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August 26, 1983
4410-83-L-0185

TMI Program Office
Attn: Mr. L. H. Barrett
Deputy Program Director
US Nuclear Regulatory Commission
c/o Three Mile Island Nuclear Station
Middletown, PA 17057-0191

Dear Sir:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Design Criteria for Temporary Modifications to
Existing Primary Containment Piping Penetrations

Attached for your information is a design criteria for making temporary modifications to existing primary containment piping penetrations in order to support the TMI-2 recovery. This criteria incorporates the general guidance provided in Met-Ed/GPU Letter LL2-81-0191 dated December 4, 1981, your review of which is discussed in Amendment of Order dated April 9, 1982.

If you have any questions or comments on the attached information, please contact Mr. J. J. Byrne of my staff.

Sincerely,

B. K. Kanga

B. K. Kanga
Director, TMI-2

BKK/JJB/jep

Attachment

CC: Dr. B. J. Snyder, Program Director - TMI Program Office

8/31/83

50-320

DESIGN CRITERIA

TEMPORARY MODIFICATIONS TO EXISTING PRIMARY CONTAINMENT PIPING PENETRATIONS

August, 1983
4410-83-L-0185

PLANT DESIGN AND MECHANICAL DESIGN CRITERIA FOR TEMPORARY MODIFICATIONS TO EXISTING PRIMARY CONTAINMENT PIPING PENETRATIONS

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1.0 INTRODUCTION

The purpose of this document is to establish criteria for temporary modifications to existing primary containment penetrations required to support Unit 2 recovery operations. All modified penetrations are for the recovery period only and are to be restored to their original design bases prior to plant start-up.

2.0 SCOPE

This document covers design, fabrication, installation, testing and quality assurance requirements to be applied to temporary penetration modifications. Due to the current status of the plant, a deviation from Section 6.2.4 of the TMI-Unit 2 FSAR and from 10 CFR Part 50, Appendix A, is acceptable and desirable regarding primary containment isolation. This deviation allows both isolation devices forming the double barrier to be located outside the containment. NRC acceptance of the deviation is documented by their acceptance of the modifications to penetrations R-561, R-565 and R-626 (see References 3.6.1, 3.6.2 and 3.6.3).

3.0 REFERENCES

3.1 Codes and Standards

The latest editions and addenda in effect at the time the drawing and/or document is issued for construction shall be used.

3.1.1 American National Standards Institute (ANSI)

B31.1, Power Piping

3.1.2 American Welding Society (AWS)

D1.1, Structural Welding Code

3.2 TMI - Unit 2 Recovery Technical Specifications

3.3 TMI - Unit 2 Recovery Quality Assurance Plan

3.4 Burns and Roe, Inc. Specification 2555-44, Reactor Building Liner, Division 13/Section 13E

3.5 Code of Federal Regulations, 10 CFR Part 50, Appendix A, General Design Criteria for Nuclear Power Plants

3.6 Engineering Change Memorandum's (ECM)'s

3.6.1 S-ECM 954, Temporary Modification of Containment Penetration R-565 for Sump Refill

3.6.2 S-ECM 963, Temporary Modification of Containment Penetration R-561 for Decontamination Experiment

3.6.3 S-ECM 818, Surface Suction Penetration Piping (R-626)

3.7 Met-Ed/GPU letter LL2-81-0191 dated 12-4-81, J. J. Barton to Dr. B. J. Snyder, Design Pressure for Containment and Future Mechanical and Electrical Penetration Modifications

3.8 Final Safety Analysis Report (FSAR), TMI-Unit 2, Section 6.2.4, Containment Isolation System

4.0 DESIGN

The existing primary containment penetrations were designed, fabricated, installed and tested in accordance with ANSI B31.7 Class I and Class II and B&R Specification 2555-44, Division 13, Section 13E. Modifications to the existing penetrations shall comply with ANSI B31.1.

The modified penetrations are only required to support Unit 2 recovery operations and will not be subjected to the conditions established in the original design for primary containment integrity. As defined in Section 3/4.6.1.1 of the TMI-Unit 2 Recovery Technical Specifications, containment integrity will be maintained based on the currrent status of the plant.

4.1 Containment

As required by Section 3.6.1.4 of the TMI-Unit 2 Recovery Technical Specifications, primary containment pressure shall be maintained at or slightly below 0 psig. The worst case accident for pressurizing the containment was analyzed and identified as resulting from uniform burning of all combustibles in containment over a 7 day period. Based on the results of the analysis, the maximum internal containment pressure would be about 2 psig. However, a conservative pressure of 5 psig (see Reference 3.7) shall be used as the maximum internal containment design pressure for modifying primary containment piping penetrations. Based on the same analysis, the maximum primary containment air temperature would be 160°F.

