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Inspection of Energy Absorbing Bumper Mounts

**SAE Recommended Practice
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INSPECTION OF ENERGY ABSORBING BUMPER MOUNTS

1. **PURPOSE:** Since 1973, regulations established by the National Highway Traffic Safety Administration (NHTSA) have required automobile manufacturers to equip all passenger cars with 2.5 to 5 mph energy absorbing bumper systems. The purpose of this SAE Recommended Practice is to provide guidelines which will help to determine the nature and extent of damage a hydraulic or mechanical energy absorber has received, after the bumper system has been involved in a collision. It is also to suggest appropriate repair procedures for energy absorbers that have sustained minor damage and are repairable.
2. **INTRODUCTION:** Manufacturers have taken various approaches to achieve sufficient energy absorption in the bumper systems to comply with the NHTSA regulations. One approach is the use of energy absorbing bumper mounts which utilize various methods to absorb the impact energy. There are Hydraulic, Gas and Hydraulic, Pressurized Gel, Spring Loaded and Mechanical Energy Absorbers.

In the past it was thought that once a hydraulic absorber has been stroked, it should be discarded and replaced with a new one. This is not always true. Most energy absorbers which contain a fluid, gas, gel or a spring, are designed to return to the original position upon being stroked and can be stroked several times, as long as the stroke is not long enough to permanently damage the absorber. If it has been stroked, slight scoring lines may be visible on the piston. (See Fig. 1)

Energy absorbers which utilize a mechanical energy absorption principle cannot return after being impacted. This type must be discarded and then replaced with a new unit (See Fig. 2). See paragraph 5.5 for flange damage analysis.

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Comments on this Recommended Practice are invited from interested parties and can be submitted in writing to SAE Headquarters.

3. DEFINITIONS:

- 3.1 Hydraulic Energy Absorber: Some hydraulic energy absorbers differ from standard suspension shock absorbers by their use of pressurized nitrogen gas. When the absorber is impacted, the gas is compressed and acts as a return spring. A variation of this system utilizes a gel instead of a hydraulic fluid. (See Fig. 3)
- 3.2 Spring Loaded Energy Absorber: This is a variation of the gas/hydraulic system, except that a mechanical spring is used to return the piston after the absorber has been impacted. (See Fig. 4)
- 3.3 Mechanical Energy Absorber: This system does not stroke after impact, but utilizes the material's strength and shape to absorb the required amount of energy. The absorber itself gets crushed, therefore, absorbing energy through its designed shape. (See Fig. 2)

4. PRECAUTIONS AND PREPARATION:

- 4.1 Safety Precautions - Safety glasses/goggles and protective clothing should be worn during any automotive repair.

WARNING - Heat **MUST NOT** be applied to any type of (gas, fluid or gel) energy absorbers. Doing so may cause the nitrogen gas and/or hydraulic fluid (or gel) contained inside a sealed cylinder to explode, resulting in serious personal injury. Before disposing of damaged energy absorbing units, it is recommended that a 1/8 in (3 mm) hole be drilled into the unit to relieve the internal pressure. (See Fig. 5)

It is **NOT** recommended to use an energy absorber as a pulling fixture to complete repairs to the chassis. If a modified energy absorber is to be used as a repair fixture, drill a 1/8 in (3 mm) diameter hole in the unit to relieve the gas and/or hydraulic pressure and then weld it together as a single unit. This will make an acceptable attachment for chassis work. (See Fig. 5) **CAUTION: BE SURE TO RELIEVE THE GAS and/or HYDRAULIC PRELOAD PRESSURE BEFORE WELDING.**

5. EXTERNAL DAMAGE ANALYSIS: The following pointers will help technicians determine the extent and nature of damage to an energy absorption unit.
- 5.1 Check for damage to the piston and/or cylinder. If damaged, discharge the gas and/or hydraulic pressure in the cylinder (as per paragraph 4.1 "Safety Precautions"), then discard the unit. (See Fig. 6)
- 5.2 Check for fluid leakage. If leakage is evident, discharge the gas and/or hydraulic pressure and properly discard. (Caution: If the vehicle you are working on has been undercoated, inspect it closely. The undercoating may give the energy absorber a false appearance of leaking.) (See Fig. 7)
- 5.3 Carefully inspect all welds on the energy absorber. If any of the welds or metal surfaces adjacent to the welds are cracked, the unit must be properly discarded. (See Fig. 8)