DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE CIVIL ENGINEER SUPPORT AGENCY

19 DEC 2007

FROM: AFCESA/CEOA
139 Barnes Drive, Suite 1
Tyndall AFB FL 32403-5319

SUBJECT: **Engineering Technical Letter (ETL) 07-10: Evaluation and Restoration of Folded Fiberglass Mats (FFM)**

1. Purpose. The purpose of this ETL is to provide guidance for evaluating and restoring current FFM reserve materiel. Specifications relating to newly manufactured FFM are still subject to Military Specification MIL-DTL-32265, *Folded Fiberglass Mat Fabrication and Packaging*, dated 2 November 2007.

Note: The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this ETL does not imply endorsement by the United States Air Force.

2. Application. This ETL applies to all Department of Defense (DOD) organizations responsible for the use and life-cycle management of FFM used in temporary airfield repair. The proper management of these stockpiles is essential to ensure that all FFM being employed is usable and of an acceptable physical condition; such practices will avoid unnecessary procurement of new FFM.

2.1. Authority: Air Force Policy Directive (AFPD) 32-10, *Air Force Installations and Facilities.*

2.2. Coordination: Major command (MAJCOM) pavement engineers.

2.3. Effective Date: Immediately.

2.4. Intended Users*:*

- Air Force Prime BEEF and RED HORSE units;
- Army Corps of Engineers;
- Navy and Marine Corps;
- Construction contractors performing DOD airfield repairs;
- Other organizations responsible for airfield maintenance.

3. Referenced Publications.

3.1. Air Force:

- AFPD 32-10, *Air Force Installations and Facilities*, available at http://www.e-publishing.af.mil/

3.2. DOD:

- MIL-DTL-32265, *Folded Fiberglass Mat Fabrication and Packaging*, available at http://assist.daps.dla.mil/quicksearch/basic_profile.cfm?ident_number=275880

3.3. American Society for Testing and Materials (ASTM):

- ASTM E-329, *Standard Specification for Agencies Engaged in Construction Inspection and/or Testing*, available at http://www.astm.org

4. Acronyms and Terms.

AFCESA – Air Force Civil Engineer Support Agency
ASTM – American Society for Testing and Materials
BCE – base civil engineer
CONUS – continental United States
DOD – Department of Defense
ETL – Engineering Technical Letter
FFM – folded fiberglass mat
FOD – foreign object damage
OCONUS – outside continental United States
Prime BEEF – Priority Improved Management Effort - Base Engineer Emergency Force
QA – quality assurance
RED HORSE – Rapid Engineers Deployable Heavy Operations Repair Squadron Engineers
WRM – war reserve materiel

5. Preface. FFM currently functions as a foreign object debris (FOD) cover for expedient bomb crater repairs in the event of runway damage. FFM is stored as war reserve materiel (WRM) in kits as described in MIL-DTL-32265. Due to the urgent, yet infrequent, nature of their use, conditional monitoring of such FFM stockpiles is vital to prepare for expedient repairs in the event of an attack. Currently, procedural methods directed toward evaluating the physical integrity of FFM are not specified, resulting in Air Force bases either developing their own individual methods and schedules or neglecting such conditional monitoring practices altogether due to lack of guidance. While the first aforementioned practice attempts to address operational issues, a uniform and rigorous evaluation plan is more desirable. In order to develop such a plan, FFM samples have been studied to gain a better understanding of their bulk physical properties and responses to degrading environments. Results from this investigation have been used to develop guidance to evaluate existing FFM and recommend qualified methods for repairing damage.

6. FFM Evaluation Methods.

6.1. General. Two nondestructive evaluation methods are recommended for the conditional assessment of FFM held as WRM. The first method, referred to hereafter as a "Level I Evaluation," is based on the systematic visual detection of critical damage. Critical damage criteria are outlined to assist personnel in the

evaluation process; however, the final decision to accept or reject any FFM will still be based on human judgment.

The second proposed method, a “Level II Evaluation,” enables mats to be evaluated using tools that attempt to decrease the amount of relative subjectivity intrinsic to human judgment. This method requires the procurement of an ultrasonic wheel probe. By taking signal measurements at damaged FFM locations with an ultrasonic wheel probe, the evaluator will be able to base their acceptance decision on quantitative data.

6.2. Level I Evaluation: Visual Inspection.

6.2.1. FFM Preparation. Before being inspected, FFM must be thoroughly cleaned with pressurized water or scrubbed to ensure there are no areas which may cause false categorization of damage. In particular, heavy soil spots or stains appear to look like impact damage or delaminations. After cleaning, the mat should dry and be oriented so the smooth resin side (FFM bottom) is facing up. This is the recommended FFM position during evaluation because it is easier to discern damage against a smooth background. FFM will be inspected during the evaluation process for critical damage as explained in the following sections.

6.2.2. Delaminations (Ply Separations). During inspection, FFM will be examined for the presence of ply separations, commonly called delaminations. It may be difficult to discern between internal dry spots and delaminations at times, so the evaluator should examine such damage closely. Delaminations, if present, may propagate very quickly under large flexural loads, leading to FFM failure. For this reason, it is recommended that no delaminations be present on rigid panel sections of FFM used in airfield repair. The most common location for delaminations to form is throughout the hinge-panel interface area. An occurrence of such a delamination is shown in Figure 1. Delaminations in this area should not be of significant concern unless they extend out into the FFM rigid panel area.

