

Pipe Support Design inside Pools of a Research Reactor

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1. Introduction

A research reactor performs radioisotopes (RI) production, neutron transmutation doping (NTD), and fast neutron flux utilization. To perform this operation inside pools in a limited space, the components in the pools should be simple and compact. In the case of pipe supports in the pools, the optimized design is required, not the existing design using the broad h-steel. In this study, the conceptual design and analysis results of the pipe supports in the pools are presented.

2. Methods and Results

Figure 1 shows the previous pipe support design using the broad h-steel.

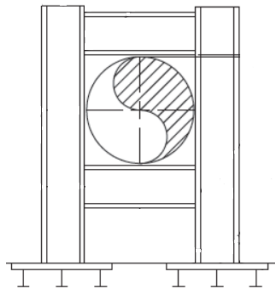


Fig. 1. Existing pipe support design (Plan)

Figure 2 shows the improved pipe support design.

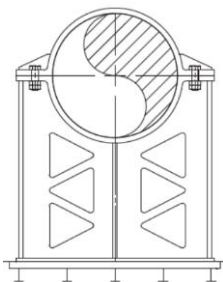


Fig. 2. Improved pipe support design (Plan)

The improved design minimizes interference in handling isotopes and experiments, etc.

The design of plate- and shell-type piping supports shall be in accordance with the requirements of NF-3260 [1]. When design by analysis is used, the stress limit factors for each loading and stress category are specified in Table I.

Table I: Stress Limit Factors for Class 3 Plate- and Shell-type Supports Designed by Analysis [1]

Stress Category	Design, Service Level A	Service Level B, Test Loadings	Service Level D
Primary stresses	$K_m = 1.0$ $K_v = 1.0$ $K_{bk} = 1.0$	$K_m = 1.33$ $K_v = 1.33$ $K_{bk} = 1.33$	Use Appendix F [1]

K_m : stress limit factor applicable to the Design allowable membrane stress or membrane plus bending stress

K_v : stress limit factor applicable to the Design allowable shear stress

K_{bk} : stress limit factor applicable to the Design allowable membrane stress or membrane plus bending stress

The rules and stress limits must be satisfied in an elastic analysis for any Level A through D Service Loading multiplied by the appropriate stress limit factor specified in Table I. Additionally, the rules and stress limits must be satisfied for bearing loads, pure shear, and design of bolting. For the representative pipe support, design by analysis is performed and the analysis results are acceptable.

3. Conclusions

In this study, the improved pipe support design inside pools of the research reactor is presented and the design by analysis is performed. The representative analysis results are acceptable and applicable according to the characteristics of the research reactor. This will be further reviewed and analyzed in the detailed design stage.

ACKNOWLEDGEMENTS

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REFERENCES

- [1] ASME Boiler and Pressure Vessel Code, Section III, Subsection NF, Supports, American Society of Mechanical Engineers, 2004.