TMC Recommended Practice

RP 750 **VMRS 077**

UPPER COUPLER INSPECTION GUIDELINES

PREFACE

The following Recommended Practice is subject to the Disclaimer at the front of TMC's *Recommended Maintenance Practices Manual.* Users are urged to read the Disclaimer before considering adoption of any portion of this Recommended Practice.

PURPOSE AND SCOPE

The purpose of this Recommended Practice (RP) is to provide general guidelines for the inspection of the upper coupler structure of commercial van and flatbed semi-trailers equipped with a two-inch kingpin in a fixed position coupler.

REFERENCES

- Society of Automotive Engineers (SAE) J2228, "Kingpin Wear Limits – Commercial Trailers and Semitrailers."
- SAE J700, "Upper Coupler Kingpin– Commercial Trailers and Semitrailers."
- Commercial Vehicle Safety Alliance (CVSA) *North American Standard Out-of-Service Criteria*.
- Truck Trailer Manufacturers Association (TTMA) TB 78, "Upper Coupler Attachment Fasteners for Van Type Trailers."

INTRODUCTION

An upper coupler can last the life of a trailer. Equipment users can help maximize coupler service life by working with the equipment manufacturer to identify and address various factors that shorten coupler life.

Upper couplers must be inspected (at minimum) as part of the Federal Annual Inspection, or whenever there is suspicion or indication of damage, wear, or an out-of-service condition (see the CVSA *North American Standard Out-of-Service Criteria*). More frequent inspection may be needed if the trailer is:

- older,
- used in trailer-on-flat-car (TOFC) service,
- used in severe-duty service, or;
- subject to atypically corrosive environments.

This RP does not attempt to identify all out-of-service conditions or repair methods. Contact the equipment manufacturer for additional guidance on repair methods and/or out-of-service conditions.

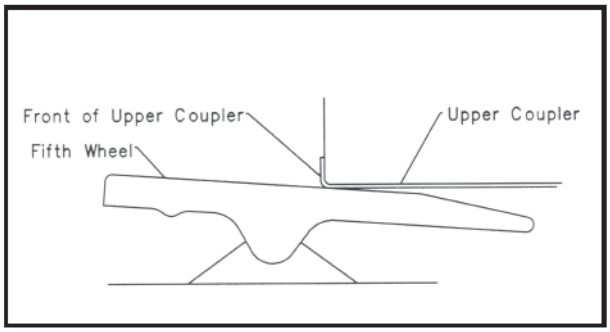

Fig. 1

INSPECTION GUIDELINES

To inspect the upper coupler, the trailer must be parked on a level surface with parking brakes set, uncoupled, unladen, and clean. If practical, the bottom surface of the coupler should be cleaned of grease and debris.

A. Front of Coupler

Inspect the front of the upper coupler where the fifth wheel makes first contact during coupling (see **Figure 1**). The leading edge of the upper coupler should allow smooth contact with the fifth wheel. Some coupler designs include pick-up plate lips which extend forward of the face of the coupler (see **Figures 2 and 3**). These pick-up plate lips should also

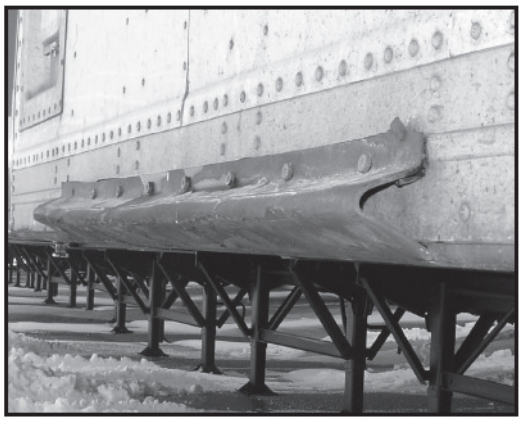

Fig. 2

Fig. 3

Fig. 4

be smooth and uniform where the lip makes contact with the fifth wheel. Sharp edges, gouges, dents, punctures, cracks, holes, excessive corrosion or any other irregularity that interferes with the smooth coupling or uncoupling of the fifth wheel should be repaired or replacements should be made. Flatbed coupler fronts are shown in **Figures 4 and 5**.

