PSEG

Public Service Electric and Gas Company 80 Park Place Newark, N.J. 07101 Phone 201/430-7000

July 31, 1978

Director of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Mr. A. Schwencer, Chief
Operating Reactors Branch 1
Division of Operating Reactors

Gentlemen:

INCREASED CAPACITY SPENT FUEL RACKS
NO. 1 UNIT
SALEM NUCLEAR GENERATING STATION
DOCKET NO. 50-272

In response to your letter of June 23, 1978, requesting additional information regarding our application to increase the spent fuel storage capacity at Salem Nuclear Generating Station, we hereby transmit the requested information as an attachment to this letter. It should be noted that a portion of our response to your request No. 18 is not included in this submittal. This information will be provided as soon as possible.

This submittal consists of forty copies.

Should you have any questions regarding this application, please do not hesitate to contact us.

Very truly yours,

F. P. Librizzi
General Manager -
Electric Production

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QUESTION 1

In view of the US DOE's announced intent to provide both interim and permanent spent fuel storage facilities and the probable availability of interim facilities in the 1983-85 time frame, what is your basis for selecting a storage capacity of 1170 assemblies to provide for storage of spent fuel to 1993-96? Include considerations of costs for interim storage and those for eventual permanent storage under DOE's estimated cost breakdown.

ANSWER

It would not be prudent to limit the storage capacity to less than the optimum design considering the uncertainty of "probable availability". An important consideration is the potential for needless radiation exposure to maintenance and construction workers in the event a design that is less than "optimum" is adopted and a future redesign and installation becomes necessary to increase the storage capacity.

Should either interim and/or permanent storage facilities become available prior to 1993-96, a decision could be made at that time as to the disposition of the spent fuel. Considering need to expand the current fuel storage capacity, the differential cost between designing a facility with a capacity to 1983-85 compared to 1993-96 is not significant considering the uncertainty of the interim facility availability and the cost and exposure penalties of later redesign and installation with many fuel assemblies already in storage.

QUESTION 2

Discuss any additional alternatives that the planned expansion of the Salem Unit No. 2 spent fuel pool capacity present with regard to the number of storage locations being requested for Unit No. 1.

ANSWER

The possibility of using the No. 2 Unit fuel storage facility for spent fuel storage from the No. 1 Unit was considered. However, this approach would only provide for storage of spent fuel from both units until the mid 1980's. Considering the uncertainty in the availability of interim storage facilities and the transferring of spent fuel from one unit to the other, it has been determined that the most effective approach would be to expand the No. 1 Unit storage capacity for No. 1 Unit fuel.

QUESTION 3

Have you investigated participation with other utilities to construct an independent spent fuel storage facility? Is it likely that such a facility would be available prior to the time (1983) when an interim Federal facility is expected to be available? Provide schedules and cost information for this option.

ANSWER

PSE&G has not investigated participation with other utilities to construct an independent spent fuel storage facility. It is not likely that such a facility could be constructed and operational prior to 1983. Some of the inherent problems associated with this alternative include land acquisition, construction and licensing of such a facility, along with the associated environmental impacts. It is unrealistic to assume that such a facility could be available when needed for storage of spent fuel from the Salem station. Furthermore, it is doubtful that constructing a new facility would be cost effective compared to expanding the capacity of existing spent fuel storage pools, or would have less environmental impact.

QUESTION 4

Have you corresponded with General Electric (Morris Operation) and NFS to confirm that no storage space is available for storage of spent fuel from Salem Unit No. 1.

ANSWER

PSE&G has not discussed spent fuel storage with either General Electric or NFS. The NRC staff has discussed the status of storage space at the Morris facility with General Electric. GE indicated that it is primarily operating the Morris facility to store GE fuel which has been leased to utilities or fuel which they had previously contracted to reprocess. The staff was informed that GE policy is not to accept spent fuel for storage except in cases where GE had a previous commitment. The NFS facility storage pool at West Valley, NY is not full, and correspondence received by the NRC staff indicates that NFS is not accepting additional spent fuel for storage, since they have withdrawn from the reprocessing business.

REFERENCE: Environmental Impact Appraised by the Office of Nuclear Reactor Regulation Related to Modification of the Spent Fuel Storage Pool, Trojan Nuclear Plant, Docket No. 50-344, Section 7.2.