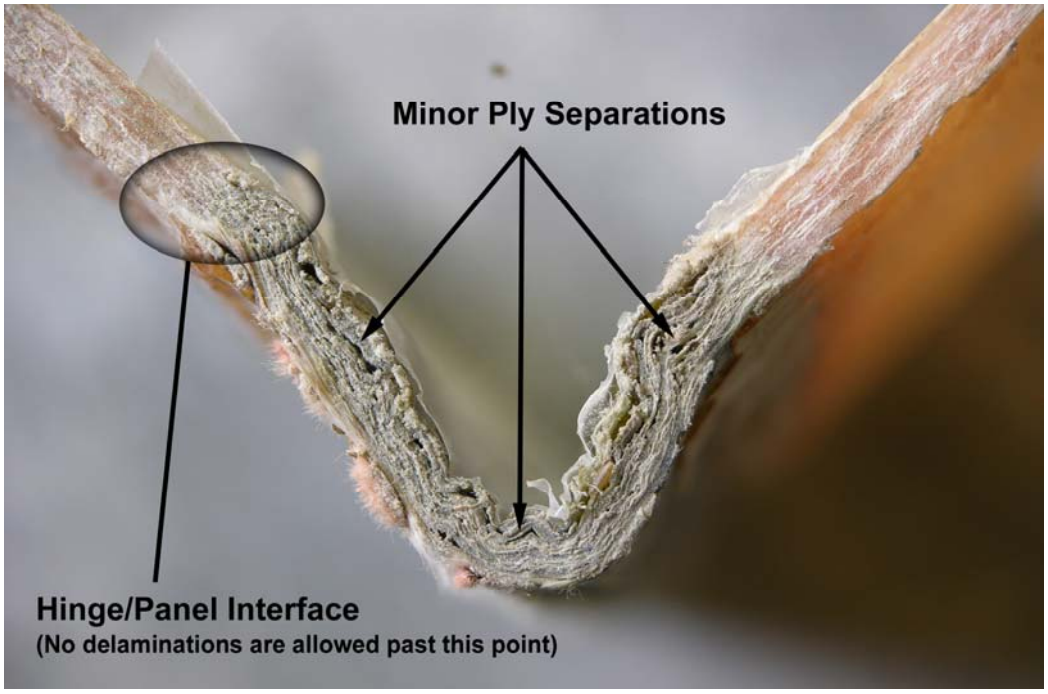


Figure 1. Minor Delaminations in Elastomer Hinge

6.2.3. Dry Spots. During the manufacturing process, some small areas of mat may not be properly wetted with resin, creating a "dry spot." Since this is a manufacturing defect, most occurrences of dry spots should be addressed during the initial compliance inspection. If found during FFM evaluations, dry spots should be held to the compliance specifications as listed in MIL-DTL-32265. None are tolerable in excess of 0.5 inches (13 millimeters) in diameter. There must be less than 10 occurrences in any 1-square-foot (0.09-square-meter) area of the mat. If these criteria are not met, the dry spot must be cleaned, prepped and rewetted with resin to restore FFM to a serviceable condition.

6.2.4. Directional Cracks. Two significantly different types of cracking have been observed on rigid panel sections of FFM. The less severe is a unidirectional cracking commonly created by large flexural loads. All cracks appear to be near the surface and do not penetrate into the fiberglass reinforcement, thus keeping fiber-matrix interfacial bonds intact. When this type of damage is discovered, the inspector should carefully examine the depth of such cracks and verify that they have not propagated into the fiberglass reinforcement area. One practical method of examining crack depths requires a fairly directional light source such as a focused flashlight or sunlight. When the light source is pointed at an angle to the FFM surface, cracks will reflect light at a different angle than light refracting off the FFM surface. This makes the cracks stand out by either making them lighter or darker than the surface depending on where the observer is located, as seen in Figure 2. Essentially, the light source is one method of increasing the visual contrast between cracks and the rest of the mat. Upon inspection, the rigid panel should be deemed acceptable if the directional cracking is localized to

the resin surface. If cracks have propagated into the fiberglass reinforcement, the rigid panel must be replaced or patched as its strength has likely deteriorated to an unacceptable level.

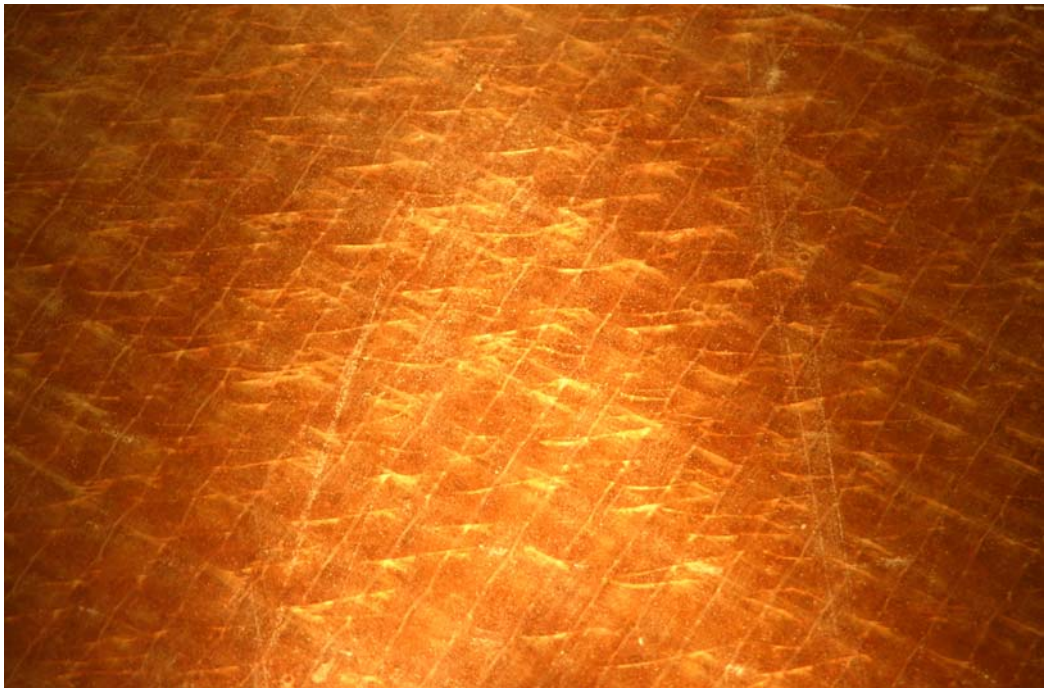


Figure 2. Unidirectional Cracking Seen with Angled Flashlight

6.2.5. Randomly Oriented Surface Cracks. The second type of cracking occurs in random patterns displaying connectivity and is often called “map” or “alligator” cracking. This damage can be seen in Figures 3 and 4. Although not common, this cracking has been determined in multiple tests to be more serious than unidirectional cracking. The severity of damage is likely a function of crack connectivity which creates a “network” of weak sections bonded onto fiberglass. During the FFM evaluation process, it is important that inspectors are meticulous enough to locate this type of surface cracking as it is not an extremely apparent type of damage. In trial inspections, this type of cracking has been observed to occur over large sections of rigid panels. Under such circumstances it is important that whole panel sections are replaced due to the likelihood of crack propagation under load.

