



Commonwealth Edison

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Address Reply to: Post Office Box 767
Chicago, Illinois 60690

August 9, 1984

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Byron Station Units 1 and 2
Braidwood Station Units 1 and 2
GDC 51 Compliance Review
NRC Docket Nos. 50-454/455 and 50-456/457

Dear Mr. Denton:

Enclosed for your review is the compliance review against GDC 51 for the reactor containment pressure boundary components of our Braidwood Station. This information was initially reviewed by NRR and addresses the comments we received from Mr. Joseph Halapatz of the Materials Engineering Branch. This submittal for our Braidwood Station should resolve Outstanding Item No. 4 (Part A) in the Braidwood SER.

Additionally enclosed is the similar review for Byron Station. This information was previously reviewed by NRR and was addressed in the Byron SER Section 6.2.7.

One signed original and fifteen copies of this letter with the compliance reviews are provided for your use. However, due to the voluminous nature of the attachments to the reviews, the attachments have been directly sent to Ms. Janice A. Stevens.

Very truly yours,

E. Douglas Swartz
Nuclear Licensing Administrator

cc: J. A. Stevens - LB-1
J. G. Keppler - RIII
RIII Inspector - Braidwood

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BRAIDWOOD STATION

GDC 51 COMPLIANCE REVIEW

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BRAIDWOOD STATION

GDC 51 COMPLIANCE REVIEW

1. The lowest service metal temperature (LSMT) is identified as the limiting temperature which will be experienced by the limiting materials of the containment pressure boundary when they are providing a pressure boundary during the performance of the containment function under operating, maintenance testing and postulated accident conditions, as cited by GDC-51.

The following environmental zones contain the containment pressure boundary: A-8, T-3 and C-6. The pressure retaining integrity of the containment vessel does not apply during maintenance operations since the equipment hatch may be open. During operation, the LSMT is the same temperature as the fluid inside the pipe. During testing, the pressure boundary may sustain loads during hydrostatic tests and the integrated leak rate test. The hydrostatic tests are conducted at or above 70 F for piping which is constructed of 5/8" thick or more carbon steel. The integrated leak rate test may be conducted at a minimum temperature of 50 F, however, this pressure is much less than the hydrostatic test pressures encountered. During postulated accident conditions the LSMT is expected to be above 102 F in all zones.

Containment pressure boundary materials have been reviewed within the context of General Design Criteria 51. The following components have been identified as having materials which fall under the context of this review: Equipment and Personnel Hatch, penetration sleeves, closure plates and flued heads, piping and isolation valves. The analysis of these components follows. The ASME III, 1977 summer addenda code rules apply to all components unless specifically noted otherwise and will be referred to as "the Code" hereinafter.

The highest PLSMT determined in the following analysis is +70°F.

2. Containment pressure boundary limiting materials - Ferritic

(A) EQUIPMENT HATCH

1. A two inch thick studding outlet plate constructed of normalized SA-350-LF2 (CBI pc. mk. 156-9) is identified as a limiting material. NUREG 0577 would characterize this material as C-Mn to which Table 4.4 would assign an (NDT + 1.3σ) NDT of -5 F. A PLSMT of +25 F would be assigned by Code rules.
2. The upper shaft mounting bracket (CBI pc. mk. 174-3) is constructed of quenched and tempered SA-516 gr 70 plate 3½ inches thick. Code rules would assign a Tndt of -100F and a PLSMT of +35F.

3. Bolting materials SA-193 gr B7 (CBI pc. mk. 329-8) and SA-194 gr 7 (CBI pc. mk. 330-14) are quenched and tempered. NUREG 0577 Table 4.6 categorizes the material as having the least susceptibility to brittle failure.

(B) PIPING PENETRATIONS

1. Sleeves

- a. The sleeve for penetration LPC-86 is constructed of $1\frac{1}{4}$ " thick normalized SA-516 gr 60 and identified as typical of the limiting materials of this type. Code rules assign a Tndt of 0°F and a PLSMT of $+30\text{F}$.
- b. The sleeve for LPC-102 is a .844 "thick normalized SA-333 gr 6 material and is typical of the limiting materials of this type. CMTR indicates Cv tests at -50 F which would infer a Tndt at or below the NUREG Table 4.4 mild steel NDT of $+40\text{ F}$. Given a Tndt of $+40\text{ F}$, Code Class 2 rules would assign a PLSMT of $+70\text{ F}$.

