TO: ALL HOLDERS OF REPAIR OF POLYYURETHANE AND POLYISOCYANURATE DUCTS COMPONENT MAINTENANCE MANUAL 36-10-12

REVISION NO. 4 DATED NOV 01/01

HIGHLIGHTS

All data that was in 737/747 OHM 36-10-02 and 757/767 CMM 36-10-02 is included in this CMM 36-10-12. Pages which have been added or revised are outlines below together with the highlights of the revision. Remove and insert the affected pages as listed and enter Revision No. and date on the Record of Revision Sheet.

CHAPTER/SECTION AND PAGE NO.	DESCRIPTION OF CHANGE
ALL PAGES	Changed the header to include polyurethane ducts.
TITLE PAGE	Added duct repairs per document D6-55553, which
1	replaces the repairs per obsolete document D6-4038.
DESCRIPTION & OPERATION	
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401	
501-502	
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CHAPTER/SECTION AND PAGE NO.	DESCRIPTION OF CHANGE
REPAIR 9-1 601	HIGHLIGHT CONTINUED FROM PREVIOUS PAGE
REPAIR 10-1 601	
TR & SB RECORD 1	Added repair of duct 214U3413-series.
CONTENTS 1	Added clarifications and updated callouts.

BOEING

COMPONENT
MAINTENANCE MANUAL

REPAIR OF POLYURETHANE AND POLYISOCYANURATE DUCTS

NO ASSIGNED PART NUMBER

COMPONENT MAINTENANCE MANUAL
WITH
ILLUSTRATED PARTS LIST

REVISION RECORD

- Retain this record in front of manual. On receipt of revision, insert revised pages in the manual, and enter revision number, date inserted and initial.

REVISION NUMBER	REVISION DATE	DATE FILED	BY

REVISION NUMBER	REVISION DATE	DATE FILED	BY

TEMPORARY REVISION AND SERVICE BULLETIN RECORD

BOEING SERVICE BULLETIN	BOEING TEMPORARY REVISION	OTHER DIRECTIVE	DATE OF INCORPORATION INTO MANUAL
		PRR N52001-72 PRR 80269 PRR 81966	JUL 10/83 JAN 10/86 NOV 01/01

PAGE	DATE	CODE
36-10-12		
TITLE PAGE		
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* = REVISED, ADDED OR DELETED

TABLE OF CONTENTS

*[1] Special instructions are not necessary. Use standard practices.

INTRODUCTION

The instructions in this manual provide the information necessary to perform maintenance functions ranging from simple checks and replacement to complete shop-type repair.

This manual is divided into separate section:

1. Title Page
2. Record of Revisions
3. Temporary Revision & Service Bulletin Record
4. List of Effective Pages
5. Table of Contents
6. Introduction
7. Procedures

Refer to the Table of Contents for the page location of applicable sections. An asterisked flagnote *[ ] in place of the page number indicates that no special instructions are provided since the function can be performed using standard industry practices.

All weights and measurements used in the manual are in English units, unless otherwise stated. When metric equivalents are given they will be in parentheses following the English units.

REPAIR OF POLYUREATHANE AND POLYISOCYANURATE DUCTS

DESCRIPTION AND OPERATION

1. This manual gives Boeing recommended procedures for repair of defects in polyurethane and polyisocyanurate ducts. Polyurethane ducts have a fiberglass core with a layer of polyurethane foam. Polyisocyanurate ducts have isocyanurate foam with fiberglass fabric or Kevlar facing skins. These ducts supply conditioned air to the cabin of the airplane. The repairs given are for the damage most frequently found. If there is more damage than this, it is better and easier to replace all, or part of the duct, than to repair the damage. Repairs to the interior duct surfaces are not recommended because they could cause noise and flutter problems.

2. The Grade 1300-series procedures come from Boeing Process Document D6-55553, which gives procedures for repair of the surfaces of certain airplane-interior components, and which replaces document D6-4038. These procedures are to help you make sure the repaired parts will continue to agree with the fireworthiness rules for the airplane interiors. The rules give the persons in the airplane more protection from the sudden flames that come when materials become heated to their flash point temperature.

CLEANING

WARNING: USE GOGGLES OR PROTECTIVE EYE COVERING WHEN YOU SPRAY DUCTS TO PREVENT DAMAGE TO THE EYES.

1. Remove loose duct skin, dirt and foam with a stiff bristle brush and compressed air.

2. Clean the area to be repaired with butyl carbitol, as indicated in the individual repairs. Wipe dry with clean gauze or cheesecloth before the solvent dries.

