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ENCLOSURE 1

Setpoint Calculation
for
Reactor Protection System
Turbine Control Valve Fast Closure
Trip Function

Prepared for Commonwealth Edison Company
Quad Cities Nuclear Station.

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1.0 Objectives

The objective of this calculation is to determine the setpoint to be used for the Reactor Protection System (RPS) Turbine Control Valve Fast Closure (TCVFC) Trip Function after the installation of new pressure switches. These pressure switches are Part Number 184C4815P001. This information was obtained via telecon with Rob Korneta of Commonwealth Edison on November 6, 1990. The new pressure switches are being installed as part of turbine vendor (GE) recommended modifications to the turbine system. The signals from these switches will replace the signals that originally came from contacts on the turbine system fast acting solenoids.

2.0 Methodology

This setpoint calculation is being performed consistent with GE document NEDC-31336, "General Electric Instrument Setpoint Methodology," dated October 1986. This is a proprietary document that was developed under contract between GE and certain members of the Licensing Review Group Instrument Setpoint Methodology Owners Group.

3.0 Assumptions

This calculation makes the following assumptions:

The individual error terms represent a two sigma value (95 percent probability of the value being correct).

Primary Element Accuracy (PEA) and Process Measurement Accuracy (PMA) are considered negligible because of the short instrument lines and because the pressure switches are measuring the process directly.

The Calibration Accuracy term (C) is conservatively estimated to be one percent (1%) of full range. Since this value is a function of the instrumentation and procedures used for calibration, this value must be verified to be conservative by Quad Cities personnel. If it is found to be non-conservative the results of this report must be recalculated to reflect the larger value.

Instrument Drift (D) for a six month interval is equal to Instrument Accuracy (A) since there is no value given for drift on drawing 184C4815. This is consistent with NEDC-31336. Drift is assumed to be random for the subsequent intervals.

The probability for avoiding a License Event Report (LER) event should be greater than 90 percent. This is consistent with NEDC-31336.

The probability for Spurious Trip Avoidance (STA) should be greater than 95 percent. This is consistent with NEDC-31336.

4.0 Inputs to Calculation

The pressure switches to which this calculation applies are measuring directly the trip oil pressure that causes the turbine control valves to close in a rapid manner. According to information in Design Record File (DRF) C71-00017 this oil pressure is normally about 1500 to 1600 psig, and the control valve can't start to close until the pressure drops to 400 psig. During normal operation of the control valves it is considered possible to have transients that would cause the trip system pressure to drop momentarily to about 740 psig. On the basis of this information the following values are derived:

Analytical Limit (AL) = 400 psig

The pressure switch must trip by the time the oil pressure reaches this level in order to ensure that a trip signal will be generated within 30 milliseconds after start of control valve fast closure.

Operational Limit (OL) = 740 psig

The Nominal Trip Setpoint must be far enough from this value so as to minimize the probability of tripping during normal operational transients.

Drawing 184C4815 indicates that the accuracy of this pressure switch is two percent (2%) of full range. Since the full range of part one (P001) is 3000 psig, the accuracy (A) is then ± 60 psig. This value is assumed to apply over the full range of operating temperatures since no information regarding temperature effect on accuracy is given.

A summary of the inputs to be used in the calculations is as follows:

Instrument Accuracy (A) = ± 60 psig

Calibration Accuracy (C) = ± 30 psig

Instrument Drift (D) = ± 60 psig (assume 6 mo.) = ± 104 psig (18 mo.)

Analytical Limit (AL) = 400 psig

Operational Limit (OL) = 740 psig

5.0 Results

The following are the results based on the methodology, assumptions, and inputs as given in sections 2.0, 3.0, and 4.0 respectively:

<u>Parameter</u>	<u>Calculated Value</u>	<u>Recommended Value</u>
Allowable Value (AV) or Tech. Spec. Value (TSV)	456 psig	460 psig
Nominal Trip Setpoint (NTSP)	540 psig	550 psig
Probability for License Event Report (LER) Avoidance (Using recommended values)	92%	N/A
Probability of Spurious Trip Avoidance (STA) (Using recommended values)	99%	N/A

The NTSP now needs to be adjusted for the practicalities of plant calibration procedures. The Required Limit (RL) is the value below which the NTSP must not be found in order to assure that the AV is not exceeded. The RL is a function of accuracy (A) and calibration accuracy (C) as follows:

$$RL = AV + (A^2 + C^2)^{1/2}$$

Information received on 11/4/90 from Erryl Mendenhall of Commonwealth Edison indicates that the calibration for this setpoint is accomplished using a Heise pressure gauge measuring 0 to 1000 psig with an accuracy of 1 psi. If one assumes an equal error when calibrating the Heise gauge and another 1 psi error when reading it, the total error is then:

$$C_T = (1^2 + 1^2 + 1^2)^{1/2} = (3)^{1/2} = 1.732 \text{ psi}$$

$$\text{Use } C_T = 2 \text{ psi}$$

$$\text{Then } RL = 460 + (60^2 + 2^2)^{1/2} = 520 \text{ psig}$$

However, this value is less than the value required for 90 percent probability of LER avoidance. Therefore, use 540 psig as the RL.

