



OPERATING MANUAL

For

OTR/EM TYRE REPAIRS

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"the solution and the cure"

CHEMVULC



CONTENTS:

Page number.

1. <u>Introduction.</u>	
1.1. Safety precautions.	3
2. <u>The CHEMVULC OTR/EM Repair System.</u>	
2.1. Description.	4
2.2. Repair system breakdown.	4
2.3. Tyre repair ranges.	5
3. <u>Care and maintenance.</u>	
3.1. EM repair system.	6
3.2. Tooling and equipment.	6
4. <u>Additional tooling.</u>	
4.1. Tooling list.	7
<u>SECTION 1</u>	
5. <u>Pre-repair inspection procedure.</u>	
5.1. Receiving and initial inspection.	
5.1.1. Securing the tyre for cleaning and inspecting.	8
5.1.2. Cleaning and inspection.	8
5.2. Repair Limits.	
5.2.1. Casing sections and EF Zone.	9
5.2.2. Radial and Cross-Ply.	9
5.2.3. SABS Standards.	9
<u>SECTION 2</u>	
6. <u>Preparing the injury.</u>	
6.1. RADIAL tyre preparation.	
6.1.1. Gouging.	10
6.1.2. Shaping.	10
6.1.3. Cord preparation.	11
6.1.4. Patch selection, marking and buffing.	
6.1.4.1. Measuring of injury.	11
6.1.4.2. Selecting the correct patch.	12
6.1.4.3. Marking the patch area for buffing.	12
6.1.4.4. Buffing the patch area.	13
6.1.5. Cleaning and cementing.	14
6.1.6. Patch application.	15
6.1.7. Curing time calculation.	15
6.1.8. Filling.	16



CONTENTS...cont.

Page number.

6.2. BIAS / CROSS – PLY tyre preparation.	
6.2.1. Gouging.	17
6.2.2. Shaping.	17
6.2.3. Cord preparation.	18
6.2.4. Patch selection, marking and buffing.	
6.2.4.1. Measuring of injury.	18
6.2.4.2. Selecting the correct patch.	19
6.2.4.3. Marking the patch area for buffing.	19
6.2.4.4. Buffing the patch area.	20
6.2.5. Cleaning and cementing.	20
6.2.6. Patch application.	21
6.2.7. Curing time calculation.	22
6.2.8. Filling.	22

SECTION 3

7. Fitting the EM Repair System for curing.

7.1. Fitting the Repair System to the tyre.	23
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1. INTRODUCTION

The OTR/EM Repair System is designed for extensive repairs to OTR tyres. This system is a *HOT* cure, *PERMANENT* repair and makes use of three very important elements namely TEMPERATURE , PRESSURE and TIME.

1.1. Safety precautions!



Before using the Repair System, Tooling Equipment and repair products, it is **IMPORTANT** to note the following **SAFETY** precautions!



Be aware of high air pressures in the airlines and air bags!



Be aware of high temperatures when handling heat pads , grinding discs and freshly cured repairs!



When handling the heat pads and control box, be aware of loose or faulty wiring.



Be aware of toxic fumes when using cleaning solvents and cements!



Always be aware of the correct PPE , (Personal Protective Equipment), that you should wear before carrying out any work.



Always ensure that anybody visiting your work place is made aware of the possible dangers that might be present and also ensure that they wear the correct PPE.



It might be necessary and advisable to cordon off a specific work area where only authorized personnel is allowed.

Always keep your work place clean and tidy to prevent injury to yourself and others.



VERY IMPORTANT!

NEVER leave a Repair System unattended when a curing process is underway!



2. THE CHEMVULC OTR/EM SYSTEM

2.1. Description.

(FIG. 1) The CHEMVULC OTR / EM Repair System is available in three repair specific sizes. They are the EM550, EM750 and the EM900. Depending on the tyre size you need to repair, you will have to make sure to order the correct system in order for it to fit the specific tyre you need to repair. CHEMVULC have developed their systems through the three ranges to accommodate a wide spectrum of tyre sizes.

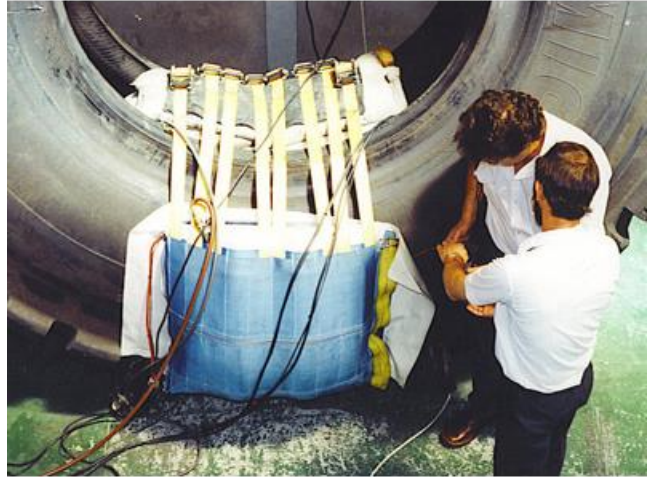


FIG. 1

2.2. Repair system breakdown.

The three **EM Repair Systems** (550,750 and 900) have been designed to do extensive major repairs to OTR tyres. This **Repair System** is called a **Hot Cure, Permanent Repair**, and it utilizes three very important elements namely **Temperature (Heat)**, **Pressure** and **Time**.

The System comprises of the following:

- (a) **Dual Control Box** – The dual control box regulates the air pressure in the air bags and the temperature of the heat pads.
- (b) **Harness** – The harness is used to keep the repair system in place during the curing cycle.
- (c) **Heat Pads** – The heat pads supply constant heat to the repair areas.
- (d) **Air Bags** – The air bags are used to supply constant pressure to the repaired areas.
- (e) **Sand Bags** – Sand bags are used to fill the cavity of a tyre in order to have the air bags flush with the repaired areas during the curing cycle.
- (f) **Tubing** – Tubing is used in large cavities where they replace sand bags which can become very heavy depending on the size of the cavity.
- (g) **Curing Cloth** – Curing cloth is used between the repair and the heat pads in order to prevent the heat pads to stick to the repair.
- (h) **Cylinder Air Bag** – The cylinder air bag is an optional extra which can be used instead of the piping and sand bags where weight is an issue.

2.3. Tyre repair ranges.

(FIG. 2a,b &c) Shows a breakdown of the three repair systems available, including the tyre size ranges repairable.

