T1c

NORTHEAST UTILITIES
THE CONNECTICUT LIGHT AND POWER COMPANY
THE HARTFORD ELECTRIC LIGHT COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

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September 17, 1979

Docket No. 50-336

Mr. Boyce H. Grier, Director
Region I
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

Reference: (1) B. H. Grier letter to W. G. Counsil dated August 13, 1979, transmitting I&E Bulletin No. 79-21.

Gentlemen:

Millstone Nuclear Power Station, Unit No. 2
Temperature Effects on Level Transmitters, I&E Bulletin No. 79-21

Reference (1) requested Northeast Nuclear Energy Company (NNECO) to review the liquid level measuring systems within containment, in particular, to:

(1) Determine if signals from these systems are used to initiate safety actions or provide post-accident monitoring information and, if so, provide a description of such systems.

(2) Evaluate the effect of post-accident ambient temperatures on the indicated water level as measured by those systems identified in Item (1).

(3) Review all safety and control setpoints derived from level signals to verify that the setpoints will initiate the action required by the plant safety analysis throughout the range of ambient temperatures, including accident conditions, encountered by the instrumentation.

(4) Review and revise emergency procedures, if necessary, to ensure that operators are instructed on the potential for and magnitude of erroneous level signals.

In addition, the NRC Staff requested that this information be submitted within 30 days from the date of Reference (1).

NNECO hereby provides the responses to Items (1) through (4) of I&E Bulletin No. 79-21 as Attachment (1). NNECO has determined that present safety and control setpoints derived from level signals need not be revised. The basis for this determination is that the potential errors in level measurement due to

reference leg heating will not occur in the adverse direction, such that the safety analysis assumptions will be invalidated, during transients for which credit is taken for low steam generator water level trips in the safety analysis. The basis for this is that during transients for which credit is taken for low steam generator water level, containment temperature will not effect the level measurement prior to the actuation of the reactor trip.

NNECO trusts you find this information responsive to your requests, and satisfactorily dispositions the Reference (1) concerns.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

W. G. Counsil
Vice President

Attachment

DOCKET NO. 50-336

ATTACHMENT (1)

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 2

I&E BULLETIN NO. 79-21

TEMPERATURE EFFECTS ON LEVEL TRANSMITTERS

SEPTEMBER, 1979

Item (1)

Review the liquid level measuring systems within containment to determine if the signals are used to initiate safety actions or are used to provide post-accident monitoring information. Provide a description of systems that are so employed; a description of the type of reference leg shall be included, i.e., open column or sealed reference leg.

Response

Both steam generator and pressurizer level measurements are derived from liquid level measuring systems within containment. Each steam generator has six (6) level measuring systems associated with it. Signals from four (4) of these systems are utilized for both safety action initiation and post-accident monitoring. The pressurizer has two (2) level measuring systems which are utilized for post-accident monitoring.

The steam generator and pressurizer levels are measured by differential pressure (D/P) cells. These cells produce signals that are proportional to the water level. Figure 1 is a schematic illustration of the steam generator level measurement system. The D/P cells are electronic force balance type transmitters which convert the differential pressure signal to a 10 - 50 milliamp current signal where the maximum current output occurs at the maximum water level. The cells measure the pressure difference between a reference and variable leg. The reference leg (high level tap, Figure 1) has a constant level which is maintained by a condensate pot. Both the condensate pot and the reference leg are unlagged and located externally to the steam generator and pressurizer. In the pot, steam is condensed due to the relatively low (120°F) ambient temperature. The variable leg (low level tap, Figure 1) has a changing level matching changes in the steam generator downcomer or pressurizer water level. For the steam generators, the level transmitter DC output current is applied to the Reactor Protection System bistables as safety actuation signals. The output current then goes through isolation devices and is recorded and displayed on the main control boards. For the pressurizer, the level transmitter DC output current is recorded and displayed on the main control boards.

Item (2)

On those systems described in Item (1) above, evaluate the effect of post-accident ambient temperatures on the indicated water level to determine any change in indicated level relative to actual water level. This evaluation must

include other sources of error including the effects of varying fluid pressure and flashing of reference leg to steam on the water level measurements. The results of this evaluation should be presented in a tabular form similar to Tables 1 and 2 of Attachment 1.

