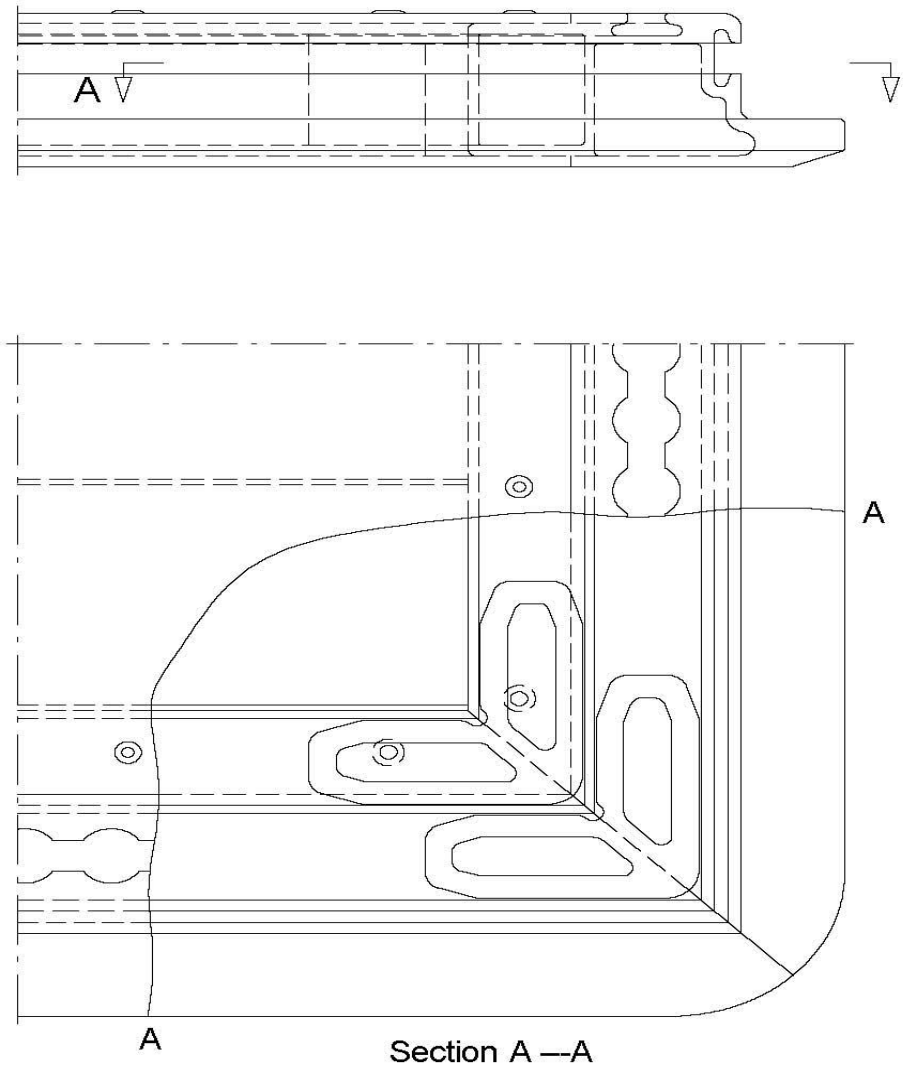


Figure 104

Ref. Section *2.2.5*.

