PROPOSED CHANGE RTS-66B TO DAEC TECHNICAL SPECIFICATIONS

I. Affected Technical Specifications

Appendix A of the Technical Specifications for the DAEC (DPR-49) provides as follows:

Specification 3.6.A provides pressure and temperature limits for the reactor coolant system.

II. Proposed Changes in Technical Specifications

The licensees of DPR-49 propose the following changes in the Technical Specifications set forth in I above:

Delete the present Specification 3.6.A and 4.6.A (limiting Conditions for Operations, Surveillance Requirement and Bases for Thermal and Pressurization Limitations) including Figure 3.6-1 and Table 3.6-1.

Replace with the attached Specifications 3.6.A and 4.6.A, including Figure 3.6-1.

III. Justification for Proposed Change

This revised change is being submitted to conform the DAEC Technical Specifications to the requirements of 10CFR50 Appendix G. Our original submittal was forwarded May 21, 1976 (RTS-66A). Additional information was requested in the NRC letter dated February 9, 1977 from Mr. G. Lear to Mr. D. Arnold. Our response dated October 12, 1977 provided the requested information, but did not forward revised proposed Technical Specifications. Submittal of a Technical Specification revision was postponed pending resolution of the applicability to a BWR plant for the requirement specified in 10CFR50, Appendix G, paragraph IV.A.2.C concerning the criticality limit based on the inservice hydrostatic test minimum temperature.

The proposed Technical Specification changes are based on analysis performed by General Electric (NEDO-21778-A, 77 NED238, Class I, December 1978, "Transient Pressure Rises Affecting Fracture Toughness Requirements for Boiling Water Reactor) and the information provided in our October 12, 1977 response. The objective of the criticality limit based on the temperature required for an inservice hydrostatic test plus a 40^{o}F specified temperature margin is to ensure acceptable limits of stress and thermal shock are maintained during anticipated operational occurrences in the control of reactivity. The report concludes that the maximum predicted effect for a BWR during anticipated operational occurrences in the control of reactivity is a pressure increase of less than 25 pounds per square inch. Since this pressure increase is very small, the requirements for minimum temperature criticality limits based on the inservice hydrostatic test minimum temperature should be deleted for BWR operations. Conservatism will be maintained

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for BWR operation by the retention of the required 40^{o} F criticality margin.

This change also reflects changes to Appendix H concerning removal of samples and reflects the fact that flux wire samples were removed during the second refueling outage.

IV. Review Procedures

This proposed change has been reviewed by the DAEC Operations Committee and Safety Committee which have found that this proposed change does not involve a significant hazards consideration.

3.6 PRIMARY SYSTEM BOUNDARY

Applicability:

Applies to the operating status of the reactor coolant system.

Objective:

To assure the integrity and safe operation of the reactor coolant system.

Specification:

A. Thermal and Pressurization Limitations

1. The average rate of reactor coolant temperature change during normal heatup or cooldown shall not exceed 100^{O}F/hr when averaged over a one-hour period.

2. The reactor vessel shall be vented and power operation shall not be conducted unless the reactor vessel temperature is equal to or greater than that shown in Curve C of Figure 3.6.1. Operation for hydrostatic or leakage tests, during heatup or cooldown, and with the core critical shall be conducted only when vessel temperature is equal to or above that shown in the appropriate curve of Fig. 3.6.1. Figure 3.6.1 is effective through 6 effective full power years. At least six months prior to 6 effective full power years new curves will be submitted.

4.6 PRIMARY SYSTEM BOUNDARY

Applicability:

Applies to the periodic examination and testing requirements for the reactor cooling system.

Objective:

To determine the condition of the reactor coolant system and the operation of the safety devices related to it.

Specification:

A. Thermal and Pressurization Limitations

1. During heatups and cooldowns, the following temperatures shall be logged at least every 15 minutes until 3 consecutive readings at each given location are within 5^{O}F.

a. Reactor vessel shell adjacent to shell flange.

b. Reactor vessel bottom drain.

c. Recirculation loops A and B.

d. Reactor vessel bottom head temperature.

2. Reactor vessel metal temperature at the outside surface of the bottom head in the vicinity of the control rod drive housing and reactor vessel shell adjacent to shell flange shall be recorded at least every 15 minutes during inservice hydrostatic or leak testing when the vessel pressure is $>$312 psig.

3. The reactor vessel head bolting studs shall not be under tension unless the temperature of the vessel head flange and the head is greater than 100° F.