CHECK

1. Use the following data to decide if the duct can be repaired.

   A. General

      (1) Only defects on the outside surface of the duct can be repaired.

      (2) Defects cannot be repaired if deeper than half the nominal wall thickness, or if there is delamination between the foam core and interior skin.

      (3) More then 5 square inches of delamination between skin and foam core cannot be repaired.

      (4) Breaks or cracks in the foam core cannot be repaired.

      (5) Defects longer than 3 inches (in any direction on the duct) or more than 5 square inches in area cannot be repaired, unless as given in item (6).

      (6) Narrow scratches and cuts up to 6 inches long can be repaired only if the damage is to the skin, and not to the foam.

      (7) A duct with two damaged areas closer then 4 inches apart cannot be repaired.

      (8) There cannot be more than two repairs for each 8 square feet of exterior duct surface. If the duct has less than 8 square feet of exterior surface, the limit is two repairs per duct.

   B. Grade 1300 Dents/Scratches

      (1) Defects must be within the general limits of par. A. given above.

   C. Grade 1301 Cuts

      (1) On the outside surface only

(2) Less than 1/8 inch deep and less than 1 inch long

D. Grade 1302 Cuts

(1) On the outer surface only

(2) Less than 1/8 inch long and more than 1 inch long

E. Grade 1303 Cuts

(1) On the outer surface only

(2) Glass to foam delamination less than 1/8 inch deep and less than 3 inches wide

F. Grade 1304 Cuts

(1) On the inside surface

G. Grade 1305 Gouges

(1) Less than 1/4 inch deep, less than 1 inch long, more than 1/32 inch wide

H. Grade 1306 Gouges

(1) More then 1/4 inch deep, more than 1 inch long

(2) No defects on inside skin

I. Grade 1307 Cuts

(1) Defects that go through the inside and outside skin

2. Examine the ducts for pin holes and leaks.

3. Look for old repairs on the inside surface of the ducts. Make sure they are smooth and have no unbonded or separated skin that could be caught up by the airstream in the duct.

REPAIR - GENERAL

1. Content

A. Repair, refinish and replacement procedures are included in separate repair sections as follows:

NAME	REPAIR
GRADE 1300 DENTS/SCRATCHES	1-1
GRADE 1301 CUTS	2-1
GRADE 1302 CUTS	3-1
GRADE 1303 CUTS	4-1
GRADE 1304 CUTS	5-1
GRADE 1305 GOUGES	6-1
GRADE 1306 GOUGES	7-1
GRADE 1307 CUTS	8-1
DUCT 214U3413-SERIES	9-1
DISBONDED DUCT JOINTS	10-1

2. Standard Practices

A. Refer to the following standard practices, as applicable, for details of procedures in individual repairs.

20-30-03 General Cleaning Procedures
20-30-91 Solvents for Final Cleaning of Composites Before Non-Structural Bonding (Series 91)
20-50-12 Application of Adhesives
20-60-01 Cleaning Materials
20-60-02 Finishing Materials
20-60-04 Miscellaneous Materials

3. Materials

A. Abrasive Paper -- Grits 80, 100, 150, 220, 240, 320, 400, 600

B. Adhesives -- Types 38, 77, 98 (SOPM 20-50-12)

C. Catalysts

(1) Benzoyl peroxide in tricresyl phosphate base

(a) Garox BZP, V22401

(b) Luperco ATC or AFR paste, V75675

(2) Methyl ethyl ketone peroxide, 60 percent in dimethyl phthalate liquid

(a) Luperson DDM-9, V75675

D. Cheesecloth, lint free -- BMS 15-5 (SOPM 20-60-04)

E. Glass Fabric -- BMS 9-3, Type D

F. Glass Fibers, milled, 1/32 inch length, V45255

G. Mylar Film -- 0.001-0.010 inch thick

H. Resin -- Hetron 92, V29672 or V70304

I. Solvents

(1) Butyl carbitol, V36346

(2) Solvents of cleaners per D6-7127 for interior painted and plastic surfaces (SOPM 20-30-03)

(3) Series 91 solvent (SOPM 20-30-91)

J. Tape, Fiberglass, 3-inch wide, V45255

4. Resin Preparation

NOTE: Resin mixes R109 and R109A are optional to each other. R109 is cured with heat. R109A is cured at room temperature.