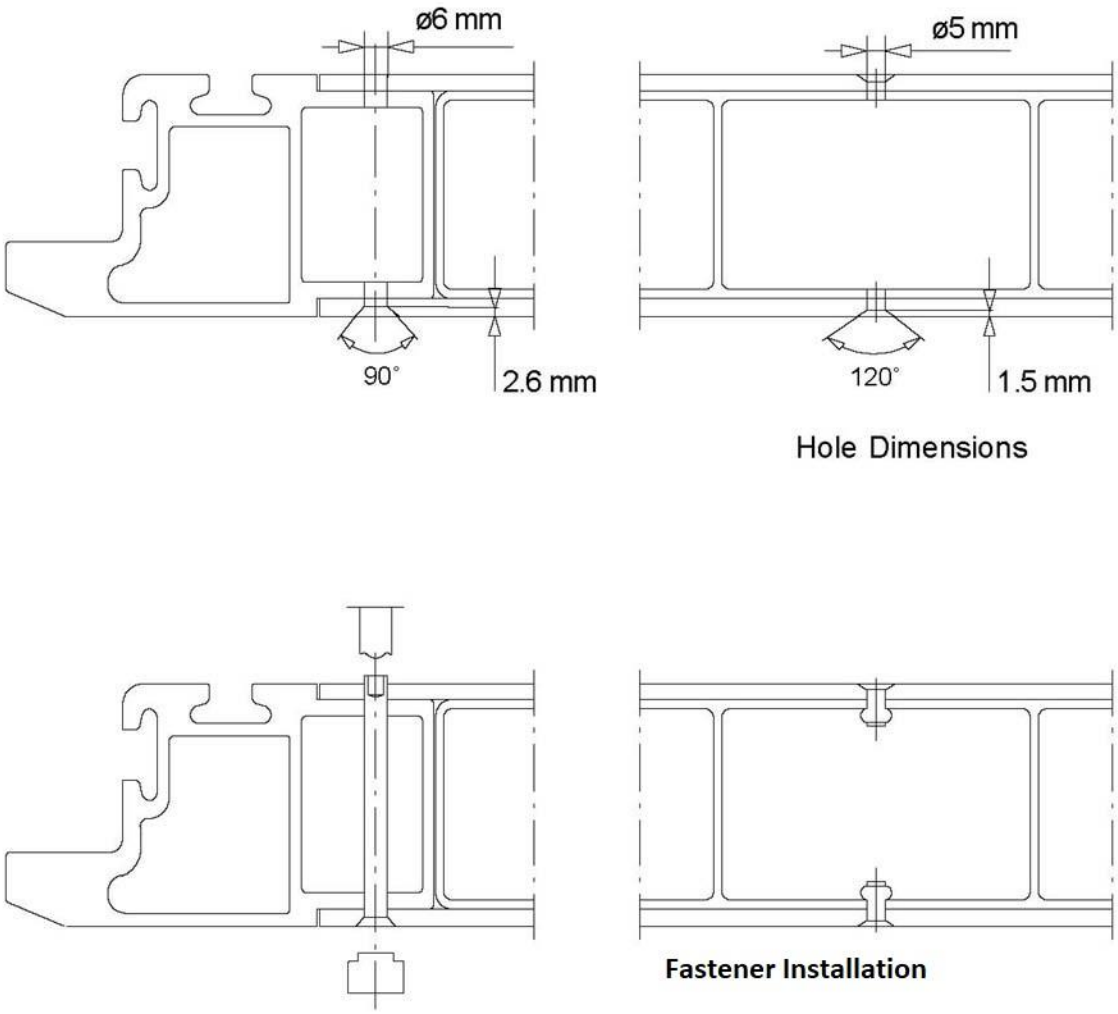


Figure 105

3 Standard Military Style Pallets

3.1 Inspection of Standard Military Style Pallets

3.1.1 **[SB] Sheet Base**
See section *1.1.1*

3.1.2 **[EB] Extrusion Base**
There shall be no broken or missing parts. No cracks in any direction. Maximum 28 mm sized bowed, warped or deflected extrusion. If these limits are exceeded, interference with the aircraft floor locks may occur.

3.1.3 **[TB] Tie-down points Base**
There shall be no missing or loose fasteners in tie-down D-rings. There shall be no clogging with dirt or other contaminant.

3.1.4 **[FB] Fasteners Base**
See section *1.1.4.*

3.1.5 **[CB] Corner connection Base**
See section 1.1.5

3.1.6 **[TM] TSO / ETSO**
See section 1.1.6

3.2 Repair of Standard Military Style Pallets

3.2.1 **[SB] Sheet Base**

3.2.1.1 Warped plate
See section *1.2.1.1.*

3.2.1.2 Plate indentation
See section *1.2.1.2.*

3.2.2 **[EB] Extrusion Base**

3.2.2.1 Bent edge rails
See section 1.2.2.1

3.2.2.2 Broken or cracked edge rails
See section 1.2.2.2

3.2.3 **[TB] Tie-down points Base**

3.2.3.1 Loose or missing fasteners in tie-down D-ring
Remove damaged fastener; first hammer out centre pin and then use a 7.5 mm drill bit to bore out the fastener. Install new fasteners as per CMM IPL using suitable tubular fastener forming equipment.

3.2.3.2 Missing tie-down ring
Any missing tie-down D-ring shall be replaced, follow instructions given in section *3.2.3.1*.

3.2.4 **[CB] Corner Base connection**

Broken corners. See Figure 106.
Broken corners shall be replaced as follows:

(1) Remove all fasteners attaching an adjacent edge rail to base plate. Use 5 mm dia. drill bit.
(2) Replace broken corner in end of the loose edge rail. It may be necessary to coax the corner into the rails with a nylon / soft faced hammer.
(3) Position the edge rail and install new fasteners as per CMM IPL using suitable tubular fastener forming equipment.