2. Closures Plates and Flued Heads

- a. The flued head for LPC-86 (Type 2) for the main steam system is identified as the limiting material, is constructed of SA-350-LF2 and is 5 inches thick. NUREG 0577 Table 4.4 would categorize the material as C-Mn. Given a (NDT $+1.30$) NDT of -5 F , Code Class 2 rules would assign a PLSMT of $+50\text{ F}$.
- b. The closure plate for LPC-102 (Type 3) is identified as the limiting material of this type and is constructed of 2" thick normalized SA-516-70 plate. Code Class 2 rules assign a Tndt of 0°F and a PLSMT of $+30^{\circ}\text{ F}$.
- c. The closure plate for LPC-21 (Type 3) is identified as the limiting material of this type and is constructed of $1\frac{3}{4}$ " thick, normalized, SA-516-60 plate. Code Class 2 rules assign a Tndt of 0F and a PLSMT of $+30^{\circ}\text{ F}$.

3. Process Pipes

- a. For Type 1 penetrations the process pipe is integral with the flued head.

- b. For Type 2 and 3 penetrations the materials applied are SA-106 gr B and SA-333 gr 6 which are less than 5/8" and therefore are exempt from testing.

C. Main Steam Piping Subassembly

1. Piping

The main steam piping subassembly is defined as the piping from the penetration to the isolation valve (pc mk MS-17-5). The pipe material is SA-155 gr KC 65, applying SA-515, gr 65, 1.344" thick normalized and hot rerolled is identified as the limiting material. Given the 1650 F reroll temperature, the material is in effect normalized. Given its thickness of 1.344" and its heat treatment, based on the expected microstructure shown in ASM Metals Handbook, 8th Edition, Volume 7, page 19, Figure 132 as compared to Figure 135, showing normalized SA-516 gr 70 a Tndt at or below +40 F would be inferred from NUREG 0577 Table 4.4. Given a Tndt of +40 F Code rules (CL. 2) would assign a PLSMT of +70 F.

Also, SA-106, .688" wall, by Jones and Laughlin who advised via telecon with Sargent & Lundy that the pipe is discharged to the cooling bed from the Mannesman Mill bed above the A3 temperature. Given then that the material is in effect normalized, NUREG 0577, Figure B7 data would infer a Tndt at or below the Table 4.4 NDT of +40 F. Code Class 2 rules would assign a PLSMT of +70 F.

2. Fittings

The fittings identified as the limiting materials are SA-105 weldolets and SA-105 pipe plugs normalized with a maximum thickness of 1 13/16". NUREG 0577 Table 4.4 assigns a (NDT + 1.3σ) NDT of -5 F to the material. Code Class 2 rules would assign a PLSMT of +25 F to this material.

A reducing tee of SA-234 WPB (W) (original material SA-515 gr 70) of 1.344" thickness normalized. The analysis for the pipe in C1 above applies for this material and assigns a PLSHT of +70F.

3. Isolation Valves

The valve body is 2.162" thick SA-216 gr WCB, normalized by Quaker Alloy. NUREG 0577 Figure B2 data would infer a Tndt at or below the Table 4.4 NDT of +35 F for 2 1/2"-5" thick material. Code Class 2 rules would assign a PLSMT of +65 F. The bonnet is the same thickness and material as the body, therefore the PLSMT is the same. The disc was heat treated per Procedure 4, which is a normalizing procedure. The disc is 3.125" thick normalized SA-105 material. NUREG 0577 would assign a (NDT + 1.3σ) NDT of -5 F to the material. Code Class 2 rules assign a PLSMT of +35 F to the material.

The bolting is characterized by NUREG 0577 Table 4.6 as having the least susceptibility to brittle fracture.

D. Main Feedwater Piping Subassembly

1. Piping

The piping subassembly (FW-15-2) is .844" thick SA-106 gr. B by U.S. Steel Lorian Works whose practice finishes the material above the upper critical temperature. Given that the material is in effect normalized, NUREG 0577, Figure B7 data would infer a TNDT at or below the Table 4.4 NDT of +40°F. Code Class 2 rules would assign a PLSMT of +70°F.

2. Fittings

The fittings identified as the limiting materials are normalized SA-105 weldolets, sockolets and pipe plugs with a maximum thickness of 1-13/16". NUREG-0577 Table 4.4 assigns a (NDT + 1.3σ) NDT of -5F to the material. Code Class 2 rules would assign a PLSMT of 25F to this material.

3. Isolation Valves

The body is 1.614" thick SA-105 and has been normalized. NUREG 0577 Table 4.4 assigns a (NDT + 1.3σ) NDT of -5 F to the material. Code Class 2 rules assign a PLSMT of +25 F to the material. The bonnet is the same thickness and material as the body, so therefore the PLSMT is also a +25 F. The disc is austenitic stainless steel which is exempt from testing.

