Design Criteria

Ginna Station

PORV Block Valves Replacement

Rochester Gas and Electric Corporation

89 East Avenue

Rochester, New York 14649

EWR 3755

Revision 0

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Design Criteria

1.0 Summary Description of the Design

1.1 Summary

1.1.1 Protection against overpressurization in the Reactor Coolant System at Ginna Station is provided by two spring-loaded safety valves and two power-operated relief valves (PORV). The lines leading to each PORV also contain remotely-actuated, motor-operated block valves to be used if the PORV sticks open. Since each block valve serves as a backup means of limiting reactor coolant loss in the event that a transient challanges the PORV's and a PORV subsequently fails open, leakage limits have been established for the block valves which are consistent with the makeup capacity provided by a single charging pump. Leakage in excess of these limits could require a plant shutdown. To maintain block valve seat leakage within these limits, it has been necessary to periodically disassemble the valves and remachine the seating surfaces. The block valves (V515 and V516) seat rings are now approaching the maximum allowable limits for remachining.

1.1.2 The purpose of this modification is to replace the two block valves 515 and 516. The existing valves shall be replaced with new ASME Section III, Class 1, seismically-qualified, environmentally qualified, motor-operated gate valves.

1.1.3 The valves are located inside containment on top of the Reactor Coolant System pressurizer.

1.2 Functions

1.2.1 Valves 515 and 516 are motor-operated block valves serving as a backup means of limiting reactor coolant loss in the event that the corresponding PORV (PCV-430 or 431C) opens inadvertantly or fails to close following an overpressurization transient.

1.2.2 Valves 515 and 516 also function to isolate the corresponding PORV for maintenance.

1.3 Performance Requirements

1.3.1 The replacement valves shall meet a manufacturer's main seat leakage acceptance test limit of 10 cubic centimeters of water per hour per inch of diameter of nominal valve size.

1.3.2 The replacement valves shall be able to open and close against the design basis differential pressure of the reactor coolant system.

1.3.3 The new valve shall have a flow capacity of 179,000 lb/hr of saturated steam.

1.4 Control

1.4.1 The existing PORV block valves are remote manual controlled from the Control Room.

1.4.2 The new PORV block valves shall be controlled in the same manner as the existing valves.

1.4.3 The new PORV block valves shall be provided with manual-override handwheels.

1.5 Modes of operation

1.5.1 During normal plant operation, the PORV block valves will be fully open.

1.5.2 In the event that a pressurizer PORV opens inadvertantly or fails to close following an overpressurization transient, the corresponding PORV block valve will be closed by operator action from manual switches in the Control Room.

1.5.3 Restrictions on operation of the existing PORV block valves, set forth in the plant Technical Specifications, shall also apply to the new PORV block valves.

1.5.4 The PORV block valves will be operated periodically for testing purposes in accordance with existing plant procedures and Appendix C of the Ginna Quality Assurance Manual.

1.5.5 The PORV block valves may be required to be closed, as necessary, to permit testing or maintenance of the PORV's.

1.5.6 The PORV block valves may be either opened or closed during various phases of the periodic hydrotests of the Reactor Coolant System.

2.0 Reference Documents

2.1 RG&E Drawings

2.1.1 33013-1258, Rev. 0, Reactor Coolant Pressurizer P & ID.

2.1.2 03021-621, Rev. 0, PORV Block Valves Modification P & ID.

2.2 Gilbert Associates, Inc. Drawings.

2.2.1 D-304-602, Rev. XI, Pressurizer Relief Piping-Plan.

2.2.2 D-304-603, Rev XIII, Pressurizer Relief Piping-Sections.

2.2.3 Piping Isometric drawings C-381-353 Shts 4 and 5, Rev. C, Pressurizer Power Relief to Relief Manifold.

2.3 Rochester Gas and Electric Corporation, Ginna Station Quality Assurance Manual.

2.3.1 Appendix A, "Quality and Safety Related Listing and Diagrams", Rev. 8, 12/30/83.

2.3.2 Appendix B, "Inservice Inspection Program", Rev. 8, 4/3/84.

2.3.3 Appendix C, "Pump and Valve Testing Program", Rev. 7, 1/20/86.

2.4 USNRC Regulatory Guides

2.4.1 No. 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radioactive Waste containing Components for Nuclear Power Plants", Revision 3, February 1976.

