R. S. Boyd, Assistant Director for
Reactor Projects, Division of Reactor Licensing
THRU: S. Levine, Assistant Director for Reactor Technology
R. C. DeYoung, Chief
Containment & Component Technology Branch
Division of Reactor Licensing

JAN 26 1968

KEWAUNEE NUCLEAR POWER PLANT, WISCONSIN PUBLIC SERVICE CORPORATION
DOCKET NO. 50-305. CONTAINMENT STRUCTURAL DESIGN

DRL:C&CTB:ALG RT 350

A. L. Gluckmann has reviewed the structural design for the Kewaunee containment. We believe, as a result, that the attached list of additional information is needed from the applicant.

Attachment:
As stated above

cc: A. L. Gluckmann, DRL
S. Levine, DRL
D. Knuth, DRL
R. G. Smith, DRL
L. Porse, DRL

bcc: R. C. DeYoung, DRL

Distribution:
Suppl.
DRL Reading
AD/RT Reading
C&CTB Reading

OFFICE ▶	DRL:C&CTB	DRL:C&CTB	AD/RT:DRL			
SURNAME ▶	ALGluckmann:ewe	RCDeYoung	SLevine			
DATE ▶	1-26-68	1-26-68	1-26-68			

Form AEC-318 (Rev. 9-53)

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KEWAUNEE NUCLEAR POWER PLANT

WISCONSIN PUBLIC SERVICE CORPORATION

CONTAINMENT STRUCTURAL DESIGN

5.2.1 CONTAINMENT

5.2.1.1. It is stated that the vessel plate nominal thickness will not exceed 1-1/2" so that the vessel will not require field stress relieving. There is a possibility that additional thickness may be required to take compression hoop stresses in the ellipsoidal bottom in a zone immediately adjacent to the knuckle line. If it is planned to achieve this by using horizontal stiffeners in this part of the vessel, provide the following information:

(a) Design criteria for the stiffeners and the shell at this location.

(b) Method of stress analysis which will be used

(c) Erection procedure at this point

(d) Quality control, especially for the welds between stiffener and shell

(e) Provisions for breaking bond between the stiffeners and the encasing concrete.

(f) Corrosion protection at this point.

In the listing of loads please add the following loads: negative pressure in the annulus during normal operation and during an accident; positive pressure in the annulus during annulus testing, and during an accident.

Please indicate the design criteria for jet forces.

Also indicate whether the deformations of the base slab will be taken into account for the design of the steel shell.

Indicate type of loading on shell during testing of shell; what type of temporary supports will be used?

5.2.1.4.1. The ASME Pressure Vessel Code does not adequately cover the erection tolerances for such large vessels. Is it intended to supplement the code in this respect? If so, provide a list of the additional tolerances which will be specified.

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5.2.1.6.2. In the description of seismic analysis, add an explanation of how the dynamic influence of heavy concentrated masses such as locks, crane, etc., will be introduced in the design of the steel shell.

Provide the design criteria for the width of joints separating different buildings. What provisions will be made to prevent impact between separate buildings?

5.2.1.8. PENETRATIONS

5.2.1.8.1. Specify exactly the different materials to be used for the penetrations.

List the Codes, in addition to the ASME Pressure Vessel Code, which may be used for the design of penetrations. If supplementary design criteria will be established, discuss them as well as the bases, in detail.

5.2.2 SHIELD BUILDING

5.2.2.3.4. Describe in more detail the "design" tornado. Will non-uniform pressure distribution be considered as acting on the Shield Building?

5.2.2.5. Indicate the minimum percentage of reinforcing to be used in the Shield Building. How will the shrinkage stresses be covered? Provide an analysis of the influence of cracking due to combined shrinkage, temperature gradient, and earthquake on the elastic behavior of the structure, on its ultimate strength, on its capacity to carry shears, especially cyclic earthquake shears, and on its long range behavior (freezing and thawing).

List the Codes, Standards, and Specifications to be used for the design and construction. Specify bar anchorage provisions in concrete under bi-axial tension and bi-axial cracking. Indicate design criteria for openings in the Shield Building and typical reinforcing arrangement at large openings, at the base of the wall, in the discontinuity zone at the dome and in the dome proper. Indicate provisions made during construction of the dome to avoid additional cracking at top of the cylindrical wall due to the dead and live load of the dome.

State the extent to which the ACI Code 301 will be followed.

Indicate the type of cement to be used and why.

Three types of reinforcing bars are specified: ASTM A-15, A-408, A-432. What provisions will be made to avoid mistakes in the field and to prevent substitutions?

If Cadweld splicing will be used indicate the type of splice that will be provided. Describe in detail the quality control intended to give assurance that design specification will be followed in the field.

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5.2.2.5.1. Provide a justification for the assumption of zero relative settlement between structures during an earthquake. Consider the difference in bearing pressure, in weight (mass) per square foot and in dynamic loading on soil, between the reactor building and the adjacent structures, also between the reactor building and the turbine room (connecting pipes?).

Explain the selected design method. Will the elasticity of the soil be considered? Will the monolithic character of the structures (continuity with the walls and other foundations) be taken into account.

5.8.1.1.2. The ASME Pressure Vessel Code does not cover the erection tolerances of such large vessels in an adequate way. Indicate the erection tolerances which will be specified. Specifically indicate if a limit on local curvature variation (local bulges) will be specified and what it will be.

5.8.1.1.3. Indicate what type of temporary supports will be used to support the steel vessel during strength and leak tests. How will they be removed? How will concrete and grout be placed beneath the ellipsoidal bottom of the vessel? What provisions will be made to avoid overstressing the steel vessel during the grouting operation? How will good bearing of the steel plates on grout be achieved and verified?

It should be noted that the ellipsoidal bottom of the steel vessel, after construction is completed, will not be accessible for inspection. What tests are planned to insure complete leak tightness of the bottom? Will soap bubble test be extended to the full area of the bottom plates?

5.8.2.1.2. Explain how the location of eventual leaks will be established when the Shield Building is tested. Also explain what provisions will be made to prevent the interior steel containment vessel from buckling, when the annulus is under positive pressure. How will the temperature corrections be made?