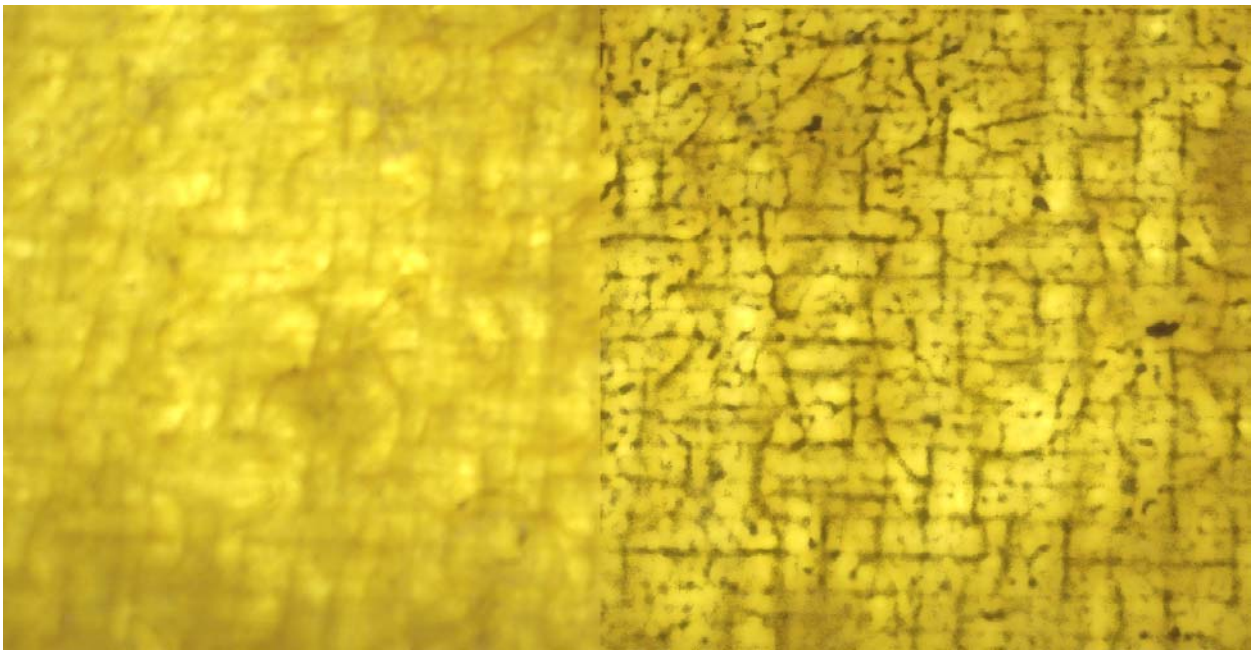


Figure 3. Randomly Oriented Surface Cracking Visualized with Image Processing

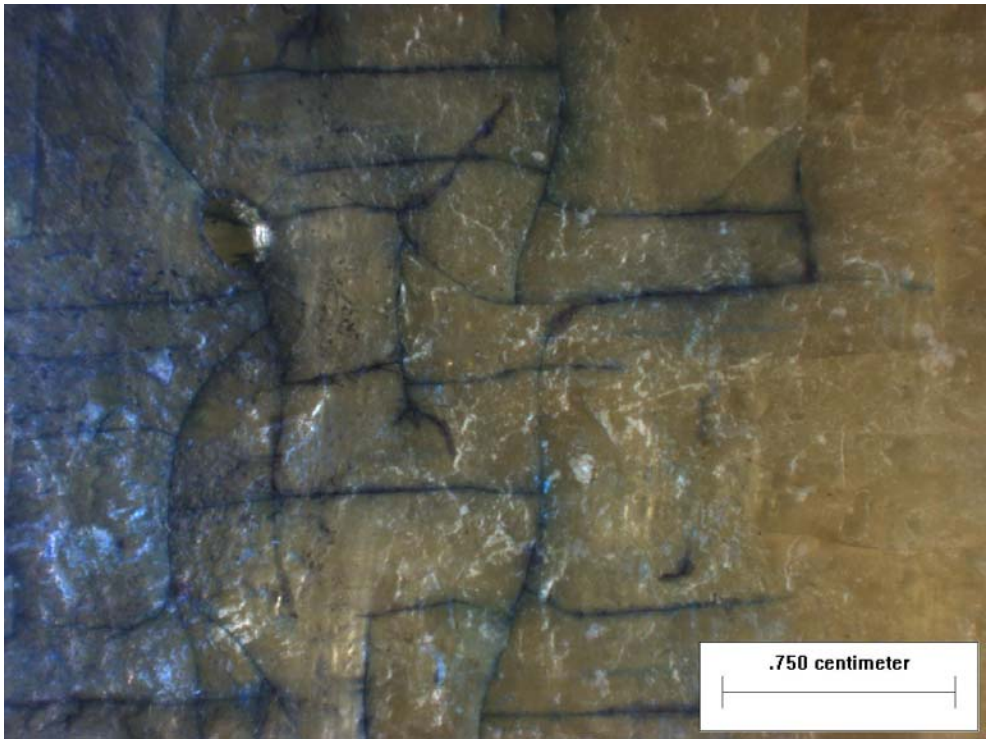


Figure 4. Randomly Oriented Surface Cracking with Methyl Blue Dye

6.2.6. Tears. Hinges that have experienced significant tensile loads may begin to exhibit failure in the form of tears or broken fiberglass. In some cases, mats

which have only been exposed to storage environments have also exhibited this type of damage, as seen in Figure 5. These cases are likely caused by elastomer shrinkage, folding strains, ultraviolet radiation damage, and/or thermal stresses. Any hinge areas that are torn, regardless of tear length, are not suitable for use. Such hinges must be replaced as allowed in approved repair methods. Some FFM manufacturers have attempted to address the occurrence of hinge tears by controlling the location of bending, in turn stress concentrations, in new elastomer hinges as seen in Figure 6. Such procedures may decrease the occurrences of tears and delaminations near hinges. At this time these hinges have not undergone proper testing or usage to validate such beneficial claims.

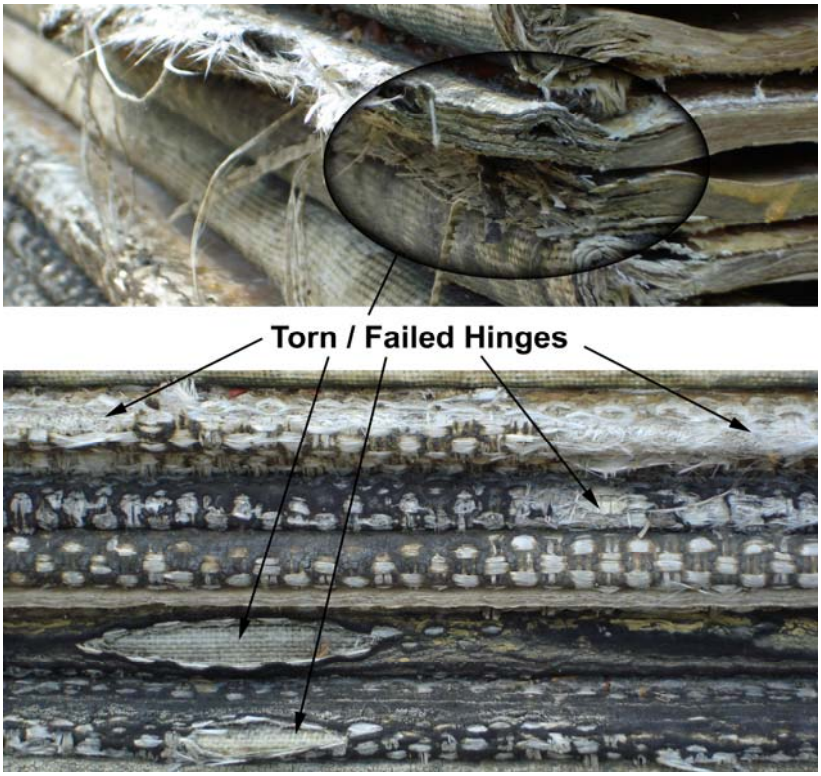


Figure 5. Critical Damage to FFM Hinges

Figure 6. Alternate Hinge Fabrication

6.2.7. Localized Impact. During FFM use, it is likely that impact damage will occur from FOD and/or aggregate underneath the FFM. Under most circumstances, impact damage will affect FFM strength in negligible amounts because it is localized to small areas. However, when impact damage is measured to be 1 inch (25 millimeters) or more in diameter, it should become a concern in the evaluation process. Locations of impact areas this size should not occur in a frequency greater than five per square foot. Also, any occurrences greater than 4 inches (100 millimeters) in diameter are not allowed. It may be necessary at times to reject panel sections due to impact damage that have less than five locations per square foot due to crack propagation. If cracks run outside of the impact (discolored) area, they should be examined as described in paragraph 6.2.4. Cracks deep enough to penetrate into the fiberglass reinforcement area are a cause for panel rejection. Such areas should be marked using a permanent marker for further evaluation in the repair process. Panel replacement may not be necessary, as damaged areas can be cut out and patched. Figure 7 shows examples of impact damage at varying intensities.