In order to obtain an STA probability of 95 percent or greater the NTSP should never exceed 638 psig. Therefore, select the NTSP to be midway between RL (540 psig) and 638 psig.

$$NTSP = 540 + (638 - 540)/2 = 589 \text{ psig}$$

Use NTSP = 590 psig with As-Left and Leave Alone Tolerances of ± 20 psi.

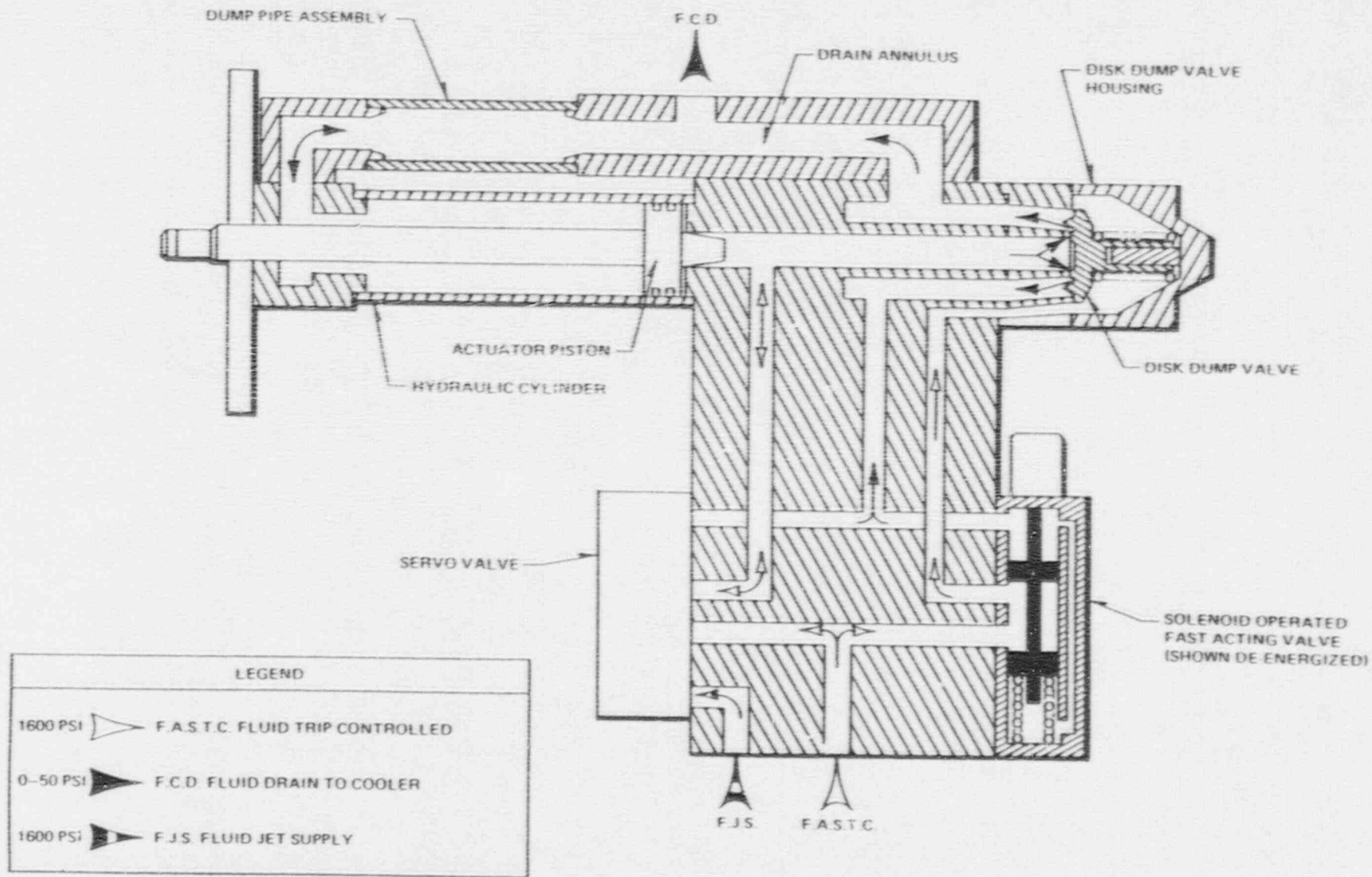


Figure 1. Steam Control Valves Nos. 1 through 4, and Intercept Valves Nos. 1, 3, and 5 (Fluid Flow Diagram)