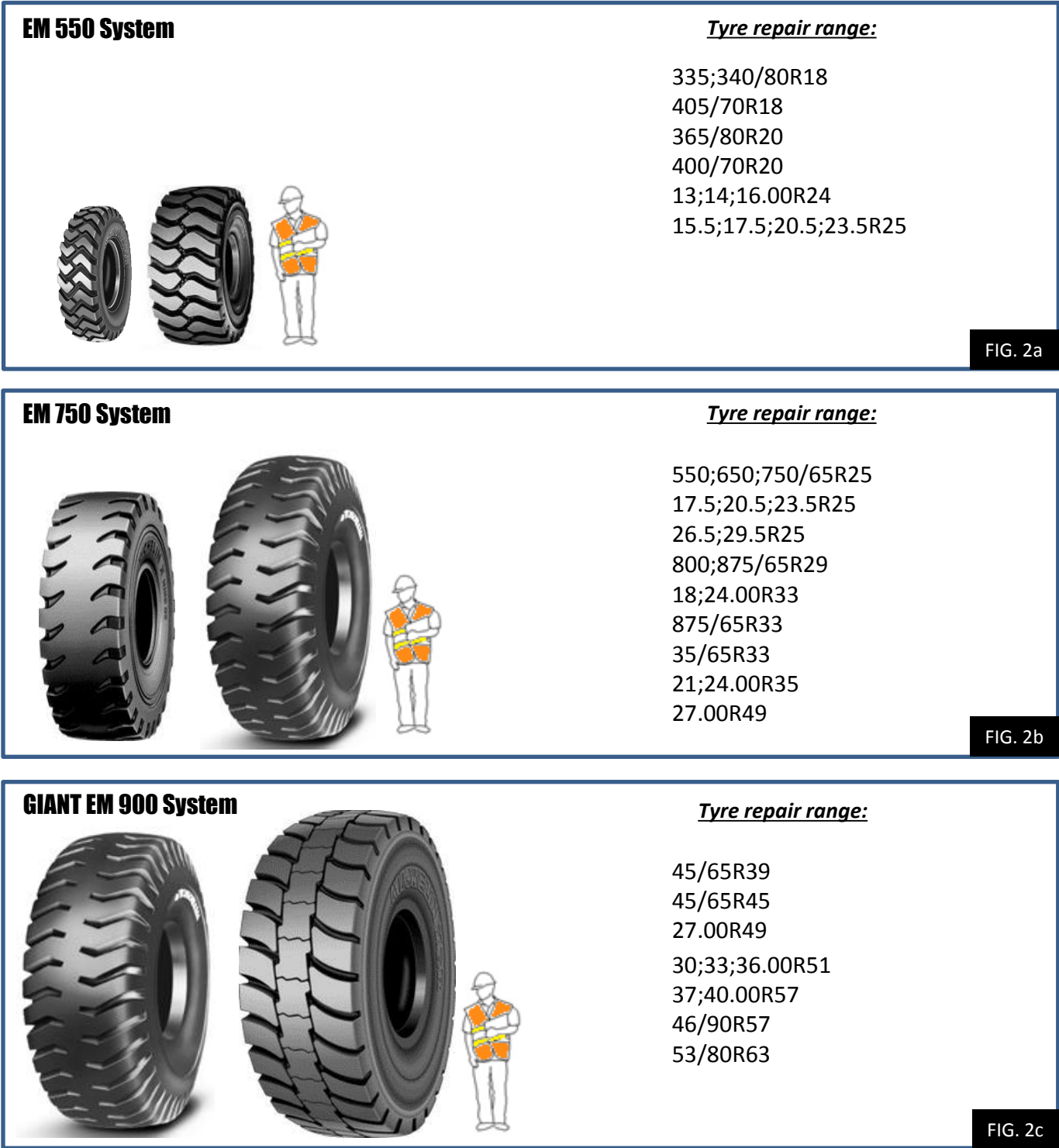


FIG. 2a

FIG. 2b

FIG. 2c



3. CARE AND MAINTANENCE



3.1 The EM Repair system.

Always take good care of your repair system in order to optimize its performance, lengthen its life span and keeping it safe to use. Always refer to your supplier for information and tips on how to care for your repair system.

Below follows a few tips on how to care for your repair system.

- (a) Always try to store the repair system, (especially the heat pads, air bags and harness) in an area where it is easily accessible and yet out of the way of traffic , (foot and vehicle), whenever it is not in use.
- (b) Before using the system it is advisable to check the various components for any defects, missing parts or incorrect air or electrical connections.
- (c) Before fitting the system to the tyre, ensure that the work area and repaired area, is clean and free of dust.
- (d) Whenever the system is in use, ensure that it is free of any foreign or protruding objects that may cause damage to the system.
- (e) Whenever you are unsure if the system is safe to put into service, please contact your supervisor or your supplier immediately.

3.2. Tooling and equipment.

It is just as important to keep your tools and equipment in a good working condition. Follow the manufacturers recommendations for how to maintain your tools and equipment.

Below follows a few tips on how to care and maintain your tools and equipment.

- (a) When not in use, always store your tools and equipment in a safe dry place.
- (b) Always follow the manufacturers instructions regarding service intervals and day to day maintenance.
- (c) Always ensure that you regularly clean your tools and equipment.
- (d) Where applicable, ensure that the correct oiling procedures are followed with tooling that requires it.
- (e) When using your tools and equipment, ensure that you use the right tool for the right job.
- (f) Never leave your tools and equipment unattended or lying around, for it may cause serious injury to yourself or your co-workers.
- (g) Always ensure that your tools and equipment are working properly in order to prevent injury to yourself or your co-workers and to ensure proper repair results.



4. ADDITIONAL TOOLING AND EQUIPMENT

4.1. Tooling list.

Before starting any repair, it is advisable to take note of the following additional tooling and equipment that is essential for doing any repair.



- 6400 – Flexible Shaft Buffer** – The flex shaft buffer is used where heavy buffing, skiving or gauging is required.
- 3524 – CP Low Speed Buffer** – The low speed buffer is used for skiving and shaping of the injury area.
- 3525 – CP High Speed Buffer** – The high speed buffer is used for the cutting of steel cords.
- 3503 – Reversible Air Drill** – The reversible air drill is used for small nail holes on the tread area in conjunction with the carbide cutters. (4620 – 4624)
- 6510 – Extruder Gun** – The extruder gun is used to extrude rope rubber into the prepared repair area.
- 5048 – Water trap and Lubricator** - This is essential to have fitted on your air lines to help remove water from your air line system and to lubricate your air tools.
- 5043 – Suction Gun** – The suction gun is used to remove excess dirt and water from the inside of a tyre.
- 3817 – EM Tread Depth Gauge** – This tool is used to measure the depth of the repair injury.
- 4500 – 4593 – Tungsten Rasps** – The tungsten rasps are used with the Low Speed buffer (3524) to shape the injured area.
- 4651 – 4652 – Rubber Gougers** - The 1” and 2” gouger are used to remove large quantities of rubber in a short space of time.
- 4620 – 4624 – Carbide Cutters**–The carbide cutters are used with the reversible air drill , (3503) to clean and prepare small nail holes in the tread area.
- 4610 – 4618 – Grinding Stones** – The grinding stones are used with the high speed buffer, (3525) to cut away steel cords.
- 3673 – Probe Tool** – The probe tool is used to probe the injured area in order to remove all foreign objects from the injured area.
- 3647 – Ball Bearing Stitcher** – The ball bearing stither is used to stitch the patch to the injured area, as well as the extruded rubber in order to eliminate any and all air traps.
- 3601 – 4” Taper Knife** – The 4” taper knife is used to cut away any loose rubber from the injured area.
- 3631 – 2” Brush** – The 2” brush is used to clean the prepared injured area from dust and buffing dust.
- 3630 – 1” Solution Brush** – The 1” solution brush is used to apply the cement to the injured area.
- 3616 – Rubber Scraper** – The rubber scraper is used to scrape the inner liner clean.



Always ensure to implement the correct care and maintenance procedures for all your equipment and tools as per supplier specifications in order to ensure optimum performance and extended lifetime!



SECTION 1

5. PRE-REPAIR INSPECTION PROCEDURE

5.1. Receiving and initial inspection.



BEFORE ANY WORK OR INSPECTIONS ARE CARRIED OUT, ENSURE THAT THE TYRE IS SECURED PROPERLY AND THAT IT HAS BEEN CLEANED AND THAT ALL FOREIGN OBJECTS HAVE BEEN REMOVED FROM THE CASING!



5.1.1. Securing the tyre for cleaning and inspecting.

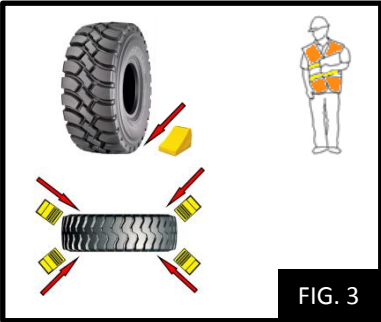


FIG. 3

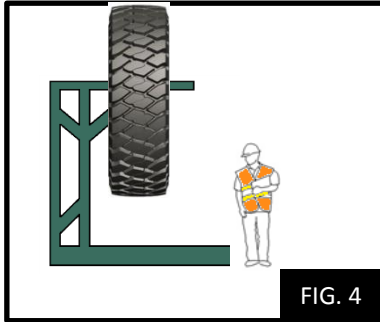


FIG. 4

Before you start cleaning and inspecting the tyre, ensure that it is secured properly. This can be achieved by using "Tyre Chocks" or specially built "Tyre Stands". (fig 3) and (fig 4) respectively.

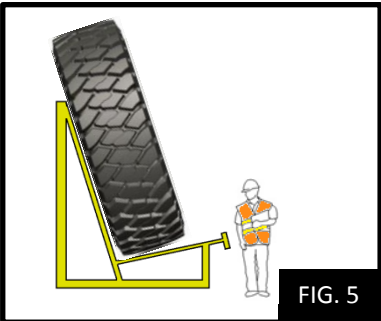


FIG. 5

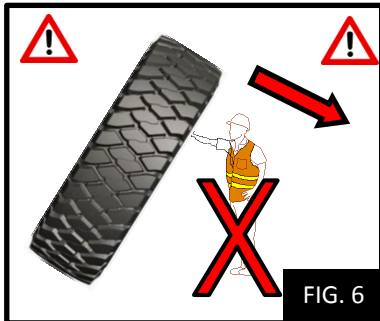


FIG. 6

For very large OTR tyres it may be necessary to make use of large Inspection stands, (fig 5).

Never attempt to stop a tyre from falling over with your bare hands, (fig 6), always stay clear to prevent serious injury.