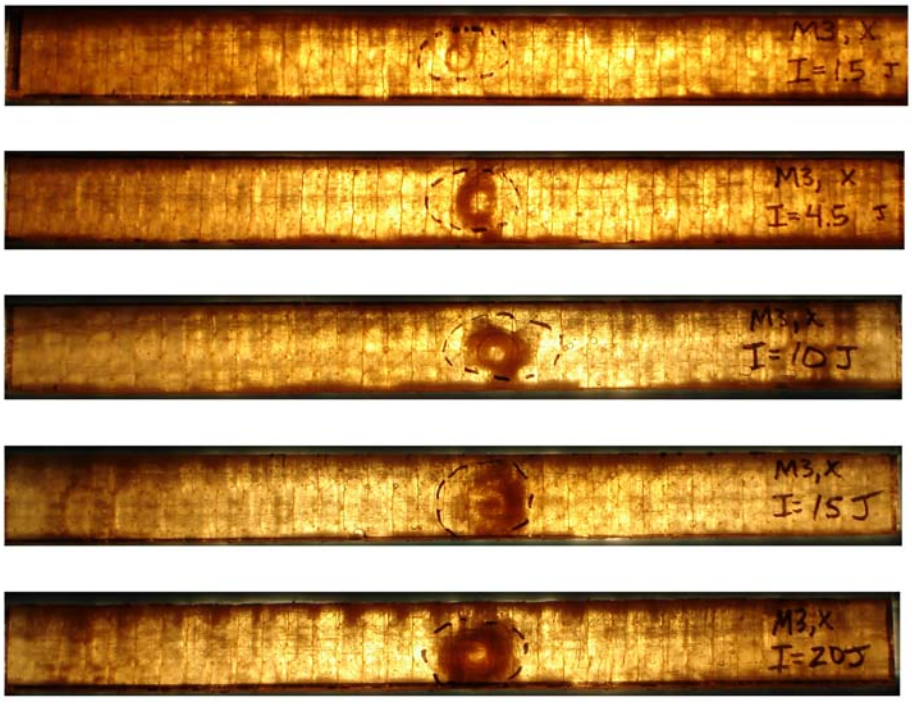


Figure 7. Localized Impact Damage Visualized with Backlighting

6.2.8. Unclassified Damage. There will undoubtedly be types of damage found during FFM evaluations that have not been covered in this ETL or seem to blur the lines of classification. The significance of such damage will require the judgment of an evaluator. An example of questionable damage is shown in Figure 8. Either caused by a “dry spot” or “impact damage,” this damaged area has worsened to the point where reinforcing fibers have failed. If larger than 1 inch (25 millimeters) in diameter, such areas should be cut out and replaced as

specified by acceptable repair methods. When dealing with unclassified damage, an evaluator should use their best judgment, keeping in mind the relative severity of previously described damage.

Figure 8. Examples of Unclassified Damage

6.3. Level II Evaluation.

6.3.1. FFM Preparation. Before inspection, FFM will be prepared as described in paragraph 6.2.1.

6.3.2. Use of Wheel Probe. In the Level II evaluation, visual inspection will still function as the method for initially locating damage. After the damage is located and recorded on an evaluation sheet (see Attachment 2), the ultrasonic wheel probe may be used by a trained operator to evaluate the severity of the internal FFM damage. It may be necessary to test an undamaged section of the same FFM as a control for comparative purposes. Signal amplitude and attenuation data from the wheel probe system, coupled with acceptance criteria from a Level I evaluation, can then be used to make an overall judgment on each panel's condition. The ultrasonic wheel probe should employ a wheel probe sensor operating between 2 to 5 MHz (megahertz) for signal clarity. A light film of water should be evenly applied to the surface of the smooth side (bottom side) of the FFM panel to serve as a coupling agent for the sensor. The wheel probe should be rolled across the damaged section at a rate of approximately 8 inches (200 millimeters) per second. A signal gain of at least 30 dB (decibels) is required to amplify the test results for analysis. The scanner's software will produce three plots for analysis: an A-scan, B-scan, and C-scan. The A-scan is sound echo response from a single position, as shown in Figure 9. The scan typically shows two amplitude peaks at the surface and bottom of the mat. Any defect inside the mat will reflect the ultrasonic energy before it reaches the bottom of the panel, resulting in an additional peak between the surface and bottom peaks. The B-scan is produced when a number of A-scans are performed along a linear length, for example by rolling the sensor across the mat surface in a straight line. An

example of a B-scan is shown in Figure 10. The C-scan uses a color-scale to represent the amplitude of the data thereby producing a pictorial representation of any change in the internal structure of the FFM. An example of a C-scan of an undamaged panel is shown in Figure 11. An example of an FFM panel with significant impact damage is shown in Figure 12. The software will permit the user to reformat the C-scan to select a binary color scale to sharply contrast damaged versus undamaged areas, as shown in Figure 13.

