FLAT REPAIR FIXES

Every time a vehicle moves, the tires run the risk of being punctured by a foreign object. When an object punctures through the inner liner of a tire, the obvious concern is the loss of air pressure. However, another risk is that the instability in the area around the puncture can lead to tread separation.

Flat repairs must be done properly and to industry standards to ensure a successful and safe repair. An improper flat repair can not only leave your customer stranded on the highway with another flat, but can also create a hazardous situation by compromising the integrity of the tire.

You will need the proper tools and supplies to correctly repair the tire. High quality tire repair tools, repair units, and supplies are available from your local NAPA store.
CAN THE TIRE BE REPAIRED?

Never attempt to repair a tire that is worn to its treadwear indicators. Repair for passenger and light truck tires through load range E is limited to the tread area. In addition, repairs are limited to punctures that are no larger than ¼” (6mm) in diameter. If the puncture does not fall within these limits, the tire must be replaced. The tire cannot be used – even as a spare – since it is unsafe to use under any condition.

Driving on a flat tire will result in damage that cannot be safely repaired. Never attempt to install a tube into a tire that has run flat damage.

LOCATE THE LEAK

With the tire inflated, inspect the tire (including the wheel rim and valve stem) for leaks. Do not dismount the tire from the wheel until the location of the leak has been identified. Use a water filled tank and a leak detection solution to locate the leak area. Check the entire tire since there may be more than one leak. Mark the location of all leaks with a tire crayon.

Once the leak is located, mark the orientation of the tire to the valve stem so the tire can be reinstalled in the same position. If the tire is balanced with clamp-on weights, mark the location of the weights in relation to the tire so they can be replaced in the same position. Marking tire-to-rim orientation and weight location can be eliminated if the tire is going to be balanced again after the repair.

Remove the balance weights and dismount the tire from the rim. If the wheel has a tire pressure monitoring system (TPMS) transponder, make sure to break the tire bead in the location identified in the proper service information. Use a tire spreader to help inspect the inside of the tire. Look for evidence of run-flat damage as identified by black powder and exposed cores. Also make sure that the new repair will not overlap an existing repair.

DETERMINE THE TYPE OF REPAIR

Remove the foreign object from the tire. Insert an awl into the puncture and use an angle gauge to determine the angle of the puncture. The puncture angle determines if a combination repair unit is acceptable, or if a two-piece repair will be required.

If the angle of the puncture is less than 25°, it is acceptable to use a combination patch/plug (one-piece) repair unit. If the angle is greater than 25°, use a two-piece repair system. Other industry standard repair procedures include chemical or heat-curing repair units.

PREPARE THE TIRE FOR REPAIR

The area of the inner liner that surrounds the puncture must be thoroughly cleaned. This is necessary to achieving a properly buffed surface. Pour some rubber prep solution onto the area and use a tire inner liner scraper to remove all dirt and debris. Repeat this process until the repair area is completely clean.

Next, clean the puncture hole. This process will remove any belt and cord material from the puncture. Use a reaming tool or appropriately sized carbon cutter bit, and, starting from the inside of the tire, work the tool through the puncture toward the outside of the tire. Make three passes through the puncture. Next, make three additional passes through
Buff the repair area. Do not buff an area larger than necessary.

APPLY THE COMBINATION REPAIR UNIT

The following procedure is for applying the combination repair unit.

1. **Apply the Cement:** Use a spiral cement probe to apply a small amount of cement into the puncture. Do not apply cement to the tapered stem of the repair unit. Next, apply a thin, even amount of cement to the buffed area. Work the cement into all of the pores. It is important to allow the cement to dry completely before applying the patch unit. Use the back of your knuckles at the very outer edge of the applied cement to test if it is dry. The cement should feel tacky but not wet.

2. **Ready the Patch Unit:** Before applying the patch unit, release the tire spreader so the tire can return to its relaxed position. Remove the backing material from the patch unit, being careful not to touch the patch cushion. Avoid touching the cushion by reapplying the backing material to its edge. If the patch is directional, usually the arrows point toward the tire beads. Guide the stem of the patch through the puncture, then use the lead wire to pull the patch unit into the puncture. Once the stem extends past the tire tread, use it to pull the unit until the cushion is fully seated against the inner liner. There should be a slight dimple in the patch when properly seated.