If the original upper coupler design provides air and electrical line protection at the front of the coupler, it should be present and functional.

B. Bottom of Coupler

Inspect the entire bottom surface of the coupler (see **Figure 6**). Check that air and electrical lines are recessed properly in the coupler. The bottom surface

Fig. 5

of the coupler should be smooth and even. Any welds on the bottom side of the coupler that extend below the surface of the coupler bottom plate should be ground smooth and even with the bottom plate.

Hand-holes in the bottom plate and pick-up plate should have no gouges, tears or any other damage that extends below the bottom surface of the bottom plate. Any such damage must be repaired. Any dents, dishing or other irregularities that affect the smooth approach of the fifth wheel to the kingpin when coupling and uncoupling, or the smooth and even contact of the fifth wheel to upper coupler interface, require repair or upper coupler replacement.

Check for cracks and areas where the bottom plate is worn or corroded through. Cracks in the area around the kingpin may indicate that the bottom plate has worn or corroded significantly. The CVSA *North American Standard Out-of-Service Criteria* defines as out-of-service conditions any repair weld cracking, any cracks in stress or load-bearing areas, or

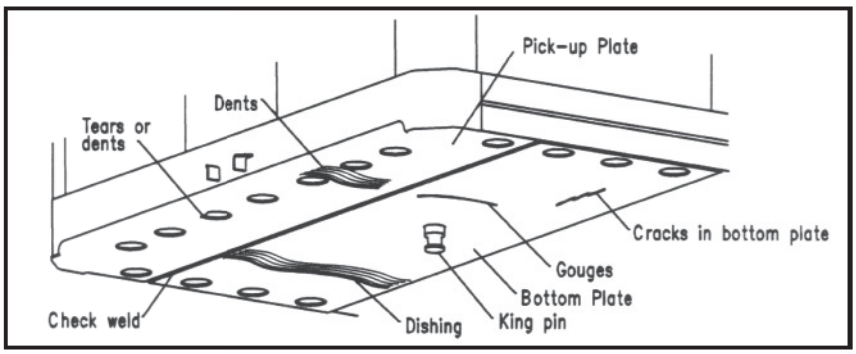

Fig. 6

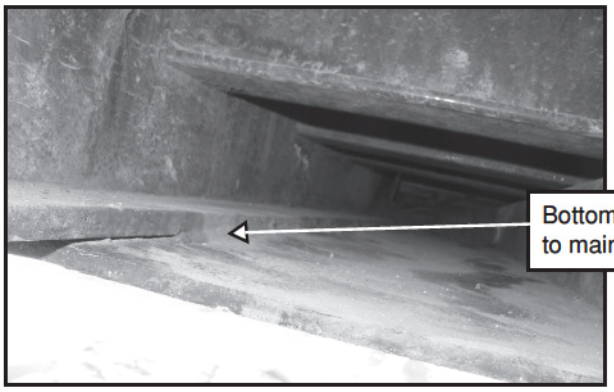

Fig. 7: Flatbed Interior of Beam

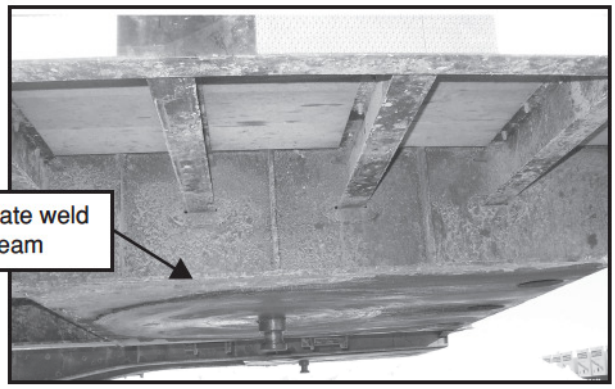

Fig. 8: Flatbed Exterior of Beam

cracks through 20 percent or more of original welds or parent metal. In these cases, the coupler must be repaired or replaced. The area within an 18-inch radius around the kingpin, where the coupler rides on the fifth wheel, is particularly susceptible to friction wear. Proper fifth wheel lubrication minimizes the wear in this area.

