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8 Sep 2022	Ray Ling	Pavel	MS-LENS-RI-001	1

## SPHERICAL LENS SURFACE REPAIR INSTRUCTION

### TABLE OF CONTENTS:

#### 1.00 LENS STRUCTURE

- 1.10 Basic Structure of Lens
- 1.20 Lens Surface Close-Up View

#### 2.00 PREPARATION

- 2.10 Material Preparation
- 2.20 Tooling Preparation
- 2.30 Material Application & Mixing Ratio

#### 3.00 TYPES OF DAMAGES

- 3.10 Fibrous Glass Fabric Damages:
  - 3.11 Fibrous Glass Fabric Detached
  - 3.12 Fibrous Glass Fabric Detached & Tear
  - 3.13 Fibrous Glass Fabric Cut & Tear
- 3.20 Fibrous Glass Fabric & Styrofoam Damages:
  - 3.21 Glass Fabric & Styrofoam Dented
  - 3.22 Glass Fabric & Styrofoam Damage
- 3.30 Meta-Material Layer Damage

#### 4.00 REPAIR INSTRUCTION

- 4.10 Fibrous Glass Fabric Layer Damage Only
- 4.20 Glass Fabric & Styrofoam Damage

#### 5.00 ALTERNATIVE REPAIR MATERIAL

- 5.10 All-Purpose Putty
- 5.20 Multi-Purpose Foam Sealer

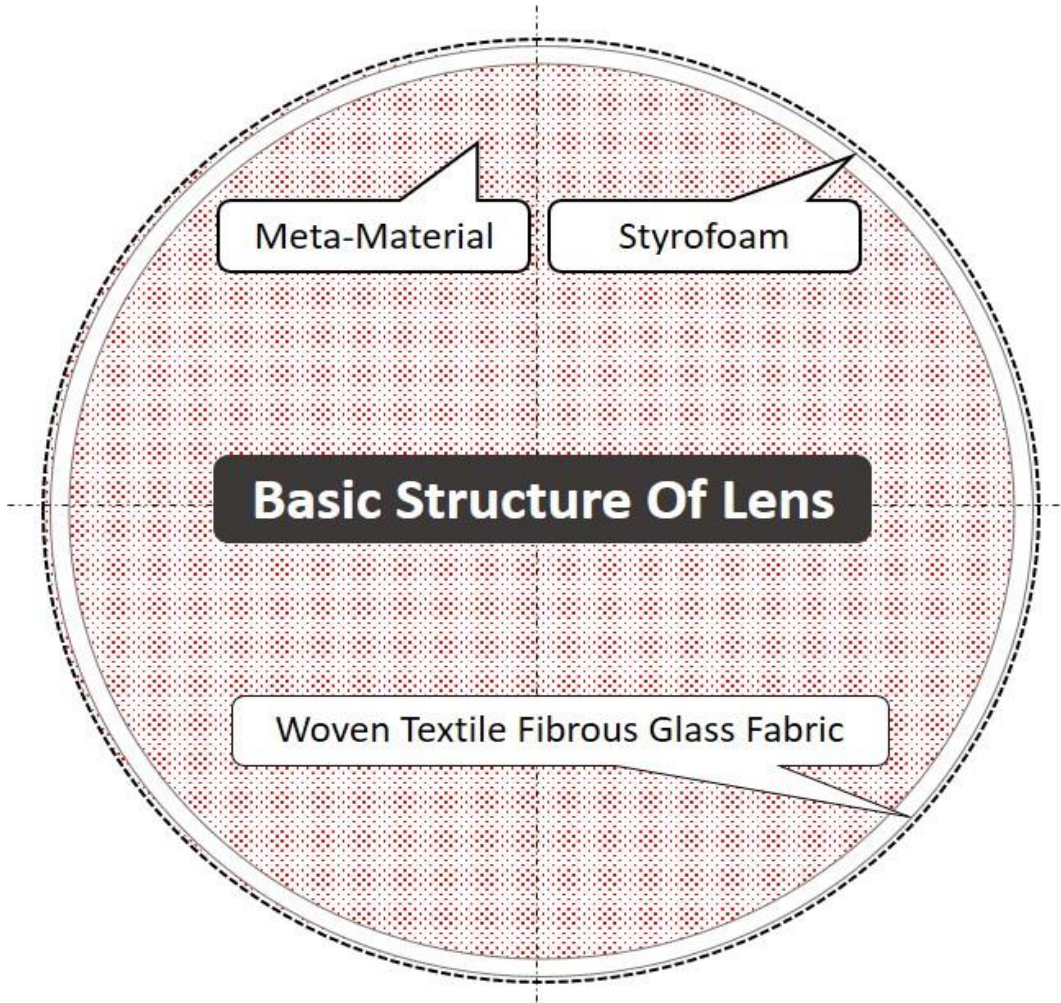
#### 6.00 Material & Tooling Picture

#### Revision History:

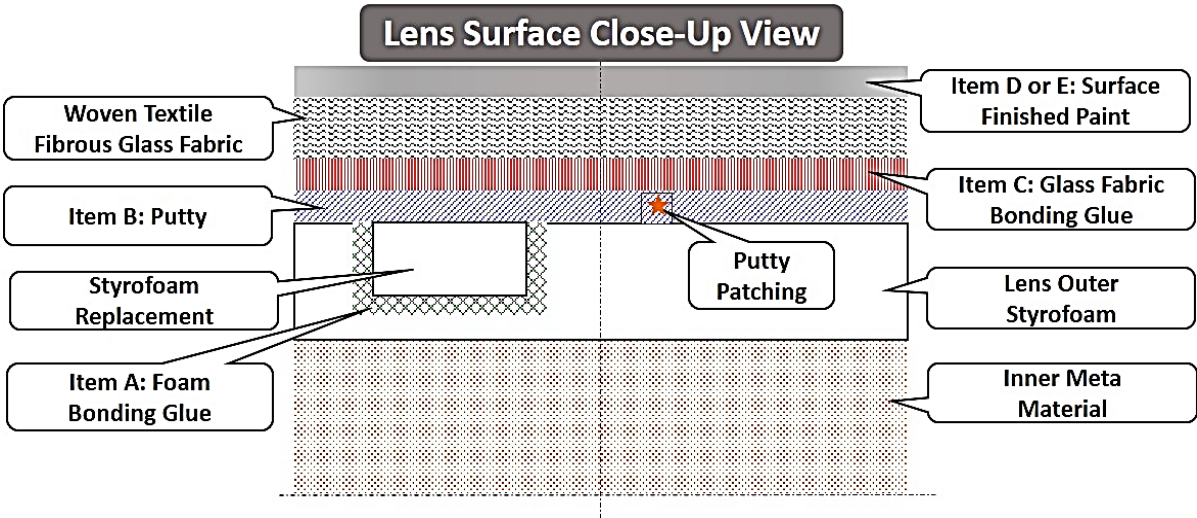
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1.00 LENS STRUCTURE

1.10 Basic Structure of Lens



1.20 Lens Surface Close-Up View



## 2.00 PREPARATION

### 2.10 Material Preparation

Item	Descriptions	Purpose
1	Spherical Lens (Surface Damages)	To Be Repair
2	Lens Outer Styrofoam (See Model Table)	Partial Replacement
3	Woven Fibrous Glass Fabric	
4	GlobalBond 970-2 A	Styrofoam Bonding Glue