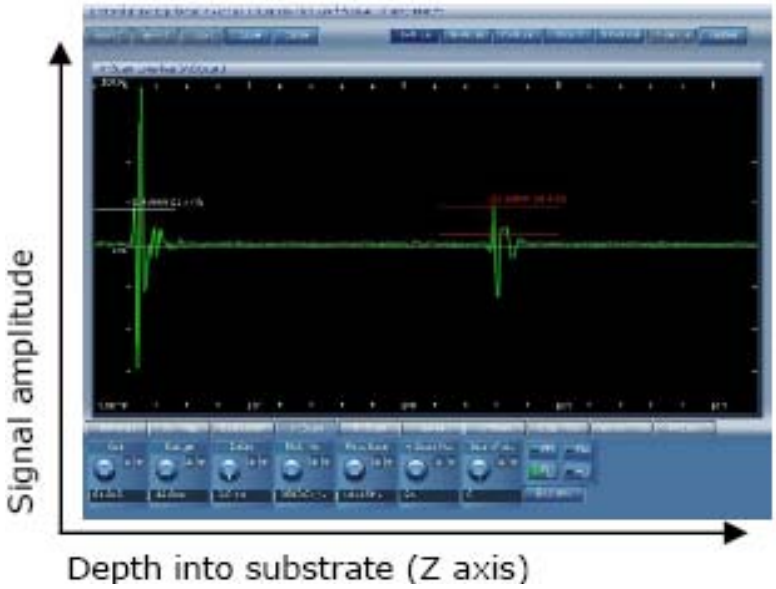


Figure 9. Example of A-Scan Plot Showing Surface and Bottom of FFM

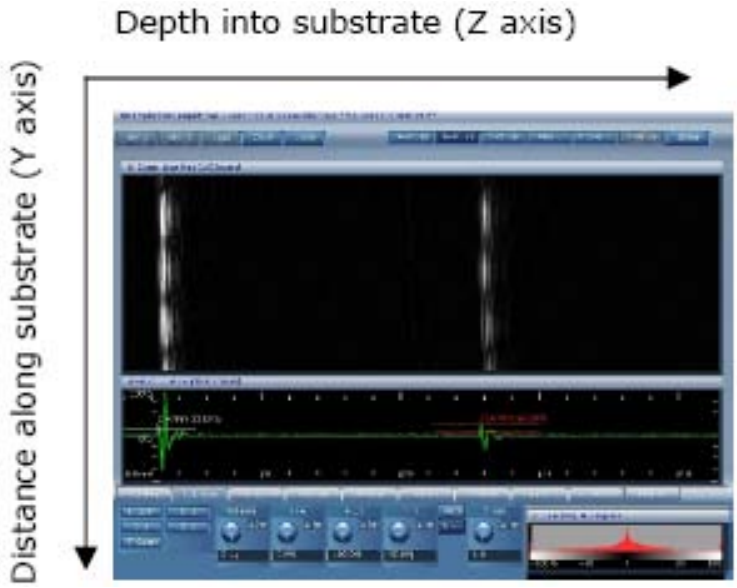


Figure 10. Example of B-Scan Plot Showing Results for One Roll Width Scan

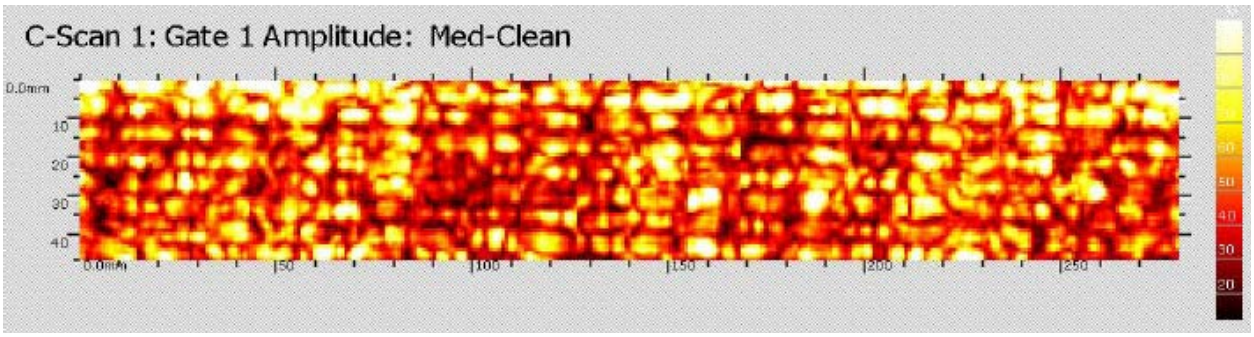


Figure 11. Example of C-Scan Plot Showing Results for Undamaged FFM

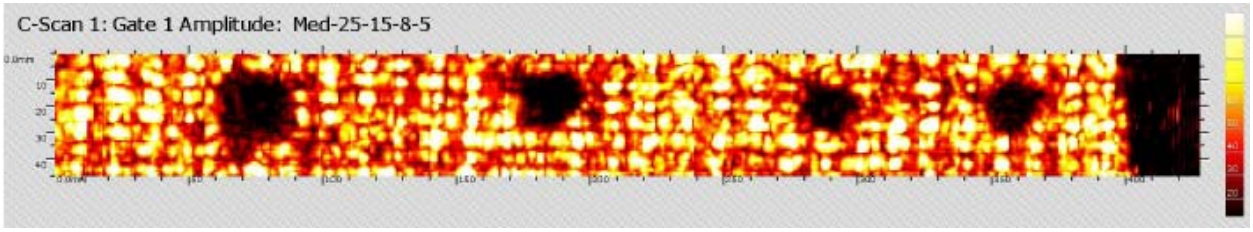


Figure 12. Example of C-Scan Plot Showing Localized Impact Damage

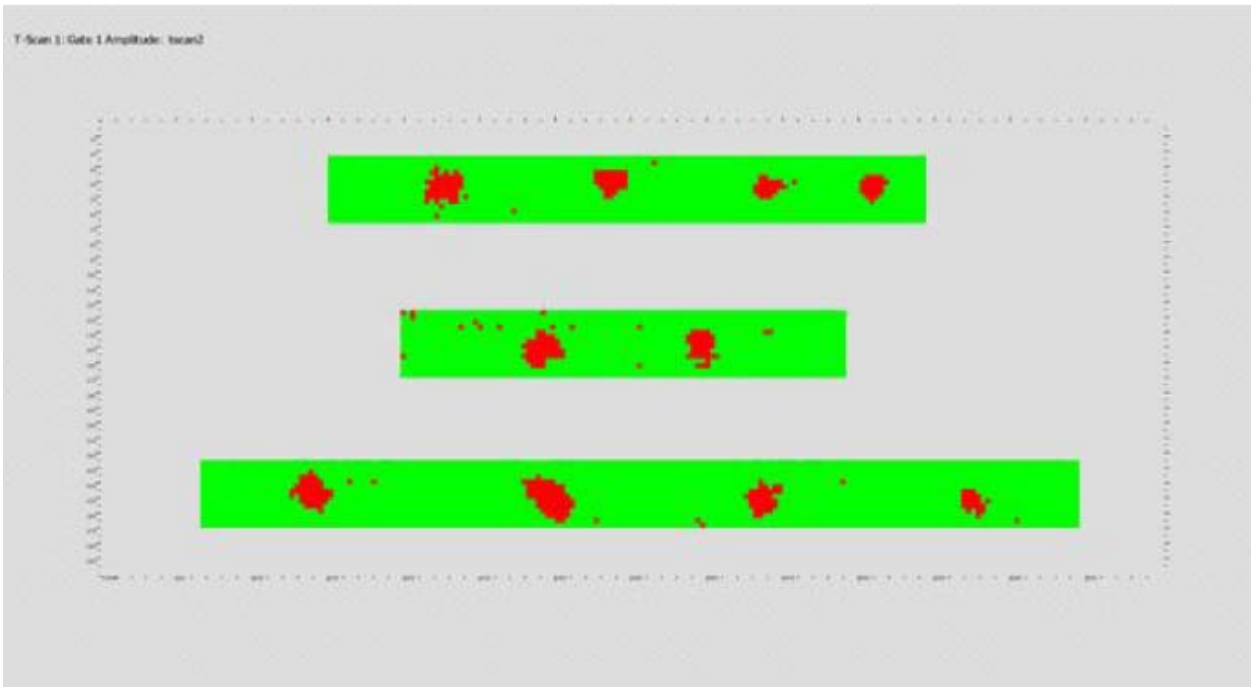


Figure 13. Example of C-Scan Plot Showing Pass-Fail Results Using Binary Colors

6.3.3. Analysis of Level II Results. The ultrasonic test results are used in conjunction with the acceptance criteria from the Level I evaluation to make an overall judgment on each panel's condition. Table 1 shows the types of damage, acceptance criteria, and guidance for Level II analysis of severity. The evaluator will be required to judge the severity of the damage from the images provided by the ultrasonic equipment. The ultrasonic sensor is meant to serve as a tool to assist in detecting the extent of damage to the panels, particularly where the damage severity is difficult to discern using a Level I evaluation.

