ATTACHMENT B

DESIGN INPUT DOCUMENT INDEX

FOR

Evaluation of the Sodium Hydroxide Tank

EWR NO. 3572

GAI W.O. NO. 04-4824-035

ROCHESTER GAS AND ELECTRIC CORPORATION

Ginna Station - Unit No. 1

Document	Revision	Date	Submitted	Approved
Design Criteria	0	9-29-82	9-30-82	10-25-82
General Arrangement Drawing	0	9-29-82	9-30-82	10-25-82

Responsible GAI P.E. D. R. Campbell

Index Revision	Date	Explanation

DESIGN CRITERIA

FOR

Evaluation of the Sodium Hydroxide Tank

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GAI W.O. No. 04-4824-035

ROCHESTER GAS AND ELECTRIC CORPORATION

Ginna Station - Unit No. 1

Originator S. S. Hsieh 10-25-82
(Date)

GAI Approval D. P. Campbell 10-25-82
(Project Engineer) (Date)

RG&E Approval 13NI-GR-L0981 10-25-82
(Date)

Revisions			Approval	
No.	Page	Date	GAI	RG&E

This design criteria follows the format and addresses the subjects established in GAI's "RG&E Continuing Services Project Management and Control Manual," Appendix A.

1.0 SUMMARY DESCRITPION OF THE DESIGN

1.1 The Sodium Hydroxide Tank (SHT) is a horizontal cylindrical headed tank located in the Auxiliary Building and supported by two saddles at the ground floor (El. 235'-8"). The tank is 17'-6" long from head to head and 90" in diameter. The spacing between saddles is 9'-0", and each saddle is anchored into concrete by eight (8) 1" diameter bolts. The tank and saddle construction are shown on Bethlehem Steel Corporation Drawing U-9913-3 (reference 2-1). The saddle foundations are shown on GAI Drawing D-422-301 (reference 2-2).

Three safety-related tanks were sampled and evaluated as part of the United States Nuclear Regulatory Commission's (USNRC) Systematic Evaluation Program (SEP) (reference 2.17, section 4.15.4). As a result of this review and subsequent analysis, it has been concluded that design modifications are required to two of the three tanks. Since those tanks required modifications, the USNRC has requested further analysis of some additional tanks, including the SHT.

The objective of this evaluation is to reanalyze the SHT to determine stress levels in its major components under seismic conditions. Stresses shall be determined in the vessel wall, saddle supports, and anchor bolts. The anchorage of the bolts into the foundation shall be checked. Factors of safety against overturning and sliding shall be calculated for the critical seismic condition. The scope of the components to be evaluated is shown on the attached General Arrangement Drawing.

1.2 The Sodium Hydroxide Tank (SHT) is referred to as the Spray Additive Tank in the Final Facility Description and Safety Analysis Report (Reference 2.11). The function of the SHT is to contain enough sodium hydroxide solution which, upon mixing with the refueling water from the Refueling Water Storage Tank, the boric acid from the Boric Acid Tank, the borated water contained within the Accumulators and primary coolant, will bring the concentration of sodium hydroxide in the containment to approximately 0.6 percent by weight (to give a final PH in the range 9.0 to 9.5).

2.0 REFERENCED DOCUMENTS

2.1 Bethlehem Steel Corporation, Buffalo Tank Division, Drawing U-9913-3.

2.2 Gilbert Associates Incorporated Drawing D-422-301, Rev. III.

2.3 USNRC Regulatory Guide 1.26, "Quality Group Classification and Standards for Water, Steam and Radioactive Waste Containing Components of Nuclear Power Plants," Rev. 3, February 1976.

2.4 USNRC Regulatory Guide 1.29, "Seismic Design Classifications," Revision 3, September 1978.

2.5 USNRC Regulatory Guide 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants," Rev. 1, December 1973.

2.6 USNRC Regulatory Guide 1.61, "Damping Values for Seismic Design of Nuclear Power Plants," October 1973.

2.7 USNRC Regulatory Guide 1.92, "Combining Modal Responses and Spatial Components in Seismic Response Analysis," Rev. 1, February 1976.

2.8 USNRC Regulatory Guide 1.122, "Development of Floor Design Response Spectra for Seismic Design of Floor Supported Equipment or Components," Rev. 1, February 1978.

