SAXTON NUCLEAR EXPERIMENTAL CORPORATION

DOCKET NO. 50-146
LICENSE DPR-4

Amendment No. 1 to Change Report No. 15

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1. On November 13, 1968, Applicant submitted Change Report No. 15 describing changes being made to the pressurizer safety relief valve installation. The section, "Safety Considerations", has been revised and this revision is being submitted as Amendment No. 1 to Change Report No. 15.

SAXTON NUCLEAR EXPERIMENTAL CORPORATION

By /s/ R. E. Neidig
R. E. Neidig, President

July 8, 1969

Docket No. 50-146
DPR-4
Change Report No. 15

Amendment No. 1

CHANGE REPORT FOR THE INSTALLATION OF NEW PRESSURIZER SAFETY VALVES AND WATER SEAL

Amendment No. 1

Description of Change

The pressurizer safety valves PSV-372 and PSV-373 have been flanged and reinstalled with a water seal. Further, at the first opportunity the valves will be replaced with the new safety valves, a drawing of which is shown in Figure 1. Some of the valve operating parameters are given in Table 1, and a list of valve material specifications in Table 2.

Purpose of Change

The present safety valves have leaked frequently resulting in severe erosion of the seating surfaces and considerable delays during plant startups. To eliminate these delays, a water seal has been installed between the top of the pressurizer and the safety relief valves. The water seal piping will accumulate condensate to form a water seal which will keep steam and gas out of direct contact with the valve seats.

Safety Considerations

The design, fabrication and erection of the water seal piping was made in accordance with USAS B31.1 - 1967 Edition. The piping from the pressurizer to the safety relief valves is designed for 2500 psia and 650°F. The safety valves satisfy the requirements of Article 9, Section III, ASME Boiler and Pressure Vessel Code.

The integrity of the water seal piping was assured by conforming to the following Code requirements:

1. Welders and weld procedures were qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX.
2. Root and final pass of all welds were liquid penetrant inspected and all butt welds were 100% radiographically inspected. The procedures and acceptance standards were in accordance with ASME Boiler and Pressure Vessel Code, Section I.

Paragraph 137.1 of B31.1 requires that all piping systems designed, fabricated and erected under the Code demonstrate leak tightness, which must be met by a hydrostatic test prior to initial operation. Where a hydrostatic test is not practicable an initial service leak test, a vacuum test or 100% radiography of all welded joints in an all welded system may be substituted. Paragraph 137.4.1(b) further specifies that the hydrostatic test, if performed, shall be conducted at a test pressure of 1.5 x design pressure unless a lesser pressure is indicated by Paragraph 137.4.1(a). Paragraph 137.4.1(a) specifies that the test pressure shall not exceed the maximum test pressure of any vessel or components in the piping system. Reference to Figure 2 shows that in order to hydrostatically test the water seal piping, the reactor coolant system will be subjected to the same hydrostatic pressure. Therefore, the practicability of conducting such a test is limited by the maximum pressure capability of the reactor coolant system.

In determining the maximum pressure capability of the reactor coolant system the following conditions were considered:

1. Pressure retaining components in the reactor coolant system include austenitic stainless steel piping and fittings, and low alloy steel.
2. NDT shift and thermal stress considerations for the low alloy steel in the reactor vessel limit minimum system temperature to 520°F for approximately system design pressure.

The allowable stress for austenitic stainless steel in both the ASME Boiler and Pressure Vessel Code and USAS B31.1 recognizes the work-hardening characteristics of these materials by permitting the allowable stress at elevated temperature to reach 90% of the minimum 0.2% offset yield strength at the specific design temperature. A footnote to Tables A-1 and A-2 of USAS B31.1 cautions that allowable stress is 90% of yield strength, and for some loading conditions undesirable plastic deformation could occur. Section III of the ASME Boiler and Pressure Vessel Code provides a more quantitative warning by limiting any test pressure to the lesser of 1.25 x design pressure or that which produces a stress equal to 90% of the material yield strength at the test temperature. Therefore, the limiting pressure for the reactor coolant system at a temperature of 520°F is set by the ausenitic stainless steel piping and fittings in the system.

The reactor coolant system piping (centrifugally cast) and the reactor coolant system fittings (static cast) were designed, fabricated and erected in accordance with USAS B31.1 - 1955 Edition, and nuclear piping Cases N-9 and N-10 respectively. The material property data curves are the same for both components; therefore, the allowable stresses as set forth in Cases N-9 and N-10 are identical. The maximum allowable stresses for the system design temperature and the leak test temperature are:

For a design temperature of 650°F, S_a = 15,000 psi

For a leak test temperature of 520°F, S_a = 15,720 psi

Thus, the maximum leak test pressure to which the reactor coolant system may be subjected to stay within the 90% yield strength limit is:

$$\frac{15,720}{15,000} \times 2485 = 2604 \text{ psig}$$

where 2485 psig is reactor coolant system design pressure.

In view of the quality control exercised during fabrication and erection, and the use of radiographic and liquid penetrant examinations to verify the structural adequacy, the use of 2604 psig is an uncessarily high pressure to demonstrate leak tightness of the water seal piping. Therefore, the piping will be leak tested at a pressure of 2575 psia. This test will be conducted in conjunction with the pressure test to be conducted on the recirculation and safety injection system piping.