Coupler designs vary, utilizing different materials and material thicknesses in the coupler bottom and pickup plate areas. If there is any indication or concern that the bottom plate has been significantly worn or corroded, contact the trailer manufacturer to determine the allowable wear. (Most manufacturers allow up to a 20 percent reduction in bottom plate thickness. Consult the original trailer manufacturer to determine acceptable wear.) If necessary, measure the thickness of the bottom plate with an ultrasonic thickness-measuring device. When using this device, take measurements in areas away from welds and other structural members that may be above the bottom plate. Clean the surface to be checked thoroughly prior to measurement.

Flatbed couplers have a bottom plate that is welded to the main beams (see **Figures 7 and 8**). Be sure to inspect the coupler bottom-plate-to-main-beam welds. Broken welds or cracks at/or near welds must be repaired. The CVSA *North American Standard Out-of-Service Criteria* defines as out-of-service conditions any repair weld cracking, any cracks in stress or load-bearing areas, or cracks through 20 percent or more of original welds or parent metal. In these cases, the coupler must be repaired or replaced.

When inspecting the coupler of an aluminum flatbed, check for corrosion between the steel coupler structure and aluminum main beams (see **Figures 9 and 10**). If excessive corrosion exists between the steel and aluminum, the bolted connections and base materials at these interfaces may be compromised. It may also indicate that the bolts have been corroded and need replacement. Check for missing, damaged, corroded or loose fasteners at this connection. Suspect, damaged, missing or loose fasteners must be replaced. Contact the equipment manufacturer for proper fasteners and installation procedures.