Table 1. Level II Mat Damage Assessment.

Damage	Criteria	Level II Guidance
Delamination/Ply Separation	No delaminations are allowed in the rigid panel; however, some delamination is allowed in the hinge itself. See par. 6.2.2 and Figure 1.	Delamination will appear as interconnected damaged zones in the C-scan.
Dry Spots	None in excess of 0.5 inch (13 mm) in diameter and less than ten per square foot.	Dry spots will appear as isolated damaged zones in the C-scan slightly larger than the visual evidence. Interconnected damaged areas indicate more severe damage.
Directional Cracking	Acceptable only if limited to the resin.	Cracks should appear as interconnected discolored lines in the C-scan. The darker the discoloration and more interconnectivity, the worse the damage.
Random Cracking	Generally not acceptable unless confined to a localized area and do not extend through the resin.	Cracks will appear as evenly dispersed, interconnected discolored lines in the C-scan. The darker the discoloration and more interconnectivity, the worse the damage.
Tears	None acceptable.	Level II evaluation unnecessary.
Localized Impact	No more than five 1-inch (25 mm) or greater diameter occurrences per square foot. No impact areas in excess of 4 inches (100 mm) in diameter are permitted.	Impact areas will appear as defined concentric discolorations in the C-scan as shown in Figure 12. Localized impact damage that indicates connections to adjacent damaged areas are more severe.
Unclassified Damage	Use judgment with above criteria.	Damage will appear as discolored sections. The size of discolored areas and interconnectivity between areas shown on the C-scan can assist in determining the severity of the damage.

7. FFM Repair.

7.1. Certification of Vendors to Complete Repairs. There are currently three principal repairs: hinge replacement, panel replacement, and panel patching. It is recommended that these repairs be accomplished by vendors that have been certified to complete these repairs. Each type of repair requires a separate certification. Therefore, a vendor may be certified to perform one repair but not another. Attachment 1 contains a list of manufacturers that are certified at the time of the preparation of this ETL to perform repairs, which repairs they are certified to perform, and contact information for each vendor.

7.1.1. Vendor certifications for each repair are issued by either of the following certification officials:

Pavements Engineer
Air Force Civil Engineer Support Agency, AFCESA/CEOA
139 Barnes Drive, Suite 1
Tyndall AFB FL 32403
Phone: (850) 283-6439
E-Mail: AFCESAReachbackCenter@tyndall.af.mil

Chief of the Airfields and Pavements Branch, Geotechnical and Structures Laboratory
U.S. Army Engineer Research and Development Center, ERDC/GM-A
3909 Halls Ferry Road
Vicksburg MS, 39180

7.1.2. Vendors can obtain certification by demonstrating to the certification official their ability to meet the required material properties of MIL-DTL-32265 and this ETL. All physical, chemical and mechanical property testing shall be performed by an independent laboratory accredited to perform the required ASTM tests. The lab must be accredited by the American Association for Laboratory Accreditation (A2LA) in accordance with the requirements of ASTM E-329, *Standard Specification for Agencies Engaged in Construction Inspection and/or Testing*. The certifying agency has the right to review and confirm all documentation and lab procedures associated with this accreditation before issuing certification.

7.2. General. After each evaluation, FFM will either be accepted or rejected based on physical condition. It is important that all rejected FFM have documentation as to why they were rejected so the proper repair protocol can be followed. A recommended evaluation sheet is provided in Attachment 2 for review and use. Other manufacturers and methods of FFM repair may exist and should be submitted to the certification officials listed in paragraph 7.1.1 for incorporation into this ETL as their ability to meet the required specifications is demonstrated.

7.3. Hinge Replacement. Currently, one method of FFM hinge replacement has been tested to verify that the repair meets minimum engineering property standards defined in this ETL. This method involves removing the damaged hinge, panel surface preparation, and the secondary bonding of a prefabricated hinge. Figure 14 shows a photo of the approved hinge replacement repair. The hinge replacement repair should include a minimum 7.1-inch (180-millimeter) -wide secondary bond to meet the minimum strength properties and is an acceptable hinge repair alternative. Repairs with secondary bonds less than 7.1 inches (180 millimeters) wide fail to meet the minimum strength requirements and are not acceptable. Certified vendors are listed in Attachment 1. An updated list of certified vendors is available upon request from the certification officials listed in paragraph 7.1.1.

