

Assessment questions:

1. What is the most likely mode of failure shown by the rivet, and what is the most probable loading geometry?
2. Did the failed rivet material meet the specifications?
3. How would you put the alloy HR15 in the heat treatment solution?
4. When the failed rivets were solution-treated and naturally aged did they meet the specified strength for HR15 in the TB condition?
5. What was the condition of the failed rivets when used to fasten the panels on the containers?
6. Compare the hardness of the annealed rivet with that of an as-solution treated and quenched rivet and account for any difference.
7. What heat treatment must a rivet undergo at the container factory?
8. Estimate the approximate hardness of a rivet immediately after being fitted according to specifications
9. Draw a diagram showing the total shear force acting on each cross section of the fully loaded container.
10. In all cases the joint that failed was 1.25 m from the end of the container and contained 48 rivets each of diameter 4.75 mm. Assuming that the rivets alone transmit the shear force from one panel to the other, what is the average shear stress acting on these rivets?
11. When the container is fully loaded, what is the static factor of safety for the rivets specified and for the defective rivets?
12. What techniques can be used to determine the areas of maximum stress on the panel? What method can be used to determine its magnitude?
13. Strain gauge measurements were made at a location 80mm away from the center rivet in a panel. The container was uniformly loaded with a load of 1.25 the allowable weight and hung by a crane. While at rest, the following measurements were obtained:
 - a. Strain along the length of the container: $11.E-5$
 - b. Strain along the height of the container: $-19E-5$
 - c. Strain along a line at 45 degrees with respect to the horizontal: $117.E-5$What are the direct and shear components in the coordinate system defined by the length and height of the container. If the panel deforms elastically what are the corresponding stresses? (Assume aluminum has a Young's modulus of 66.5 MPa and a Poisson ratio of 0.33)
14. Suppose that the stress in the panel is the last question is transmitted to the next channel entirely by rivets of 4.75 mm diameter spaced 50mm apart (i.e. 50mm between their centers). Assume that the panels are 1mm thick. What is the average shear force on the rivet. If this rivet is in accordance to the specs, what is the static factor of safety? Compare you answer with question 11.

USE THESE QUESTIONS AS A GUIDE IN THE PREPARATION OF YOUR REPORT.