QUESTION 5

In your February 14, 1978 submittal you state that the additional cost to your customers for purchase of replacement power is estimated to be approximately $500,000 for each day the reactor is not operating. Provide the basis for this figure. In addition, discuss the following:

a. Would replacement power be available within the PSE&G system? If not, would replacement power be available on a short term or long term basis outside your system? In either case, will replacement cost be influenced by seasonal considerations?

b. Provide your estimate of the costs, apart from the cost of replacement power, associated with maintaining the plant in a shutdown condition (e.g., interest or investment, security, maintenance, personal, etc.).

ANSWER 5a

The replacement energy value of $500,000 per day for the shutdown of a Salem unit is based on the differential costs of producing energy from Salem and other available units in the PSE&G and Pennsylvania-New Jersey-Maryland (PJM) Interconnection systems. Production costs consist of fuel costs and variable operating and maintenance expenses associated with producing electrical energy.

The PJM Interconnection is a power pool which is comprised of eleven operating companies, including PSE&G. PJM is operated as a single system with centralized dispatch of generating units and free-flowing transmission ties among member companies. At any given time, if a PSE&G unit (such as Salem) must be taken out of service, the most economical unloaded or partially loaded units in the PJM system are brought up in load to compensate. The units may or may not be in the PSE&G system. The

incremental costs of operating these additional units varies during the day and throughout the year. Generally speaking, these costs are higher during peak periods than during off-peak periods and are higher when large numbers of base load units are out of service.

It is estimated that the average incremental cost of operating additional capacity in the PJM system for the second half of 1978 will be approximately 2.4¢/kWhr. Since the production costs for Salem during this period are expected to be approximately 0.47¢/kWhr, there will be a penalty of approximately 1.9¢/kWhr for each unit of electricity which must be provided by the PJM system in lieu of Salem.

Multiplying 1.9¢/kWhr by the 1,090,000 kW capacity of the Salem No. 1 Unit and by 24 hours per day, results in a penalty of approximately $500,000 for each day the No. 1 Unit is out of service.

Answer 5b

The estimated cost of maintaining the Salem No. 1 Unit in a shut-down condition has been calculated utilizing 1978 as the base year. The annual finance cost, including return on investment, depreciation, taxes, etc., is $94 million; costs associated directly with the fuel cycle (fuel carrying charges and escalation) are $5.8 million; and the estimated annual operating cost, including labor and materials, is $18 million.

QUESTION 6

Provide a breakdown of the estimated total cost of making the spent fuel rack modification ($3,000,000). Include the cost of removal and disposal of existing racks, fabrication and installation of the new racks, interest on funds used for the project, engineering costs and any other related costs.

ANSWER

The cost for the new spent fuel racks is approximately $2,100,000. The construction costs (including removal and disposal of the existing unused racks) are estimated to be approximately $600,000. The engineering costs and other indirect costs are approximately $300,000.

QUESTION 7

Discuss the effect of energy conservation programs within your service area as related to operation of Salem Unit No. 1 and associated refueling schedules.

ANSWER

The Salem No. 1 Unit is PSE&G's most economical unit and will be used as a base load unit, even should the most optimistic energy conservation program that can be envisioned be instituted. PSE&G's energy conservation programs, therefore, have no effect on the operation and associated refueling schedules of the Salem No. 1 Unit.

QUESTION 8

Discuss any plans to modify core design to extend the time between refuelings.

ANSWER

PSE&G is currently studying the feasibility of changing the Salem No. 1 Unit from a 12 month refueling cycle to an 18 month refueling cycle, but no decision has been made to date.

In either case, the spent fuel storage requirements would remain virtually unchanged, since a longer cycle would result in a greater number of fuel assemblies being discharged in each cycle.

QUESTION 9

Discuss the commitment of material resources (e.g., stainless steel) required to fabricate the replacement storage racks. Will the existing racks be salvaged or used at another facility? Will the old racks be cut up for disposal or disposed of "as-is"?

ANSWER

PSE&G's commitment of material resources for this project is similar to other high density spent fuel storage projects which have been undertaken by the electric utility industry. The materials involved (e.g., stainless steel) are small in relation to the quantities of these materials available commercially. The existing uncontaminated spent fuel storage racks will be cut up and salvaged for material value.

QUESTION 10

Discuss the measures that you will take to insure that the boral plates of the spent fuel racks will not deform during their expected service life due to the expansion of gas that may evolve from any water entrapped during the fabrication process.