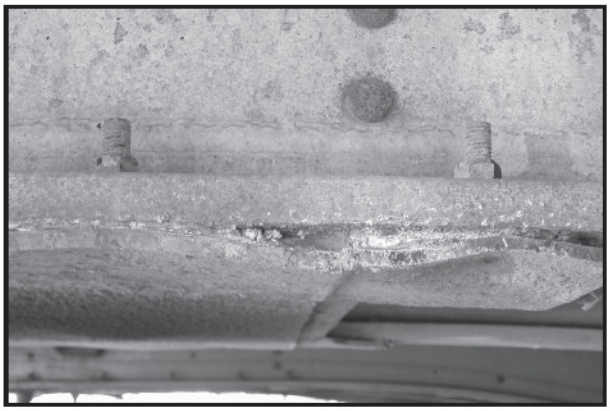

Fig. 9: Corrosion Between Aluminum I-beam and Steel Bottom Plate

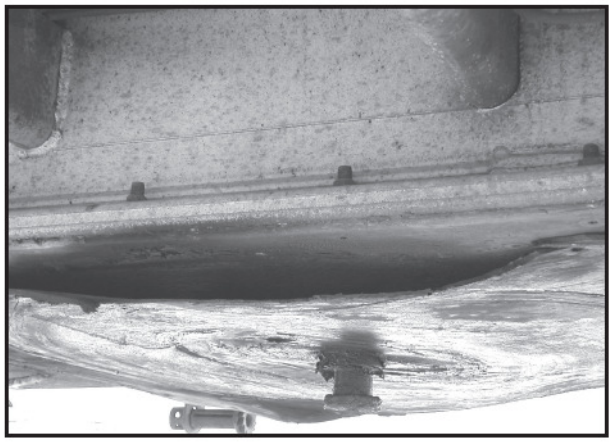

Fig. 10: Aluminum Flatbed Damage

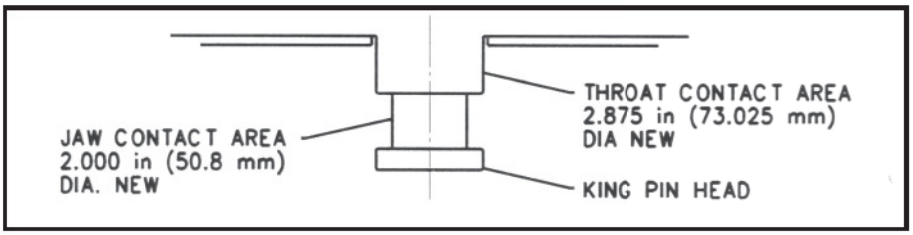

Fig. 11: 2" Kingpin

C. Kingpin Inspection

Manual Check—Attempt to move the kingpin by hand. A trailer with a kingpin that can be moved by hand in any direction must be taken out of service.

Check the kingpin for wear. A new two-inch kingpin is 2.875 inches in diameter at the throat contact area and two inches in diameter at the jaw contact area (see **Figure 11**). Wear of 0.125 inches or more in these areas at any point around the circumference requires that the trailer be placed out of service. Manufacturers offer gages to check kingpin wear against the limits of SAE J2228 and the kingpin length, squareness and bolster (bottom plate) flatness of SAE J700.

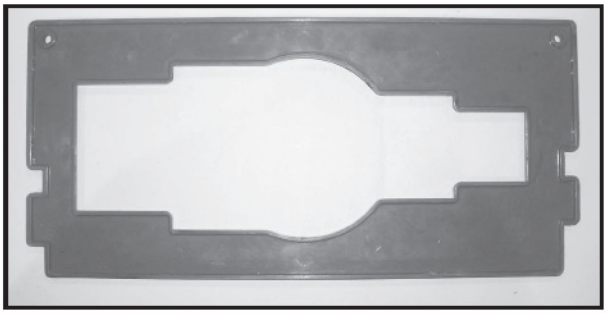

Fig. 12: Kingpin Gage

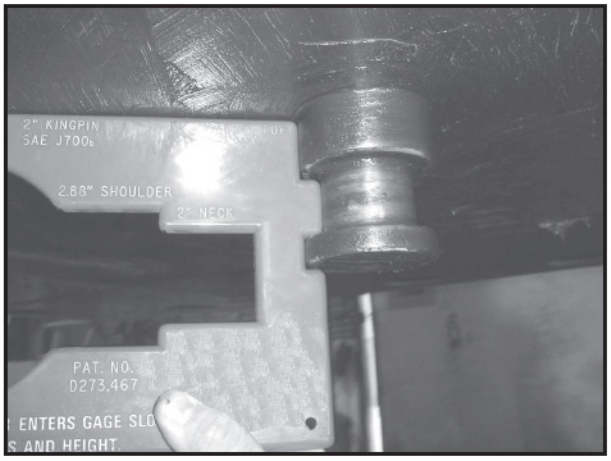

Fig. 13: Dimensional and Squareness Check (Check 360 degrees around kingpin)

Figure 12 shows a typical gage with slots for a two-inch kingpin on one side and the larger, less common, 3.5-inch (SAE J848) heavy-duty kingpin on the other. **Figures 13-15** show "go/no-go" gages. Gage checks should be confirmed with a measuring device of greater accuracy. Any wear on the kingpin head is not acceptable.