3.0 ATTACHMENT LISTING

<u>TAB</u>	<u>DESCRIPTION</u>
1	<u>Equipment Hatch and Personnel Lock Data</u>
A	CBI Drawings
1	135 Sub Final Assembly for Emergency Personnel Lock
2	156 Int. Door Assembly for Personnel Lock
3	157 Ext. Door Assembly for Personnel Lock
4	172 Sub Final Assembly for Personnel Lock
5	174 Lock Structural Assembly for Personnel Lock
6	328 Equipment Hatch
B	Sargent & Lundy Drawings S-1086
C	<u>Certifications</u>
1	Certification from Western Forge for pc. mk. 156-9
2	Certification from Lukens Steel for pc. mk. 174-3
3	Certification from Victor Products for pc. mk. 329-8
4	Certification from Victor Products for pc. mk. 330-14
2	<u>Piping Penetrations</u>
A	1 PC-86 Sleeve: Certification from Bethlehem Steel Corp.
B	1 PC-102 Sleeve: Certification from Phoenix Steel Corp.
C	1 PC-86 Flued Head: Certification from Earl M. Jorgensen
D	1 PC-102 Closure Plate: Certification from Lukens Steel Corp
E	1 PC-21 Closure Plate: Certification from Lukens Steel Corp.
3	<u>Main Steam Piping Subassembly</u>
A	Sargent & Lundy P&ID, M35, Sheet 1, Main Steam System
B	Phillips, Getschow Drawing MS-17 (for pc. mk. MS-17-5)
C	Certification from Taylor Forge for 32 inch SA-155 gr KC65 pipe

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Main Steam Piping Subassembly (continued)

- D Certification from Jones and Laughlin Company for SA-106 gr B pipe
- E Certification from Alloy Fittings Corporation for SA-105 pipe plugs
- F Certification from LADISH for SA-234 WPB (W) reducing tee and pipe cap
- G Certification from Bonney Forge for the SA-105 weldolet
- H Certification from Quaker Alloy for the MSIV body
- I Certification from Quaker Alloy for the MSIV bonnet
- J Certification from Cann and Saul for the MSIV disc
- K Anchor Darling MSIV drawing 94-14062
- L Anchor Darling MSIV drawing 94-14063
- M NPV-1 Forms
- N Minimum Dimensional Record Sheets

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Main Feedwater Piping Subassembly

- A Sargent & Lundy P&ID M-36, Sheet 1, Main Feedwater System
- B Phillips, Getschow drawing FW-15 (for pc. mk. FW-15-2)
- C Certification from U.S. Steel for the piping pc. mk. FW-15-2)
- D Certification from Alloy Fittings for the pipe plugs (pc. mk. FW-15-2)
- E NPP-1 Form
- F Certification from Jorgensen Steel for the Isolation Valve body
- G Certification from Compton Forge for the valve bonnet

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Main Feedwater Piping Subassembly (continued)

H

Borg Warner Feedwater Isolation Valve drawing 80210

I

NPV-1 Forms

J

Minimum Dimension Record Sheets

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BYRON STATION

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- b. The sleeve for LPC-102 is a .844 "thick normalized SA-333 gr 6 material and is typical of the limiting materials of this type. CMTR indicates Cv tests at -50°F which would infer a Tndt at or below the NUREG Table 4.4 mild steel NDT of $+40^{\circ}\text{F}$. Given a Tndt of -40°F , Code Class 2 rules would assign a PLSMT of $+70^{\circ}\text{F}$.

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B	1 PC-102 Sleeve: Certification from Phoenix Steel Corp.
C	1 PC-86 Flued Head: Certification from Earl M. Jorgensen
D	1 PC-102 Closure Plate: Certification from Lukens Steel Corp
E	1 PC-21 Closure Plate: Certification from Lukens Steel Corp.
3	<u>Main Steam Piping Subassembly</u>
A	Sargent & Lundy P&ID, M35, Sheet 1, Main Steam System
B	Southwest Fabricating Drawing MS-17 (for pc. mk. MS-17-5)
C	Certification from Taylor Forge for 32 inch SA-155 gr KC65 pipe

3

Main Steam Piping Subassembly (continued)

D Certification from Youngstown Sheet and Tube Company for SA-106 gr B pipe
E Certification from Alloy Fittings Corporation for SA-105 pipe plugs
F Certification from LADISH for SA-234 WPB (W) reducing tee
G Certification from Bonney Forge for the SA-105 weldolet
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I Certification from Quaker Alloy for the MSIV bonnet
J Certification from Cann and Saul for the MSIV disc
K Anchor Darling MSIV drawing 94-14060
L Anchor Darling MSIV drawing 94-14061
M NPV-1 Forms
N Minimum Dimensional Record Sheets

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Main Feedwater Piping Subassembly

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Main Feedwater Piping Subassembly (continued)

- H Borg Warner Feedwater Isolation Valve drawing 80210
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