# Design to Prevent Interference with Pool Platforms for Vertical Pipings in Research Reactor Pools

Hwanho Lee [a*], Jongmin Lee [b]
[a]*Kijang Research Reactor Design and Construction Project, KAERI, Daejeon, Korea*
[b]*Innovative SMR Coordination Team, KAERI, Daejeon, Korea*
[*]*Corresponding author: leo@kaeri.re.kr*

## 1. Introduction

The Kijang research reactor pools have limited space for radioisotope production, neutron transmutation doping, and fast neutron flux utilization. In particular, previous designs required design change to avoid interference between piping and platform in the pools. The outline of the piping that falls down after passing through the pool penetration shall not interfere with the pool platform. In this study, the distance between the pool liner and the pipe outline is calculated, and the design modification ensures that the piping with a nominal diameter of 2-1/2" or less does not interfere with the pool platform.

## 2. Methods and Results

Originally, the penetration in the pool was a projection type. Figure 1 shows a projection type penetration and piping.

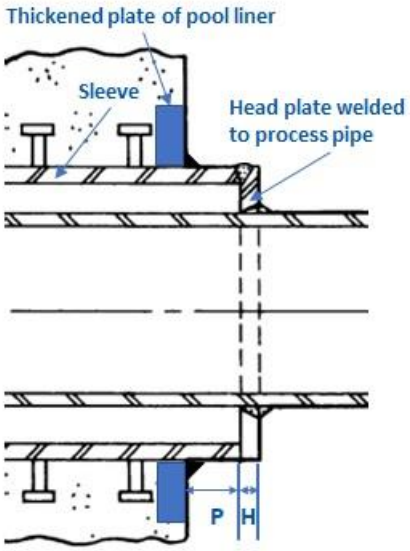


Fig. 1. Modified projection type penetration [1] and piping (reference only)

P = projection length, mm
H = head plate thickness, mm

Figure 2 shows modified pool liner penetration section and piping.

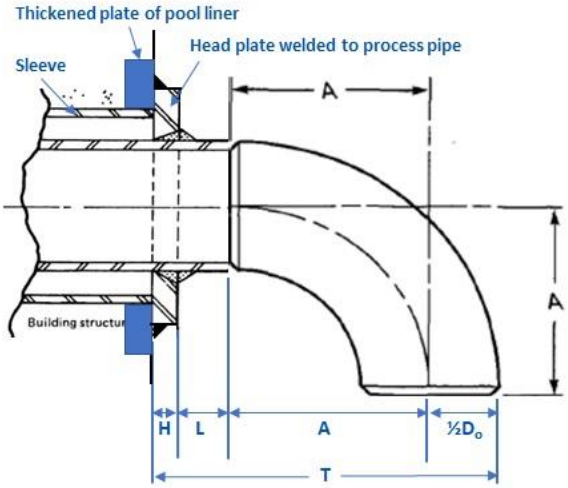


Fig. 2. Modified non-projection type penetration [1] and piping [2] (reference only)

L = pipe length from head plate to elbow, mm
A = elbow curvature, mm
$D_o$ = outside diameter of pipe, mm
T = total length from pool liner to pipe outline, mm

### *2.1 Non-Projection Type Penetration*

To prevent interference with the pool platforms, non-projection type penetrations (Fig. 2) were applied for vertical pipings with a nominal diameter of 2-1/2" or less. The distance between the pool liner and the pipe outline (T) is reduced by the length of the previous projection (P), and the head plate of the pipe is welded directly to the embedded plate of the pool liner. Table I shows the calculated results of total length (T) with long radius elbows of 2 and 2-1/2" for non-projection type penetration.

Table I: Total Length with Long Radius Elbow

| NPS, inch | H, mm | A (LR), mm | ½$D_o$, mm | T, mm |
|---|---|---|---|---|
| 2 | 9.5 | 76.2 | 30.2 | 115.9 + L |
| 2-1/2 | | 95.3 | 36.5 | 141.3 + L |

NPS: Nominal Pipe Size
LR: Long Radius (A = 1.5 NPS)

For pipings of 2" or less with non-projection type penetration, there are no interference with the pool

platforms. However, 2-1/2" pipings require additional design change.

*2.2 Short Radius Elbow*

Considering welding for 2-1/2" pipings including variable pipe length (L), it is not easy to avoid interference with the pool platforms. Because the total length (T) decreases as the elbow curvature (A) decreases, the elbows are changed from long radius to short radius for 2-1/2" pipings. Table II shows the calculated result of total length (T) with short radius elbow of 2-1/2".

Table II: Total Length with Short Radius Elbow

| NPS, inch | H, mm | A (SR), mm | $\frac{1}{2}D_o$, mm | T, mm |
|---|---|---|---|---|
| 2-1/2 | 9.5 | 73.0 | 36.5 | 119.0 + L |

SR: Short Radius (A = 1.0 NPS)

For pipings of 2-1/2” with short radius elbow, there are no interference with the pool platforms.

## 3. Conclusions

In this study, the total lengths from the pool liner to the pipe outline are calculated for some cases, and no interference was made through design modifications. The design changes include the application of non-projection type penetration and short radius elbow. This method can be expanded to other types of penetration and sizes of piping and it will be useful in the efficient use of limited space.

## ACKNOWLEDGEMENTS

This project is supported by the National Research Foundation of Korea (NRF) grant funded by the Government of Korea (MSIT: Ministry of Science and ICT) (No. 2020M2C1A1061043).

## REFERENCES

[1] ASME Boiler and Pressure Vessel Code, Section III, Subsection NF, Supports, American Society of Mechanical Engineers, 2004.
[2] ASME B16.9, Factory-made Wrought Buttwelding Fittings, American Society of Mechanical Engineers, 2001.