PSE&G

Public Service Electric and Gas Company P.O. Box 236 Hancocks Bridge, New Jersey 08038

Nuclear Department

April 27, 1983

Director of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, Maryland 20014

Attention: Mr. Steven A. Varga, Chief
Operating Reactors Branch 1
Division of Licensing

Dear Mr. Varga:

NUREG 0612, CONTROL OF HEAVY LOADS
SUPPLEMENT TO SIX-MONTH RESPONSE
SALEM GENERATING STATION
UNITS NO. 1 AND 2
DOCKET NOS. 50-272 AND 50-311

PSE&G transmitted its response to the six-month requirements of Generic Letter 81-07 on February 23, 1982. The NRC on June 28, 1982 transmitted a draft Technical Evaluation Report (TER) prepared by the Franklin Research Center (FRC). On August 4, 1982, a telephone conference call was held by representatives of the NRC, FRC, Quadrex Corporation, and PSE&G to discuss open items in the TER.

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The information below and in the attachments to this letter constitutes a supplementary response to our "six-month" response to confirm and clarify the items discussed in the August 4, 1982 conference call.

ADD: F. Clemenson

General Guidelines

1.0 The heavy load weight is corrected from 1,850 lbs. to 2,200 lbs. and consists of the fuel element with control rod cluster assembly and the spent fuel handling tool with load cell and for miscellaneous rigging equipment allowances.

2.0 The following overhead handling systems shall formally be derated to a capacity of not more than 2,200 lbs.

2.1 Fuel Handling Cranes, serial numbers 10246 and 10247

2.2 Manipulator cranes

2.3 Decontamination room overhead crane

Note: The stud tensioner hoist(s), which exceed the 2,200 pound definition limit, will be excluded by analysis.

3.0 The spent fuel pool gate monorails will be subject to NUREG-0612, since previous "high density fuel rack" modification commitments regarding the monorails, do not conflict.

Guideline No. 1

4.0 Load Paths

4.1 Polar Gantry cranes, 80 ton Grove crane, and 900 series American crawler crane - inadvertently omitted paths are contained within the Maintenance Procedures attached.

4.2 Mobile cherry pickers and Solid Radwaste Overhead cranes - by nature of their engineered function, these cranes do not have limited line paths but have "area" paths (multitudinous, crisscrossing paths). (See marked "Controlled No. 2, No. 3, and No. 4" copies of the Quadrex Corporation report attached).

5.0 Visual Aids

5.1 The visual aids for operator and supervisors will be sketches contained within, or referenced in, the appropriate handling procedures (representative copies enclosed). The appropriate procedure(s) address(es) the lift in a step by step manner with witness and/or hold-signoff points, and use signal or tag personnel and the like. These comply with the intent of walking the path and checking it out (See paragraph 9.5 of procedure M2R).

5.2 Permanent markings on the floor of the building and/or trolley to bridge and bridge to building "match marks" are not being used, nor will they be used as visual aids, as these can be confusing and take the operators attention away from monitoring the load and the tag person or signal person.

6.0 In order to enhance the existing paragraph 9.2 of procedure M2R, "Control of Heavy Loads," a "policy" statement will be prepared and will be added to the overall plant procedures for "rigging and load handling," which states that deviations from designated safe load paths shall require the establishment of approved written alternative procedures.

GUIDELINE NO. 2 - None

GUIDELINE NO. 3 - None

GUIDELINE NO. 4

7.0 The wording should be changed to reflect the fact that Westinghouse Electric Corporation has been contracted to perform the NUREG evaluation of the reactor vessel head and reactor internal special lifting devices, and the results of their work will be forwarded for NRC evaluation within three to four months. In addition, the reactor coolant pump lift rig is being evaluated by our consultant and will be sent with the Westinghouse evaluation. The noted guideline items within the draft Technical Evaluation Report will be considered.

GUIDELINE NO. 5

8.0 Lifting Devices

8.1 Sling installation and use has been verified per maintenance procedure M2Q which includes ANSI B30.9 requirements.

8.2 An evaluation of impact (dynamic) allowance (loading), using CMAA-70, Section 3.3.2.1.1.3, has resulted in only cranes with hoist speeds in excees of 30 feet per minute exceeding the 15% allowance and thereby needing consideration. These are yard type, mobile cranes, which use rigging equipment that exceed the static load weight requirements by at least fifty (50) percent.

8.3 Slings carry only the "manufacturer's tag" for static rating. The impact allowance (dynamic load) is addressed procedurally in keeping with 8.2 above.

8.4 Generally, slings are not assigned to a specific function or crane; however, if this should occur the sling will be appropriately marked to so indicate.

GUIDELINE NO. 6 - None

GUIDELINE NO. 7

9.0 The applicable portion of the spent fuel pit filter handling system and the refueling water purification and concentrates filter handling system were designed in accordance with CMAA-70.

10.0 CMAA-70 requirements, b/c ratio, and h/t ratio.

10.1 Polar Gantry Crane(s)

10.1.1 The b/c ratio is less then 38.

10.1.2 Both longitudinal and transverse stiffeners were used.

10.1.3 The moment of inertia of the longitudinal stiffeners is 93 percent of the CMAA-70 code requirements.

10.1.4 The transverse stiffeners meet code requirements for those heavy loads whose postulated drop would be considered important to safety.