5.1.2. Cleaning and inspection.



FIG. 7



FIG. 8

(Fig 7)

Make sure to clean the tyre properly on the outside by removing excess mud and dirt. Use a hand brush to clean of any and all dust.

(Fig 8)

Make sure that you clean the tyre on the inside as well. Remove any and all excess water, soap and mud and allow to dry properly before inspecting.



FIG. 9



FIG. 10

(Fig 9)

While inspecting the tyre, ensure that all trapped stones in the tread area are removed.

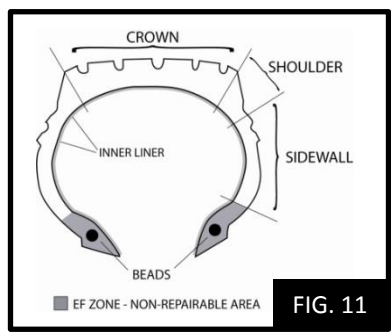
(Fig 10)

Clearly mark the areas to be repaired by using your marking chalk. Remember to mark all new injuries as well as previous repair work.



5.2. Repair limits.

5.2.1. Casing sections and EF Zones.



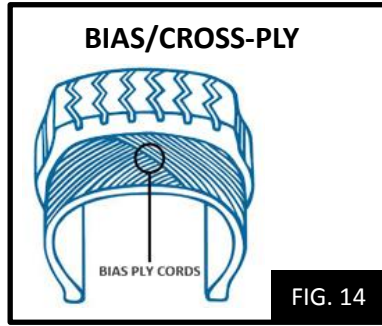
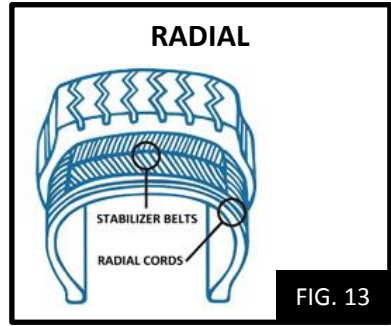
TYRE SIZE	EF ZONE
24"	80MM
25"	95MM
29" to 39"	120MM
49"	169MM
51" to 57"	240MM

FIG. 12

(Fig 11)
Tyre casings are divided into four main sections, of which three can be repaired. They are: The **CROWN**, **SHOULDER**, **SIDEWALL** and the **BEAD** area. Injuries in the Crown, Shoulder and Sidewall areas can be repaired, as long as the injury size falls within the repair parameters set by the supplier.

(Fig 12)
Injuries to the Bead area, (EF ZONE), **CANNOT** be repaired. The EF ZONE varies between different size tyres.

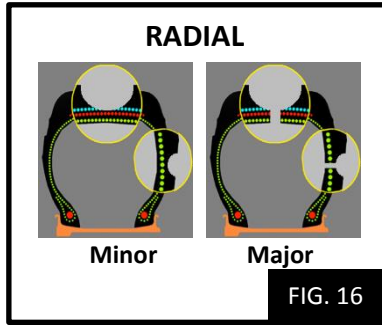
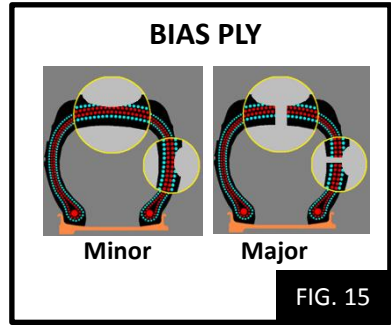
5.2.2. Radial and Cross-Ply.



Before starting the repair process, it is important to understand the differences between RADIAL and BIAS /CROSS-PLY tyres. This is important for preparation and patch selection.

(Fig 13)
Radial constructed tyres are built up with ply cords that extend from bead to bead at right angles to the centre line of the tyre. They are parallel to each other, and are combined with stabilizer belts.

(Fig 14)
Bias, (or Cross-ply) tyres, have ply cords that extend diagonally from bead to bead at a range of 30 to 40 degree angles. Each successive ply is laid at an opposing angle, forming a criss-cross pattern



(Fig 15 &16)
There are two main types of repairs that can be performed on a tyre namely: **MAJOR** and **MINOR** repairs.

5.2.3. SABS Standards.

According to the standards set forth by the **South African Bureau of Standards, (SABS sans 765:2009)**, the various Major and Minor allowed per tyre are as follows:

BIAS-PLY Tyres: (fig 15)

- Minor repairs conducted on tyres with rubber damage or local damage of a cosmetic nature; - **NO LIMIT**
Major repairs conducted on tyres with damage exceeding that mentioned above, including cut - through penetrations and structural damage of 50% or greater to the actual casing plies and not exceeding repair limits; - **ONE REPAIR PER QUARTER SEGMENT, (90° apart).**

RADIAL Tyres: (fig 16)

- Minor repairs conducted on tyres within the following limits:
(a) Rubber damage or local steel belt damage to the crown area protector belts including the top working belt and not exceeding 25mm in diameter with no damage to the second belt from the crown and without any cut - through damage. (**NO LIMIT**)
(b) Damage to the turn-up ply shall not extend into the EF ZONE ; - **NO LIMIT**
Major repairs conducted on tyres with damage exceeding that mentioned above including cut - through penetrations and structural damage to the radial casing ply not exceeding 70mm on small tyres and 125mm on larger tyres in the crown area. On the sidewall cuts or damage not exceeding 100mm across the radial ply in small tyres, and 150mm in larger tyres. Structural damage to the radial casing ply not exceeding 90mm in the shoulder area. Damage not exceeding repair limits ; - **TWO REPAIRS PER QUARTER SEGMENT, (45° apart)**



SECTION 2

6. PREPARING THE INJURY.

ALWAYS ENSURE THAT THE CORRECT PPE (PERSONAL PROTECTIVE EQUIPMENT)
IS WORN BEFORE STARTING ANY REPAIR PREPARATION!



6.1. Radial tyre preparation.

6.1.1. Gouging.



FIG. 17



FIG. 18

(Fig 17 & fig 18)

All injuries should be carefully gouged open utilizing the flexible shaft buffer and, depending on the size of the injury, either a 1" or 2" gouger. The 1" and 2" gougers are used where large amounts of rubber needs to be removed quickly. It is important to check for any moisture in the injury. If any is detected it should be allowed to fully dry out before any further work is done.

(Flex shaft buffer— code 6400 ; 1" gouger - code 4651 ; 2" gouger – code 4652)

6.1.2. Shaping.



FIG. 19



FIG. 20

(Fig 19 & fig 20)

After gouging, the actual injury is now shaped by using the low speed buffer with the tungsten rasps.

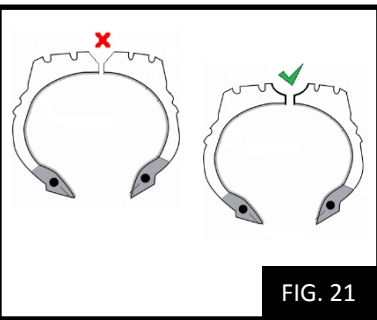


FIG. 21

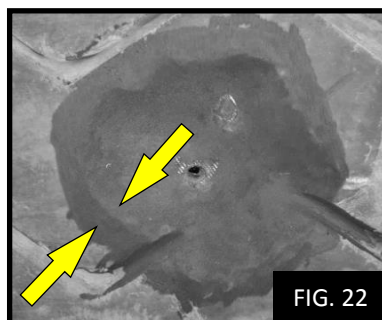


FIG. 22

(Fig 21)

Careful gouging and skiving will ensure a 'WELL' shaped skive-out. This skive - out will insure a better bonding of the new rubber to the old rubber.

(Fig 22)

Finish of the skive - out by over buffing the edge of the injury by approximately 15mm all around. This will allow the new rubber to flow and bond properly without leaving untidy loose rubber flaps after the curing process.

(Low speed buffer – code 3524 ; tungsten rasps – codes 4500 to 4593)



6.1.3. Cord preparation.

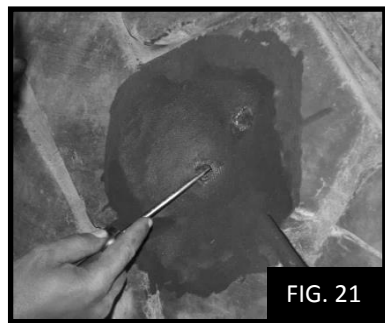


FIG. 21



FIG. 22

(Fig 21)

By using the probe tool, ensure that there are no loose plies, cracks or belt separations in the injury area. If any loose plies and /or cracks are detected , they must be removed before continuing further. If any belt separations are detected, it should be determined if the injury still falls within the repair parameters after the separation has been removed. If not, the tyre should be scrapped.