A. Resin Mix R109

WARNING: COBALT NAPHTENATE MUST NOT BE MIXED WITH BENZOYL PEROXIDE OR METHYL ETYL KETONE PEROXIDE. SUCH A MIXTURE IS EXPLOSIVELY REACTIVE.

(1) Add 1.8-2.2 parts by weight of Benzoyl Peroxide catalyst to 98 parts Hetron 92 resin.

(2) If the mixture becomes a gel before you can use it, discard the mixture and make some more.

(3) Apply the mixture as specified in the repair procedure.

(4) Cure this mixture 30 minutes at 250-280°F.

B. Resin Mix R109A

(1) Add 0.2 weight percent cobalt naphthenate to 49-51 grams Hetron 92.

(2) Add 0.625 weight percent MEK peroxide.

(3) Pot life of this mixture is 60 minutes at 70-80°F.

(4) Apply the mixture as specified in the repair procedure.

(5) Cure this mixture 60 minutes at 85-95°F.

C. Titanium dioxide can be added to the resin mixture to make it opaque.

D. To fill voids, mix catalyzed resins with the milled glass fibers to make a paste.

5. Vendors

V22401 RAM CHEMICALS DIV OF WHITTAKER CORP
210 EAST ALONDRA BOULEVARD
GARDENA, CALIFORNIA 90248-2808

V29672 ASHLAND CHEMICAL CO.
8901 OLD GALVESTON ROAD
HOUSTON, TEXAS 77034-3939

V36346 UNION CARBIDE CORPORATION, LINDE DIVISION
39 OLD RIDGEBURY ROAD
DANBURY, CONNECTICUT 06817-0001

V45255 OWENS-CORNING FIBERGLASS CORPORATION
WORLD HQ, FIBERGLASS TOWER - T/11
TOLEDO, OHIO 43659-0001

V70304 ASHLAND CHEMICAL CO GENERAL POLYMERS DIV
11524 WEST ADDISON STREET
FRANKLIN PARK, ILLINOIS 60131

V75675 ATOCHEM NORTH AMERICA
1740 MILITARY ROAD
BUFFALO, NEW YORK 14240

GRADE 1300 DENTS/SCRATCHES - REPAIR 1-1

NOTE: Refer to REPAIR - GENERAL for a list of applicable standard practices.

1. Grade 1300 Dents/Scratches

   A. Sand the damaged area lightly with 180-grit or finer abrasive paper.

   B. Wipe the surface with butyl carbitol.

   C. Fill dents with BMS 5-28 material.

   D. Cut a patch from fiberglass material to be 3/8 inch larger than the damaged area.

   E. Soad the patch with Type 38 adhesive.

   F. Put the patch over the damaged area.

   G. Cure the repair (SOPM 20-50-12)

GRADE 1301 CUTS - REPAIR 2-1

NOTE: Refer to REPAIR - GENERAL for a list of applicable standard practices.

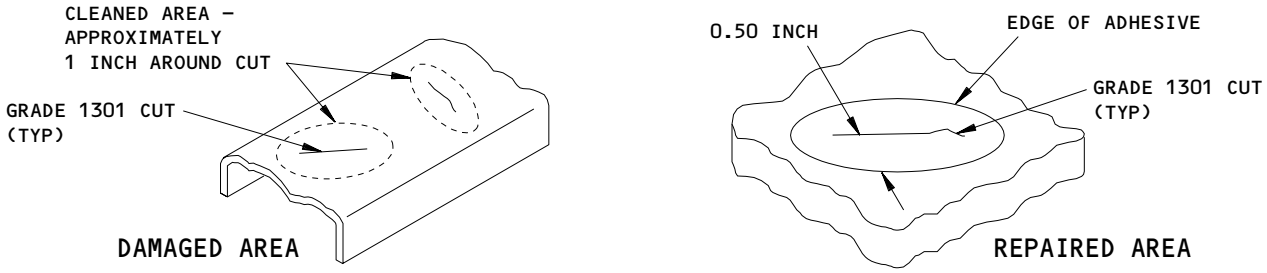
1. Grade 1301 Cuts

A. Clean the area of the cut with butyl carbitol.

B. Mix some prepared resin with milled glass fibers to make a paste.

C. Apply a layer of the resin mixture to the area of the cut.

D. Cure the resin.



Grade 1301 Repair
Figure 601

43978

GRADE 1302 CUTS - REPAIR 3-1

NOTE: Refer to REPAIR - GENERAL for a list of applicable standard practices.