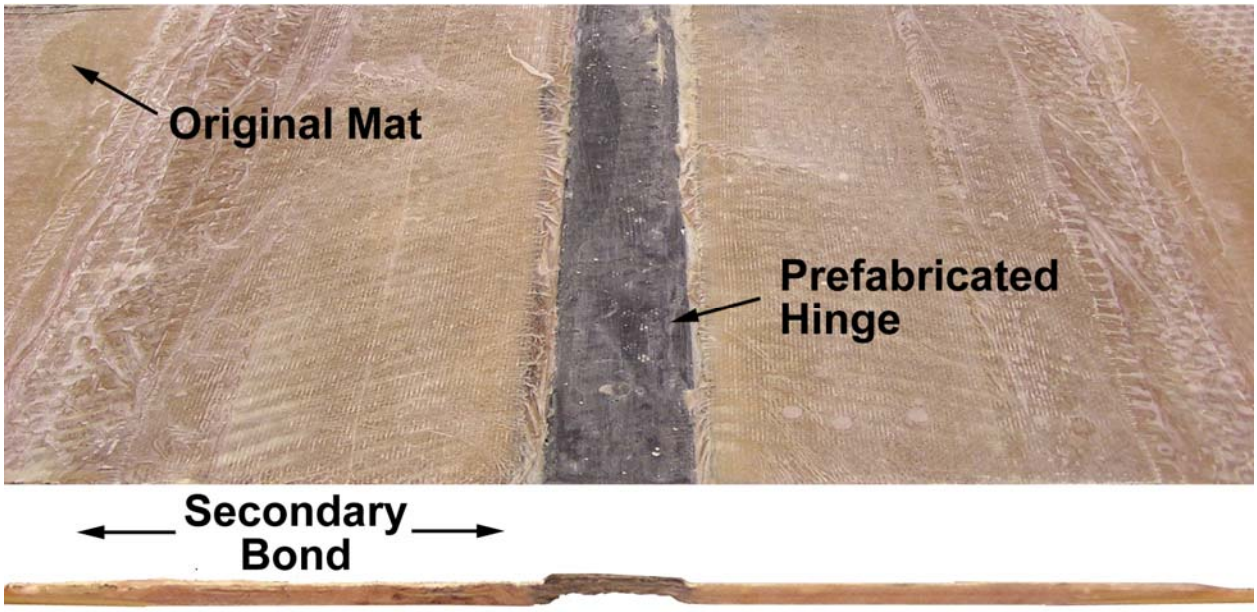


Figure 14. Plan View and Cross Section of Hinge Repair

7.4. Panel Replacement. Should an FFM rigid panel need replacement, it is possible to place a new panel by performing two hinge replacement operations (as described in paragraph 7.2) on both sides of the new panel. If the newly manufactured panel meets initial compliance specifications and the hinge replacements meet repair standards, the repair should be considered acceptable. Certified vendors are listed in Attachment 1. An updated list of certified vendors is available upon request from the certification officials listed in paragraph 7.1.1.

7.5. Panel Patches. When small areas of damage are found, it is possible to repair them with a “patch” instead of replacing the entire rigid panel. The damaged section can be cut out, prepared, and a secondary bond can be made between the patch and existing panel. The patch must be physically equivalent to the panel in material composition, including the type of resin used as the secondary bonding agent. Testing was completed to determine an optimal secondary bond size for patches in the rigid panel area. It has been determined that a secondary bond width of

3.5 inches (90 millimeters) is sufficient relative to the required specifications. This means that all new patches applied to FFM must overlap the existing mat by 3.5 inches (90 millimeters) on the top and bottom surfaces. At this size, the bond strength exceeds that of a mat's tensile strength. The cross-section of a failed test specimen with a secondary bond is shown in Figure 15 for reference. Certified vendors are listed in Attachment 1. An updated list of certified vendors is available upon request from the certification officials listed in paragraph 7.1.1.

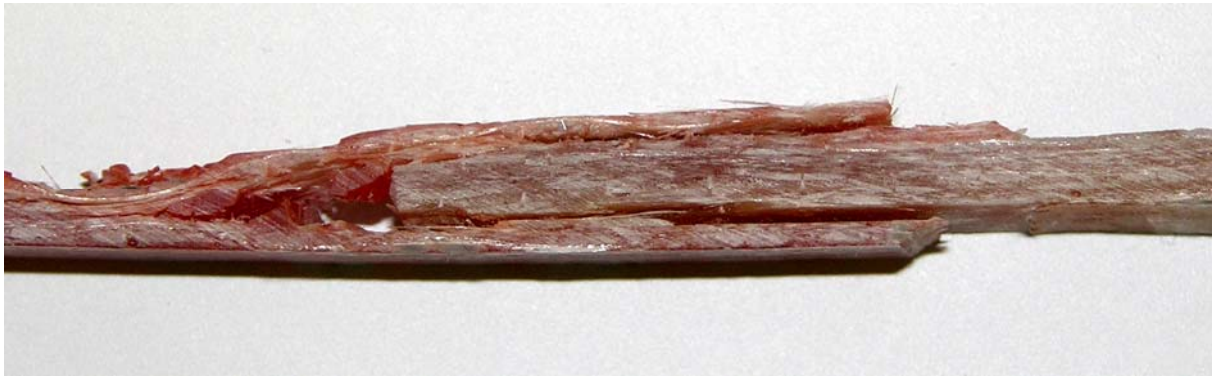


Figure 15. Cross-Section of Failed Secondary Bond Test Specimen

8. Point of Contact. Recommendations for improvements to this ETL are encouraged and should be furnished to the Pavements Engineer, HQ AFCESA/CEOA, 139 Barnes Drive, Suite 1, Tyndall AFB, FL 32408-5319, DSN 523-6439, commercial (850) 283-6439, e-mail AFCESAReachbackCenter@tyndall.af.mil.

JAMES D. FRISHKORN, Colonel, USAF
Director of Operations & Program Support

5 Atchs
1. Certified Repair Vendors and Manufacturer Contact Information
2. Folded Fiberglass Mat Evaluation Sheet
3. Example of Statement of Work: Inspection of FFM
4. Example of Statement of Work: Restoration of FFM
5. Distribution List

CERTIFIED REPAIR VENDORS AND MANUFACTURER CONTACT INFORMATION

Certified Repair Vendors

Hinge Replacement:

ReadyMat Industries, LLC

Panel Replacement:

ReadyMat Industries, LLC

Panel Patching:

ReadyMat Industries, LLC

Rapid Runway Repair, Inc.

FFM Manufacturers

ReadyMat Industries, LLC
Attn: Chuck Stenbeck
200 L & R Road
Metairie, LA 70001

Rapid Runway Repair Inc.
Attn: Don Brown
245 Illinois Street, Bldg. No. 7
Delhi, Louisiana 71232

Ultrasonic Wheel Probe Manufacturer

The ultrasonic sensor and software recommended for a Level II evaluation could be obtained from NDT Solutions Ltd at a cost of approximately $60,000.00 in FY07. Actual costs depend upon quantity. Alternative sources may be available.

NDT Solutions Ltd
Dunston Innovation Centre
Dunston Road
Chesterfield, U.K. S41 8NG
Tel: +44 (0) 1246 267550
Fax: +44 (0) 1246 269381
info@ndtsolutions.com
www.ndtsolutions.com

