

DIRECTIVE

Split Reinforcing Pads

SUMMARY

The use of split repads is not addressed by the design codes and standards adopted by Alberta regulations. In cases where design rules are not available, engineering principles must apply (e.g., see U-2(g) of ASME Section VIII Division 1). This Directive provides some possible methodologies to apply when split reinforcing pads are used. Further information or discussion of area replacement method in opening reinforcement design and use of this Directive can be found in Information Bulletin IB05-005.

DETAILS AND EXPLANATION

Reinforcing pads are pressure parts used to replace material removed from openings. It appears that, as a matter of practicality and sometimes, for manufacturing convenience, manufacturers split the repad in two, quite often on the meridional centreline (i.e., along the longitudinal axis of the vessel), even though this split and the weld to put the pieces back together is often not on the drawing.

Because the pads are a replacement for material removed, their strength must be equal to that of the removed material. If there is a butt weld in the pad, the efficiency of that weld must logically be addressed. There could be ways to accomplish this.

(A) Strictly speaking, the pad area can be calculated using a joint efficiency of 0.65 (Type 2 joint) applied to S_p , the allowable stress for the repad material, (f_{r4} is effectively multiplied by 0.65). This will result in a pad that is 54% thicker for the same pad diameter. The pad thickness without radiography would be limited to that for which full RT is required by paragraph UW-11 (see next paragraph).

(B) Alternatively, the butt welds in the repad can be fully radiographed to provide a joint efficiency of 0.90 (Type 2 joint) which would be applied to S_p , the allowable stress for the repad material, (f_{r4} is effectively multiplied by 0.90). The resulting pad would be 11% thicker for the same pad diameter.

In many cases these welds are radiographable. Ultrasonic examination in accordance with Appendix 12 would be acceptable, if the construction of the vessel does not permit interpretable radiographs in accordance with Code requirements.

(C) When a repad is used, the nozzle is no longer recognized as an integrally reinforced nozzle (See ASME Section VIII Division 1, Paragraph UG-37 and Fig. UG-37) because of

uncertainty in determining the transfer of load between the shell, the repad, and the nozzle. However, it is likely that the stress level across the split repad weld may be lower when the repad is split along an axis away from the meridional (longitudinal) axis of the vessel. To encourage good engineering practice, it is proposed that if the repad is split at an angle no less than 45 degree from the meridional (longitudinal) axis of the vessel, a joint efficiency of 1.0 could be used for full radiography (or acceptable UT as equivalent) and 0.7 when no radiography is used.

CONCLUSION

Since this subject matter is not addressed by the adopted codes and standards, the above suggested methodologies may serve as means to justify the use of split repads and to satisfy design requirements such as U-2(g). Alternatively, designers may do otherwise and in such cases, they are urged to contact ABSA's Design Survey Department before fabrication to assure the acceptance of the equipment for operation in Alberta.

It should be noted that a letter of inquiry has been sent to ASME on this matter for review and possible future code interpretation or revision. At this point, it may be concluded that obviously there is an advantage to keeping the pad as one piece.

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