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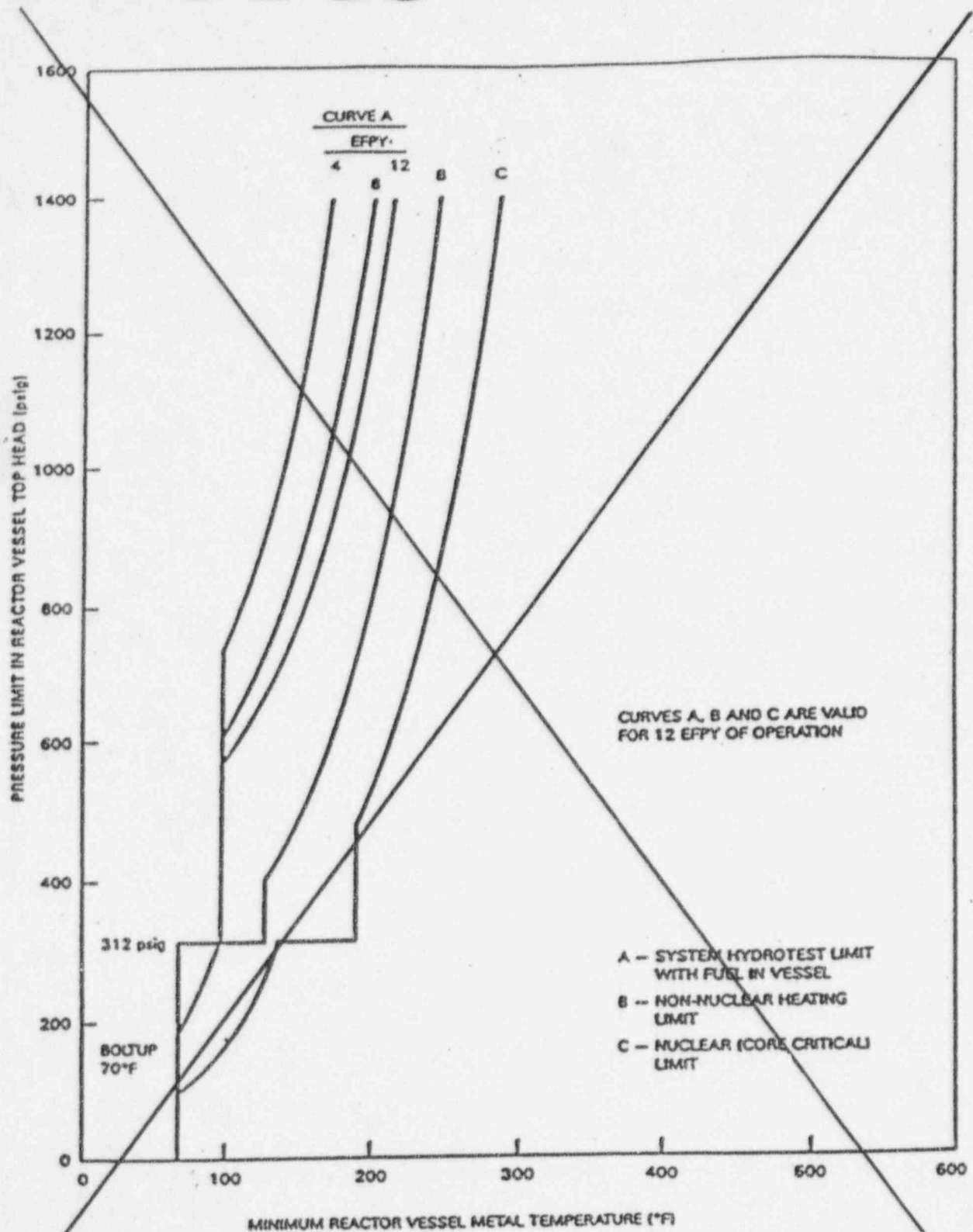


Figure 3.4.11-1 (page 1 of 1)
RCS Pressure Versus Minimum Reactor Vessel Metal Temperature