(Fig 22)

It is also important to remove all loose cord wires, this will prevent air traps during the curing process.



FIG. 23



FIG. 24

(Fig 23 & 24)

Cut away damaged or loose cords and or plies utilizing the high speed buffer with the grinding stones.

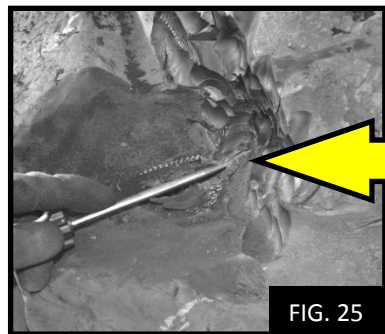
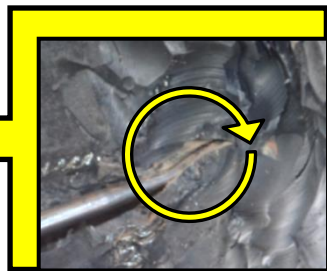


FIG. 25



(Fig 25)

It is important to ensure that any and all rust that are present within the injury is completely removed. Rust on non damaged steel cords can be removed without damaging the steel cords by using an encapsulated wire brush.

(High speed buffer – code 3525 ; grinding stones – codes 4610 to 4618)
(Low speed buffer – code 3524 ; tungsten rasps – codes 4500 to 4593)
(Probe tool – code 3673 ; 16 grit rasp – code 4505, 4550 and 4552)

6.1.4. Patch selection, marking and buffing.

6.1.4.1. Measuring of injury.

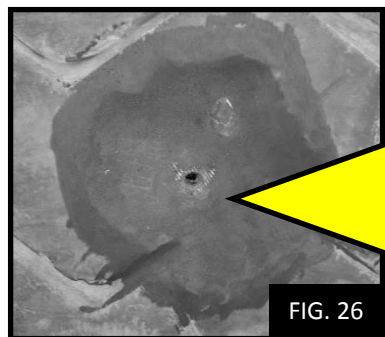


FIG. 26

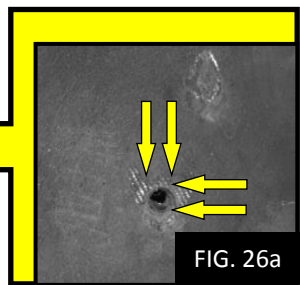


FIG. 26a

(Fig 26)

The skived - out injury is now measured to determine the correct patch to be used on the repair.

(Fig 26a)

It is important to measure only the part of the injury that penetrates the body ply, and not the entire skived out area.

Continue on next page...



..... patch selection, marking and buffing cont.

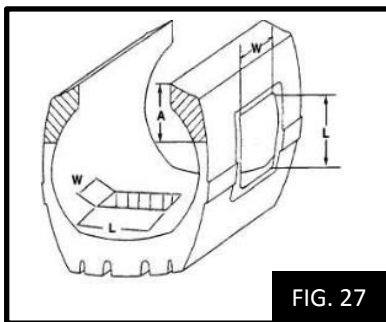


FIG. 27

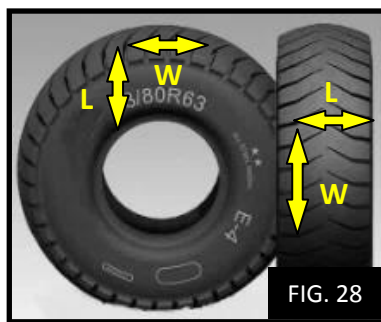


FIG. 28

(Fig 27 & 28)

The length and width of the injury is measured.

The measurements are always taken at right angles to the tyre casing, irrespective if the injury is on the crown, shoulder or sidewall. The measurements taken here should be written on the sidewall of the tyre for future reference.

6.1.4.2. Selecting the correct patch.

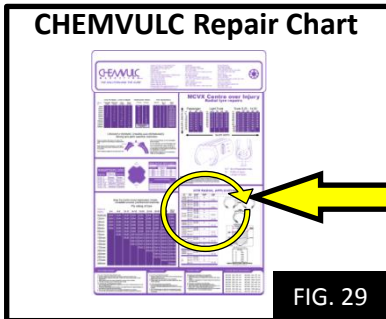


FIG. 29

Tyre Size	Patch Code	Side Wall mm	Shoulder mm	Crown mm
2700 R49	MCV/X60	40 x 350	85	
	MCV/X55	80 x 250		50 x 90
3000 RS1	MCV/X62	50 x 400	70	
3300 RS1		80 x 250		
3000 RS1	MCV/X64			80 x 100

(Fig 29)

This measurement is then applied to the CHEMVULC Repair chart to determine the correct patch to be used. The repair parameters for RADIAL OTR tyres will be found on the bottom right hand corner of the repair chart as illustrated.

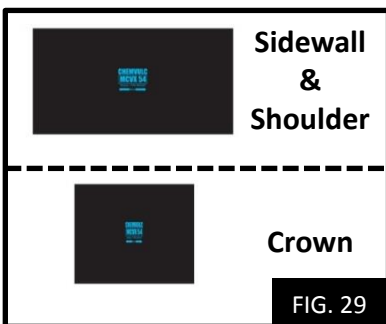


FIG. 29



FIG. 30

(Fig 30)

For this RADIAL repair the **CHEMVULC MCVX SECTIONAL** patch range should be used. Two types are available, one for sidewall and shoulder application, and one for crown application.

(Fig 31)

Note the construction of the **MCVX** patch. These patches are constructed on the same principle as the RADIAL tyre to flex with the tyre when the tyre is in operation. The **MCVX SECTIONAL** patch is also an uncured patch.

6.1.4.3. Marking the patch area for buffing.



FIG. 31

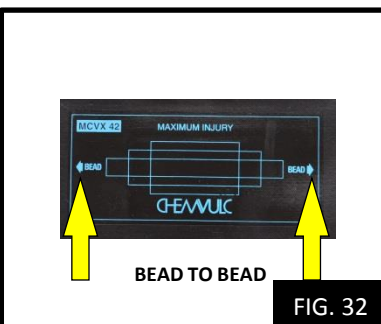


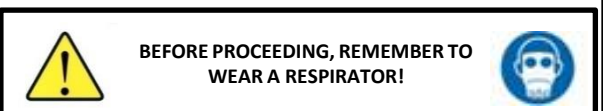
FIG. 32

(Fig 31)

Before starting any work on the inside of the tyre, ensure that it is cleaned properly. It must be free of dust and the liner must be cleaned by using a rubber scraper and CHEMBUFF.

(Fig 32)

It is important to note the markings on the patch. These markings indicate the direction of the patch when it is applied to the injured area. The arrows should always point to the two beads of the tyre.



(Marking chalk – code 6003; CHEMBUFF – code 1040 to 1043; Rubber scraper – code 3616; MCVX Sectionals – code 0500 to 0537)



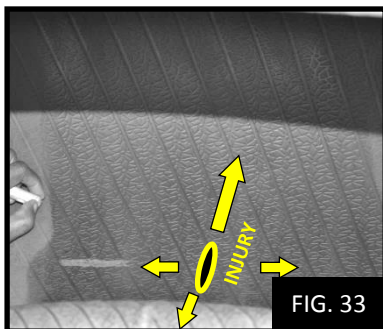


FIG. 33

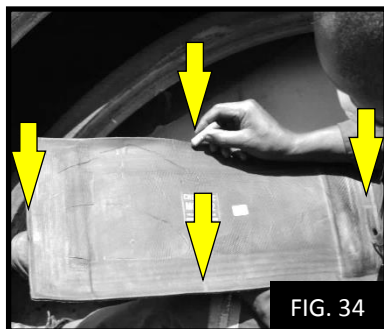


FIG. 34

(Fig 33)

Proceed now to draw guide lines on the liner using your tyre chalk. The guide lines should be at right angles to the tyre starting from the centre of the injury.

(Fig 34)

Next, draw guide lines on the front, outside edges of the patch, dividing each of the four sides of the patch in half.