4.2 Service Piping

Penetration service piping shall conform with the maximum design pressure/temperature as defined in ANSI B31.1 for the individual service.

4.3 Seismic Classification

Modifications to existing penetrations shall be designed to nonseismic Category I since an earthquake is not postulated during the recovery period.

4.4 Primary Containment Isolation

4.4.1 Penetration arrangements which satisfy 10 CFR Part 50, Appendix A, are acceptable.

4.4.2 Extensions of penetration assemblies which do not satisfy 10 CFR Part 50, Appendix A, shall require double barrier isolation as follows:

a. Two isolation valves outside containment; or

b. One isolation valve and a blind flange/cap outside containment.

For typical arrangements, see Figures 1 and 2.

4.4.3 Penetration modifications in which the service piping passes through the containment penetration shall require single barrier isolation closure for the annulus area (area between service piping and the penetration sleeve). The closure and the service piping shall be leak rate tested per Section 7.2. For typical arrangements, see Figures 1 and 2.

4.4.4 Test, drain or vent connections where provided shall be located external to the containment. Connections located within the double barrier isolation form part of the penetration, and therefore shall satisfy the same requirements. Double barrier isolation shall include two isolation valves or one isolation valve and a blind flange/cap.

4.4.5 Isolation valves outside containment shall be located as close to the penetration as practical. If the inboard containment penetration isolation is removed as a result of the modification, the penetration boundary may be extended beyond the existing outboard single barrier to the next valve, blind flange or cap. This extension is considered part of the containment penetration.

5.0 FABRICATION

5.1 Materials

All materials used shall comply with ANSI B31.1 and be suitable for the intended service.

5.2 Welding

All welding shall be performed in accordance with ANSI B31.1 and an approved TMI-2 welding procedure. Examination of pressure retaining welds shall be in accordance with ANSI B31.1, Section 136.4.2. Support welds shall be inspected per AWS D1.1, Section 8.15.1. Welded construction should be used to the maximum extent possible.

6.0 INSTALLATION

6.1 Installation of all modified penetrations shall require an NRC approved procedure.

6.2 Primary containment pressure boundary shall be maintained during all penetration installation activities. As a minimum, single barrier isolation is to be maintained which shall consist of at least one isolation valve, blind flange, cap, pipe stopper or other suitable isolation device. Temporary type isolation devices such as pipe stoppers may be used during the installation phase only. If existing isolation devices have been modified or new ones added, they are to be leak rate tested (see Section 7.2) prior to performing their function of maintaining primary containment integrity.

7.0 TESTING

7.1 New penetration service piping assemblies shall be leak tested per ANSI B31.1. The test pressure shall be based on the maximum design pressure of the service system (see Section 4.2).

7.2 Modified penetrations including the annulus area as defined in Section 4.4.3 shall be leak rate tested with air or nitrogen per the following criteria. The test pressure shall be applied in the same direction as that when the isolation device would be required to perform its safety function, unless it is determined that the results from the tests for a pressure applied in a different direction will provide equivalent or more conservative results. Each isolation device is to be individually tested. A procedure for leak rate testing shall be prepared for each modified primary containment penetration. No periodic leak rate testing is required.

7.2.1 Pneumatic leak rate test pressure shall be 7.0 $\pm$ 0.5 psig maintained for a minimum of ten (10) minutes.

7.2.2 Acceptance criteria for the leak rate test is based on 100 standard cubic centimeters per minute, per one (1) inch nominal valve/flange size.

8.0 QUALITY ASSURANCE

Modifications to containment penetrations (boundary as defined in Section 4.4) shall be classified as Important to Safety, however not Nuclear Safety Related. Design, procurement, fabrication and installation activities shall be in accordance with the TMI-Unit 2 Recovery Quality Assurance Plan. In addition, the following quality assurance requirements shall be applied:

8.1 Quality control (QC) shall visually inspect each modified penetration to verify conformance with the design drawing.

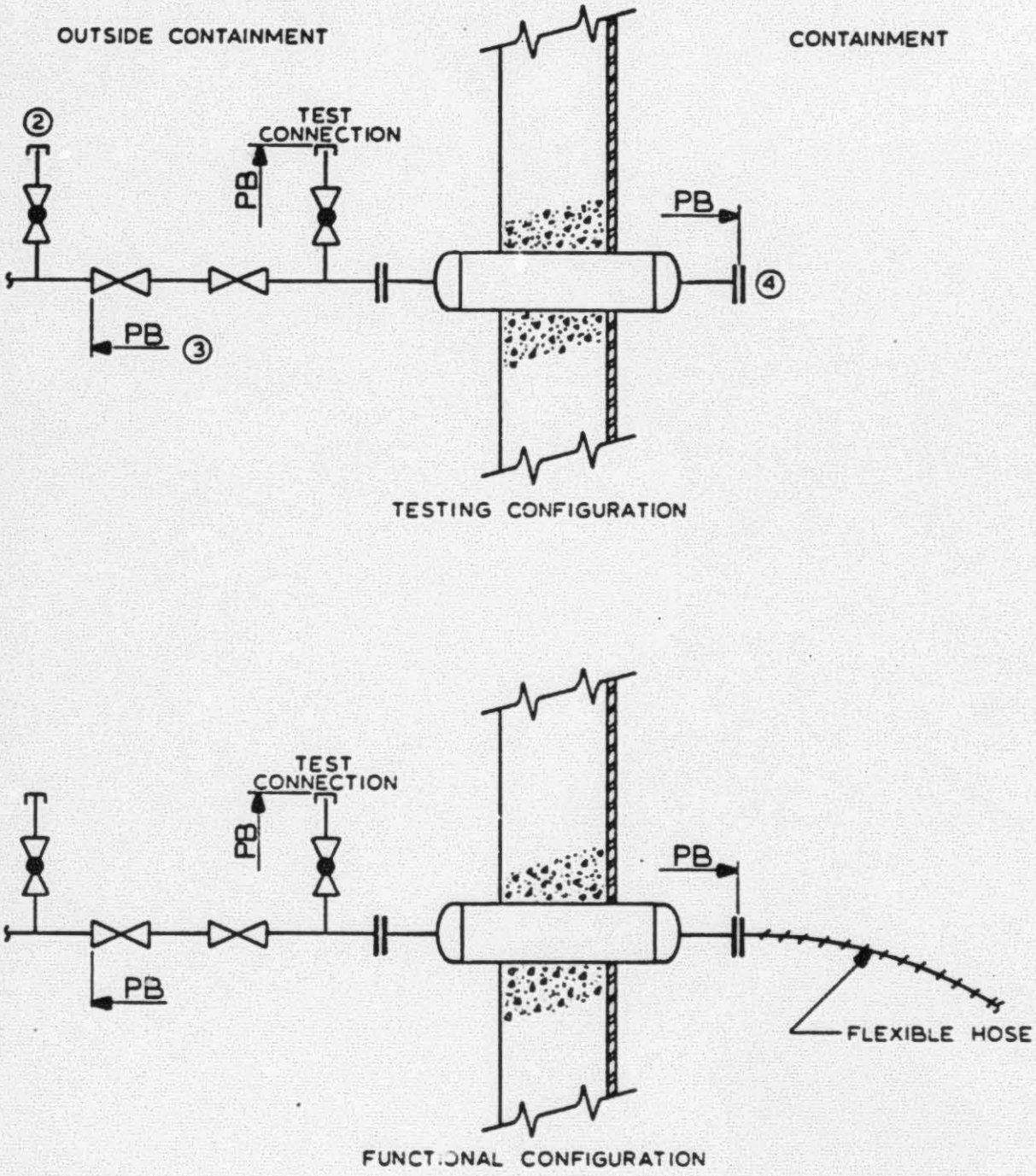
8.2 QC shall visually inspect pressure retaining welds to verify conformance with ANSI B31.1, Section 136.4.2

8.3 QC shall visually inspect support welds to verify compliance with AWS D1.1, Section 8.15.1.

8.4 All testing is to be witnessed by QC.

8.5 Manufacturers' material certificates of compliance with material specifications (ASTM/ASME) shall be provided for newly purchased pressure-retaining components within the penetration boundary. Certificates of compliance shall accompany material deliveries to TMI. No material certificates of compliance are required for existing pressure-retaining components which are within the double barrier isolation as a result of extending the penetration boundary.

