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SUBJECT: Forwards revised Relief Request RP-9 to permit use of ref curve for testing specific pumps (RHR, HPCS, LPCS & RCIC) instead of fixed ref point.

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May 27, 1993
G02-93-128

Docket No. 50-397

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Subject: WNP-2, OPERATING LICENSE NPF-21
INSERVICE TESTING PROGRAM FOR
PUMPS AND VALVES (TAC NO. M60493)

Reference: Letter G02-92-269, dated December 22, 1992, GC Sorensen (SS) to NRC,
same subject

In the Reference, the Supply System submitted Relief Request RP-9 for using a reference curve for testing specific pumps (RHR, HPCS, LPCS and RCIC) instead of a fixed reference point. As stated previously in RP-9, the independent reference variables (flow rate for RHR, HPCS and LPCS pumps and flow rate and speed for the RCIC pump) are very difficult to adjust to a fixed reference value and require excessive valve manipulation. The maximum variance for these variables was limited to $\pm 1\%$ of the reference values in the relief request.

Since submittal of Relief Request RP-9, quarterly inservice testing to limit the variables to $\pm 1\%$ of the reference values has taken up to two hours of jogging the throttle valve to achieve the desired flow rate. At WNP-2, Transient Data Acquisition System (TDAS) is usually used to obtain flow rate and pump speed. TDAS converts output signals from the transmitter into a digital format. Thus, high resolution capability, coupled with the coarse adjustment of the large throttling valves, make it extremely difficult to adjust precisely to $\pm 1\%$ band. It is requested that the allowable variance of independent reference variables be increased to $\pm 2\%$ of the reference values. This alternate testing provides adequate assurance and accuracy in monitoring pump condition to assess pump operational readiness and will adequately detect pump degradation. Alternate testing will have no adverse impact on plant and public safety.

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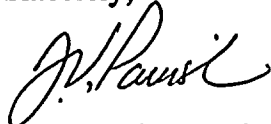
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Page Two

**INSERVICE TESTING PROGRAM FOR
PUMPS AND VALVES (TAC NO. M60493)**

Revised Relief Request RP-9 with changes shadowed is being submitted for approval.

Sincerely,



J. V. Parrish (Mail Drop 1023)
Assistant Managing Director, Operations

RR/bk
Attachments

cc: JB Martin - NRC RV
NS Reynolds - Winston & Strawn
JW Clifford - NRC
DL Williams - BPA/399
NRC Site Inspector - 901A

RELIEF REQUEST NO. RP-9 (Revised May 17, 1993)

Systems: Low Pressure Core Spray (LPCS),
Residual Heat Removal (RHR),
High Pressure Core Spray (HPCS) and
Reactor Core Isolation Cooling (RCIC)

Pumps:

Pump	Code Class	P & I D Dwg. Number
LPCS-P-1	2	M520
RHR-P-2A	2	M521, SH 1
RHR-P-2B	2	M521, SH 2
RHR-P-2C	2	M521, SH 2
HPCS-P-1	2	M520
RCIC-P-1	2	M519

Section XI Code Requirements For Which Relief is Requested:

IWP-3100 requires that the system resistance be varied until either the measured differential pressure or measured flow rate equals the corresponding reference value. The quantities of Table IWP-3100-1 are then measured or observed and compared to the corresponding reference value.

Basis for Relief:

Reference values are defined as one or more fixed sets of values of quantities as measured or observed when the equipment is known to be operating acceptably. All subsequent test results are to be compared to these reference values. Based on the operating experience, flow rate (independent variable during inservice testing) for these pumps cannot be readily duplicated with the existing flow control systems. Flow control for these systems can only be accomplished through the operation of relatively large motor operated globe valves as throttling valves. Because these valves are not equipped with position indicators which reflect percent open, the operator must repeatedly jog the motor operator to try to make even minor adjustments in flow rate. These efforts, to exactly duplicate the reference value, would require excessive valve manipulation which could ultimately result in damage to valves or motor operators.