5	GlobalBond 970-2 B	
6	GlobalCast 946 A	Putty
7	GlobalCast 946 B	
8	GlobalCast 131-2 A	Glass Fabric Bonding Glue
9	GlobalCast 131-2 B	
10	3M Glass Bubbles	Powder for 970-2A/B & 946A/B
11	Jotun HardTop XP White A	WHITE Surface Finished Paint
12	Jotun HardTop XP Light Grey A	L.GREY Surface Finished Paint
13	Jotun HardTop XP Compound B	Mixer for White / Light Grey Paint
14	Detergent & Water	General Cleaning
15	ETHYL ACETATE (E.A.)	Cleaning for Stubborn Stain

### 2.20 Tooling Preparation

Item	Descriptions	Purpose
1	Cutter	General Cutting
2	Chisel	Chipping Styrofoam
3	Hammer	
4	Scissor	General Cutting
5	Razor Scarper	Surface Scraping
6	Clean Cloth	General Cleaning
7	Sand Paper (Rough)	Surface Smooth the Surface
8	Sand Paper (Fine)	
9	Scraper	Glue/Putty Application
10	Brush	General Application
11	Paint Roller with Brush	Painting

### Styrofoam Thickness

Model	Lens DiaØ (cm)	Thickness (cm)
MS-12.6DB180	180	5.0
MS-8.4DB120	120	3.0
MS-6.3DB90	90	2.0
MS-4.2DB60	60	1.5

### 2.30 Material Application & Mixing Ratio

Item	Applications	Material 1	Ratio 1	Material 2	Ratio 2	Material 3	Ratio 3
A	Foam Bonding Glue	GlobalBond 970-2 A	25	GlobalBond 970-2 B	25	3M Glass Bubbles	5
B	Putty	GlobalCast 946 A	20	GlobalCast 946 B	10	3M Glass Bubbles	5
C	Glass Fabric Bonding Glue	GlobalCast 131-2 A	2	GlobalCast 131-2 A	1	--	--
D	White Surface Finished Paint	HardTop XP White A	4.55	HardTop XP Comp B	0.45	--	--
E	L.Grey Surface Finished Paint	HardTop XP L.Grey A	4.55	HardTop XP Comp B	0.45	--	--