2.9 USNRC Standard Review Plan, Section 3.8.4, "Other Category I Structures," NUREG-75/087, November 1975.

2.10 American Institute of Steel Construction (AISC), "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings," effective November 1, 1978.

2.11 Rochester Gas & Electric Corporation, Robert Emmett Ginna Nuclear Power Plant Unit No. 1, Final Facility Description and Safety Analysis Report.

2.12 Rochester Gas and Electric Corporation "Ginna Station Quality Assurance Manual," Volumes 1 and 2, current revision.

2.13 Rochester Gas and Electric Corporation Specification QA-19, "Quality Assurance Requirements for Suppliers of Design, Procurement, and Construction Management Services," Revision 3, January 19, 1978.

2.14 American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code, Sec. III, Division 1, 1980 Edition.

2.15 Gilbert Associates, Incorporated, report entitled "Ginna Station Seismic Upgrading Program Auxiliary Structures Seismic Analysis," May 15, 1980 including Addendum I, March 12, 1981.

2.16 American Concrete Institute (ACI), "Code Requirements for Nuclear Safety Related Concrete Structures (ACI 349-76)," Appendix B - Steel Embedments, 1979 Supplement.

2.17 USNRC NUREG-0821, "Integrated Plant Safety Assessment, Systematic Evaluation Program, R.E. Ginna Nuclear Power Plant," Draft Report, May 1982.

3.0 SEISMIC CATEGORY

The SHT is Seismic Category I as defined by USNRC Regulatory Guide 1.29 (reference 2.4).

4.0 QUALITY GROUP

The SHT is ASME Quality Group B as defined by USNRC Regulatory Guide 1.26 (reference 2.3).

5.0 CODE CLASS

The SHT is Class 2 and governed by the ASME Boiler and Pressure Vessel Code, Section III, Subsection NC and NF (reference 2.14).

6.0 CODES, STANDARDS AND REGULATORY REQUIREMENTS

The evaluation of the SHT shall be in compliance with the codes, standards and regulatory requirements as specified in Section 2.0.

7.0 DESIGN CONDITIONS

See Reference 2.11

Volume, gal.	5,100
NaOH concentration, w/o	30
Temperature, ^{o}F	300
Pressure, psig	300

Weight, lbs.	18,000	- tank body empty
	1,100	- saddles
	19,100	- total

8.0 LOAD CONDITIONS

Plant conditions considered during the evaluation are normal, severe environmental and extreme environmental.

Loads encountered during normal plant startup, operation, and shutdown are associated with normal plant conditions.

Loads to be sustained during severe environmental conditions correspond to the Operating Basis Earthquake (OBE).

Loads to be sustained during extreme environmental conditions correspond to the Safe Shutdown Earthquake (SSE).

8.1 Loads

A. Dead Loads (D)

Dead loads are all permanent gravity loads due to the weight of the SHT and its contained liquid.

B. Pressure Loads (P)

Pressure loads are loads induced on the SHT and its supports due to expansion from atmospheric to design pressure.

C. Temperature Loads (T)

Temperature loads are thermal loads induced on the SHT and its supports due to change from ambient to design temperature.

D. Nozzle Loads

Nozzle loads from piping attached to the SHT shall not be included in the evaluation, since the attached piping is small and the forces that it can generate are not significant in comparison to other loads.

E. Seismic Loads (E and E')

Seismic loads are inertial loads generated by the SHT in response to an earthquake. OBE loads are designated E, SSE loads are designated E'. In the following criteria, SSE loads are assumed to control the evaluation. This assumption will be confirmed during the evaluation.

Seismic loads are developed for the SSE due to a maximum ground acceleration of 0.20g. Natural frequencies of the SHT are obtained by analysis. Equivalent static seismic loads are then calculated by multiplying the SHT mass by the corresponding acceleration from the currently available floor response curves (reference 2.15) at the calculated frequency. Damping values are taken from USNRC Regulatory Guide 1.61 (reference 2.6). Three orthogonal components of seismic acceleration, two horizontal and one vertical, are considered simultaneously and the responses are combined by the "square root of the sum of squares" (SRSS) method (reference 2.7). The dynamic characteristics of the SHT with the contained fluid are considered in establishing the seismic loads that act on the SHT. Sloshing effects of the water are included in this evaluation.

8.2 Load Combinations and Stress Limits

A. Tank Body

The SHT body shall be evaluated in accordance with ASME Code Section III, Division 1, Subsection NC (reference 2.14) for the following load combination and stress limits.