10.1.5 The longitudinal stiffeners are located further from the compressive flange than the code allows. This was previously reported in our Six Month Response. However, the effective safety factor is still judged to be within CMAA-70 code requirements.

10.1.6 Justification

10.1.6.1 The h/t ratio of the polar crane girder is 280, and the maximum compressive stress is 6.0 ksi. The code allowable is 240 if no longitudinal stiffeners are present and if the compressive stress is between 0 and 10.0 ksi. The h/t ratio exceeds the code allowable by 16% only if the effect of the longitudinal stiffeners is completely ignored. In addition, the code very conservatively does not provide any allowance for compressive stress levels between 0

and 10 ksi. By considering the actual maximum compressive stress level of 6.0 ksi and conservatively extrapolating from the code defined stress levels of 16.3, 12.0 and 10.0 ksi, the "real" h/t requirement without any longitudinal stiffeners is approximately 300. Therefore, the actual h/t ratio of 280 should be adequate.

10.1.6.2 The centerline of the longitudinal stiffeners is located 31 inches (.60)* from the compressive flange rather than the required 21 inches (.40)*. However, to mitigate this there are additional partial transverse stiffeners T6-2/1 05 supporting the webs between the longitudinal stiffeners and the compressive flange.

*Distance from compressive flange to stiffener location divided by distance from compressive flange to the neutral axis.

10.1.6.3 The requirements for the ratio of web thickness (t) to clear depth (h) is based on plate buckling theory with the web being subjected to shear and to compressive bending stresses. The plate buckling theory conservatively assumes the web is an isolated plate; however, this is not true. For the polar crane box girder, the webs are part of a built-up member. If the critical buckling stress in the web was reached, the diagonal compressive resistance of the web does not disappear and the girder would not collapse. The flange plates would carry all of the bending moment, the buckled webs would serve as tension diagonals, and the full transverse stiffeners would act as vertical compression members. This has the effect of making the girder act as a Pratt truss.

10.1.6.4 Tests at Lehigh University have shown that differences in web slenderness ratio (h/t) produce little effect on the ultimate load carrying capacity of girders with the same compression flange. The research demonstrated that the ultimate load carrying capacity of girders is directly proportional to the restraint offered by the compression flange. The more torsionally flexible flange (wide and thin) resulted in the lower ultimate loads, and the more torsionally rigid flange (tubular) resulted in higher ultimate loads.

10.1.7 Conclusion/Summary: The conservative safety factor required by CMAA-70 has been met by the polar cranes. This is based on the following considerations:

10.1.7.1 The longitudinal stiffeners are not required if the actual low compressive stress levels are considered and the code requirements are extrapolated.

10.1.7.2 The webs are supported between the longitudinal stiffeners and the compressive flange by numerous partial transverse stiffeners, in addition to the required full transverse stiffeners.

10.1.7.3 Test results have demonstrated that the h/t ratio has little effect on the ultimate girder strength.

10.1.7.4 If the web buckles, it is unlikely the girder will collapse due to the diagonal tension field within the web.

10.2 Cask Handling Crane(s)

10.2.1 The b/c ratio is less than 38.

10.2.2 Both longitudinal and transverse stiffeners were used.

10.2.3 The transverse stiffeners meet code requirements.

10.2.4 The longitudinal stiffeners are located further from the compressive flange rather than the required 11.27 inches.

10.2.5 The longitudinal stiffeners do not meet code requirements for moment of inertia. This was previously reported in our Six Month Response. The details to correct this deficiency will be in the Nine Month Response.

10.3 Fuel Handling Crane(s)

10.3.1 These cranes do not have to be evaluated because:

10.3.1.1 They have been evaluated by Whiting Corporation and found to be in compliance.

10.3.1.2 They do not carry "heavy loads".

10.3.1.3 They will be "derated" to 2,200 pounds per section 2.1 of this letter.

10.4 The bumpers and stops are in substantial conformance for the Polar Gantry Cranes, Cask Handling Cranes, and Fuel Handling Cranes.

10.5 The Polar Gantry, Cask Handling, and Fuel Handling cranes are pendant controlled.

11.0 Technical Specification 3.9.7 for both Salem Units will be changed to reflect 2,200 lbs. for the heavy load by substituting 2,200 lbs. for the current 2,500 lbs.

INTERIM PROTECTION MEASURES

12.0 The interim action items, with special attention to loads over the core, were addressed as follows:

12.1 Load paths were defined, including visual aids (See item 5.0 of this letter).

12.2 Procedures did exist and have been updated to comply with NUREG-0612.

12.3 The existing crane operator training and qualification requirements had been developed in accordance with the appropriate ANSI Standards.

12.4 The existing crane inspection, testing and maintenance requirements had been developed in accordance with the appropriate ANSI Standards.

Should you have any questions in this regard, we will be pleased to discuss them with you.

Very truly yours,

E. A. Liden
Manager - Nuclear
Licensing and Regulation

Attachments

CC: Mr. Donald C. Fischer
Licensing Project Manager (w/o attach.)

Mr. Leif Norrholm
Senior Resident Inspector (w/o attach.)