1. Grade 1302 Cuts

   A. With butyl carbitol, clean the area of the cut and an adjacent area a minimum of one inch around the cut.

   B. Cut a patch from from fiberglass material to be larger than the damaged area.

   C. Put the cut patch on a clean work surface or on a piece of Mylar.

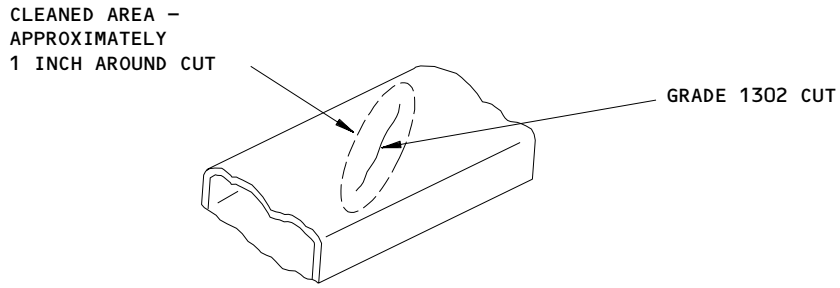
   D. Pour resin on the patch. Cover this with more Mylar and wipe off unwanted resin with a squeegee.

   E. Put the path over the damaged area.

   F. Rub the patch down smooth over the surface and wipe off unwanted resin.

   G. Cure the resin.

   H. Remove the Mylar.



DAMAGED AREA

REPAIRED AREA

Grade 1302 Repair
Figure 601

43981

GRADE 1303 CUTS - REPAIR 4-1

NOTE: Refer to REPAIR - GENERAL for a list of applicable standard practices.

1. Grade 1303 Cuts

A. Cut away loose glass.

B. Clean the area around the damage with butyl carbitol.

C. Cut a patch from fiberglass material to be larger than the damaged area.

D. Put the cut patch on a clean work surface or on a piece of Mylar.

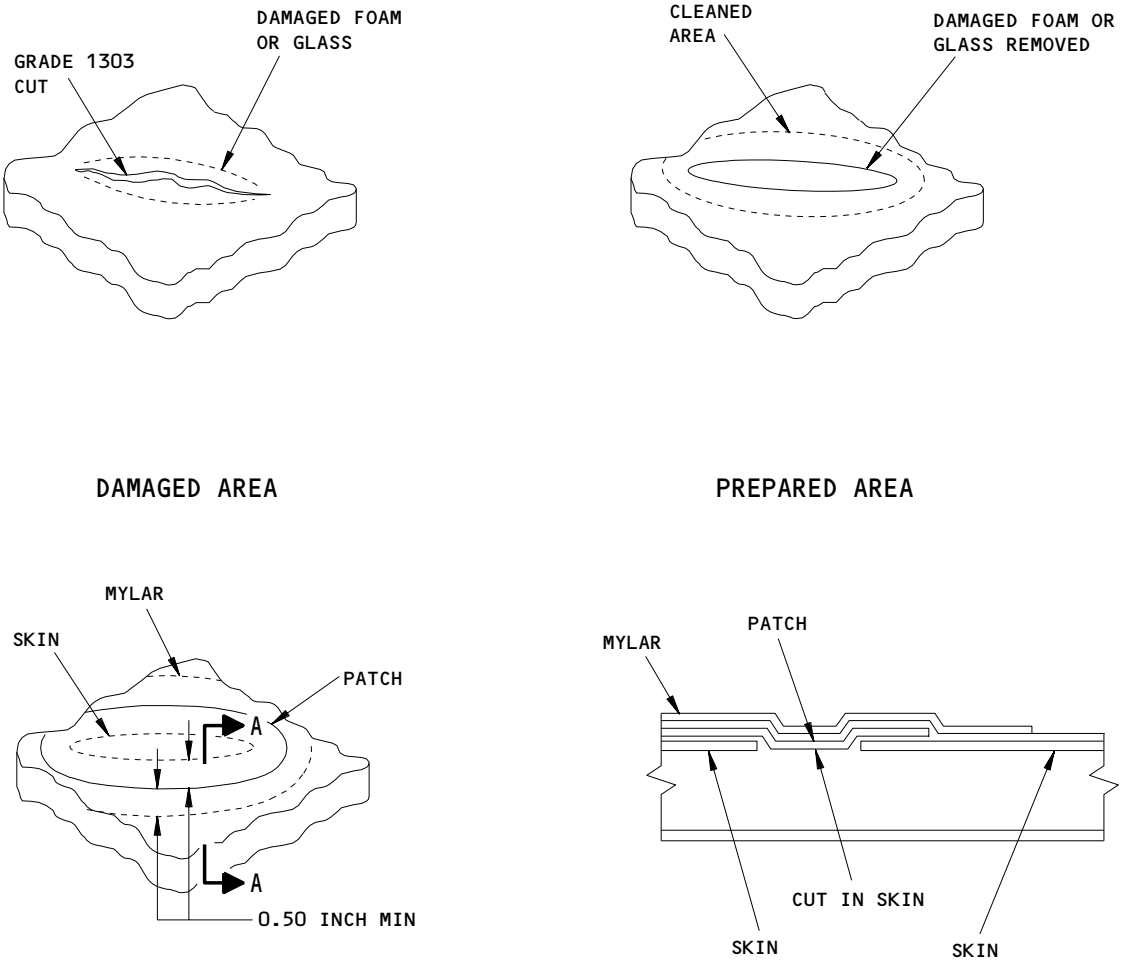
E. Pour resin on the patch. Cover this with more Mylar and wipe off unwanted resin with a squeegee.