ASME Service Limit	Load Combination	Stress Limits
Level D	D+P+T+E'	$\sigma_m \leq 2.0S$ $(\sigma_m \text{ or } \sigma_L) + \sigma_b \leq 2.4S$

σ_m = general membrane stress, psi, which is the average stress across the solid section under consideration. It excludes discontinuities and concentrations.

σ_L = local membrane stress, psi, which is the same as σ_m except that it includes the effect of discontinuities.

σ_b = bending stress, psi, which is the linear varying portion of the stress across the solid section under consideration. It excludes discontinuities and concentrations.

S = allowable stress value, psi, from Table I-7.0 of Appendix I of the ASME code (reference 2.14).

B. Tank Supports

The SHT supports shall be evaluated in accordance with ASME Code, Section III, Division 1, Subsection NF (reference 2.14) for the following load combination and stress limits.

ASME Service Limit	Load Combination	Stress Limits
Level D	D+P+T+E'	$\sigma_1 \leq 1.5S$ or $.4S_u$
		$\sigma_1 + \sigma_2 \leq 2.25S$ or $0.6S_u$

σ_1 = membrane stress, psi, which is the average stress across the solid section under consideration. It includes the effects of discontinuities, but not local stress concentrations.

σ_2 = bending stress, psi, which is the linear varying portion of the stress across the solid section under consideration. It excludes the effects of discontinuities and concentrations.

S = allowable stress value, psi, from Table I-7.1 and I-8.1 of Appendix I of the ASME code (reference 2.14).

Su = specified minimum ultimate tensile strength of the material, psi.

C. Anchor Bolts

The anchor bolts shall be evaluated for the following loading combination and stress limit, based on elastic working stress design methods.

$D + P + T + E' \leq 1.6S$

S = For structural steel, S is the required section strength based on the elastic design methods and the allowable stresses defined in Part 1 of AISC, "Specification for the Design, Fabrication and Erection of Structural Steel for Building", 1978 (reference 2.10).

D. Anchorage Concrete

The anchorage concrete shall be evaluated for the following loading combination and stress limit, based on strength design methods.

$D + P + T + E' \leq U$

U = the section strength required to resist design loads based on strength design methods described in ACI 349 Code (reference 2.16).

9.0 ENVIRONMENTAL CONDITIONS

The ambient environmental design conditions are as follows:

Temperature	60°-120° F
Humidity	20%-80%
Pressure	Atmosphere
Radiation	Negligible

10.0 INTERFACE REQUIREMENTS

See Section 1.0

11.0 MATERIAL REQUIREMENTS

The materials considered in this evaluation shall be those specified by reference 2.1, which will be assumed to be installed provided no conflicting evidence is found during field inspections.

12.0 MECHANICAL REQUIREMENTS

Nozzle loads from piping attached to the SHT shall be treated as defined in section 8.1.D.

13.0 STRUCTURAL REQUIREMENTS

The SHT and its supports shall be evaluated against the stress limits specified in Section 8.2.

14.0 HYDRAULIC REQUIREMENTS

Not applicable.

15.0 CHEMISTRY REQUIREMENTS

Not applicable.

16.0 ELECTRICAL REQUIREMENTS

Not applicable.

17.0 OPERATIONAL REQUIREMENTS

The SHT and its supports are required to function during all modes of plant operation, including the period during and after a SSE.

18.0 INSTRUMENTATION AND CONTROL REQUIREMENTS

Not applicable.

19.0 ACCESS AND ADMINISTRATIVE CONTROL REQUIREMENTS

Not applicable.

20.0 REDUNDANCY, DIVERSITY AND SEPARATION REQUIREMENTS

Not applicable.

21.0 FAILURE EFFECTS REQUIREMENTS

The SHT and its supports shall be evaluated to determine if they can withstand the design load conditions stated in Section 8.0, and remain functional during and after a safe shutdown earthquake (SSE).

22.0 TEST REQUIREMENTS

Not applicable.

23.0 ACCESSIBILITY, MAINTENANCE, REPAIR AND INSERVICE INSPECTION REQUIREMENTS

Not applicable.

24.0 PERSONNEL REQUIREMENTS

Not applicable.

25.0 TRANSPORTABILITY REQUIREMENTS

Not applicable.

26.0 FIRE PROTECTION REQUIREMENTS

Not applicable.