2.4.2 No. 1.29, "Seismic Design Classification", Revision 3, September 1978.

2.4.3 No. 1.38, "Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants", Rev. 2, 5/77.

2.4.4 No. 1.48, "Design Limits and Loading Combinations for Seismic Category 1 Fluid System Components," May 1973.

2.4.5 No. 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants," Rev. 1, December 1973.

2.4.6 No. 1.61, "Damping Values for Seismic Design of Nuclear Power Plants," October 1973.

2.4.7 No. 1.92, "Combining Modal Responses and Spatial Components of Seismic Response Analysis," Rev. 1, February 1976.

2.4.8 IE Bulletin No. 85-03, "Motor-Operated Valve Common Mode Failures During Plant Transients Due To Improper Switch Settings," November 1985.

2.4.9 IE Bulletin No. 81-02, "Failure of Gate Type Valves to Close Against Differential Pressure".

2.4.10 IE Bulletin No. 81-02, Supplement 1, "Failure of Gate Type Valves to Close Against Differential Pressure".

2.4.11 RG&E Letter Response to IE Bulletin No. 81-02, Supplement 1, dated 9/18/81.

2.5 American National Standards Institute (ANSI)

2.5.1 ANSI N45.2.1 "Cleaning of Fluid Systems and Associated Components for Nuclear Power Plants" 1980 Edition.

2.5.2 ANSI N45.2.2 "Packaging, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants" 1978 Edition.

2.5.3 ANSI N45.2.6 "Qualifications of Inspections, Examination and Testing Personnel for Nuclear Power Plants" 1978 Edition.

2.6 Institute of Electrical and Electronics Engineers (IEEE).

2.6.1 IEEE 323-1974, "Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations".

2.6.2 IEEE 382-1972, "Standard for Qualification of Safety-Related Valve Actuators".

2.6.3 IEEE 344-1975, "Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations".

2.6.4 IEEE-383-1975, "Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations."

2.7 American Society of Mechanical Engineers Boiler and Pressure Vessel Code - 1983 Edition, including Addenda through Summer 1985.

Section II	Material Specifications
Section III	Nuclear Power Plant Components
Section V	Nondestructive Examination
Section IX	Welding and Brazing Qualifications
Section XI	Inservice Inspection

2.8 Hilti, Incorporated, "Architects and Engineers Design Manual."

2.9 Gilbert Associates, Inc.; Auxiliary Structures Seismic Analysis Report developed for EWR 2512 (Response Spectra) 5/15/80.

2.10 Ginna Station Updated Final Safety Analysis Report (UFSAR)

2.10.1 Section 3, "Design of Structures, Components, Equipment, and Systems".

2.10.2 Section 5, "Reactor Coolant System and Connected Systems".

2.10.3 Section 16, "Technical Specifications".

2.11 Westinghouse Electric Corporation Equipment Specification G676258, "Motor Operated Valves", Rev. 0, 5/23/66.

2.12 Velan Engineering Company drawing 88405-4, ASA 1500-LB 3" Motor Operated Gate Valve.

2.13 Ginna Design Criteria

2.13.1 EWR 2602, "Pressurizer Safety and Relief Valve Piping", Rev. 0.

2.13.2 EWR 2512, "Seismic Upgrade Program", Rev. 2, 8/10/81.

2.14 Westinghouse Electric Corporation Analyses

2.14.1 Westinhouse Piping Stress Analysis Report, SDTAR-80-05-127, Revision 0, "Pressurizer Safety and Relief Valve Piping System", March 1983.

2.14.2 Westinghouse Letter PT-SSA-2847, dated March 28, 1981, "Modifications to Stress Report SDTAR-80-05-127," Rev. 0.

2.14.3 Westinghouse Letter PT-SSA-2991, dated May 6, 1983, "Modifications to Stress Report SDTAR-80-05-127," Rev. 0.

2.15 NUREG-0737, "Preliminary Clarification of TMI Action Plan Requirements," Section II.D.1.

2.16 EPRI NP-2541-LD, "EPRI - Marshall Electric Motor-Operated Valve (Block Valve) Interim Test Data Report".

2.17 Westinghouse Report, MUHN-1072, "Assurance of Primary Boundary Bolting and Closure Integrity," December 1985.

3.0 Seismic Category

Based on USNRC Reg. Guide 1.29 and consistent with Appendix A of the Ginna Station Quality Assurance Manual, all piping, valves and supports within scope of this modification shall be Seismic Category I.