F. Put the patch over the damaged area.

G. Rub the patch down smooth over the surface and wipe off unwanted resin.

H. Cure the resin.

I. Remove the Mylar.



Grade 1303 Repair
Figure 601

43982

GRADE 1304 CUTS - REPAIR 5-1

NOTE: Refer to REPAIR - GENERAL for a list of applicable standard practices.

1. Grade 1304 Cuts

A. Generally, cuts on the inside surface of a duct cannot be repaired.

GRADE 1305 GOUGES - REPAIR 6-1

NOTE: Refer to REPAIR - GENERAL for a list of applicable practices.

1. Grade 1305 Gouges

A. Cut away loose or delaminated glass.

B. Clean the area around the damage with butyl carbitol.

C. Mix some prepared resin with milled glass fibers to make a paste.

D. Fill the gouge with the resin mixture.

E. Cut a patch from fiberglass material to be larger than the damaged area.

F. Put the cut patch on a clean work surface or on a piece of Mylar.

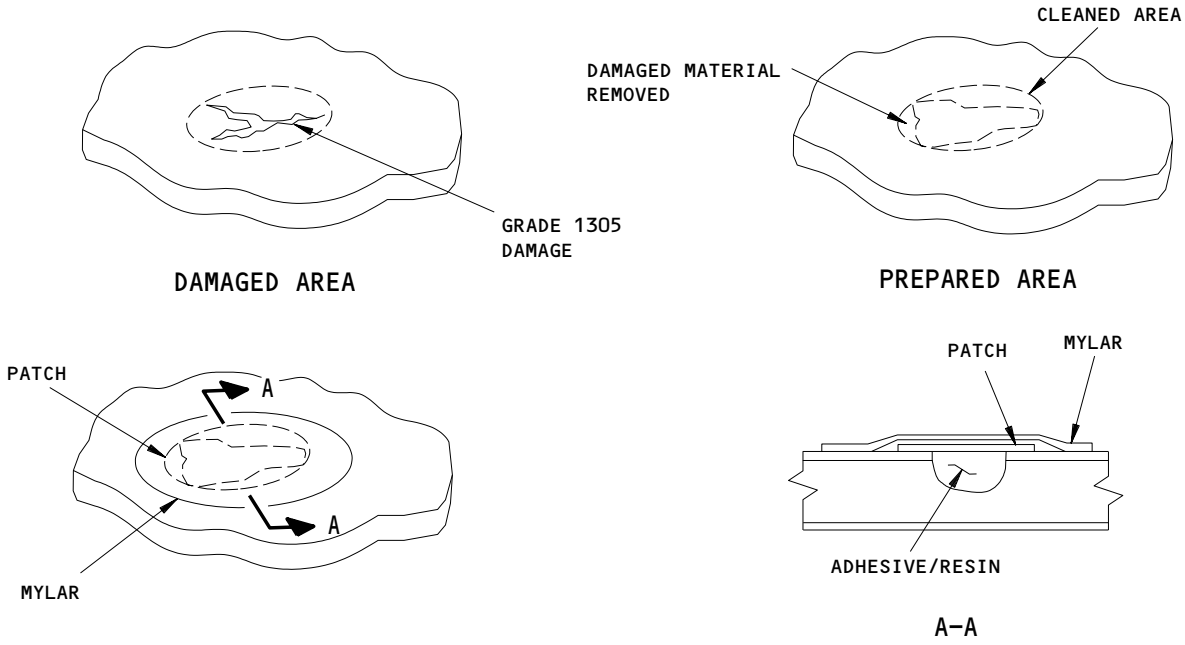
G. Pour resin on the patch. Cover this with more Mylar and wipe off unwanted resin with a squeegee.

