

QUESTION  
#13

DESIGN CRITERIA

FOR

MAJORITY WALL EVALUATION

EMR No. 2846

CAI W.O. No. 04-4824-045

ROCHESTER GAS AND ELECTRIC CORPORATION

R. E. Cinnas Station - Unit 1

Originator J.J. Kavan 3-21-84  
(Date)

CAI Approval D.P. Campbell 3-21-84  
(Project Engineer) (Date)

RC&E Approval Mark B. Fitzmaurice 4/5/84  
4-6-84 (Date)

Revisions

Approval

<u>No.</u>	<u>Page</u>	<u>Date</u>	<u>CAI</u>	<u>RC&amp;E</u>
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QUESTION #13

**DESIGN CRITERIA**

FOR

**MASCHERY WALL EVALUATION**

ENR No. 2846

CAI W.O. No. 04-4826-015

ROCHESTER GAS AND ELECTRIC CORPORATION

R. E. Cinnas Station - Unit 1

Originator JD Krause 3-21-84  
(Date)

CAI Approval D.P. Campbell 3-21-84  
(Project Engineer) (Date)

RC&E Approval Mark B. Johnson 4/5/84  
M.B.J. 4-6-84 (Date)

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	<u>Page</u>	<u>Date</u>	<u>CAI</u>	<u>RC&amp;E</u>

1.0 SUMMARY DESCRIPTION OF THE DESIGN

1.1 This Design Criteria applies to the analyses and evaluation of the safety related masonry walls. The specific walls are listed in the RC&E letter dated 4-28-83 from J. E. Maier to NRC (Ref. 2.1) and are shown on RC&E drawings 33013-971, 972, and 973. The Ginna masonry walls were previously evaluated and modified in response to NRC Inspection and Enforcement Bulletin 80-11 utilizing Design Criteria EWR #2846, Rev. 0, 9-26-80 (Ref. 2.2). This evaluation is performed in response to the NRC request for additional information by letter dated 9-21-83 to Mr. John E. Maier (Ref. 2.3), and is performed to more conservative criteria levels corresponding to current requirements. These criteria levels are defined in this document.

1.2 The basic functions of the masonry walls depend on the particular building and location of the wall. With the exception of a few exterior walls which provide weather protection, the majority of the interior walls serve to subdivide the space within the steel frame buildings and do not perform a structural function in the building framing system.

2.0 REFERENCED DOCUMENTS

- 2.1 RC&E letter dated 4-28-83, Mr. J. E. Maier to Mr. D. M. Crutchfield, NRC - list of safety-related masonry walls.
- 2.2 "Design Criteria - Ginna Station - Block Wall Modifications", EWR #2846, Rev. 0, 9-26-80.
- 2.3 NRC letter dated 9-21-83, Mr. D. M. Crutchfield to Mr. J. E. Maier, RC&E - "Request for Additional Information; Masonry Wall Design, IE Bulletin 80-11".
- 2.4 Technical Specification, Masonry Work, Robert Emmett Ginna Nuclear Power Plant, Unit No. 1, RC&E Corp., Rochester, New York (1967) SP-5360.
- 2.5 C/C Design Input Record for Masonry Wall Evaluation, W.O. 04-4947-000: File Code 1:44.2 and 1:44.3, Rev. 0, 9-22-80.
- 2.6 C/C Ginna Masonry Wall Evaluation, W.O. 04-4947-000: File Code 1:44.2 Calculations for Boundary Fix Analysis and Design, and File Code 1:44.3 Application of Boundary Fixes.
- 2.7 C/C Ginna Masonry Wall Evaluation, W.O. 04-4947-000: File Code 1:44.1, Calculations for Structural Analysis Using Finite Element Computer Models.
- 2.8 Abbot A. Hanks, Inc. Testing Laboratories Report No. 8783R, "Summary Report Kwik Bolt Testing Program", March 24, 1977.

- 2.9 Technical Specifications for Furnishing Steelwork for Pressurization Walls and Miscellaneous EWR's, TS-201-044594-G5, Cinna Station.
- 2.10 Technical Specifications for Installation of Steelwork for Pressurization Walls and Miscellaneous EWR's, TS-202-044594-G5, Cinna Station.
- 2.11 RC&E Technical Specification for Installation of Hilti Kwik Bolts, ME-130.
- 2.12 RC&E Report on Masonry Wall Design, I.E. Bulletin 80-11, E. E. Cinna Nuclear Power Station. November 4, 1980, transmitted to NRC by letter from Mr. J. E. Maier, RC&E, to Mr. B. H. Grier, NRC, dated 11-4-80.
- 2.13 RC&E Supplemental Information Response to I. E. Bulletin 80-11, transmitted to NRC by letter from Mr. J. E. Maier, RC&E, to Mr. B. H. Grier, NRC, dated 1-30-81.
- 2.14 C/C Cinna Station Seismic Upgrading Program, W.O. 04-4824-005: "Reactor Building Seismic Analysis", December 21, 1979; "Auxiliary Structures Seismic Analysis", May 15, 1980; and "Auxiliary Structures Seismic Analysis, Addendum I, Additional Floor Response Spectra", March 24, 1972.

