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Penetration Sealing System of Proton Accelerator Research Center

J. M Nam, Y. G Han, G. P Jeon, Y. S Min, S. S Park, J. S Cho, K. J Mun, I. T Song, J. Y Kim
Proton Engineering Frontier Project, Korea Atomic Energy Research Institute,
Daedeok-Daero 989-111, Dukjin-Dong Yuseong-Ku, Daejeon, 305-353, Korea
**Corresponding author:namjm@kaeri.re.kr*

1. Introduction

PEFP(Proton Engineering Frontier Project) was Launched in 2002 as one of the 21st Century Frontier R&D Programs of MOST(Ministry of Science & Technology). Gyeongju city was selected as the project host site in March, 2006, where 'Proton Accelerator Research Center' was going to be constructed. After starting the design in 2005, the Architectural and Civil design work has been performed by 2010. Since the Earthwork was started in 2009, the Construction works of Accelerator Facilities has been going smoothly to complete by 2012.

In this paper, we describe penetration sealing system of Proton Accelerator Research Center.

2. Requirements of Penetration Sealing

In this section, the requirements of the penetration sealing according to design base and materials are described.

2.1 Design Base

I. Ventilation Seals(V)
To remain negative pressure

II. Fire Seals(F)
To remain fire resistance above two hours
- ASTM E 119 & ASTM E 814

III. Radiation Seals(R)
To meet radiation shielding factor

2.2 Materials

I. High density silicone
- Density ≥ 148 lbs/ft^3
- Limit temp. ≥ 93℃

II. Silicone elastomer
- Density : 90~95 lbs/ft^3
- Limit temp. ≥ 93℃

III. Silicone foam
- Density : 14~28 lbs/ft^3
- Expansion rate : 100~300%
- Limit temp. ≥ 93℃

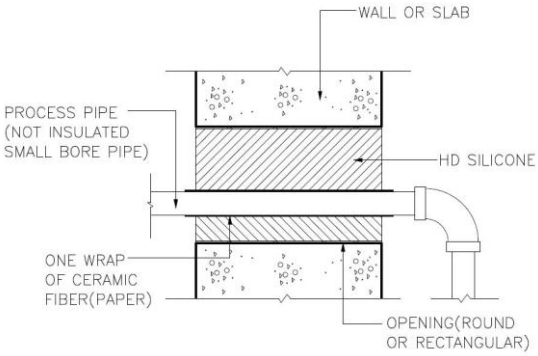
IV. Ceramic fiber
- Max. permissible Temp. : 2300˚F
- Nominal thickness : 0.118inch(3mm)
- Compressive strength : ASTM D 545

V. Flexible boot
- Thickness ≥ 0.031inch(0.8mm)

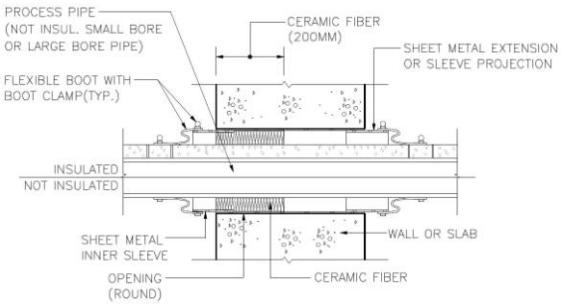
3. Details of Penetration Sealing

In this section, the penetrations sealing details used to meet sealing requirements are described. The penetration sealing types includes a process pipe, I&C tubing and tray & conduit.

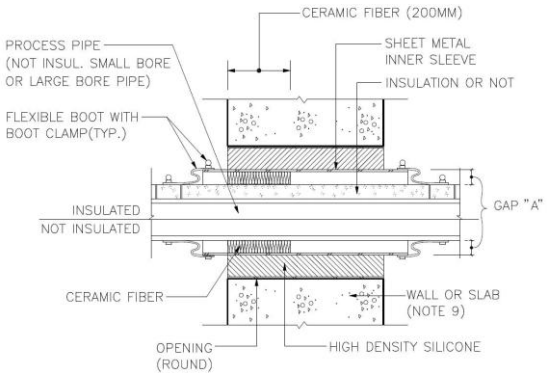
3.1 Penetration Sealing Details of Process Pipe