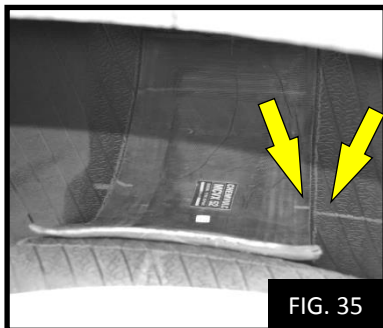


FIG. 35

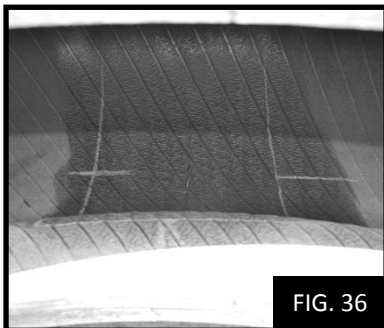


FIG. 36

(Fig 35)

Position the patch over the injury by lining up the guide lines on the inner liner with the guide lines on the patch. By doing this, you ensure that the patch is centred over the injury.

(Fig 36)

Continue now to draw an outline of the patch with your chalk. This will mark the section of the inner liner that should be removed.

6.1.4.4. Buffing the patch area.



FIG. 37

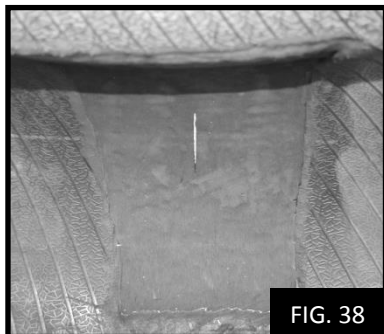


FIG. 38

(Fig 37)

The liner should now be buffed out using the tungsten TCW210 36 grit buffing disc.

(Fig 38)

The entire liner within the chalk markings should be removed.

It is important to remove the inner liner completely within the marked section. Remove the chalk markings as well.

NOTE!

Once the liner has been removed, the inside of the tyre should be cleaned of all buffing dust. The buffed area, and surrounding areas should then be cleaned using a rubber scraper and CHEMBUFF.

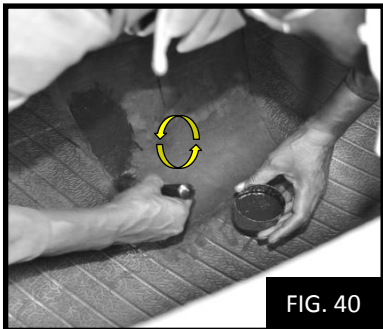
See fig. 3 page 10.



6.1.5. Cleaning and cementing.

NOTE!

Whenever there is a large time lapse between the cleaning of the prepared areas and the cementing procedure, it is advisable to clean the areas again, using a rubber scraper and CHEMBUFF. See fig. 3 page 10.

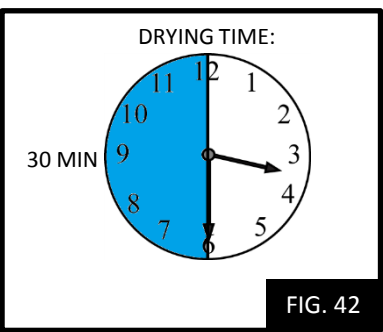


(Fig 39)

You can now start applying the vulcanizing cement to the prepared areas. For this HOT vulcanizing process, you should use the CHEMVULC BLACK VULCANIZING CEMENT. Always ensure that you shake the cement container well before applying it.

(Fig 40)

Use your 1" solution brush to apply the cement. First start by applying it to the inside of the tyre. Note the arrows in fig 40, this indicates how to apply the cement correctly. A thin coat should be applied using circular movements.



(Fig 41)

Next, apply a thin coat to the outside of the injury also using circular movements. Once the cement has been applied to the inside and the outside of the tyre, mark the cementing time and drying time clearly on the outside of the tyre.

(Fig 42)

The drying time of the BLACK VULC CEMENT is 30 min.

NOTE!

When cement has been applied to the prepared areas, take care not to touch it during the drying time.

Also keep the tyre out of areas that are dusty or wet.

Ensure that the cement have been applied evenly and also make sure that there are no wet cement 'pockets' left in the prepared Areas.



6.1.6. Patch application.



NOTE

When applying the patch to the prepared area, always
take care not to touch the part of the patch that will
make contact with the cement.



FIG. 43

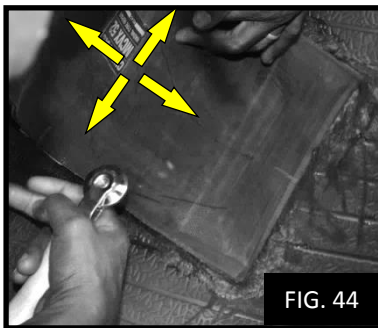


FIG. 44

(Fig 43)

Use the 4" Taper Knife to cut the centre of the protective backing of the selected patch and peel away only a small piece on either side.

(Fig 44)

Centre the patch over the injury and start stitching it using a Ball Bearing Stitcher. It is important to start stitching in the centre of the patch working outwards gradually, and peeling away small sections of the protective backing at a time as you progress.



FIG. 45

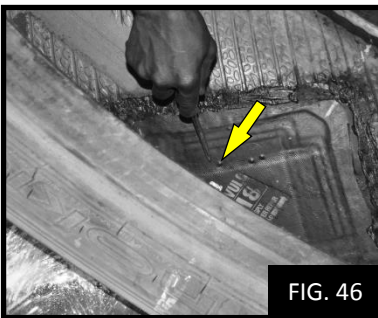


FIG. 46

(Fig 45)

Use a rubber mallet on the patch to eliminate any air traps.

(Fig 46)

Use a pricking awl to punch holes into the patch. This will also eliminate possible air traps during the curing process.

6.1.7. Curing time calculation.



FIG. 47

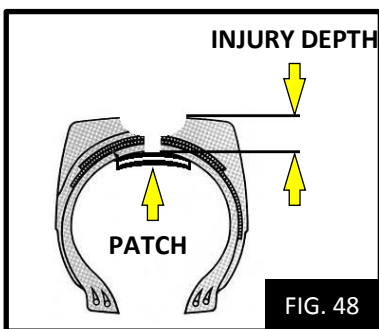


FIG. 48

(Fig 47)

To determine the correct curing time the injury depth should be measured.

(Fig 48)

The measurement should be taken from the patch to the highest point of the injury. This measurement should be recorded on the outside of the tyre.

(Fig 49)

The formula for calculating the curing time is:
For every 1 (one) mm, you allow 6 (six) minutes. Add 10mm on to the millimetres of the injury depth. This will allow for the raw SECTIONAL patch that was fitted to the repair, as well as allow time for the heat pads to reach the correct temperatures. Below follows a few examples.

Example :

Injury depth = 50mm + 10mm
Curing time = 60mm x 6 minutes
= 360 minutes or 6 hours

(Fig 50)

It is important to calculate the curing time correctly to ensure the heat from the heat pads reaches the centre of the injury for a set period of time.

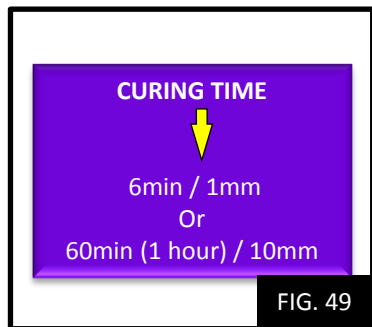


FIG. 49

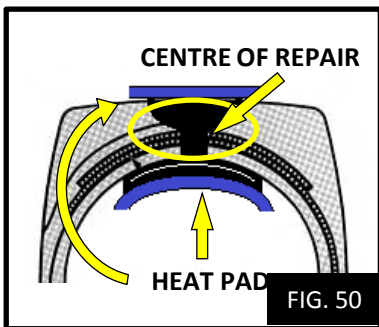


FIG. 50



6.1.8. Filling.



(Fig 51)

The injury can now be filled with rope rubber using an extruder gun.

(Fig 52)

Make sure that the injury cut / hole is properly filled with rubber up to the patch. This can be achieved by using a pricking awl to work the rubber into the cut / hole.



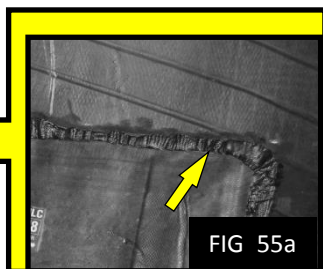
(Fig 53)

Using the extruder gun, start filling the skived out area with rubber.

(Fig 54)

Do this a layer at a time, stitching the rubber properly between layers.

Stitching at this point in time is very important to prevent any air traps that might cause the rubber to cure incorrectly.



(Fig 55 & 55a)

If any 'over buffed' areas are detected between the patch and the inner liner, it can be filled with some extruded rope rubber and stitched down to fill the gaps.