FFM EVALUATION SHEET

Mat Identification #: _____

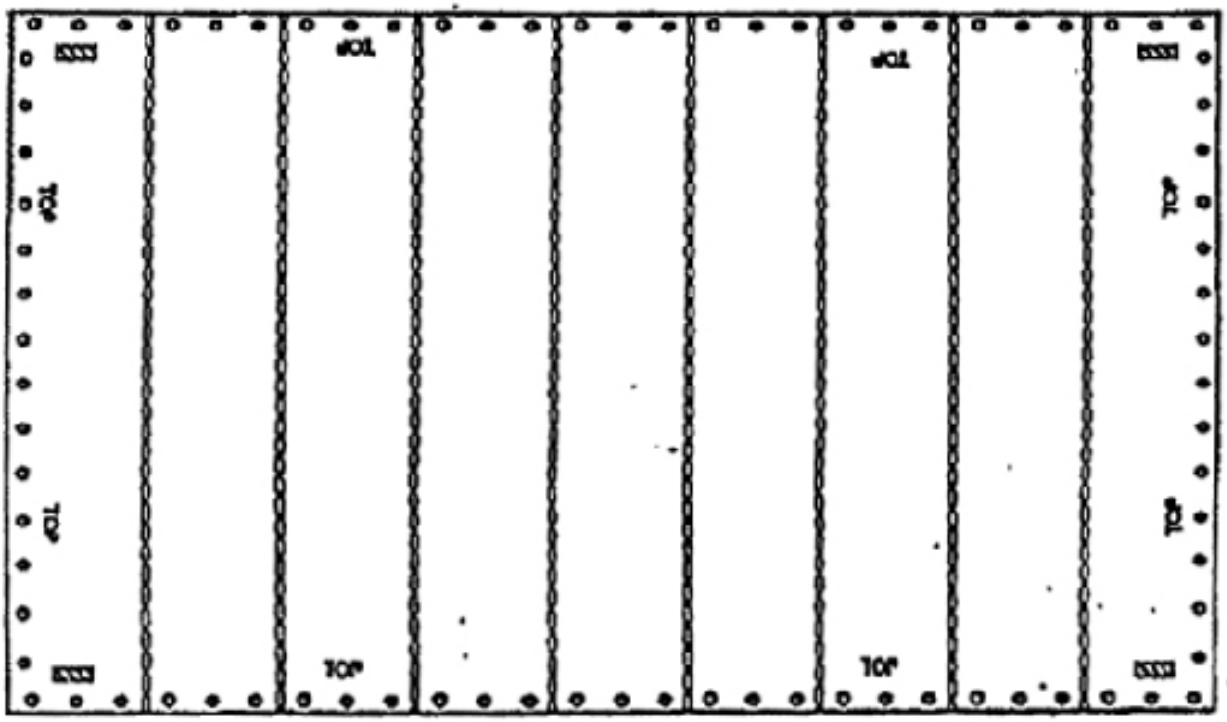
Date: _____

Inspected By: _____

Damage Listing:

- **DL** – *Delamination* – None allowed
- **DS** – *Dry Spot* - < 0.5 inch acceptable if < 10 occurrences in 1 sq. ft.
- **DC** – *Directional Cracks* – Acceptable if cracks have not propagated into fiberglass reinforcement
- **HT** – *Hinge Tears* – None allowed
- **LI** – *Localized Impact* - < 4 inch diameter acceptable if < 5 occurrences in 1 sq. ft.
- **UD** – *Unclassified Damage* – Evaluator judgment
- **RC** – *Randomly Oriented Surface Cracks* – No areas allowed

Circle Areas of Damage and Label Appropriately



Accept / Reject

EXAMPLE STATEMENT OF WORK:
INSPECTION OF FFM

Description: The _____(organization)_____ is tasked with maintaining readiness to support the rapid repair of damaged airfield pavements. Folded Fiberglass Mat (FFM) is a critical enabling technology in supporting this mission, and the condition of FFM materials must be monitored to ensure that the material will perform should its deployment become necessary. The _____(organization)_____ currently has a stockpile consisting of _____ mats stored indoors/outdoors. The required technical support required under this contract consists of inspecting the condition of the entire inventory of FFM mats, including all kit components, and reporting the condition of the mats in accordance with ETL 07-10 along with recommendations for refurbishment, disposal, and replacement. The specific tasks required include, but are not limited to:

1. Locating and identify by manufacture lot all FFM kits currently in inventory,
2. Visually inspecting all FFM kits in inventory according to the Level I inspection process in ETL 07-10.
3. Visually inspecting FFM kit components, including anchor bushings, connector bushings, joining panels, concrete anchor bolts, and asphalt anchor materials.
4. Nondestructively testing a minimum of 10 percent of the entire inventory according to the Level II inspection process in ETL 07-10.
5. Performing destructive tests on samples removed from 10 percent of the mats identified in the inspection that are in questionable condition to determine if the mats meet the minimum engineering properties described in ETL 07-10. The engineering physical property tests must be conducted in accordance with the ASTM procedures described in MIL-DTL-32265.
6. Documenting the results of the visual inspection, nondestructive testing, and any destructive testing in a final report within (1) month of the date of inspection.
7. Providing recommendations regarding the disposal or refurbishment of mats failing to meet the minimum standards, as well as recommendations for procurement of replacement mats and kits.

Government Estimate: The FY07 government estimate for completing this scope of work can be approximated by the following in the absence of better data:

CONUS: Travel Expenses: $3,000.00
Inspection Labor: $400/kit (Command Provides Forklifts and Operators)
Destructive Testing: $7,500.00
Reporting: $2,500.00
Overhead Costs: $4,000.00
Total Estimate for 20 Kits: $25,000.00

OCONUS: Travel Expenses: $7,000.00
Inspection Labor: $600/kit (Command Provides Forklifts and Operators)
Destructive Testing: $10,000.00
Reporting: $2,500.00
Overhead Costs: $7,500.00
Total Estimate for 20 Kits: $39,000.00

EXAMPLE STATEMENT OF WORK:
RESTORATION OF FFM

Description: The _____(organization)_____ is tasked with maintaining readiness to support the rapid repair of damaged airfield pavements. Folded Fiberglass Mat (FFM) is a critical enabling technology in supporting this mission, and the condition of FFM materials must be monitored to ensure that the material will perform should its deployment become necessary. A recent inspection of the ___(organization)_____ FFM kit inventory revealed that _____ FFM panels were in need of refurbishment or repair. The required technical support required under this contract consists of repairing the substandard mats according to procedures described in ETL 07-10 (attached). The type and number of repairs required are as follows:

1. Hinge Replacement _____ Hinge(s)
2. Panel Replacement: _____ Panel(s)
3. Panel Patches _____ Patch(es) Approximate Area: _____ square feet

Proposal Preparation: The proposal should include the cost for pickup of the damaged panels and delivery of the repaired panels if the panels will not be repaired at the government facility. The proposal should include an itemized cost for performing each type and number of repairs. Each repaired panel should be stenciled in permanent white lettering (minimum letter height 2 in.) with the word "REFURBISHED – MM/YY – Vendor Name" in the center of the panel approximately 6 in. from each edge of the panel. The government reserves the right to randomly sample repaired panels to verify that the repairs meet minimum engineering property requirements defined in MIL-DTL-32265. The government reserves the right to reject all repairs failing to meet the minimum published standards. All repairs must be completed and the panels returned to the _____(organization)_____ within (2) months of pickup. A letter documenting the date, vendor, and QA procedures must accompany each repaired panel.

Government Estimate: The FY07 government estimate for completing this scope of work can be approximated by the following in the absence of better data:

CONUS: Shipping/Travel Expenses: $2,500.00/mat
- Hinge Replacement: $2,000/hinge
- Panel Replacement: $4,500/panel
- Panel Patching: $100/square foot
- Reporting/Stenciling: $1,500.00
- Overhead Costs: $2,000.00

OCONUS: Shipping/Travel Expenses: $7,000.00
- Inspection Labor: $600/kit (Command Provides Forklifts and Operators)
- Hinge Replacement: $3,000/hinge
- Panel Replacement: $5,500/panel
- Panel Patching: $150/square foot
- Reporting/Stenciling: $2,000.00
- Overhead Costs: $3,000.00

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DEPARTMENT OF DEFENSE

Defense Commissary Agency (1)
Design and Construction Division
2250 Foulois St., Suite 2
Lackland AFB, TX 78236

AAFES (1)
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PO Box 660202
Dallas, TX 75266-0202

SPECIAL INTEREST ORGANIZATIONS

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