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Amendment No. 95

RCS P/T Limits
 3.4.11

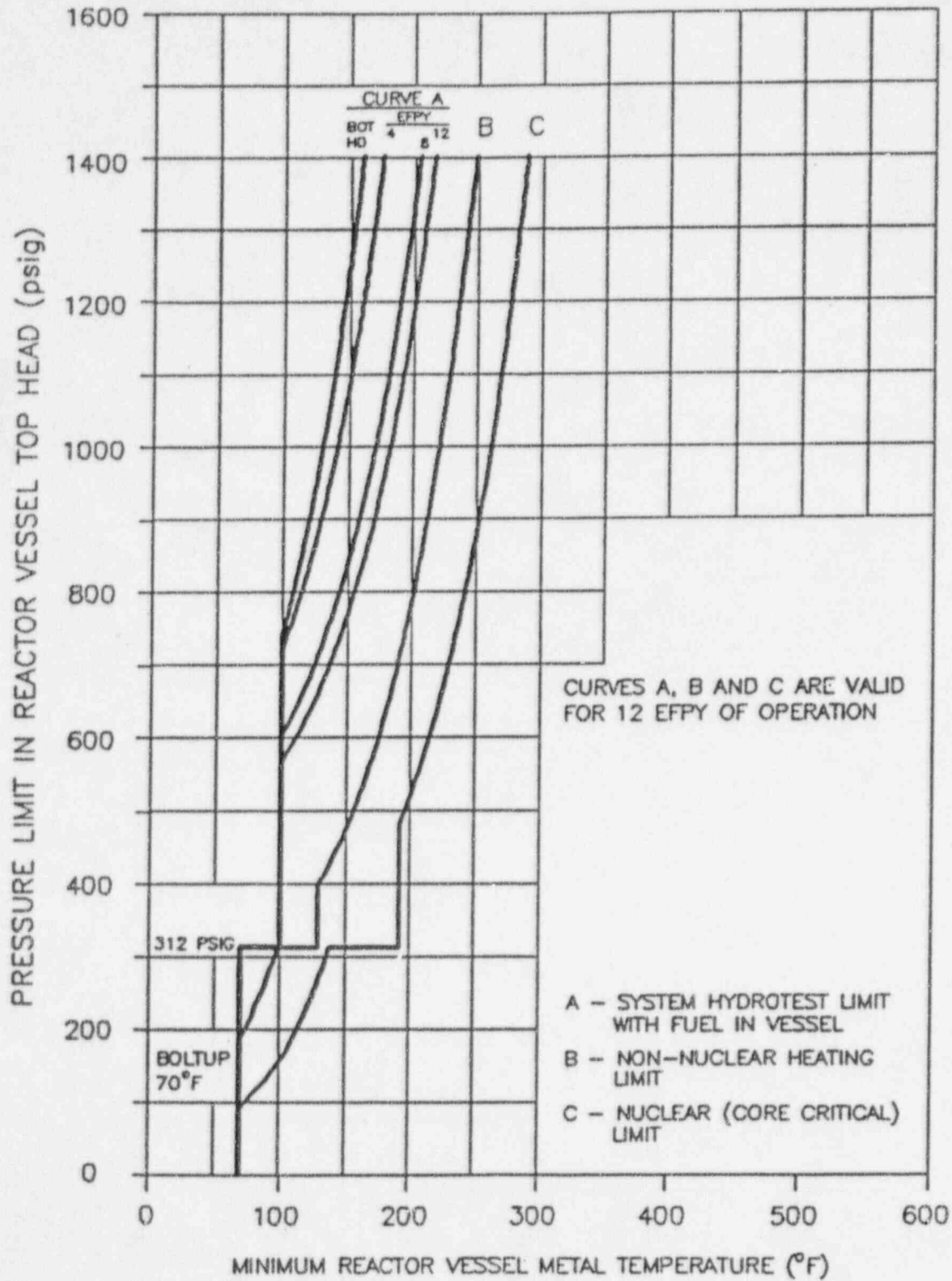


Figure 3.4.11-1 (page 1 of 1)
 RCS Pressure Versus Minimum Reactor Vessel Metal Temperature