3.0 SEISMIC CATEGORY

The walls listed in reference 2.1 are classified as Class I as stated in Cinna Station FSAR Vol. #5.1.2-14. For this evaluation, Class I corresponds to Seismic Category I in accordance with NRC Reg. Guide 1.29.

4.0 QUALITY GROUP

None.

5.0 CODE CLASS

None.

6.0 CODES, STANDARDS AND REGULATORY REQUIREMENTS

6.1 Cinna Station FSAR

6.2 American Institute of Steel Construction (AISC), "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings", New York, N.Y. November 1978.

6.3 American Concrete Institute, ACI 349 - Appendix B, "Steel Embedments", August 1978.

- 6.4 American Concrete Institute, ACI Committee 531-79 and Commentary ACI 531R-79, "Concrete Masonry Wall Structures - Design and Construction".
- 6.5 U. S. Nuclear Regulatory Commission, Standard Review Plan Appendix A to Section 3.8.4 "Interim Criteria for Safety-Related Masonry Wall Evaluation", Rev. 0, July 1981.
- 6.6 U. S. Nuclear Regulatory Commission, Inspection and Enforcement Bulletin 80-11, "Masonry Wall Design", July 8, 1980, Docket No. 50-264.
- 6.7 American Welding Society (AWS): D1.1 Structural Welding Code, 1981.
- 6.8 USNRC Regulatory Guide 1.29 "Seismic Design Classification", Rev. 3, September 1978.
- 6.9 State of New York, "State Building and Construction Code", November 30, 1979, Section C 304-4.
- 6.10 American National Standards Institute, ANSI A58.1-82, "Standard Building Code Requirements for Minimum Design Loads in Buildings and Other Structures."

7.0 DESIGN CONDITIONS

None.

8.0 LOAD CONDITIONS

8.1 Dead (Ref. 2.2)

Based on material density of 115 pounds per cubic foot for masonry.

<u>Material</u>	<u>Dead Load (PSF of Wall)</u>
4" Brick Facing	35
8" Solid Block	73
12" Solid Block	110
4" Open Cell Block	17
8" Open Cell Block	37
12" Open Cell Block	55

An additional distributed dead load is applied to the surface of the wall panels to account for attachments to the walls. For the evaluation work included in this scope, the attachment load will be either 15 psf or 5 psf corresponding to the attachment load used for the initial 80-11 evaluation performed previously. Attachment loads may be reduced to reflect actual field as-built conditions. Dead load of masonry will remain the same for each

panel as used in the previous computer analyses. Attachment loads 500 pounds or more are reflected as concentrated loads on the model.

8.2 Seismic

This evaluation addresses masonry wall behavior during a design Safe-Shutdown Earthquake. Seismic accelerations are obtained using the Floor Response Spectra generated in the seismic analyses of the buildings (ref. 2.14).

Level 1 Analysis:

Safe Shutdown Earthquake (SSE) 0.2g.

Levels 2, 3, and 4 Analyses:

Safe Shutdown Earthquake (SSE) 0.17 g.

Damping for the masonry walls under SSE is 7% in accordance with item 4.(c) in Appendix A to SRP 3.8.4. (Ref. 6.5).

The response due to vertical direction seismic acceleration is combined separately with the response from each of the two horizontal directions.

8.3 Wind

Wind loads correspond to plant design normal wind load defined in the FSAR applied in accordance with ANSI A58.1-82 (ref. 6.10).

8.4 Live, Pressure, Temperature

There are no live loads or loads associated with temperature or pressure differentials applicable to the wall panels in this evaluation.

8.5 Other

Interstory drift effects are included in the analysis as required by SRP 3.8.4 Appendix A item 4f.

8.6 Tornado

Tornado loads are not considered in this evaluation.

9.0 ENVIRONMENTAL CONDITIONS

Environmental conditions such as temperature and pressure differentials were reviewed during original Bulletin 80-11 evaluation and found to be negligible. Therefore, these load conditions are not applicable to this evaluation.