ANSWER

Strict process controls are employed at the fuel cell fabricator's facility which provide for identification of each cell that may have been exposed to water during fabrication. Each of those cells which are affected are segregated from the rest to a separate controlled area. A Quality Assurance procedure has been implemented in the drying process for the affected cells to assure that moisture has been removed prior to releasing those cells for installation in a rack module. This Quality Assurance procedure for the drying process has been utilized on the Monticello spent fuel storage rack project.

QUESTION 11

Provide the dose equivalent rates (mrem/hr) associated with the expected radionuclide concentrations in the spent fuel pool prior to and after refueling, above and around the SFP, and the concentration of those radionuclides that significantly contribute to this dose rate, including ^{58}Co, ^{60}Co, ^{134}Cs and ^{137}Cs. Based on these dose rates, estimate the annual collective occupational exposure, in man-rem, due to all operations in the SFP area. Provide the annual occupational exposure increase in man-rem, and a result of the proposed modifications.

ANSWER

The spent fuel pool is presently uncontaminated. Following refueling the principal radionuclides and their concentrations that are expected to be found in the spent fuel pool (SFP) water are:

Isotopes	Concentrations
Co-58	1.3 E-4 μ Ci/cc
Co-60	2.6 E-4 μ Ci/cc
Cs-134	5.0 E-4 μ Ci/cc
Cs-137	1.0 E-3 μ Ci/cc

The dose rate above and around the SFP from these isotopes in solution is expected to be approximately 1.15 mrem/hr. The total dose rate in this area is expected to be approximately 3.175 mrem/hr, which includes a maximum of 2.5 mrem/hr from a fuel assembly being transferred within the SFP and $<$ 0.1 mrem/hr from the spent fuel assemblies in the storage racks. The contribution of fission products from the Reactor Coolant System water to the SFP water is negligible, since the reactor coolant undergoes continuous cleanup and is degassed prior to transfer of the fuel. Additionally, the volume of reactor coolant which is mixed with the refueling water in the reactor cavity is small and becomes even smaller when considering further dilution in the spent fuel pool.

The 1.15 mrem/hr dose rate contribution from the Cs and Co isotopes was calculated using an equivalent disk source taking the dose point at the center of the pool as six feet off the surface of the water. The source was assumed evenly distributed in the water and no consideration was given to buildup on the SFP walls, since the top portion of the walls has been ground smooth to minimize the possibility of crud deposits.

The occupational exposure due to all operations associated with fuel handling in the SFP area is approximately 3.3 man-rem/yr. This occupational dose rate is based on an estimated 875 manhours required in the SFP area during refueling operations.

The expected increase in annual occupational exposure due to the proposed spent fuel storage rack modification is insignificant, i.e., the occupational exposure is expected to be the same as that from the current SFP rack design. The occupational exposure from the storage of spent fuel and the dose contribution from activity in the water is not expected to increase.

QUESTION 12

Identify the normal operating temperature and the worst thermal gradient through the racks for which the racks were analyzed. Provide justification for that temperature and gradient and the results of these analyses for the most critical elements of the racks. (Your submittals indicate that pool temperatures up to 150°F are possible).

ANSWER

The fuel storage racks were analyzed for a maximum normal operating temperature of 150°F and the following thermal gradient and thermal stress conditions:

a) Each rack module is free to expand within the pool at all temperatures up to and including pool boiling temperature (T_a). There are, therefore, no overall thermal stresses in the racks.

b) Locally within a rack module, the worst thermal stress inducing condition occurs when one or more recently discharged assemblies are placed in the center of an empty rack. This condition produces the maximum restrained thermal stress condition. Under this postulated condition, thermal hydraulic analysis shows that the maximum cooling water temperature increase occurs as the water flows up through the fuel assemblies and will be less than 33°F. This temperature increase will result in a maximum temperature increase of the rack structural members of 17°F, which in turn results in a maximum thermal stress of 4,500 psi.

QUESTION 12 (Cont'd)

For the $(D+E+T_o)$ loading condition the allowable stresses are increased by 50% over the (D+E) loading condition. This means that if the (D+E) loading condition is at the maximum permissible stress at some location, then a thermal stress of up to 8,100 psi is permissible at the same location. It is therefore concluded, from the conservative analysis described above, that the thermal stresses in the racks are well within acceptable limits and that the results presented in Table 3.7-2 of our February 14, 1978 submittal represents the limiting loading conditions.

QUESTION 13

Provide a summary of the material properties used in the rack structural analyses and verify that these are the properties at the appropriate temperatures.