Response

The effect of post-accident ambient temperatures on the indicated water level relative to the actual water level, for both the steam generator and pressurizer, is shown graphically in Attachment 2. An instrument error of $\pm$ 3% must be added to these curves.

Boiling will not occur in the reference leg unless the pressure drops below the saturation pressure for the temperature of the water in the reference leg. Analyses have shown that the highest containment temperature during the worst case accident is less than 280°F. The system pressure would have to decrease to 49.2 psia, the saturation pressure at 280°F, for boiling to occur in the reference leg.

Item (3)

Review all safety and control setpoints derived from level signals to verify that the setpoints will initiate the action required by the plant safety analyses throughout the range of ambient temperatures encountered by the instrumentation, including accident temperatures. Provide a listing of these setpoints.

Response

Potential errors in level indication, due to reference leg heating, are not involved during transients for which low steam generator level trips are relied upon to provide reactor trips as analyzed in current safety analyses. As shown in Table 1, the low steam generator level trip is relied upon for, a) the excess load transient, b) loss of feedwater flow, and c) transients resulting from the malfunction of one steam generator. NNECO has determined that setpoint adjustments are not required to compensate for reference leg heating because safety analyses only take credit for low steam generator level trip at normal operating temperatures and pressures.

Item (4)

Review and revise, as necessary, emergency procedures to include specific information obtained from the review and evaluation of Items (1), (2), and (3) to insure that the operators are instructed on the potential for and magnitude of erroneous level signals. All tables, curves, or correction factors that would be applied to post-accident monitors should be readily available to the operator. If revisions to procedures are required, provide a completion date for the revisions and a completion date for operator training on the revisions.

Response

All Emergency Operating Procedures will be reviewed and revised, as necessary, to take into account level measurement errors resulting from reference leg heating, process variable change, to include flashing, and instrument error by January 18, 1980. In addition, all operators will have completed training on the revisions by the same date. The information presented in Attachment (2) will be used to revise post-accident monitoring level limits to envelop the most conservative conditions.