4.0 Quality Group/Code Class

Based on Reg. Guide 1.26 and consistent with Appendix A of the Ginna Station Quality Assurance Manual, the quality group classification for the new PORV block valves shall be quality group A and ASME Class I.

5.0 Electrical System Safety Classification

Electrical Systems shall be designed to Class 1E.

6.0 QA Program Applicability

Ginna Station QA Program shall apply to this modification.

7.0 Codes, Standards, and Regulatory Requirements

7.1 The new PORV block valves shall be designed, examined, tested, constructed and installed to ASME Code Section III Class 1 requirements.

7.2 Analysis of all piping shall be in accordance with EWR-2602 Design Criteria.

8.0 Design Conditions

The design pressure and temperature of the existing PORV block valves shall be used for the design of the new valves. These are:

8.1 Design pressure: 2485 psig

8.2 Design temperature: 650°F

8.3 The valve and operator shall be able to withstand the pressure and temperature transients corresponding to operating cycles 1 through 11 of the attached Appendix H, "Thermal Transients and Catagories", Rev. 0.

9.0 Load Conditions

9.1 Any required reanalysis of piping and supports shall consider the load combinations used in the Design Criteria for EWR-2602 (Ref. 2.13.1).

9.2 For new valves 515 and 516 the pipe loads at the pipe/valve interface shall meet the requirements defined in Section 12.3.1 of EWR-2602 Design Criteria.

9.3 The seismic acceleration of new valves 515 and 516 shall be calculated and the calculated accelerations shall not be permitted to exceed values for which the valves are qualified.

9.4 If required, all new component support embedments shall be evaluated using current analytical techniques in accordance with the Hilti Design Manual Criteria.

10.0 Environmental Conditions

The valves, operators wiring and field connections shall be designed and qualified to withstand the following environmental conditions without impairing operability:

	Normal	Accident	Post-Accident
Ambient Temperature			
Maximum	120°F	300°F	160°F
Minimum	60°F	60°F	60°F
Ambient Pressure			
Maximum	3 psig	60 psig	20 psig
Minimum	0 psig	0 psig	0 psig
Humidity			
Maximum	100%	100%	100%
Minimum	10%	10%	10%
Radiation			
Dose Rate	1Rad/hr.		-
Integrated Dose	-		1.6×10^8 Rad Tota
Duration	See Figs.6.1-1 and 6.1-2 in Ref. 2.10		

In the event of a Loss of Coolant accident, the valve and actuator will be subject to a chemical spray of borated water containing 2000-3000 ppm boric acid and NaOH to create a solution pH of 8-10.

11.0 Interface Requirements

11.1 The new valves shall be designed for installation in the existing pressurizer relief system. There shall be no degradation of function to existing systems, components, or structures.

12.0 Material Requirements

12.1 Valve and piping materials shall be compatible with those presently installed in the pressurizer relief system.

12.2 Due to availability restrictions, material may be purchased in accordance with a later edition of the ASME Code provided that the requirements are no less stringent than the Code edition and addenda listed in Ref. 2.7.

13.0 Mechanical Requirements

13.1 Valve operators and limit switches shall be set and verified consistent with valve opening and closing against maximum design pressure of 2485 psig.

13.2 The new PORV block valves and operators shall be designed to open and close against the maximum differential pressure of 2485 psi.

13.3 The body/bonnet bolting for the replacement valves shall meet the requirements of Westinghouse Report MUHN-1072.

14.0 Structural Requirements

14.1 The piping system component supports and their embedments shall be designed and evaluated according to the Design Criteria for EWR 2602.

15.0 Hydraulic Requirements

15.1 This modification shall be designed to have no significant adverse effect on the pressure and flow characteristics of the pressurizer relief system.