H. Put the patch over the damaged area.

I. Rub the patch down smooth over the surface and wipe off unwanted resin.

J. Cure the resin.

K. Remove the Mylar.



Grade 1305 Repair
Figure 601

M19116

GRADE 1306 GOUGES - REPAIR 7-1

NOTE: Refer to REPAIR - GENERAL for a list of applicable standard practices.

1. Grade 1306 Gouges

A. Cut away damaged foam down to, but not through, the opposite layer of glass.

B. Clean the area around the damage with butyl carbitol.

C. Get an old scrap duct and cut a plug from it to fit the hole in the good duct within 1/8 inch.

D. Mix some prepared resin with milled glass fibers to make a paste.

E. Bond the plug in position and fill gaps around it with the resin mixture.

F. Cut a patch from fiberglass material to be larger than the damaged area.

G. Put the cut patch on a clean work surface or on a piece of Mylar.

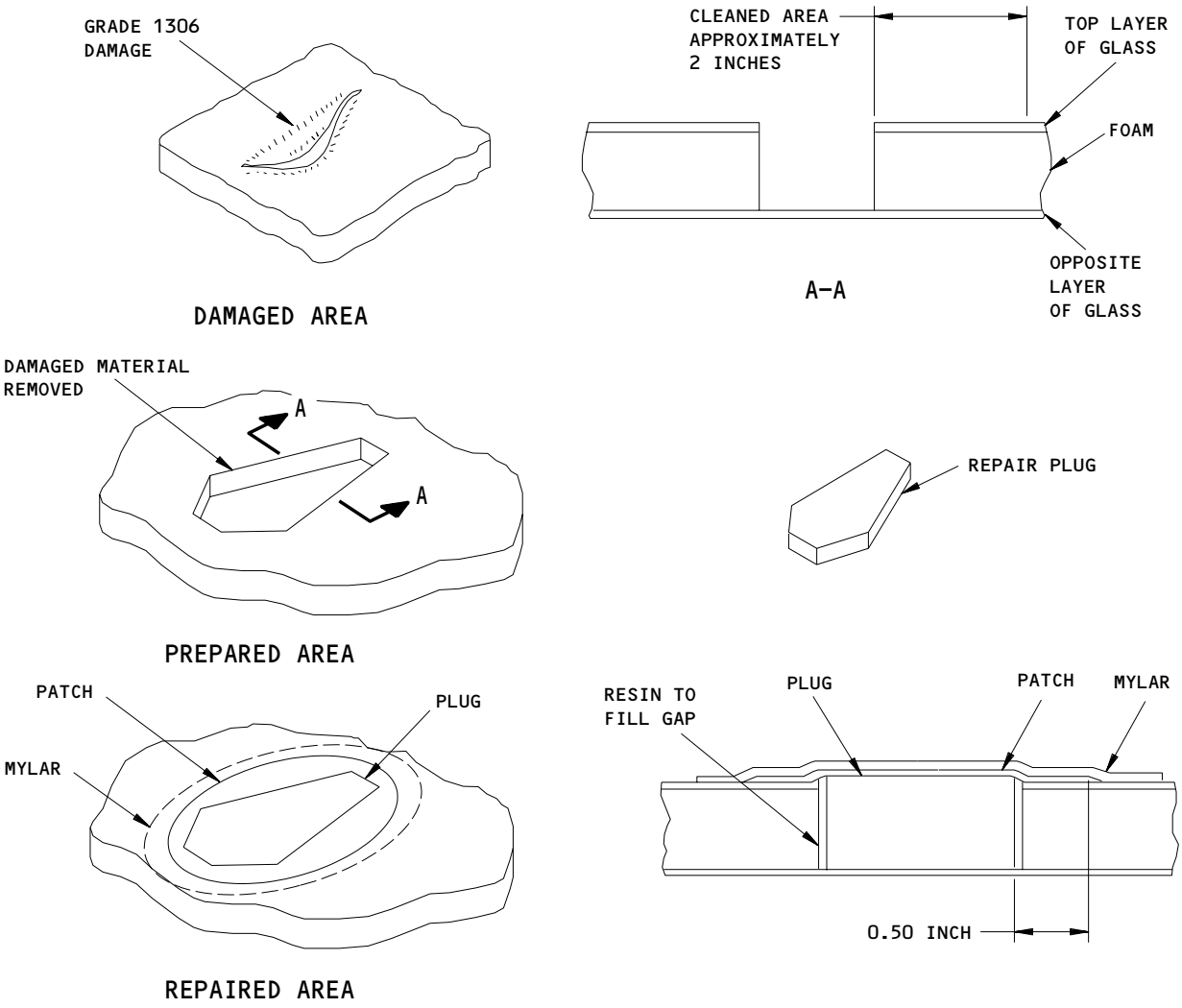
H. Pour resin on the patch. Cover this with more Mylar and wipe off unwanted resin with a squeegee.