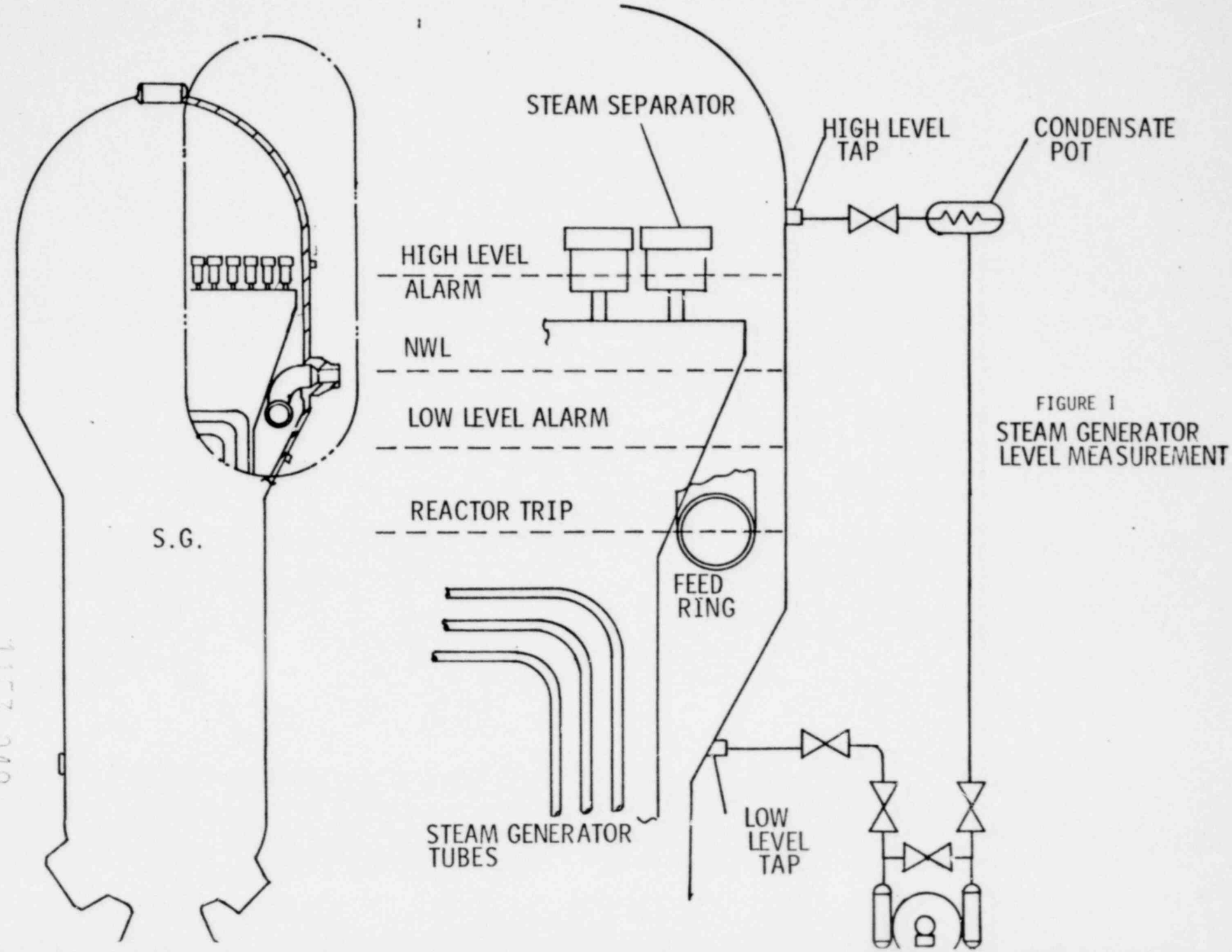


FIGURE I

STEAM GENERATOR LEVEL MEASUREMENT

TABLE 1

MILLSTONE II LOW STEAM GENERATOR LEVEL TRIP

TRIP SETPOINT (SAFETY ANALYSIS/TECH SPEC)

IN UNITS OF % OF TOTAL TAP SPAN

	EVENT	MILLSTONE II
1.	Control Element Assembly Withdrawal	-
2.	Boron Dilution	-
3.	Startup of Inactive Loop	-
4.	Excess Load	31.5/36.0
5.	Loss of Load	-
6.	Loss of Feedwater	31.5/36.0
7.	Excess Heat Removal due to Feedwater Malfunction	-
8.	RCS Depressurization	-
9.	Loss of Coolant Flow	-
10.	Loss of AC	-
11.	Full Length CEA Drop	-
12.	Transients Resulting from Malfunction of Steam Generator	31.5/36.0
13.	CEA Ejection	-
14.	Large Steam Line Break	-
15.	Steam Generator Tube Rupture	-
16.	Seized Rotor	-

DOCKET NO. 50-336

ATTACHMENT (2)

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 2

I&E BULLETIN NO. 79-21

PRESSURIZER AND STEAM GENERATOR LEVEL CORRECTION CURVES

SEPTEMBER, 1979

Pressurizer and Steam Generator level correction curves to account for Reference Leg Heatup and varying fluid pressure effects (post-accident monitoring)

The enclosed curves provide the necessary Pressurizer and Steam Generator level corrections to account for Reference Leg Heatup and varying fluid pressure effects for post accident monitoring. The curves only provide density effect corrections and do not include transmitter or indicator errors.

Basis:

Pressurizer

Level Calibration Pressure	2250 psia
Reference Leg Calibration Temperature	120°F

Steam Generator

Level Calibration Pressure	900 psia
Reference Leg Calibration Temperature	120°F

Flashing in Reference Leg not assumed.

Instrument error of $\pm$ 3% must be included.