4. The pump in an idle recirculation loop shall not be started unless the temperatures of the coolant within the idle and operating recirculation loops are within 50° F of each other.

5. The reactor recirculation pumps shall not be started unless the coolant temperatures between the dome and the bottom head drain are within 145°F.

Test specimens of the reactor vessel base, weld and heat affected zone metal subjected to the highest fluence of greater than 1 MeV neutrons shall be installed in the reactor vessel adjacent to the vessel wall at the core midplane level. The specimens and sample program shall conform to ASTM E 185-66 to the degree discussed in the FSAR.

Samples shall be withdrawn at one-fourth and three-fourths service life in accordance with 10CFR50, Appendix H.
Neutron flux wires shall be installed in the reactor vessel adjacent to the reactor vessel wall at the core midplane level. The wires shall be removed and tested during the second refueling outage to experimentally verify the calculated values of neutron fluence at one-fourth of the beltline shell thickness that are used to determine the NDTT shift.

3. When the reactor vessel head bolting studs are tensioned and the reactor is in a Cold Condition, the reactor vessel shell temperature immediately below the head flange shall be permanently recorded.

4. Prior to and during startup of an idle recirculation loop, the temperature of the reactor coolant in the operating and idle loops shall be permanently logged.

5. Prior to starting a recirculation pump, the reactor coolant temperatures in the dome and in the bottom head drain shall be compared and permanently logged.

3.6.A & 4.6.A BASES:

Thermal and Pressurization Limitations

The thermal limitations for the reactor vessel meet the requirements of 10CFR50, Appendix G.

The allowable rate of heatup and cooldown for the reactor vessel contained fluid is 100°F per hour averaged over a period of one hour. This rate has been chosen based on past experience with operating power plants. The associated time period for heatup and cooldown cycles when the 100°F per hour rate is limiting provides for efficient, but safe, plant operation.

Specific analyses were made based on a heating and cooling rate of 100°F/hour applied continuously over a temperature range of 100°F to 546°F. Calculated stesses were within ASME Boiler and Pressure Vessel Code Section III stress intensity and fatigue limits even at the flange area where maximum stress occurs.

Chicago Bridge and Iron Company performed detailed stress analysis as shown in FSAR Appendix K, "Field Fabricated Reactor Vessel". This analysis includes more severe thermal conditions than those which would be encountered during normal heating and cooling operations.

The permissible flange to adjacent shell temperature differential of 145°F is the maximum calculated for 100°F hour heating and cooling rate applied continuously over a 100°F to

550^{o}F range. The differential is due to the sluggish temperature response of the flange metal and its value decreases for any lower heating rate or the same rate applied over a narrower range.

The coolant in the bottom of the vessel is at a lower temperature than that in the upper regions of the vessel when there is no recirculation flow. This colder water is forced up when recirculation pumps are started. This will not result in stresses which exceed ASME Boiler and Pressure Vessel Code, Section III limits when the temperature differential is not greater than 145^{o}F.

The reactor coolant system is a primary barrier against the release of fission products to the environs. In order to provide assurance that this barrier is maintained at a high degree of integrity, restrictions have been placed on the operating conditions to which it can be subjected.

The nil-ductility transition (NDT) temperature is defined as the temperature below which ferritic steel breaks in a brittle rather than ductile manner. Radiation exposure from fast neutrons ($>$ 1 mev) above about 10^{17} nvt may shift the NDT temperature of the vessel base metal above the initial value. Extensive tests have established the magnitude of changes as a function of the integrated neutron exposure.

Neutron flux wires and samples of vessel material are installed in the reactor vessel adjacent to the vessel wall at the core midplane level. The wires and samples will be removed and tested according to 10CFR50 Appendix H. Results of these analyses will be used to adjust Figure 3.6-1 as appropriate.

As described in paragraph 4.2.5 of the Safety Analysis report, detailed stress analyses have been made on the reactor vessel for both steady state and transient conditions with respect to material fatigue. The results of these transients are compared to allowable stress limits. Requiring the coolant temperature in an idle recirculation loop to be within 50^{o}F of the operating loop temperature before a recirculation pump is started assures that the changes in coolant temperature at the reactor vessel nozzles and bottom head region are acceptable.