Check the kingpin for damage. Any nick or gouge greater than 0.12 inches deep in the throat contact area or the jaws contact area requires that the kingpin be replaced. Also, any burr in those two areas that extends beyond the surface of the kingpin is not acceptable. Nicks, burrs or gouges should not exceed 0.25 inch in length, measured at the maxi-

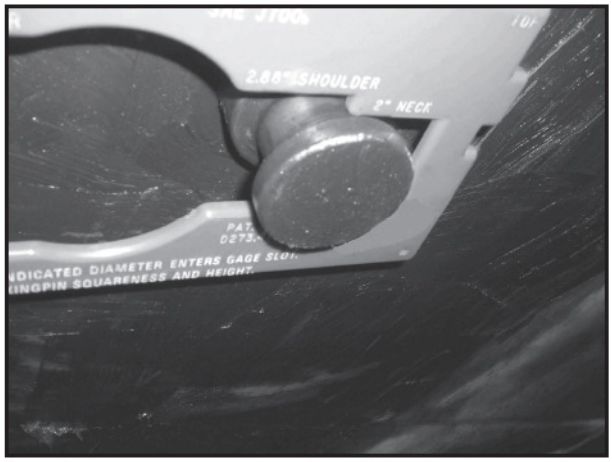

Fig. 14: Kingpin 2" Wear Check at Jaws Contact Area

Fig. 15: Kingpin 2.87" Wear Check at Throat Contact Area

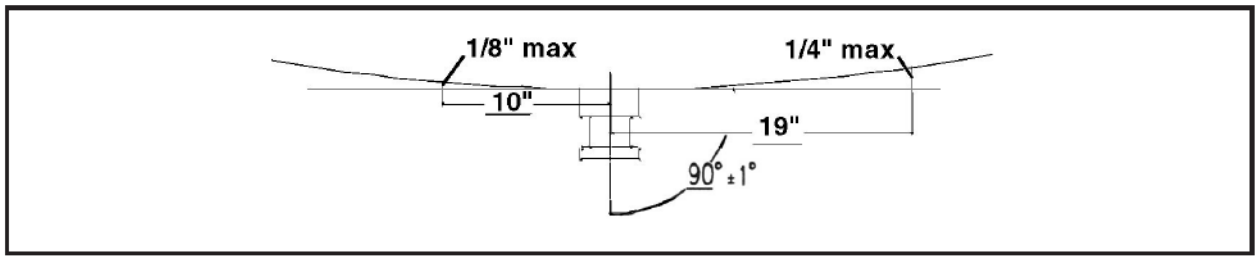

Fig. 16: Downward Bow Limit (inches)

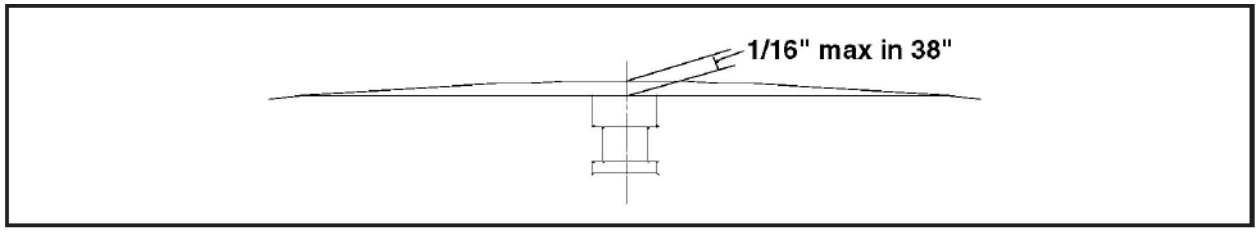

Fig. 17: Upward Bottom Plate Bow

mum length. There should be no more than 10 nicks, burrs or gouges of 0.06 inch in length in the jaw contact area.

NOTE: Trailers used in TOFC rail service may be more susceptible to wear and damage. Couplers and especially kingpins of trailers in rail service should be checked for wear and damage more frequently.

Be certain that the kingpin has no cracks. If the kingpin has a crack, the trailer should be placed out of service. **Never attempt to repair weld a kingpin. Never grind a kingpin.**

Check that the kingpin is perpendicular to the bottom plate of the upper coupler by means of a square or gage (see **Figure 13**). The kingpin should be within one degree of perpendicular with the bottom plate at any point around the kingpin. Any trailer with a bent kingpin must be taken out of service until the kingpin is replaced.