ANSWER

The rack material properties for structural components used in the analysis of the fuel racks were taken from Appendix I of Section III of the ASME Code. The values used in the analysis for Type 304 stainless steel as interpolated from the ASME Code are as follows:

Yield Strength

Sy= 27.5Ksi at 150°F
Sy= 24.0Ksi at 240°F

Modules of Elasticity

E= 28,000Ksi at 70°F-200°F

Coefficient of Thermal Expansion

a = 0.0000095in/in/F at 200°F

The material properties at 150°F were used for all load cases at normal operating temperatures (To) and 240°F properties were used for the load cases at maximum temperature (T_a).

QUESTION 14

Provide the detailed water chemistry which will be maintained in the spent fuel pool (SFP).

ANSWER

The following is the chemistry specification for the SFP:

pH	4.0 to 8.0
Boric Acid, as ppmB	2,000
Chloride, ppm max.	0.50
Fluoride, ppm max.	0.15
Make-up Water	Same as for Reactor Coolant System make-up water.

QUESTION 15

Verify that the racks will withstand the drop from the maximum transport height of any of the items which will be carried over the racks when impacting the racks both horizontally and vertically, without violating the appropriate acceptance criteria. In addition, discuss the effects of the total rack structure flexibility on the results of the postulated drop analyses.

ANSWER

Administrative controls prohibit loads greater than that of a fuel assembly to travel over the spent fuel pool. The maximum height at which a fuel assembly can be carried is restricted by limit switches on the crane to 15 inches over the top of the spent fuel racks. The racks have been analyzed for a fuel bundle dropped from a maximum height of 15 inches above the top of the rack. The energy of the dropped fuel bundle is absorbed by local and elastic deformation of the top 7 inches of the fuel cell. In the computer model a static load equivalent of the force required for the deformation of the top of the cell was imposed on the top of the rack. The rack members were analyzed and shown to be within the allowable loads of the design criteria for this maximum fuel drop load. Since the maximum load is limited by the crushing strength of the top of the fuel cells, the total rack structure flexibility has no effect on the postulated drop loads.

Since the fuel assembly is the heaviest load carried over the spent fuel pool, analysis of other load drops is not required.

QUESTION 16

Verify that the factors of safety against overturning of 1.7 and 1.45 for the OBE and SSE, respectively, are minimum values considering the worst case of partially full racks and describe the assumed spent fuel distribution. If they are not, provide these minimum factors of safety against overturning and the assumed spent fuel distribution.

ANSWER

The previously reported factors of safety against overturning of 1.7 and 1.45 for the OBE and SSE, respectively, where calculated assuming one rack to be fully loaded with fuel and the two adjacent, intertied racks to be empty. Additional analyses have been performed showing that a slightly worse case occurs with the end rack only half full of fuel (50 assemblies) and with that fuel located in the five fuel storage rows closest to the pool wall. The resulting factors of safety against overturning were 1.60 and 1.31 for the OBE and SSE, respectively; these factors being above the minimum allowable values of 1.5 and 1.1 as defined in SRP 3.8.5. This analysis is conservative in that no credit was taken for the increased frequency and decreased accelerations which would result from decreasing the mass of fuel stored in the end rack.

QUESTION 17

Provide the coefficient of friction assumed in the calculation of a 7,000 lb. net wall load if the wall load is determined from the linear elastic analyses.

ANSWER

The coefficient of friction used to calculate the net wall load determined from the linear elastic analysis was 0.3. The reference* provides details of a variety of friction tests representative of water reactor operating conditions. For a Type 304 stainless steel sliding couple, the following friction coefficients were measured:

Experiment	Lubrication	Friction Coefficient	
		100 psi	1,500 psi
304SS on 304SS	Dry at 74°F	0.40	0.44
304SS on 304SS	Water at 200°F	0.59	0.48

The actual condition is at approximately 120°F and an average bearing pressure of 2,000 psi, at which conditions, a sliding coefficient of friction of at least 0.45 would be anticipated. The static friction coefficient would be expected to be even higher. It is concluded, therefore, that the values used in the linear and non-linear analyses of 0.2 and 0.3, respectively, are conservatively low.

*Reference: General Electric Report No. 60GL20, "Investigation of the Sliding Behavior of a Number of Alloys Under Dry and Water Lubricated Conditions", R. E. Lee, Jr., January 22, 1960.

QUESTION 18

Provide a summary of the maximum stresses in the most critical sections of the fuel assemblies due to impact with the cans during a seismic event. Justify the acceptability of these stresses and provide the details of the analyses used to determine these stresses.