3. **Apply the Patch:** Use a ribbed roller (stitching tool) to apply pressure to the patch. Start in the center of the patch and work outward. Work in one direction until the patch is completely adhered to the tire. Next, work the stitching tool in the opposite direction, again starting from the center and working outward. After the patch is secured, remove the plastic protection cover. To restore the integrity of the inner liner, apply inner liner sealer to the edge of the patch and any remaining exposed buffed areas. Finish the repair by cutting off the excess of the stem at the level of the tire tread.

Proper buffing of the inner liner around the repair area is a critical part of a successful tire repair. Use the low-speed buffer to even out the inner liner surface. Buff an area around the puncture that is ½" (12mm) in diameter larger than the size of the patch. Be careful not to buff through the inner liner and into the cords of the tire. Use a brass brush over the repair area to completely remove any debris. Finally, use a vacuum to remove all debris from the inside of the tire. Debris left in the tire may prevent proper adhesion of the patch unit.
**TECH TIPS**

- A plug by itself, or a patch by itself, is not an acceptable repair. The plug does not permanently seal the inner liner, and the patch does not fill the void left by the penetrating object. This allows water to enter the body of the tire and corrode the steel belts.
- The use of sealants, or emergency inflators that contain a sealant, are not recommended as long-term solutions to a flat tire.
- If the puncture is outside of the tread area or exceeds ¼" (6.35mm) in diameter, the tire must be replaced.
- When buffing the repair area, use a low-speed buffer and light pressure to prevent buffing through the inner liner.
- Do not use compressed air to remove debris from the repair area. Compressed air contains moisture, and possibly oil, that will prevent proper adhesion of the patch.
- Do not use compressed air or an external heat source to speed up the drying process of the cement.
- When rolling the patch, start from the center and work outward to ensure air is removed from under the patch.
- When cutting off the excess stem, do not stress the stem by pulling on it.
- If necessary, the stem can be buffed level with the tread to produce a smooth finish.

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**TWO-PIECE REPAIR**

If a two-piece repair is required, the prep procedure is the same as for the combination repair unit. After cleaning the repair area (but prior to buffing), apply cement to the puncture channel and allow it to dry.

Fill the puncture with the appropriate size rubber stem. A suitable vulcanizing material can also be used. Cut the stem ¼” (3mm) to ¼" (6mm) higher than the surface of the inner liner.

Determine the size of the area to be buffed based on the size of the patch. Buff the inner liner and the protruding portion of the stem until it is flush with the inner liner. Clean the repair area and the inside of the tire as described previously. Apply the patch using the same procedure described for the combination repair unit. Without pulling on the stem, cut the stem so it is flush with the tread.

**FINISH THE REPAIR**

The tire is now ready to be mounted to the wheel. Install a new valve stem and apply lubricant to the tire bead. Mount the tire to the wheel. Align the mark on the tire to the valve stem so the tire is in the same position it was when removed. Inflate the tire to the specified air pressure and return to the water tank to confirm the repair is successful. Check to confirm that the tire bead is properly seated to the wheel and check for any other leaks. If all leak tests pass, install the weights or balance the tire.

When installing the tire and wheel assembly to the hub, follow the specified torque sequence to prevent warping brake components. Also, torque the lug nuts or bolts to the proper specification. Some TPMS types will require the transponder to be trained or relearned. This may require a training magnet or a scan tool. In addition, some systems will not update the tire pressure status until the vehicle is driven at speeds above 20 mph (32 km/h).

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**REVIEW QUESTIONS**

1. Technician A says if the angle of puncture is less than 25° to the tread, a two-piece repair unit is required. Technician B says any puncture that enters at an angle greater that 25° must be repaired with a combination repair unit. Who is correct?
   - a. Technician A
   - b. Technician B
   - c. Both Technician A and Technician B
   - d. Neither Technician A nor Technician B

2. Technician A says before applying the patch unit, release the bead stretcher. Technician B says to apply cement to the stem of the repair unit before inserting it into the puncture. Who is correct?
   - a. Technician A
   - b. Technician B
   - c. Both Technician A and Technician B
   - d. Neither Technician A nor Technician B

3. Technician A says to roll the patch with a stitching tool starting from the outside edge of the patch and working toward the center. Technician B says repair for passenger and light truck tires through load range E is limited to the tread area and to punctures less than ¼" (6mm) in diameter. Who is correct?
   - a. Technician A
   - b. Technician B
   - c. Both Technician A and Technician B
   - d. Neither Technician A nor Technician B