10.0 INTERFACE REQUIREMENTS

10.1 The definition of which walls are safety-related and included in the scope of this evaluation has been performed by RC&E and is set forth in reference 2.1.

10.2 Justification of the boundary conditions used for the computer analytical models is included in the scope of this evaluation.

10.3 As-built drawings of each wall have been prepared under previous work scopes (ref. 2.6). The as-built drawings are used as-is for input to this evaluation.

11.0 MATERIAL REQUIREMENTS

The scope of work addressed by this criteria includes analysis only; no design of fixes is included. Based on the original project specifications (refs. 2.4, 2.9, 2.10, 2.11) the materials are listed below as excerpts from these specifications.

11.1 Brick

Facing brick shall conform to the requirements of ASTM Specifications C 216-65, Grade SW and Type FBS. Final selection of brick shall be by the Engineer.

11.2 Concrete Masonry Units

11.2.1 Hollow loading bearing units conforming to ASTM C 90-66T, Grade C-II.

11.2.2 Interior non-load bearing partitions shall be Haydite block. All block, both normal and lightweight, conform to ASTM C 90.

11.3 Concrete Masonry Bed Reinforcing

Reinforcing shall be Dur-O-Wal standard, truss design, or Hohmann & Barnard, Inc. Trus-Mesh, of width 2 in. less than the nominal thickness of the wall. Reinforcing in exterior walls shall be galvanized in accordance with ASTM A 116-65, Class 1, specification. Installation shall be in strict accordance with the manufacturer's recommendations.

11.4 Partition Ties

A 1/4" x 1/4" x 8" with 2 in. right angle bends at either end, prime painted with 13-Y-5 Zinc Chromate primer as made by Mobil Chemical Co., Metuchen, NJ, or approved equal.

11.5 Anchors at Columns

As shown on the drawings, anchors will be provided by others at 24 in. centers. Locations will be established as a part of this Contract.

11.6 Control Joints

Dur-O-Wal, wide flange, Rapid Control Joint.

11.7 Mortar

11.7.1 Mortar and mortar materials shall conform to the requirements of the property specifications of ASTM Specifications for Mortar for Unit Masonry C 270-64T, Type N.

1. Portland Cement: ASTM C 150-66, Type I or II.
2. Hydrated Lime: ASTM C 207-49, Type S, or Miracle Lime as made by G.&W.H. Corson, Plymouth Meeting, PA.
3. Sand: ASTM C 144-66T.
4. Water: Water shall be clean and free of deleterious amounts of acids, alkali, or organic materials.
5. Mixing: Mixing shall be done in a mechanical batch mixer. No more mortar shall be mixed at one time than can be used within 1-1/2 hours.
6. Admixtures: Salts and anti-freeze compounds to lower the freezing point of mortar will not be permitted.

11.7.2 At the subcontractor's option, a prepared mortar may be used conforming to ASTM Specification C 91-66, Type II.

11.8 Concrete Fill

f'c = 3000 psi.

11.9 Reinforcing Bars

ASTM A 615, Grade 40.

11.10 All materials will be considered "Controlled Materials" per C 302-2 of the State Building Construction Code.





15.0 CHEMISTRY REQUIREMENTS

None.

16.0 ELECTRICAL REQUIREMENTS

None.

17.0 OPERATIONAL REQUIREMENTS

None.

18.0 INSTRUMENTATION AND CONTROL REQUIREMENTS

None.

19.0 ACCESS AND ADMINISTRATIVE CONTROL REQUIREMENTS

None.

20.0 REDUNDANCY, DIVERSITY AND SEPARATION REQUIREMENTS

None.

21.0 FAILURE EFFECTS REQUIREMENTS

The masonry walls are evaluated for the loads defined in Section 8.0 and load combinations as described in Section 13.0. The results of the evaluation will indicate the level of criteria as described herein to which a wall is qualified.

22.0 TEST REQUIREMENTS

None.

23.0 ACCESSIBILITY, MAINTENANCE, REPAIR AND INSERVICE INSPECTION REQUIREMENTS

None.

24.0 PERSONNEL REQUIREMENTS

None.

25.0 TRANSPORTABILITY REQUIREMENTS

None.

26.0 FIRE PROTECTION REQUIREMENTS

None.

27.0 HANDLING REQUIREMENTS

None.

28.0 PUBLIC SAFETY REQUIREMENTS

None.

29.0 APPLICABILITY

None.

30.0 PERSONNEL SAFETY REQUIREMENTS

None.

31.0 UNIQUE REQUIREMENTS

None.

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