ANSWER

The maximum loads on the fuel bundle from the non-linear seismic impact analysis were 2,319 lbs. on the upper end fitting and 978 lbs. on the spacer grid. These loads are from a computer model of the fuel bundle with three equally spaced spacer grids, an upper end fitting and a lower end fitting. The maximum loads on the fuel bundle from top to bottom are 2,319 lbs. on the upper end fitting, 824 lbs., 978 lbs. and 215 lbs., respectively on the top, middle and bottom spacer grids, and no load on the bottom end fitting.

The effect of these loads on the fuel assemblies is currently being analyzed by our fuel supplier. The results of this analysis will be submitted to you at a later date.

QUESTION 19

Provide justification that the consideration of fixed-base models in the design of the racks is conservative.

ANSWER

The maximum horizontal load that can be transmitted to the fuel storage racks during a seismic event is limited by the friction coefficient between the floor of the spent fuel pool and the fuel storage racks. With the base fixed against translational movements, the friction coefficient is effectively infinite, permitting transmission of the maximum possible seismic loads to the rack structure. Use of a fixed base in the structural computer model is, therefore, a conservative assumption.

QUESTION 20

Which portions of the stainless steel clad boral can walls are relied upon for load carrying capacity?

ANSWER

A series of structural tests were performed on full size composite stainless steel and boral fuel cell sections. These tests were performed to determine the stiffness and strength characteristics of the fuel cell, acting as a composite structure. The results of these tests were then used for stiffness properties in the computer model and to evaluate the resulting loads on the fuel cell. The composite structure, as tested, is therefore relied upon for load carrying capacity.

The primary load carrying capability of the fuel cell is provided by the outer stainless steel shroud with a small contribution provided by the inner shroud. The boral poison sheets provide a negligible contribution to both the strength and stiffness of the fuel cell.

QUESTION 21

The use of the plastic section modulus in the determination of the member limit loads for a combination of dead (D), thermal (T_a) and OBE (E) loadings is not acceptable. Verify that the design is acceptable if the acceptance criteria is determined in accordance with the elastic design methods and the allowable stresses defined in ASME Section III, Subsection NF, Article NF-3400.

ANSWER

The rack design is acceptable if the combination of dead (D), thermal (T_a) and OBE (E) loadings is considered on an elastic design basis without use of the plastic section modulus. The allowable stresses are, therefore, 1.6 times the normal limits of NF3231.1a, in accordance with the NRC OT Position For Review And Acceptance of Spent Fuel Storage and Handling Applications, dated April, 1978. The stress summary presented in Table 3.7-2 of our February 14, 1978 submittal is not changed by this acceptance criteria, since this particular load case does not control any part of the design.

QUESTION 22

What are the local effects of fuel assembly impact during a seismic event on the can walls? Provide a summary of your analysis and results.

ANSWER

The maximum impact load on the fuel cell was 2,319 lbs. at the upper end fitting, as determined from the non-linear analysis. (See response to Question 18) A transverse compression test was performed as part of testing on the stainless stell clad boral fuel cell. This test showed that the cell could elastically resist the uniform load of up to 105 lbs/in^2 against the side of the cell. Therefore, for the maximum impact load against the side of the cell, a 2-3/8 inch length of cell would be required to resist this load, which is much less than the area impacted by the fuel bundle. At the location of the fuel assembly upper end fittings, where the maximum impact loads occur, additional conservatism is provided by the fact that the fuel cells are supported laterally by the inter-cell spacer grid bars.

QUESTION 23

Provide justification that one fuel rack, and not two or more racks, in contact with the wall, with the other racks equally spaced, produces the greatest wall impact load. In addition, what is the effect on the fuel racks themselves for the worst impacting arrangement?

ANSWER

An analysis with one rack in initial contact with the wall and a friction coefficient of 0.20 was performed to obtain a limiting impact load for design purposes after determining that rack movement was very small at a friction coefficient of 0.3. As shown in response to Question 17, an actual sliding friction coefficient of at least 0.45 would be anticipated, at which condition there would be no rack movement and, therefore, no impact against the wall.

If the very conservative case of two or more racks initially lumped against the wall with a friction coefficient of 0.20 was considered, the racks would move away from each other immediately after the first impact and the case already analyzed would then be representative of subsequent motion. Therefore, any higher loads determined from such an analysis would be a single impact of short duration which would not impair the structural capability of the racks and the wall restraints.