### 3.00 TYPES OF DAMAGES

#### 3.10 Fibrous Glass Fabric Damages:

#### 3.11 Fibrous Glass Fabric Detached



**Sample 1: Fibrous Glass Fabric Detached**

#### 3.12 Fibrous Glass Fabric Detached & Tear



**Sample 2: Glass Fabric Detached & Tear**

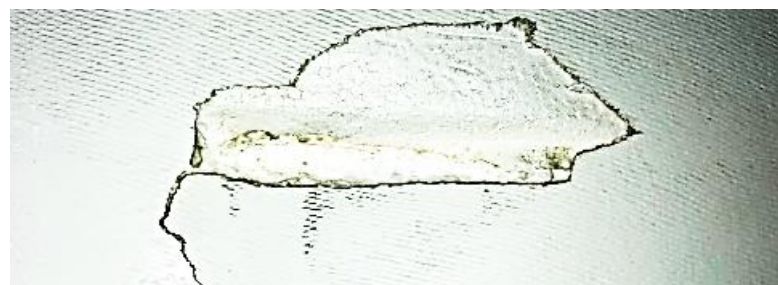
#### 3.20 Fibrous Glass Fabric & Styrofoam Damages:

#### 3.21 Glass Fabric & Styrofoam Dented



**Sample 4: Glass Fabric & Styrofoam Dented**

#### 3.22 Glass Fabric & Styrofoam Damage



**Sample 5: Glass Fabric & Styrofoam Damage**

#### 3.13 Fibrous Glass Fabric Cut & Tear



**Sample 3: Glass Fabric Cut & Tear**

#### 3.30 Meta-Material Layer Damage

Dent where both Fibrous Glass Fabric Layer, Styrofoam Layer are penetrated and Meta-Material is Exposed & Visible.

**\*\*\* Please contact MatSing for consultation on Procedure for Repair.**



**Sample 6: Meta-Material Exposed**

## 4.00 REPAIR INSTRUCTION

### 4.10 Fibrous Glass Fabric Layer Damage Only

### 4.20 Glass Fabric & Styrofoam Damage

Step	Procedure	Notes
<b>4.10 Fibrous Glass Fabric Layer Damage Only</b> <b>1. Glass Fabric Layer Damage only:</b> Surface damage / Tear / Small Dent approximately 1/4" or Less. This type of damage can be repair without the need for a replacement of foam Or use the foam-Sealer		
1	Clean surface of the damage areas, mark damaged area in a square or rectangle shape for easy repair.	<b>4.10 Fibrous Glass Fabric Layer Damage Only</b>
2	Use a cutter to cut out the damage areas, using a razor scraper, scrap off the layer of glue and sand the area to achieve a smooth surface area.	

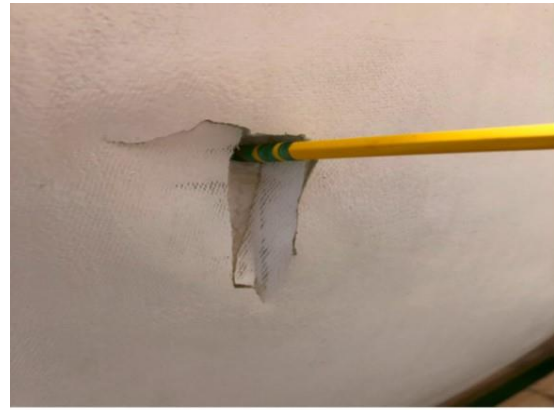
<b>4.20 Glass Fabric &amp; Styrofoam Damage</b>		
<b>2. Foam Layer Damage:</b> Dented with the foam layer 1/4" or more but not penetrating the Meta-Material		
3	If it is foam damage, use cutter/chisel with hammer to cut out the damaged part, clean the areas after removing damaged part.	<b>( Additional Steps for) 4.20 Glass Fabric &amp; Styrofoam Damage</b>
4	Refer to "Styrofoam Thickness Table" for the correct size of Styrofoam foam for replacement, cut out the foam shape same as the Damage areas.	
5	Refer to " <b>Material Application &amp; Mixing Ratio Table</b> " for preparation of "Foam Bonding Glue" and apply to replacement part.	
6	Attach new Styrofoam with glue into the cut out part, use masking tape to hold new Styrofoam in place while waiting for glue to settle.	
7	Cut out excess Styrofoam to get the same curved shape as the sphere.	
8	Refer to " <b>Material Application &amp; Mixing Ratio Table</b> " for preparation "Putty", apply putty only if there are any gaps between the replacement Styrofoam and cut out area.	