27.0 HANDLING REQUIREMENTS

Not applicable.

28.0 PUBLIC SAFETY REQUIREMENTS

Not applicable.

29.0 APPLICABILITY

Not applicable.

30.0 PERSONNEL SAFETY REQUIREMENTS

Not applicable.

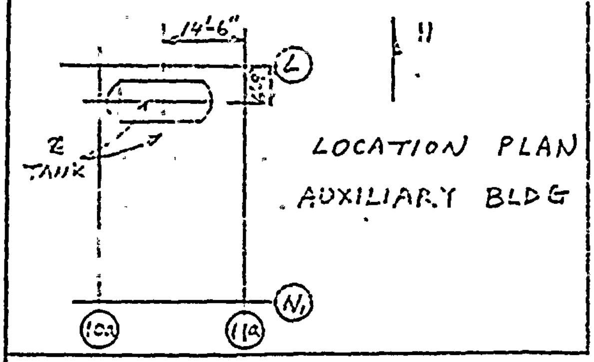
31.0 UNIQUE REQUIREMENTS

Not applicable.

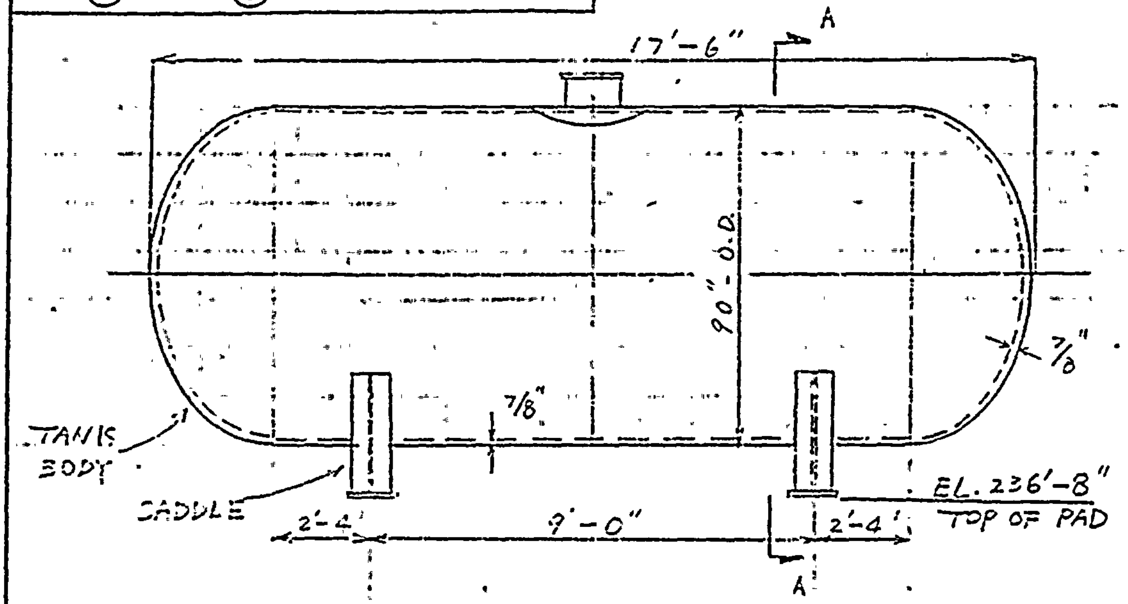
GILBERT ASSOCIATES, INC. ENGINEERS AND CONSULTANTS READING, PA.	DEPARTMENT NAME STRUCTURAL ENG	DEPT. NO. 0412	FILING CODE
	PROJECT NAME GINNA STATION	W.O. NUMBER 04-4824-035	PAGE