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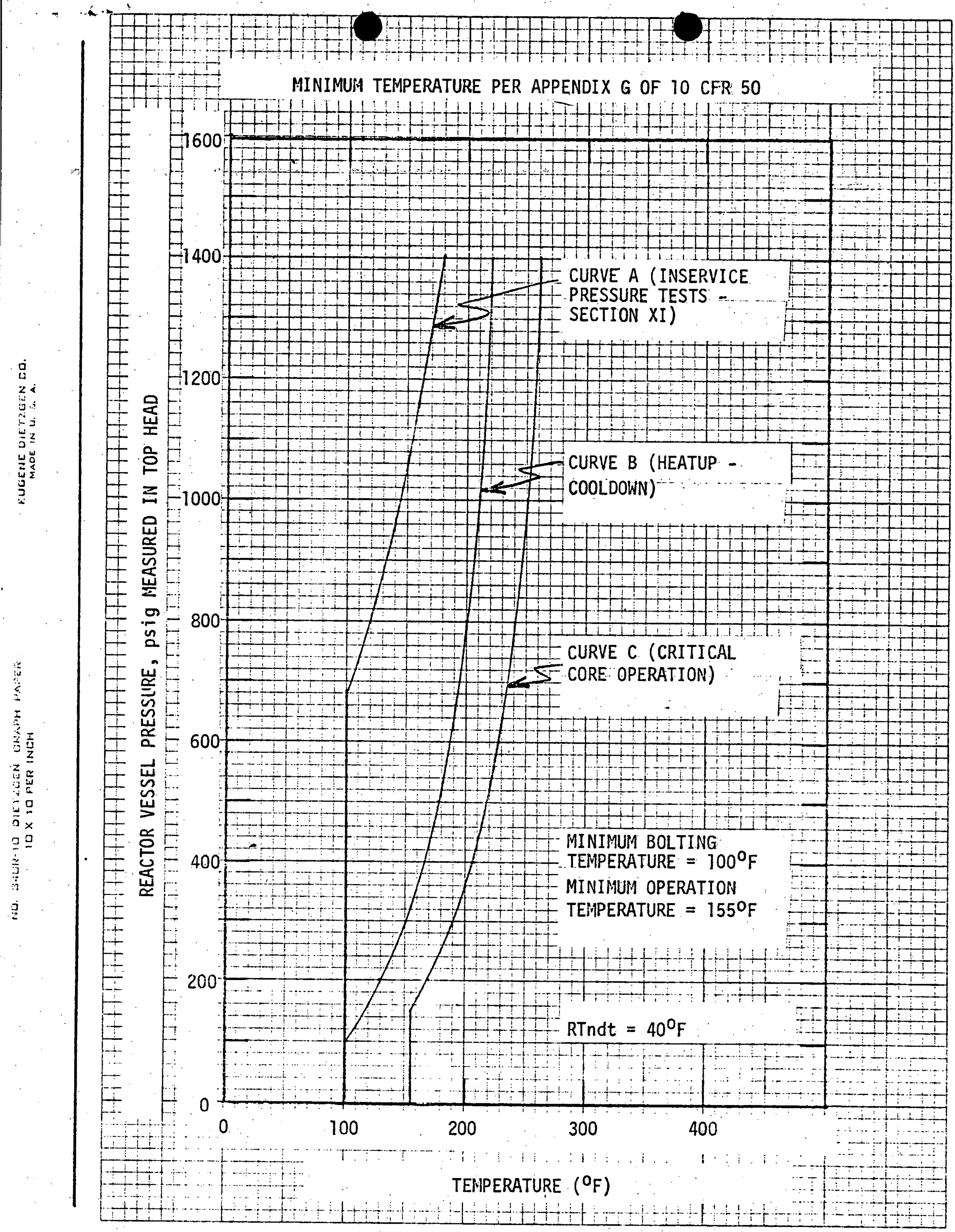

MINIMUM TEMPERATURE PER APPENDIX G OF 10 CFR 50
REACTOR VESSEL PRESSURE, psig MEASURED IN TOP HEAD
1600
1400
1200
1000
800
600
400
200
0
CURVE A (INSERVICE PRESSURE TESTS - SECTION XI)
CURVE B (HEATUP - COOLDOWN)
CURVE C (CRITICAL CORE OPERATION)
MINIMUM BOLTING TEMPERATURE = 100°F
MINIMUM OPERATION TEMPERATURE = 155°F
RTndt = 40°F
0
100
200
300
400
TEMPERATURE (°F)
EUGENE DIETZGEN CO. MADE IN U. S. A.
NO. 340R-10 DIETZGEN GRAPH PAPER 10 X 10 PER INCH

FIGURE 3.6-1