6.2. Bias / Cross - ply tyre preparation.

NOTE!

Below follows the preparation for BIAS / CROSS-PLY tyres. Although many of the preparation is similar to that of the RADIAL tyre, there are some differences. It is important to familiarize yourself with the differences between RADIAL and BIAS / CROSS-PLY tyres!



6.2.1. Gouging.



FIG 56



FIG 57

(Fig 56 & fig 57)

All injuries should be carefully gouged open utilizing the flexible shaft buffer and, depending on the size of the injury, either a 1" or 2" gouger. The 1" and 2" gougers are used where large amounts of rubber needs to be removed quickly. It is important to check for any moisture in the injury. If any is detected it should be allowed to fully dry out before any further work is done.

(Flex shaft buffer- code 6400 ; 1" gouger - code 4651 ; 2" gouger - code 4652)

6.2.2. Shaping.



FIG. 58



FIG. 59

(Fig 58 & fig 59)

After gouging, the actual injury is now shaped by using the low speed buffer with the tungsten rasps.

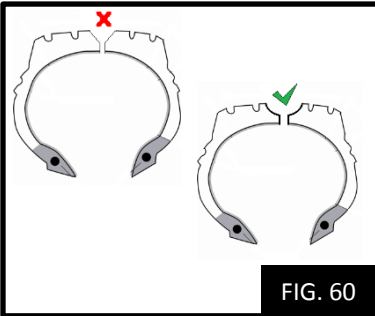


FIG. 60

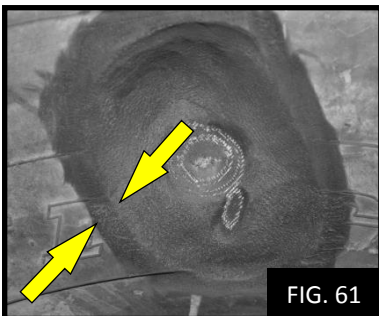


FIG. 61

(Fig 60)

Careful gouging and skiving will ensure a 'WELL' shaped skive-out. This skive - out will insure a better bonding of the new rubber to the old rubber.

(Fig 61)

Finish of the skive - out by over buffering the edge of the injury by approximately 15mm all around. This will allow the new rubber to flow and bond properly without leaving untidy loose rubber flaps after the curing process.

6.2.3. Cord preparation.

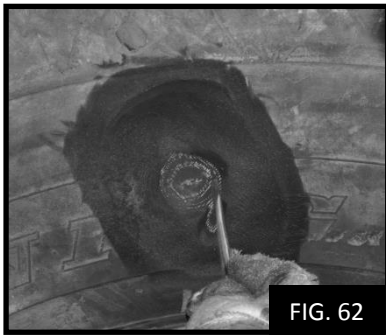


FIG. 62



FIG. 63

(Fig 62)

By using the probe tool, ensure that there are no loose plies, cracks or belt separations in the injury area. If any loose plies and / or cracks are detected, they must be removed before continuing further. If any belt separations are detected, it should be determined if the injury still falls within the repair parameters after the separation has been removed. If not, the tyre should be scrapped.

(Fig 63)

Using a 4" taper knife or a Stanley blade, you must cut away the damaged cords and any loose rubber that may exist.



FIG. 64

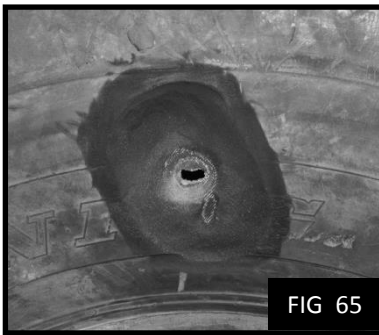


FIG. 65

(Fig 64)

To trim away the nylon cords, it is advisable to use the tungsten rod or cone rasps.

(Fig 65)

Ensure that all loose cords and rubber are removed to leave a clean prepared surface.

6.2.4. Patch selection, marking and buffing.

6.2.4.1. Measuring of injury.

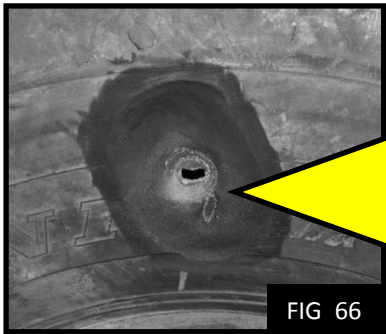


FIG. 66

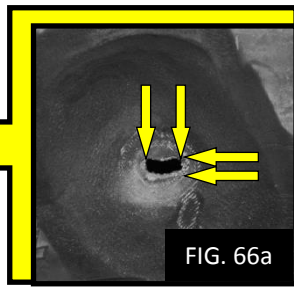


FIG. 66a

(Fig 66)

The skived - out injury is now measured to determine the correct patch to be used on the repair.

(Fig 66a)

It is important to measure only the part of the injury that penetrates the body ply, and not the entire skived out area.

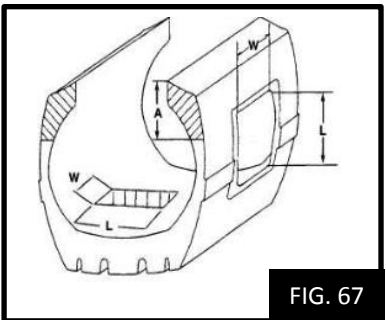


FIG. 67



FIG. 68

(Fig 67 & 68)

The length and width of the injury is measured.

The measurements are always taken at right angles to the tyre casing, irrespective if the injury is on the crown, shoulder or sidewall. The measurements taken here should be written on the sidewall of the tyre for future reference.

Tungsten rod rasps, (codes 4580 to 4583), or the tungsten cone rasps, (codes 4590 to 4593).

4" Taper knife, (code 3601), Stanley handle and blade, (code 3615 and 3612)



6.2.4.2. Selecting the correct patch.

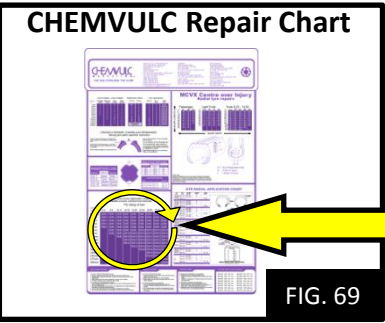


FIG. 69

Size of	2.4	6.8	10.12	14.16	18.24	22.24	26.28	30.36	36.6
Number	1000	1000	1000	1000	1000	1000	1000	1000	1000
12mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
15mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
20mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
25mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
30mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
35mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
40mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
45mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
50mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
55mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
60mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
65mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
70mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
75mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
80mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
85mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
90mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
95mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
100mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
105mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
110mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
115mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
120mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
125mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
130mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
135mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
140mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
145mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
150mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
155mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
160mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
165mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
170mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
175mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
180mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
185mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
190mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
195mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
200mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
205mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
210mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
215mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
220mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
225mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
230mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
235mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
240mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
245mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
250mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
255mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
260mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
265mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
270mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
275mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
280mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
285mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
290mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
295mm	1000	1000	1000	1000	1000	1000	1000	1000	1000
300mm	1000	1000	1000	1000	1000	1000	1000	1000	1000

(Fig 69)

This measurement is then applied to the CHEMVULC Repair chart to determine the correct patch to be used. The repair parameters for BIAS PLY OTR tyres will be found on the bottom left hand corner of the repair chart as illustrated.

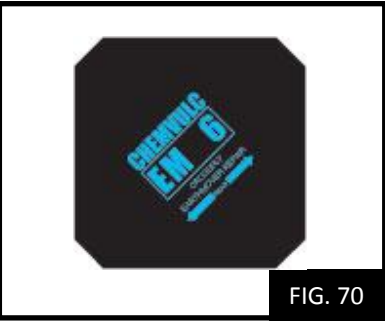


FIG. 70

(Fig 70)

For this CROSS-PLY repair the **CHEMVULC EM SECTIONAL** patch range should be used. Note the construction of the **EM** patch. These patches are constructed on the same principle as the BIAS PLY tyre to flex with the tyre when the tyre is in operation. The **EM SECTIONAL** patch is also an uncured patch.