Relief Request RP-9 (Continued)

Alternate Testing to be Performed:

As discussed above in the basis for relief section, it is extremely difficult or impossible to return to a specific value of flow rate or differential pressure for testing of these pumps. Since the independent reference variable (flow rate) for these pumps is very difficult to adjust to a fixed reference value and requires excessive valve manipulation, the maximum variance shall be limited to $\pm 2\%$ of the reference value. Thus flow rate shall be adjusted to be within $\pm 2\%$ of the reference flow rate and the corresponding differential pressure shall be measured and compared to reference differential pressure value determined from the pump reference curve established for this narrow range of flow rate. Slope of the pump reference curve is not flat even over this narrow range of flow rate. Assuming the flow rate to be fixed over this narrow range can result in additional error in calculating the deviation between the measured and reference differential pressure and at times this deviation can be non-conservative. ASME Section XI allows establishing multiple reference points but does not specify any variance from the fixed reference values. Since the dependent variable (differential pressure) can be assumed to vary linearly with flow rate in this narrow range, establishing multiple reference points in this narrow range is similar to establishing a reference pump curve representing multiple reference points. This assumption of linearity between differential pressure and flow rate is supported by the manufacturer pump curves in the stable design flow rate region. For RCIC-P-1 pump both flow rate and speed are adjusted to be within $\pm 2\%$ of their respective reference values and the differential pressure is measured. The following elements are used in developing and implementing these reference curves.

1. A reference pump curve (flow rate vs differential pressure) has been established for RHR pumps from data taken on these pumps when they were known to be operating acceptably. These pump curves represent pump performance almost identical to manufacturer's test data. The methodology employed for establishing a reference pump curve is similar to that for performing a comprehensive test being proposed by the OM Code Committee.
2. For RCIC-P-1, a variable speed drive pump, flow rate is set within $\pm 2\%$ of reference flow rate and the reference curve is based on speed with acceptance criteria based on differential pressure. This is done because of the difficulty in setting speed to a specific reference value as specified by the Code.

Relief Request RP-9 (Continued)

Additionally, evaluation of manufacturer pump data, preoperational and special test data used to establish pump reference curve indicates insignificant change (0.25 psi/gpm) in differential pressure with small variation (12 gpm) in flow rate.

3. For HPCS-P-1 and LPCS-P-1 pumps, the reference pump curve is based on the manufacturer pump curve which was validated during the preoperational testing.
4. RHR and RCIC pump curves are based on seven or more test points beyond the flat portion of the curve. These ECCS pumps have a minimum flow rate requirements specified in Technical Specifications and are being tested at full design flow rate.
5. To reduce the uncertainty associated with the pump curves and the adequacy of the acceptance criteria, special test gauges ($\pm 0.5\%$ full scale accuracy) were installed to take test data in addition to plant installed gauges and Transient Data Acquisition System (TDAS). All instruments used either met or exceeded the Code required accuracy.
6. Review of the pump hydraulic data trend plots indicates close correlation with the established pump reference curves, thus further validating the accuracy and adequacy of the pump curves to assess pumps operational readiness.
7. Acceptance criteria curves are based on differential pressure limits given in Table IWP-3100-2. See the attached sample RHR-P-2A pump Acceptance Criteria sheet. Area 1-2-3-4 is the acceptable range for pump performance. Areas outside 1-2-3-4 but within 5-6-7-8 define the Alert Range, and the areas outside 5-6-7-8 define the required Action Range. These acceptance criteria limits do not conflict with Technical Specifications or Final Safety Analysis Report operability criteria.
8. Only a small portion of the established reference curve is being used to accommodate flow rate variance.
9. Review of vibration data trend plots indicates that the change in vibration readings over the narrow range of pump curves being used is insignificant and thus only one fixed reference value has been assigned for each vibration location.

Relief Request RP-9 (Continued)

10. After any maintenance or repair that may affect the existing reference pump curve, a new reference pump curve shall be determined or the existing pump curve revalidated by an inservice test. New reference pump curve shall be established based on at least 5 test points beyond the flat portion of the pump curve.

Implementing Schedule:

These pumps are being tested quarterly using a pump reference curve. This relief request supersedes the testing requirements specified in Relief Request RP-7 which was denied by the NRC per SER dated September 23, 1992 (TAC No. M82292).

Quality/Safety Impact:

Due to impracticality and difficulty of adjusting independent variables (flow rate, and speed for variable drive RCIC pump) to a fixed reference value for inservice testing without system modifications, alternate testing to vary the variables over a very narrow range ($\pm 2\%$ of reference values) and using pump reference curves for this narrow range is being proposed. Alternate testing using a reference pump curve for each pump provides adequate assurance and accuracy in monitoring pump condition to assess pump operational readiness and shall adequately detect pump degradation. Alternate testing will have no adverse impact on plant and public safety.