3.2.5 **[TM] TSO / ETSO**

See section 1.2.4.4

Ref. Section 3.2.4

Corner Details

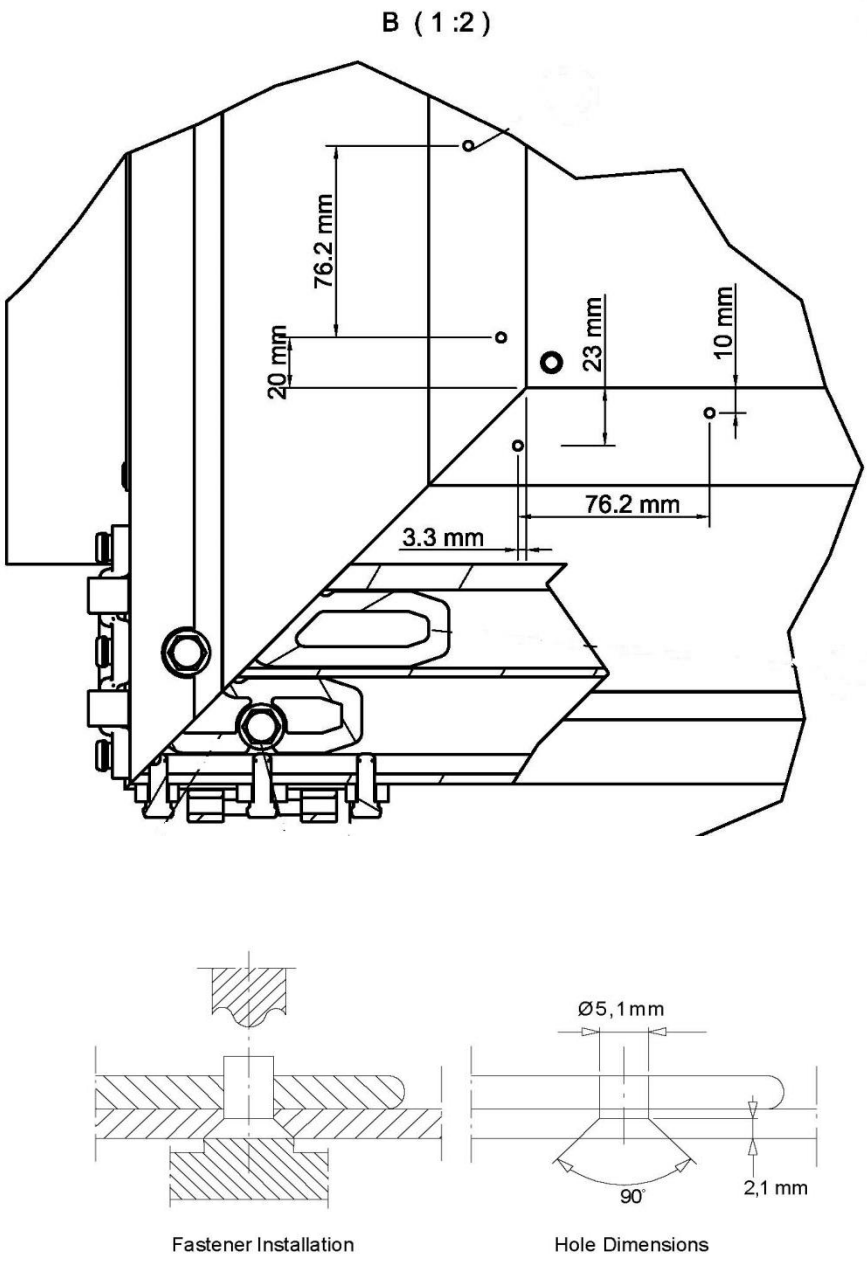


Figure 106

DAMAGE LIMITS AND REPAIR MANUAL
AIR CARGO PALLETS

4 Standard Non-Certified Pallets

4.1 Inspection of Standard Non-Certified Pallets

4.1.1 General

The pallet should be checked for clearly visible damage prior to each loading. In addition to this continuous control, it is advised to inspect the pallet thoroughly for damage each time it is in for repair.

If damage found exceeds limitations as described in this chapter, the pallet shall be subject to repair. Please note that the wording “should” indicate the manufacturers recommendation only, and it is left to the ULD owners’ discretion to follow this recommendation or not.

Operational Damage Limit Notice: **ODL-NonCrt-001**.

Pallet may not be used if any of the conditions below are exceeded.

[N/A] No damage that result in:

- the ULD or cargo becoming a hazard to the airplane structure or system
- pallet not matching the contour as approved in the aircraft W&B
- pallet not being restrained in the cargo loading system

4.1.1.1 [TM] Manufacturers sign

The manufacturers markings shall be in place and legible.

4.2 Repair of Standard Non-Certified Pallets

4.2.1 General

For Standard Non-Welded Pallets if damage outside limits as per section *4.1.1*, repair according to Part 1 – Standard Non-Welded Pallets, section *1.2*.