6.1.4.3. Marking the patch area for buffing.

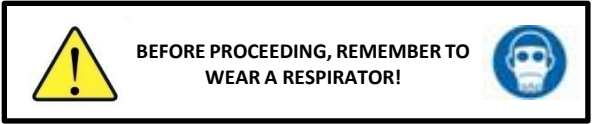


FIG. 71

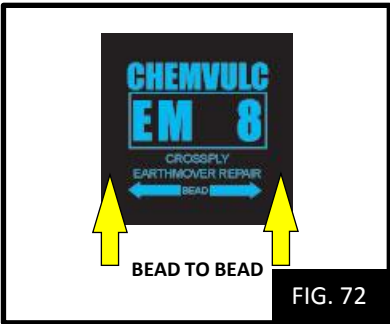


FIG. 72

(Fig 71)

Before starting any work on the inside of the tyre, ensure that it is cleaned properly. It must be free of dust and the liner must be cleaned by using a rubber scraper and CHEMBUFF.

(Fig 72)

It is important to note the markings on the patch. These markings indicate the direction of the patch when it is applied to the injured area. The arrows should always point to the two beads of the tyre.

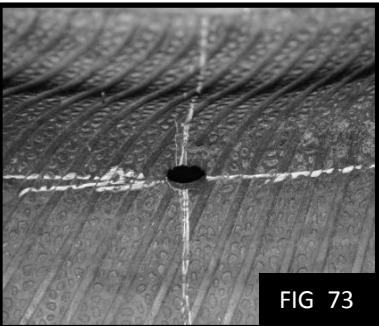


FIG 74

(Fig 73)

Proceed now to draw guide lines on the liner using your tyre chalk. The guide lines should be at right angles to the tyre starting from the centre of the injury.

(Fig 74)

Next, draw guide lines on the front, outside edges of the patch, dividing each of the four corners of the patch in two.

(Marking chalk – code 6003; CHEMBUFF – code 1040 to 1043; Rubber scraper – code 3616; (EM SECTIONALS – codes 0740 to 0749)



..... patch selection, marking and buffing cont.

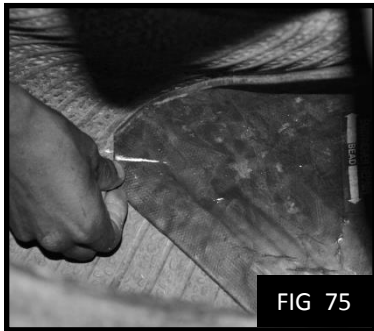


FIG 75

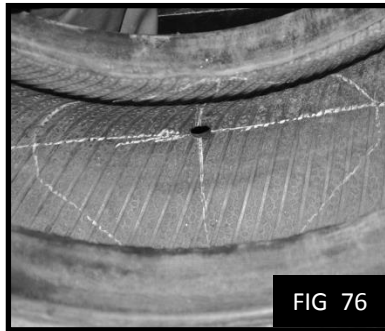


FIG 76

(Fig 75)

Position the patch over the injury by lining up the guide lines on the inner liner with the guide lines on the patch. By doing this, you ensure that the patch is centred over the injury.

(Fig 76)

Continue now to draw an outline of the patch with your chalk. This will mark the section of the inner liner that should be buffed.

6.2.4.4. Buffing the patch area.



FIG 77

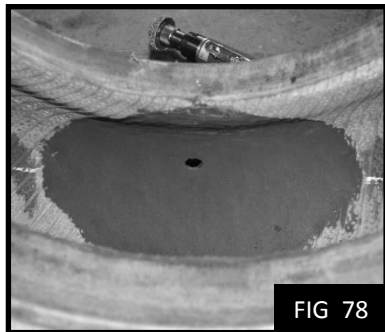


FIG 78

(Fig 77)

The liner should now be buffed out using the tungsten TCW210 36 grit buffing disc.

(Fig 78)

The entire liner within the chalk markings should be buffed.

NOTE!
Once the liner has been buffed, the inside of the tyre should be cleaned of all buffing dust. The buffed area, and surrounding areas should then be cleaned using a rubber scraper and CHEMBUFF. See fig. 3 page 10.



6.2.5. Cleaning and cementing.

NOTE!
Whenever there is a large time lapse between the cleaning of the prepared areas and the cementing procedure, it is advisable to clean the areas again, using a rubber scraper and CHEMBUFF. See fig. 3 page 10.



FIG. 79



FIG. 80

(Fig 79)

You can now start applying the vulcanizing cement to the prepared areas. For this HOT vulcanizing process, you should use the CHEMVULC BLACK VULCANIZING CEMENT. Always ensure that you shake the cement container well before applying it.

(Fig 80)

Use your 1" solution brush to apply the cement. First start by applying it to the inside of the tyre. Note the arrows in fig 80, this indicates how to apply the cement correctly. A thin coat should be applied using circular movements.



FIG. 81

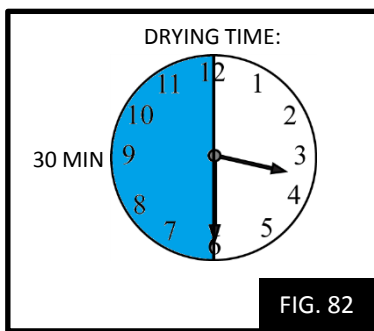


FIG. 82

(Fig 81)

Next, apply a thin coat to the outside of the injury also using circular movements.

Once the cement has been applied to the inside and the outside of the tyre, mark the cementing time and drying time clearly on the outside of the tyre.

(Fig 82)

The drying time of the BLACK VULC CEMENT is 30 min.



NOTE!

When cement has been applied to the prepared areas, take care not to touch it during the drying time.

Also keep the tyre out of areas that are dusty or wet.
Ensure that the cement have been applied evenly and also make sure that there are no wet cement 'pockets' left in the prepared Areas.



6.2.6. Patch application.



NOTE

When applying the patch to the prepared area, always take care not to touch the part of the patch that will make contact with the cement.

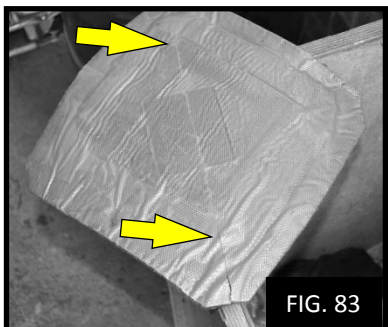


FIG. 83



FIG. 84

(Fig 83)

Use the 4" Taper Knife to cut the centre of the protective backing of the selected patch and peel away only a small piece on either side.

(Fig 84)

Centre the patch over the injury and start stitching it using a Ball Bearing Stitcher. It is important to start stitching in the centre of the patch working outwards gradually, and peeling away small sections of the protective backing at a time as you progress.



FIG. 85

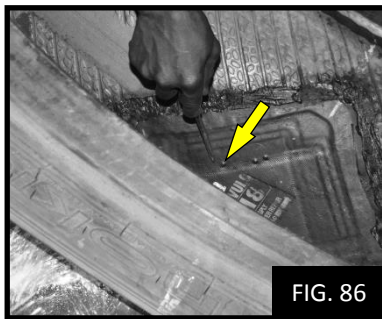


FIG. 86

(Fig 85)

Use a rubber mallet on the patch to eliminate any air traps.

(Fig 86)

Use a pricking awl to punch holes into the patch. This will also eliminate possible air traps during the curing process.

6.2.7. Curing time calculation.



FIG. 87

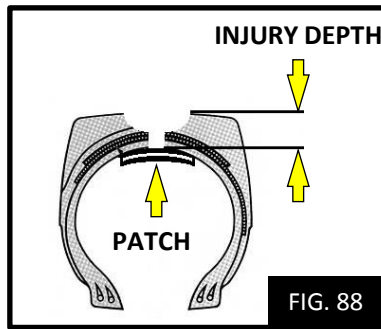


FIG. 88

(Fig 87)

To determine the correct curing time the injury depth should be measured.

(Fig 88)

The measurement should be taken from the patch to the highest point of the injury. This measurement should be recorded on the outside of the tyre.

(Fig 89)

The formula for calculating the curing time is:
For every 1 (one) mm, you allow 6 (six) minutes. Add 10mm on to the millimetres of the injury depth. This will allow for the raw SECTIONAL patch that was fitted to the repair, as well as allow time for the heat pads to reach the correct temperatures. Below follows a few examples.

Example :

Injury depth = 50mm + 10mm

Curing time = 60mm x 6 minutes

= 360 minutes or 6 hours

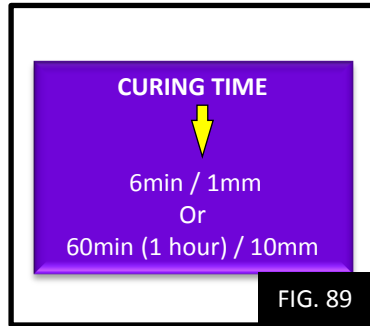


FIG. 89

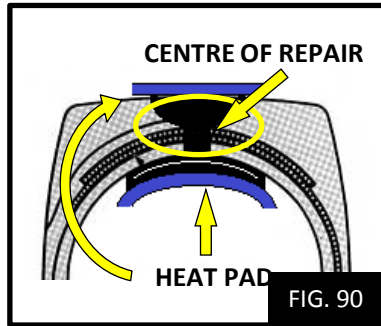


FIG. 90

(Fig 90)

It is important to calculate the curing time correctly to ensure the heat from the heat pads reaches the centre of the injury for a set period of time.