8.6 Purchased materials and components shall be QC receipt inspected upon delivery to TMI.

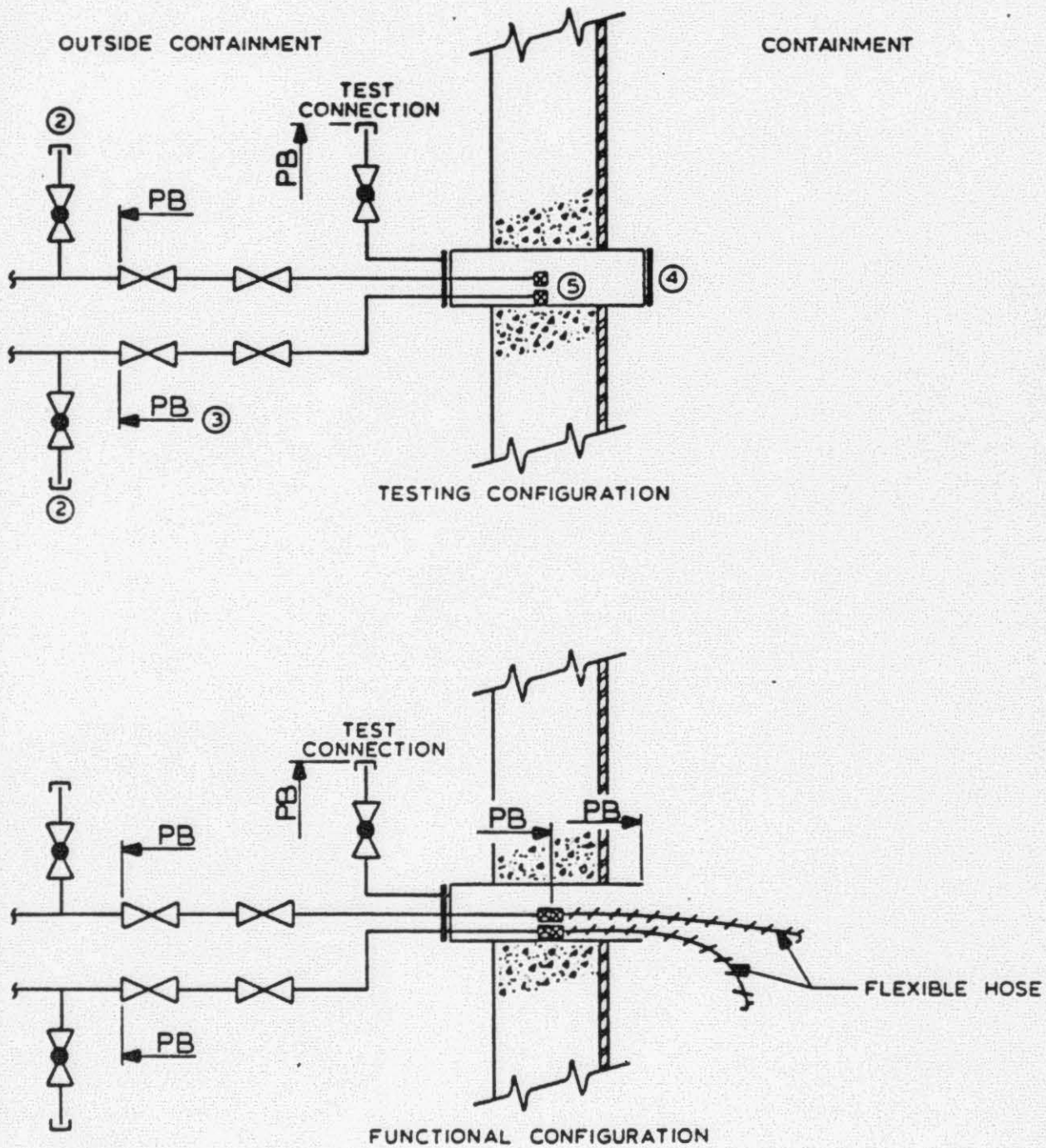


NOTES:

1. THE BASIC CONFIGURATION SHOWN IS A TYPICAL MODIFIED PRIMARY CONTAINMENT PIPING PENETRATION PROVIDED FOR INFORMATION ONLY.
2. CONNECTION TO BE USED TO LEAK RATE TEST THE PENETRATION CONNECTION.
3. PB DENOTES THE PENETRATION BOUNDARY (TYPICAL).
4. INBOARD CLOSURE REQUIRED TO LEAK TEST THE PENETRATION. CLOSURE NOT REQUIRED IF SERVICE PIPING IS ISOLATED INSIDE CONTAINMENT.

FIGURE 1

TYPICAL MODIFIED PRIMARY CONTAINMENT PIPING PENETRATION



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4. INBOARD CLOSURE REQUIRED TO LEAK TEST THE PENETRATION. CLOSURE NOT REQUIRED IF SERVICE PIPING IS ISOLATED INSIDE CONTAINMENT.
5. SERVICE PIPING IS TO BE LEFT OPEN-ENDED FOR LEAK RATE TESTING PURPOSES. IF THIS IS NOT PRACTICAL, AN ADDITIONAL TEST CONNECTION ON EACH SERVICE PIPE IS REQUIRED.

FIGURE 2
TYPICAL MODIFIED PRIMARY CONTAINMENT PIPING PENETRATION