Finally, as shown in Table 3.7-2 of our February 14, 1978 submittal, the wall restraints are stressed to only 0.417 times the

QUESTION 23 (Cont'd)

allowable. The restraints are therefore capable of resisting loads of approximately 2.5 times the calculated values, within the applicable stress limits.

As stated in our February 14, 1978 submittal, the calculated impact forces were directly superimposed on the other seismic and dead weight loads for analysis of the rack module base structure.

It is concluded, therefore, that the analysis previously reported provides sufficient conservatism to ensure that the rack structure and wall restraints meet the applicable requirements.

QUESTION 24

Clarify what is meant by your statement that the racks are in "general conformance" with the provisions of NF-2000, 4000 and 5000. Justify any non-conformance.

ANSWER

The spent fuel storage rack modules are in "general conformance" with the materials, fabrication, installation and examination criteria of the 1977 Edition of the ASME Code, Section III, Subsection NF Articles NF-2000, NF-4000, and NF-5000 respectively. The Code is not specific enough on the fabrication of austenitic stainless steel to adequately cover all concerns. In a few areas, the Code requires documentation, certification and programs which are specifically concerned with production of a Code certified component. The fuel storage modules are not certified Section III for component supports, and in these areas Exxon Nuclear has substituted its own requirements. These areas are as follows:

1. Exxon Nuclear does not require that any of the agencies involved in the production of the storage modules (i.e., designers, fabricators, installers, or material suppliers) maintain a Section III Code certification. Therefore, the quality systems in use at these agencies is not required to be in full compliance with the various requirements of Subsection NA. Each of these agencies are qualified by Exxon Nuclear or its assigned agent. This qualification process, in part, requires a quality system which con-

QUESTION 24 (Cont'd)

forms to the requirements of ANSI N45.2 and 10CFR50, Appendix B.

2. As a clarification to NF-2121, Exxon Nuclear occasionally permits substitution of equivalent ASTM materials for ASME certified material. This happens primarily where the ASTM materials are more readily available than the ASME equivalent. In the case of austenitic stainless steels, there are no differences between ASME and ASTM specifications.

3. Exxon Nuclear does not require compliance with NF-4122. The fabricator is required to demonstrate a material control program which will insure that only certified material is used in the storage module. The only exception to this rule is in the use of neutron poison materials, which are required to be in compliance with NF-4122.

4. Exxon Nuclear does not comply with the requirements of NF-4725 which requires locking devices in all threaded fasteners except high strength bolts. The intent of the Code requirement for high strength bolts is met on the rack intertie bolts which are torqued at installation to prevent loosening. In addition, locking of the intertie bolts is not necessary since there is no known source of vibration which would tend to loosen the bolts in service. It is undesirable to provide locking devices on these bolts since this would impair the capability for remote, underwater rack removal.

QUESTION 25

Provide detailed justification that the 2.0S linear elastic limit for the faulted condition is in accordance with F-1370 of ASME Section III, Appendix F.

ANSWER

The basic tensile stress allowable of 2.0S is derived from F-1370 of ASME Section III, Appendix F as follows:

Per Appendix XVII paragraph XVII-2211(a) the tensile stress allowable is $F_t=0.60S_y$

Per Appendix F, Paragraph F-1370(a) the allowable stresses may be increased by a factor of 1.2 (S_y/F_t).

Combining these two equations results in a faulted condition stress increase factor of $1.2(S_y/0.6S_y) = 2.0$.

In summary, the rack design is in accordance with the requirements of F-1370 of ASME Section III, Appendix F.

QUESTION 26

Identify the maximum strains at the most critical rack sections resulting from self-limiting stresses due to T_a in combination with other loads and provide justification that these strains are not excessive.

ANSWER

The racks are free to expand in the pool. Therefore, no thermal stresses or strains are imposed on the racks due to thermal expansion at all temperatures up to and including pool boiling (T_a).

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QUESTION NO. 27

Verify that the rack design is in accordance with the provisions of Paragraphs C.2, C.3 and C.4 of Regulatory Guide 1.124, "Design Limits and Load Combinations for Class 1 Linear Type Component Supports."

ANSWER

The rack design is in accordance with the provisions of Paragraphs C.2, C.3 and C.4 of the Regulatory Guide. Estimates of values of Su at temperatures in accordance with methods 1 or 2 of Paragraph C.2 were not required, since these values are listed in Section III (Table 1-3.2) for Type 304 stainless steel.