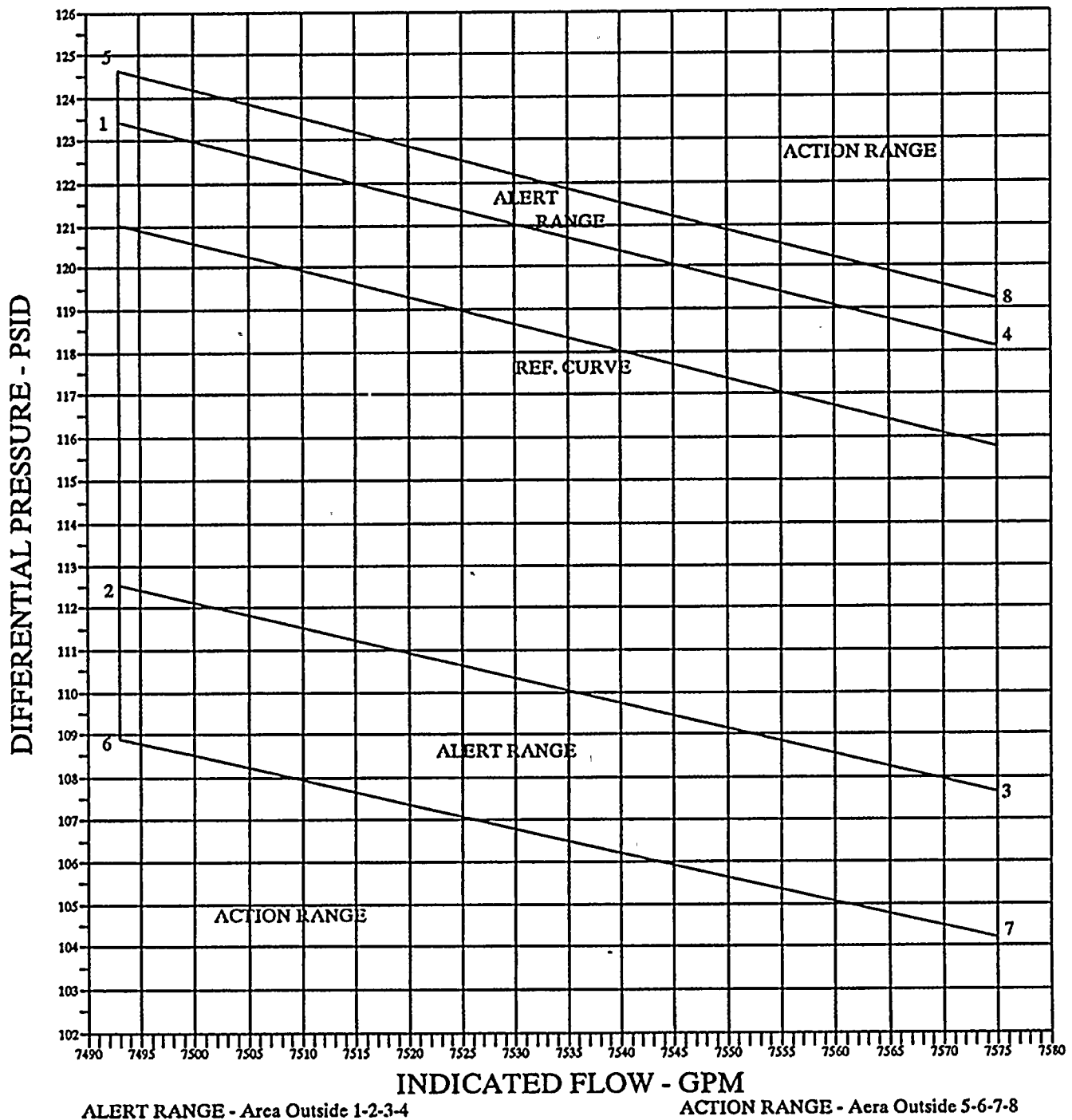
NRC Acceptance:

Pending

Relief Request RP-9 (Continued)

SAMPLE DATA SHEET¹

RHR-P-2A ACCEPTANCE CRITERIA



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