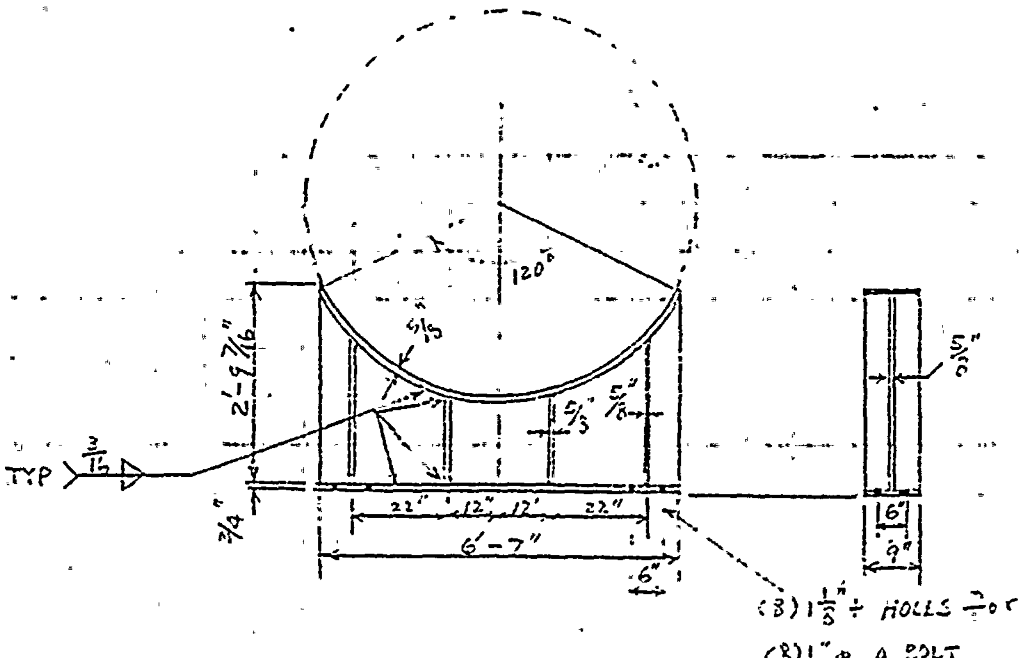
SUBJECT: GENERAL ARRANGEMENT DRAWING SODIUM HYDROXIDE TANK

ORIGINATOR: S S HSIEH
DATE: 9/13/82
VERIFIER: D. P. CAMPBELL
DATE: 9-29-82



MATERIALS :
1. TANK BODY
– A240 TP304
2. SADDLES
– A285 C
3. BOLTS
– A36





SECTION A-A

FILING CODE

RESPONSE TO NRC COMMENTS RELATIVE TO SODIUM HYDROXIDE TANK ANALYSIS

1. What damping values were used for the analysis assuming the tank full, and with inclusion of sloshing effects.

Answer: The damping values used were 3% and 0.5%, respectively.

2. Were frequencies other than the fundamental (first-mode) frequency considered?

Answer: Yes. All vibration modes were considered. The first mode is at 13 Hertz, much higher than the critical frequency range of 2.5 to 9 Hertz. The other modal participation factors were found to be negligible.

It should also be noted that very conservative criteria for seismic input spectra and damping were used in this analysis (Regulatory Guides 1.60 and 1.61) vs. the SEP seismic spectra approved for use by Ginna. Additional conservatism is thus provided.

Attachment C - Tanks in Auxiliary Building

TANK (NUMBER)	CAPACITY (Gal.)	SEISMIC ?
Refueling Water Storage Tank (1)	338,000	YES
Reactor Makeup Water Tank (1)	75,000	NO
Volume Control Tank (1)	1,500	NO
Boric Acid Storage Tank (2)	3,600	YES
Monitor Tank (2)	7,500	NO
Component Cooling Water Surge Tank (1)	2,000	YES
Waste Holdup Tank (1)	21,438	BEING ANALYZED
CVCS Holdup Tank (3)	31,154	BEING ANALYZED
Boric Acid Batch Tank (1)	400	NO
Chemical Mixing Tank (1)	3	NO
Sodium Hydroxide Tank (1)	5,100	YES
Waste Evaporator Condensate Tank (2)	600	NO
Concentrates Holding Tank (1)	700	NO

The total volume of all non-Seismic Category I tanks is 208,703 gallons. Based on the 70,000 gallon capacity of the RHR pit, and the net free surface area of the auxiliary building basement of 4813 ft^2, this would result in a water level of 3'10". This is a level greater than the height of required safe shutdown equipment. Thus, RG&E will qualify the three CVCS Holdup Tanks, or prevent their affecting the required safe shutdown equipment. The resulting maximum water volume which could be discharged onto the auxiliary building floor is 115,241 gallons. This would result in a maximum water level of only 15 inches, which is below the elevation of the bottom of the Safety Injection Pump motor of 20 inches. Thus, with the qualification of these tanks, the issue of internal flooding due to seismic qualification of tanks will be resolved.