FIGURE 1

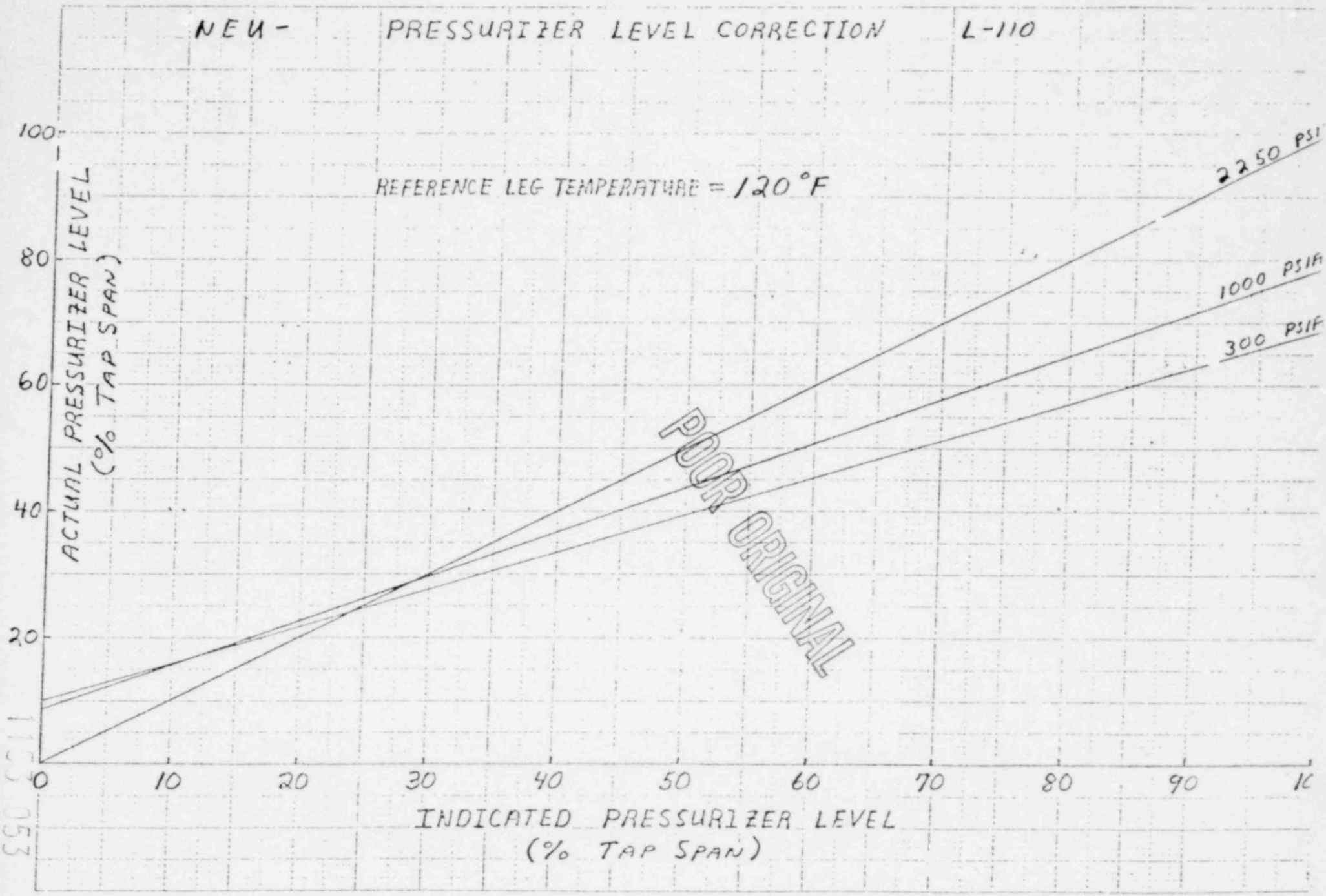

NEW- PRESSURIZER LEVEL CORRECTION L-110
REFERENCE LEG TEMPERATURE = 120°F
2250 PSIA
1000 PSIA
300 PSIA
ACTUAL PRESSURIZER LEVEL (% TAP SPAN)
INDICATED PRESSURIZER LEVEL (% TAP SPAN)
100
80
60
40
20
0
10
20
30
40
50
60
70
80
90
POOR ORIGINAL