9	Prepare the Fibrous Glass Fabric the same shape as the damaged area but 2cm bigger on all sides for overlapping and easy application.	<b>4.10 Fibrous Glass Fabric Layer Damage Only</b>
10	Refer to " <b>Material Application &amp; Mixing Ratio Table</b> " for preparation of "Glass Fabric Bonding Glue", apply glue onto replacement Fibrous Glass Fabric using a flat piece of plastic, remove excess glue after fabric has been evenly soaked.	
11	Place the new glued fabric onto the Damage area, ensure the fabric fully covers the area required to be repaired.	
12	After 1 hour of letting the glue settle, using a cutter cut out excess fabric to make it look neater.	
13	Use sand paper to smooth the repaired Damage areas and refer to "Material Application & Mixing Ratio Table" prepare the correct color of paint.	
14	Dry clean with final check, start painting the repaired Damage areas and finished it with visual close to the existing color condition.	

## 5.00 ALTERNATIVE REPAIR MATERIAL



**Fibrous Glass Fabric layer Damage Only**



**Glass Fabric & Styrofoam Damage**

### 5.10 All-Purpose Putty

**1. Glass Fabric Layer Damage only:** Surface damage / Tear / Small Dent approximately 1/4" or Less. This type of damage can be repaired without the need for a replacement of foam Or use of foam-Sealer

Step	Procedure
1	Sand surface of tear/crack
2	Apply thin layer of All-Purpose Putty (Follow instructions on specific putty for curing times and hardener amount)
3	Sand putty once cured
4	Apply layer of provided paint (Paint is epoxy based and need to be mixed in ratio of 10:1 (Component A & B)
5	Let paint dry at least 24 hours and second layer can be applied if needed.



### 5.20 Multi-Purpose Foam Sealer

**2. Foam Layer Damage:** Dented with the foam layer 1/4" or more but not penetrating the Meta-Material

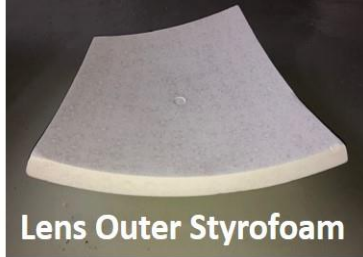
Step	Procedure
1	Apply Multi-Purpose Foam Sealer (Provided) as a filler for the dent, Please follow instructions on specific All-Purpose Foam for directions.
2	Please note foam expands (20-30%) so do not overfill dent. Let foam cure at least 24 hours.
3	If there a large part of the Glass Fabric is torn off or missing, Glass Fabric material will need to be applied separately after foam curing.
4	Please call MatSing in this instance for further consultations.
5	Once foam cures, remove any excess from the surface and sand, Apply thin layer of All-Purpose Putty.
6	Sand Putty once cured, Apply layer of provided paint.



## 6.00 Material & Tooling Picture



Lens For Repair



Lens Outer Styrofoam



Woven Textile Fibrous Glass Fabric



GlobalBond 970-2 A (Glue)



GlobalBond 970-2 B (Glue)



GlobalCast 131-2 A (Glue)



GlobalCast 131-2 B (Glue)



GlobalCast 946 A (Putty)



GlobalCast 946 B (Putty)



3M Glass Bubbles (Mixing Powder)



Cutter



Chisel



Hammer



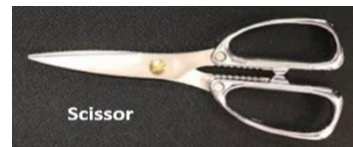
JOTUN HARDTOP XP WHITE A (Paint)



JOTUN HARDTOP XP LIGHT GREY A (Paint)



JOTUN HARDTOP XP COMP B



Scissor



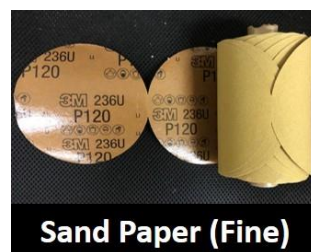
Razor Scraper



Clean Cloth



Sand Paper (Rough)



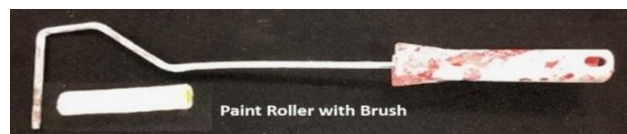
Sand Paper (Fine)



Brush



Scraper



Paint Roller with Brush