I. Put the patch over the damaged area.

J. Rub the patch down smooth over the surface and wipe off unwanted resin.

K. Cure the resin.

L. Remove the Mylar.



Grade 1306 Repair
Figure 601

M19136

GRADE 1307 CUTS - REPAIR 8-1

NOTE: Refer to REPAIR - GENERAL for a list of applicable standard practices.

1. Grade 1307 Cuts

   A. Cut away the foam and the outside layer glass to make a slot 1/8 inch wide.

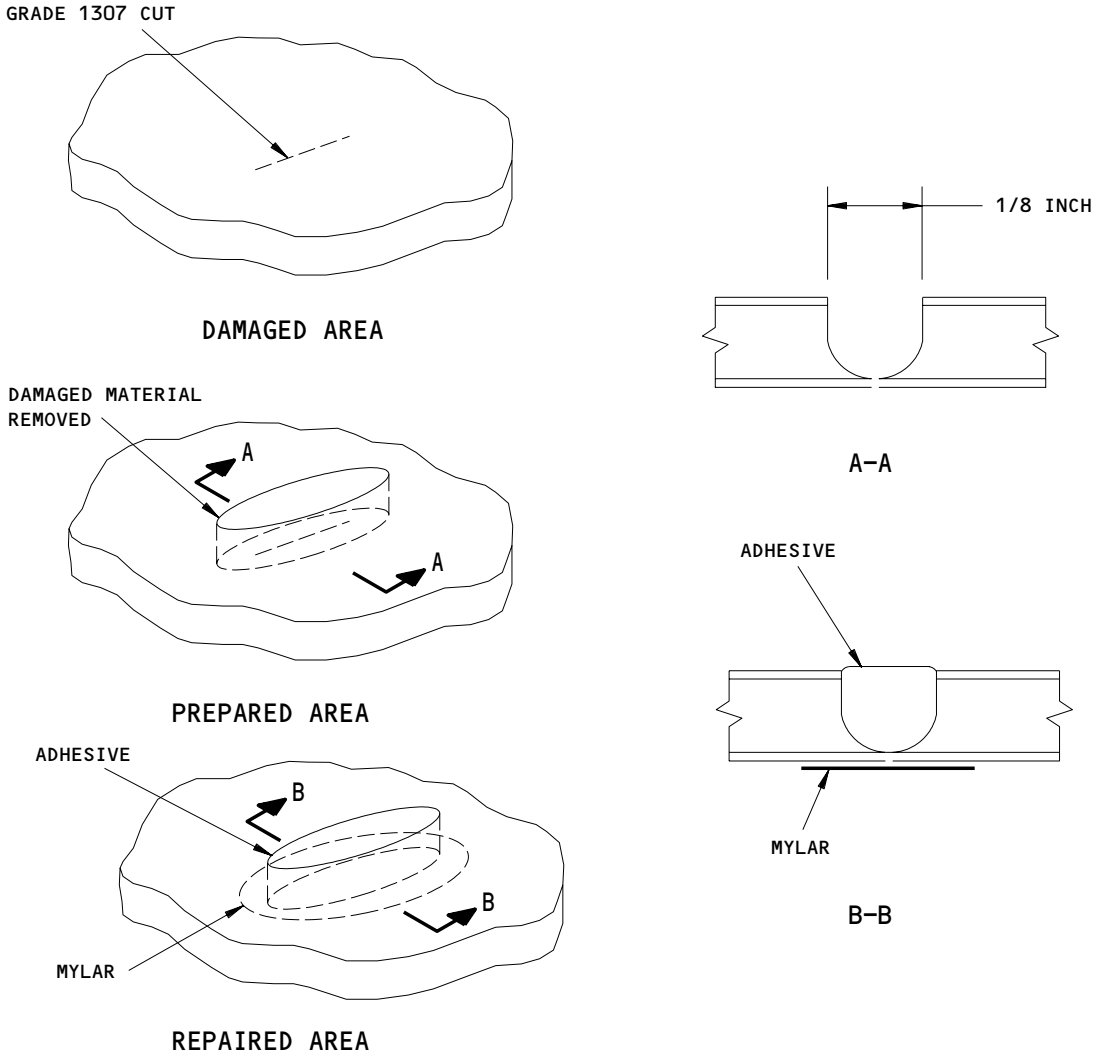
   B. Mix some prepared resin with milled glass fibers to make a paste.