16.0 Chemistry Requirements

This modification shall not, by design, employ materials or processes which could introduce potential contaminants into the Reactor Coolant System in excess of the currently accepted levels.

17.0 Electrical Requirements

17.1 Electrical power for the operators on the PORV block valve shall be consistent with the existing design.

17.2 New Class 1E cable and new splices used in this modification shall be qualified with the requirements of IEEE-383-1974

17.3 The electric motor operators installed with the PORV block valves shall be Class 1E and shall be seismically and environmentally qualified in accordance with IEEE-323 and IEEE-344.

18.0 Operational Requirements

The operation of existing plant structures and equipment shall not be degraded by this modification.

19.0 Instrumentation and Control Requirements

19.1 The existing instrumentation and controls, except for those supplied with the new motor-operators shall be reconnected to the new PORV block valves.

19.2 The new PORV block valves shall be provided with control features which are consistent with the existing valves.

20.0 Access and Administrative Control Requirements

None

21.0 Redundancy, Diversity and Separation Requirements

21.1 The new PORV block valves shall be provided with hand wheels to permit manual operation of the valves.

21.2 Redundancy, diversity, and separation requirements for the electrical portion of this modification shall be maintained consistent with the existing design.

22.0 Failure Effects Requirements

22.1 The PORV block valves shall fail "as-is" upon loss of electrical power or control voltage.

23.0 Test Requirements

23.1 Hydrostatic test procedures and acceptance criteria for Seismic Category I, Class 1 piping shall be in accordance with RG&E QA Appendix B and ASME Section XI, Article IWB-5000.

23.2 Piping welds in Seismic Category I, class 1 piping shall be examined in accordance with ASME Section III, Article NB-5000.

23.3 The new PORV block valves (515 and 516) shall be tested for operability in accordance with existing plant procedures and Appendix C of the Ginna Quality Assurance Manual.

23.4 The new PORV block valves (515 and 516) shall be leak tested by the valve manufacturer prior to shipment.

23.5 The new PORV block valves shall be hydrotested by the valve manufacturer in accordance with ASME Section III, Class 1 requirements.

23.6 The new PORV block valve indications and controls shall be tested for proper operation.

24.0 Accessibility, Maintenance, Repair and Inservice Inspection Requirements

24.1 The new valves shall be accessible for maintenance, testing, and repair, to the extent possible.

24.2 The welds that are required for this modification shall be included under Inservice Inspection Program.

25.0 Personnel Requirements

25.1 All welders shall be qualified in accordance with the requirements of ASME Section IX.

25.2 All test personnel and NDE personnel, where required in performing the modifications, shall be qualified in accordance with the requirements of ANSI N45.2.6.

26.0 Transportability Requirements

None

27.0 Fire Protection Requirements

27.1 New electric cable used in this modification shall meet the flame test requirements of IEEE 383-1974.

27.2 Non-combustible and heat-resistant materials shall be used whenever practical.

27.3 All new penetrations through fire barriers shall be sealed with appropriate fire seals.

28.0 Handling Requirements

Packaging, shipping and storage of the new PORV block valves shall comply with the requirements of ANSI N45.2.2, Level C.

29.0 Public Safety Requirements

None

30.0 Applicability

The materials, processes, parts and equipment shall be suitable for their intended application.

31.0 Personnel Safety Requirements

31.1 Existing Ginna Station work procedures shall apply.

31.2 Precautions shall be taken to ensure that occupational radiation exposures shall be As Low as Reasonably Achievable (ALARA). See attached Health Physics Radiation Survey Maps for conditions in the modification locations.

32.0 Environmental Qualification Requirements

32.1 New valves and operators shall utilize materials which are compatible with the environmental conditions set forth in Section 10.0.

32.2 New valves and operators are subject to the requirements of Appendix E to the Ginna Station QA Manual.

33.0 Unique Requirements

The requirements set forth in the Design Criteria for EWR 2602 shall be met in the analysis of this modification.

ROCHESTER GAS AND ELECTRIC CORPORATION

GINNA STATION PORV BLOCK VALVE REPLACEMENT PROGRAM

ATTACHMENT C.2

Safety Analysis for EWR 3755, Revision 0, dated January 22, 1986