Technical Specification Bases Changes

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.11 RCS Pressure and Temperature (P/T) Limits

BASES

BACKGROUND

In addition, Curve A includes a separate P/T limit curve for the reactor pressure vessel bottom head to account for the fact that during leak and hydrostatic pressure testing, the bottom head temperature may be cooler than the higher elevations of the vessel if the recirculation pumps are either stopped or operating at low speed, and injection through the control rod drives is used to pressurize the vessel.

All components of the RCS are designed to withstand effects of cyclic loads due to system pressure and temperature changes. These loads are introduced by startup (heatup) and shutdown (cooldown) operations, power transients, and reactor trips. This LCO limits the pressure and temperature changes during RCS heatup and cooldown, within the design assumptions and the stress limits for cyclic operation.

Figure 3.4.11-1 contains P/T limit curves for heatup, cooldown, and inservice leak and hydrostatic testing. ~~The P/T limit heatup curve provides limits for both heatup and criticality and is valid for 12 Effective Full Power Years (EFPY) of operation.~~ Curves B and C are based on core beltline conditions with an assumed 130°F shift from an initial weld RT_{NDT} of -30°F. Curve A includes beltline adjusted reference temperatures (ARTs) of 58°F for 4 EFPY, 88°F for 8 EFPY, and 100°F for 12 EFPY. ↑

Each P/T limit curve defines an acceptable region for normal operation. The usual use of the curves is operational guidance during heatup or cooldown maneuvering, when pressure and temperature indications are monitored and compared to the applicable curve to determine that operation is within the allowable region.

The LCO establishes operating limits that provide a margin to brittle failure of the reactor vessel and piping of the reactor coolant pressure boundary (RCPB). The vessel is the component most subject to brittle failure. Therefore, the LCO limits apply mainly to the vessel.

10 CFR 50, Appendix G (Ref. 1), requires the establishment of P/T limits for material fracture toughness requirements of the RCPB materials. Reference 1 requires an adequate margin to brittle failure during normal operation, anticipated operational occurrences, and system hydrostatic tests. It mandates the use of the American Society of Mechanical Engineers (ASME) Code, Section III, Appendix G (Ref. 2).

(continued)

BASES

ACTIONS
(continued)C.1 and C.2

Operation outside the P/T limits in other than MODES 1, 2, and 3 (including defueled conditions) must be corrected so that the RCPB is returned to a condition that has been verified by stress analyses. The Required Action must be initiated without delay and continued until the limits are restored.

Besides restoring the P/T limit parameters to within limits, an evaluation is required to determine if RCS operation is allowed. This evaluation must verify that the RCPB integrity is acceptable and must be completed before approaching criticality or heating up to > 200°F. Several methods may be used, including comparison with pre-analyzed transients, new analyses, or inspection of the components. ASME Section XI, Appendix E (Ref. 6), may be used to support the evaluation; however, its use is restricted to evaluation of the beltline.

SURVEILLANCE
REQUIREMENTSSR 3.4.11.1

RCS temperature conditions are determined by measuring the metal temperature of the reactor vessel flange surfaces, bottom head outside surface, and bottom head inside surface (as measured by the bottom head drain temperature, and reactor recirculation loop temperature). Verification that operation is within limits is required every 30 minutes when RCS pressure and temperature conditions are undergoing planned changes. This Frequency is considered reasonable in view of the control room indication available to monitor RCS status. Also, since temperature rate of change limits are specified in hourly increments, 30 minutes permits assessment and correction of minor deviations.

Surveillance for heatup, cooldown, or inservice leakage and hydrostatic testing may be discontinued when the criteria given in the relevant plant procedure for ending the activity are satisfied.

This SR has been modified by a Note that requires this Surveillance to be performed only during system heatup and cooldown operations and inservice leakage and hydrostatic testing.

(continued)