   C. Fill the slot with the resin mixture.

   D. Cover this with Mylar to keep the resin smooth.

   E. Cure the resin.

   F. Remove the Mylar.



Grade 1307 Repair
Figure 601

M19192

LAVATORY AND GALLEY VENT DUCT - REPAIR 9-1

214U3413-1, -2

1. Reninforcing Ply Repair

A. Clean the inside diameter surface of the duct, from the forward end to approximately 6 inches aft, with methyl ethyl ketone (MEK), naphtha, or isopropyl alcohol.

NOTE: The outside diameter surface of the duct can be used for reinforcing repair only if enough area is available after the repair to let the main flow balance orifice and forward duct be installed.

B. Patch Preparation

(1) Cut a piece of fiberglass cloth larger than the area to be repaired and put the cloth on a clean table or on a piece of Mylar film.

(2) Pour prepared resin on the patch, cover the Mylar and sweep off unwanted resin with a squeegee.

(3) This patch can be used immediately. If must be used before the resin remaining in the container starts to gel.

C. Apply one reinforcing ply to the inside diameter duct surface from the forward end to approximately 6 inches aft.

D. Sweep smooth and wipe off unwanted adhesive.

E. Let the adhesive cure before you remove the Mylar.

F. Clean the surface of the installed reinforcing ply with MEK, naphtha, or isopropyl alcohol.

G. Apply a second reinforcing ply to the surface of the installed ply.

H. Sweep smooth and wip off unwanted adhesive.

I. Let the adhesive cure before you remove the Mylar.

DISBONDED DUCT JOINTS - REPAIR 10-1

NOTE: Refer to REPAIR - GENERAL for a list of applicable standard practices.

1. Duct End Treatment (for foam core ducts only)

WARNING: USE SOLVENT ONLY IN AREAS WITH LOCAL EXHAUST VENTILATION. DO NOT LET SOLVENT GET ON SKIN. DO NOT BREATHE VAPORS.

A. Clean the area of ducts to get the tape with methyl ethyl ketone (MEK), naphtha or isoproply alcohol.

B. If the foam core duct does not have end treatment, apply fiberglass tape to the ends of the ducts by one of these methods:

(1) Soak a strip of 3-inch wide fiberglass tape with type 77 adhesive and immediately apply this to the outside surface at the ned of the duct.

(2) Or apply a 3-inch wide layer of type 77 adhesive to the outside surface at the end of the duct, then imediately install the tape. Apply one more layer of type 77 adhesive as necessary to be sure the fiberglass is soaked.

(3) Let the adhesive cure a minimum of 12 hours at 65-100°F.

2. How to Bond Duct Joints

CAUTION: WHEN YOU ASSEMBLE DUCTS ON THE BENCH, BE CAREFUL NOT BEND THE DUCTS. YOU COULD WEAKEN OR BREAK BONDED DUCT JOINTS.

BEFORE YOU BOND THE JOINTS OF FOAM CORE DUCTS. BE SURE TO TREAT THEIR ENDS PER PAR. 1.

A. Apply a layer of Type 98 adhesive to one side of fiberglass tape. A bondline thickness of 0.04-0.08 inch is necessary. To get this, apply approximately 1.5 ounces of adhesive per foot of 3-inch wide tape.

B. Immediately wrap one layer of the prepared tape, with the adhesive side down, over the duct joint. A minimum of one inch of coated tape must overlap each duct.

C. Overlap the tape ends 1 to 2 inches at the tape joint for ducts with nozzle openings.

D. Smooth out all voids, wrinkles or air pockets in the tape wrap, and apply positive pressure to be sure all of the adhesive touches the duct. Make sure the bondline thickness is 0.04-0.08 inch.

E. Let the adhesive cure under contact pressure a minimum of 24 hours at 65-100°F and minimum of 20 percent relative humidity.