a. *Service Condition : R, RV, RF OR RFV*



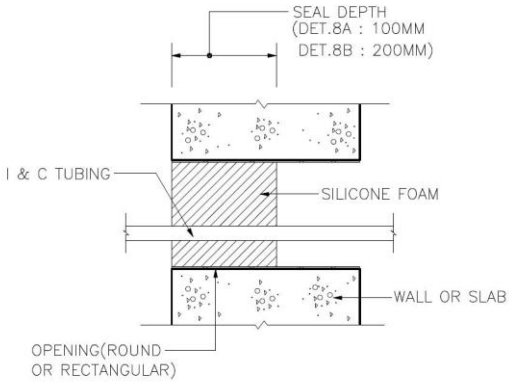
b. Service Condition : F OR FV



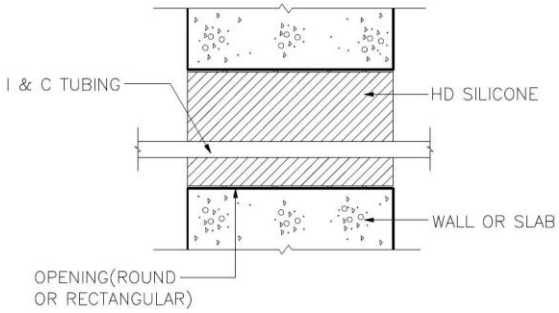
c. Service Condition : RF OR RFV

Fig. 1. Penetration Sealing Types for Process Pipe

3.2 Penetration Sealing Details of I&C Tubing



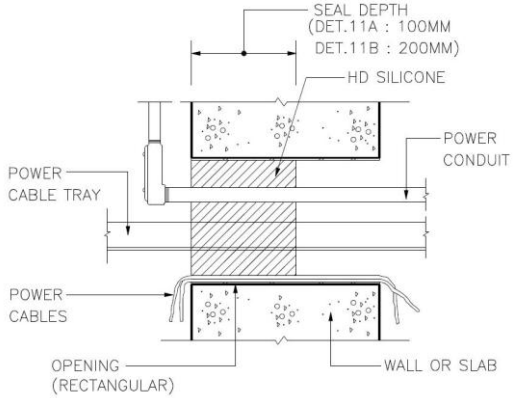
a. *Service Condition : DET. 8A – V ONLY*
DET. 8B – F OR FV



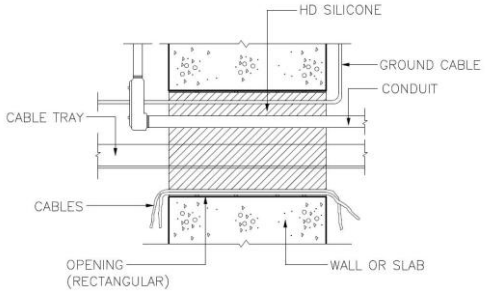
b. Service Condition : R, RV, RF OR RFV

Fig. 2. Penetration Sealing Types for I&C Tubing

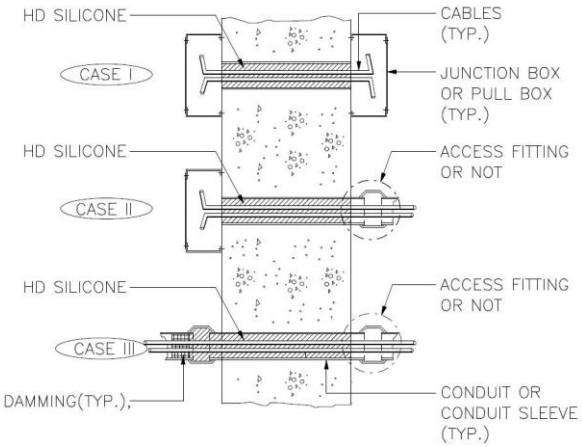
3.3 Penetration Sealing Details of Cable Tray&Conduit



a. *Service Condition : DET. 11A – V ONLY*
DET. 11B – F OR FV



b. Service Condition : R, RV, RF OR RFV



Service Condition : R, RV, RF OR RFV

Fig. 3. Penetration Sealing Types for Tray & Conduit

4. Conclusions

As shown in Fig. 4, the penetration sealing works which are now under construction will have been completed by October according to the penetration sealing requirements.

Especially to keep radiation shielding requirements, the high density silicone is used in the penetration of high radiation area.

Fig. 4. Penetration Sealing work for the I&C Tubing

Acknowledgement

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