6.2.8. Filling.



FIG. 91



FIG. 92

(Fig 91)

The injury can now be filled with rope rubber using an extruder gun.

(Fig 92)

Make sure that the injury cut / hole is properly filled with rubber up to the patch. This can be achieved by using a pricking awl to work the rubber into the cut / hole.



FIG. 93



FIG. 94

(Fig 93)

Using the extruder gun, start filling the skived out area with rubber.

(Fig 94)

Do this a layer at a time, stitching the rubber properly between layers.

Stitching at this point in time is very important to prevent any air traps that might cause the rubber to cure incorrectly.

SECTION 3

7. FITTING OF THE EM REPAIR SYSTEM FOR CURING.

7.1. Fitting the Repair System to the tyre.

BEFORE FITTING THE EM SYSTEM TO THE TYRE, PLEASE NOTE THE FOLLOWING WARNING SIGNS!



NOTE

Before proceeding to fit the repair system to the tyre, always check that the electrical fittings and the heat pads are in good condition and that all the wiring is in working condition. Also check that the air couplings are clean and free of dust and that the air bags are in good working condition.

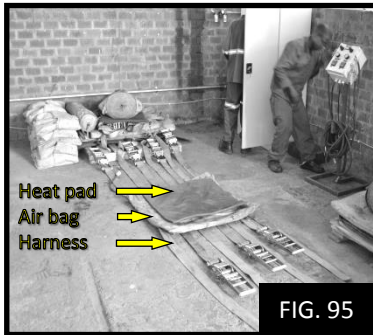


FIG. 95

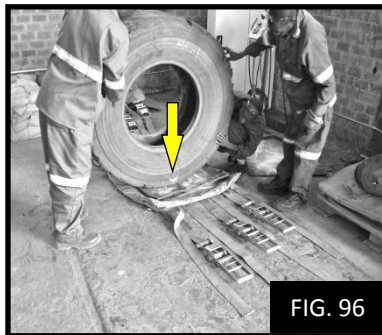


FIG. 96

(Fig 95)

Start by laying the harness on the floor. Ensure that the tie-down straps are fully extended and untangled.

Lay the outer air bag on top of the harness with the outer heat pad on top of the air bag.

The heat pad should now be wiped with french chalk, (code 6020), or covered with curing cloth, (code 6450). This will prevent the heat pad to stick to the repair after curing.

(Fig 96)

Roll the tyre onto the system, ensuring that the repair is centred with the heat pad and air bag.



FIG. 97



FIG. 98

(Fig 97)

Continue now with the inside of the tyre. First, place some curing cloth over the patch. Fit the inner heat pad ensuring that it overlaps the patch on the inside by at least 50mm.

(Fig 98)

Next, fit the inner air bag, ensuring that it covers the heat pad completely.



FIG. 99



FIG. 100

(Fig 99)

Start filling the rest of the cavity with sand bags, ensuring that they are flush with the inner air bag. Make sure that they fit snugly to ensure proper pressure on the injury once the air bags are inflated.

(Fig 100)

Continue to fill with sandbags until they are stacked well past the bead of the tyre, (fig 70).



..... fitting of the EM system cont.



FIG. 101

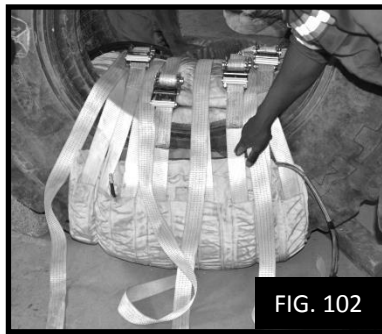


FIG. 102

(Fig 101)

Start tightening the tie straps. Always start from the centre of the harness then proceed sideways.

(Fig 102)

Ensure that the buckles are stacked, meaning, no two buckles should be next to one another. The straps should be tight, but not over tight and the buckles should be locked.



FIG. 103



FIG. 104

(Fig 103)

Next, connect the heat pads and the air bags to the control box. Remember to connect the Thermo coupling wires.

(Fig 104)

Start inflating the air bags slowly. Start with the inner air bag by inflating it to 0.5 bar. Then continue with the outer air bag up to 0.5 bar. Next, bring the inner air bag up to 1 bar, then the outer. At this stage it is important to look and listen to see that the air bags are inflating properly and that the strapping and sand bags are settling correctly.

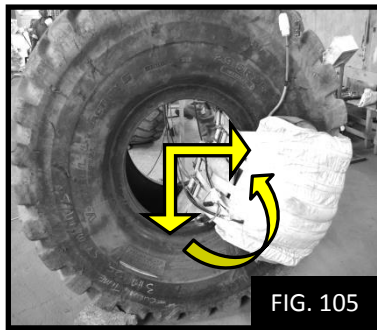


FIG. 105

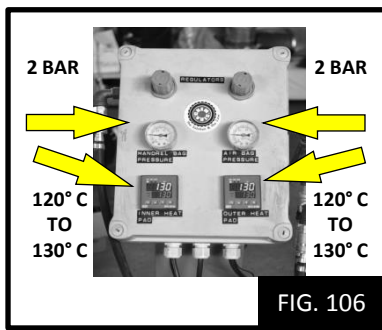


FIG. 106

(Fig 105)

Rotate the tyre to the between 7 and 9 o'clock position. This will keep the repair system away from the floor and away from objects that might damage it during the curing process.

(Fig 106)

Proceed to inflate the inner and outer airbags to 2 bar. The temperature controllers on the control box are pre-set to the correct temperatures. The standard is 125° Celsius, but can range from 120° C to 130° C, depending on the individual needs. Once the heat pads have reached the desired temperature, the pre determined curing cycle can begin, (fig 76).



NOTE!

Once the curing cycle has started, it must be monitored at 20 min intervals to ensure that the air pressures and temperatures stay within the prescribed settings!



FIG. 107

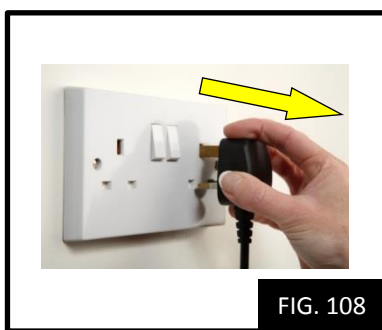


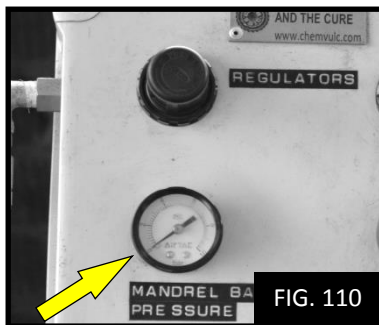
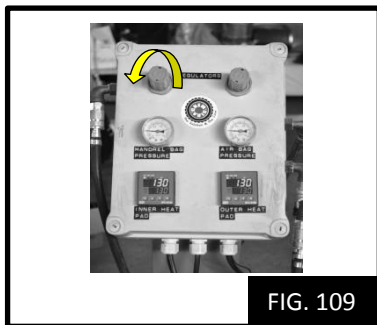
FIG. 108

(Fig 107)

It is advisable to write the curing cycle on the sidewall of the tyre. This will eliminate confusion as to the curing cycle.

(Fig 108)

After the curing cycle is complete, cut the power to the control box by disconnecting it from the wall socket. Keep the air bags inflated at 2 bar pressure for at least 20 minutes after the power to the heat pads have been cut. This will allow the heat pads and the repair time to cool off under pressure. This step is known as the **POST CURE**.



(Fig 109)

After the 20 minute POST CURE, you can release the air pressure in the air bags by turning the pressure regulators anti clockwise until it is opened fully.

(Fig 110)

Allow for the pressure gauges to reach zero before loosening the system harness.

You can now proceed to remove the tyre from the system.

CAUTION!

Never loosen the harness straps
when the air bags are still inflated!

This can cause serious injury to yourself and your colleagues!



CAUTION!

When removing the system from the
tyre, note that it will still be HOT.
It is important to wear the correct
PPE before proceeding!