Check the bottom plate flatness around the kingpin. SAE J700 allows the amount of downward bow (see **Figure 16**) in the bottom plate to be no more than 0.12 inches within a 10-inch radius from the kingpin, or 0.25 inches within a 19-inch radius from the kingpin center. The maximum amount of upward bow (see **Figure 17**) allowed is 0.06 inch in the 38-inch diameter around the kingpin.

A flat bar or a template may be used to check bow in the bottom plate. The template shown in **Figures 18 and 19** quickly locates the kingpin center and allows quick measurement of bow.

Fig. 18

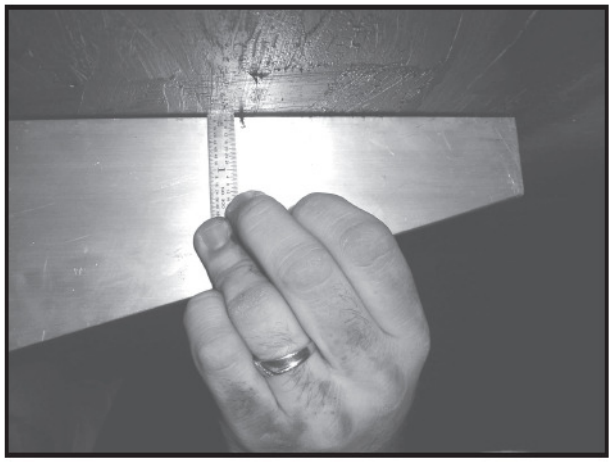

Fig. 19

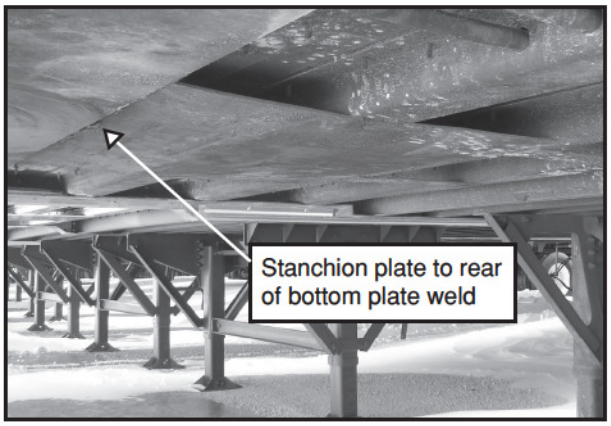

Fig. 20

D. Rear of Coupler
Move to the rear of the coupler. The rear edge of the bottom plate should be smooth, beveled or rounded to allow the fifth wheel to rotate freely around the kingpin. This is especially important if using a no lube fifth wheel. Sharp edges must be removed.

Check the attachment and condition of any stanchion or tire plates to the upper coupler (see **Figure 20**). Repair or replace welded or fastened attachments per original equipment specifications.

Check the rear of the coupler for cracked welds between the bottom plate and upper coupler cross member and coupler top plate. The CVSA *North American Standard Out-of-Service Criteria* defines as out-of-service conditions any repair weld cracking, any cracks in stress or load-bearing areas, or cracks through 20 percent or more of original welds or parent metal. In these cases, the coupler must be repaired or replaced.

For trailers with floors that cover the top of the coupler, check the rear of the coupler near the floorboards for indications of moisture or corrosion. If this condition exists, when you inspect the coupler cavity, pay particular attention to this area.

E. Side of Coupler
(Coupler to Side Rail Connection)
For van trailers, move to the side of the coupler to inspect the upper coupler connection to the sidewall. For flatbed trailers inspect the coupler connection to the main beams.

Van Trailers—Inspect the fasteners that secure the sidewall of the trailer to the upper coupler (see **Figure 21**). Loose, missing or damaged fasteners must be replaced with fasteners of equal or greater

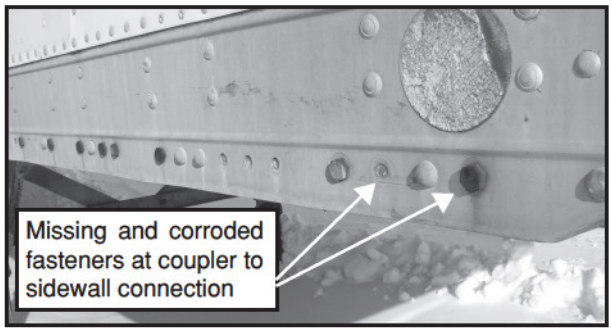

Fig. 21

size and strength. The lower side rails of the trailer should be inspected for corrosion. If excessive corrosion exists at any fastener, a few fasteners should be removed so fastener condition can be checked. Do not reinstall fasteners removed for inspection. Install new fasteners of the same size and strength. Consult trailer manufacturer for proper fasteners (larger fasteners may be recommended) and installation procedures.

Aluminum rails that show signs of swelling (see **Figures 22 and 23**) should be checked frequently to be sure the rails do not begin to crack. Cracked rails should be properly repaired or replaced.

Fig. 22: Swelling Between Fasteners

Fig. 23: Swelling

Check condition and welds of the upper coupler end plates at the sides of the coupler if possible through the hand holes or sides of coupler for excessive corrosion, fastener condition and cracks. If cracks are found in this area, the trailer should be taken out of service (as per CVSA *North American Standard Out-of-Service Criteria*) until cracks are repaired.

Flatbed Trailers—If the upper coupler design allows, inspect any fastened or welded connections between the coupler and main beams. Loose, missing or damaged fasteners must be replaced. Cracked welds should be repaired. The CVSA *North American Standard Out-of-Service Criteria* defines as out-of-service conditions any repair weld cracking, any cracks in stress or load-bearing areas, or cracks through 20 percent or more of original welds or parent metal. In these cases, the coupler must be repaired or replaced. Check for areas of corrosion and electrolytic corrosion between dissimilar metals.

F. Upper Coupler Cavity

An inspection of the coupler cavity can identify the condition inside the coupler and the general condition of accessible coupler structural members.

⚠ WARNING :Use caution when inspecting the coupler cavity of a trailer that has not been in service for an extended period. Insects, birds and mammals can occupy this area and create a hazard when trying to inspect the upper coupler cavity.

Debris inside the coupler cavity can hold moisture, which can accelerate the deterioration of the coupler. If practical, remove debris from the coupler cavity. Do not attempt to remove debris from inside the coupler cavity by means of pressure wash or spray. Pressure washing the inside of the coupler may allow water to get into cavities that will not drain.

With a mirror and a flashlight, inspect the inside of the coupler for visible cracks, corrosion damage, crushed, bent or damaged structural members. Using a small pick or awl, tap or scrape the accessible members to determine soundness. It may be necessary to scrape away layers of corroded metal to determine the condition of coupler components.

If the trailer has a floor over the coupler, also check the top of the structural members in the cavity. Moisture trapped between the floor and the top of the coupler can accelerate deterioration in this area. This is the only means of inspecting the structural condition of the top of the coupler without removing the floor over the coupler.

G. Top of Coupler

If there is no floor over the coupler, the top of the coupler is normally in plain view after unloading. Occasionally check to see if the top of the coupler sags. Sagging sometimes occurs between interior stiffeners that run from one side of the coupler to the other. This is normally not a problem unless sagging is excessive, the safe loading and unloading of the trailer is affected, or if cracks have developed.

Check the condition of any welds for cracks. There should be no tears in the top of the coupler. Tears and cracks must be repaired. The CVSA *North American Standard Out-of-Service Criteria* defines as out-of-service conditions any repair weld cracking, cracks in stress or load-bearing areas, or cracks through 20 percent or more of original welds or parent metal. In these cases, repair or replace the coupler.