FIGURE 2

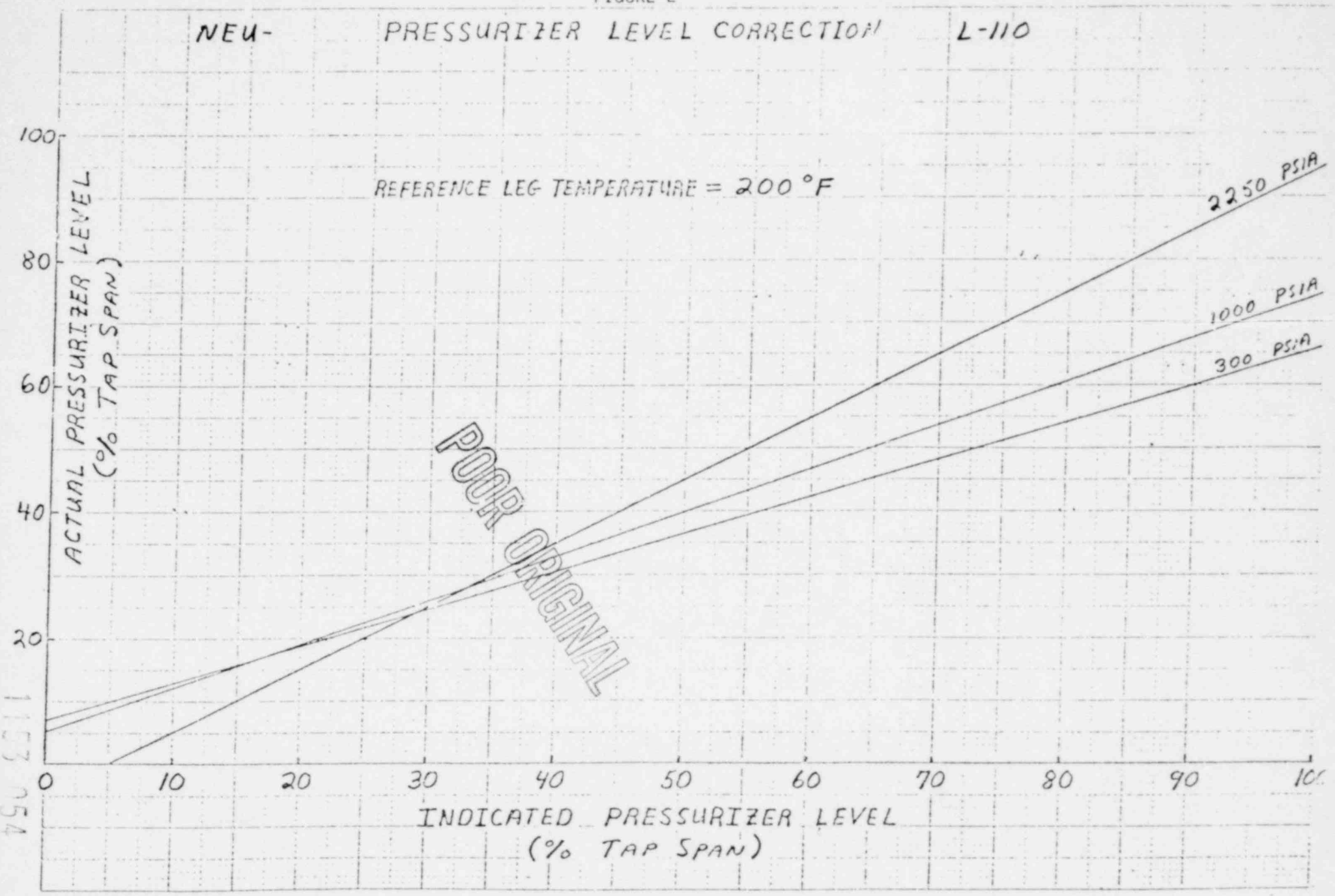

NEU- PRESSURIZER LEVEL CORRECTION L-110
REFERENCE LEG TEMPERATURE = 200 °F
2250 PSIA
1000 PSIA
300 PSIA
ACTUAL PRESSURIZER LEVEL (% TAP SPAN)
INDICATED PRESSURIZER LEVEL (% TAP SPAN)
100
80
60
40
20
0
10
20
30
40
50
60
70
80
90
POOR ORIGINAL

FIGURE 3

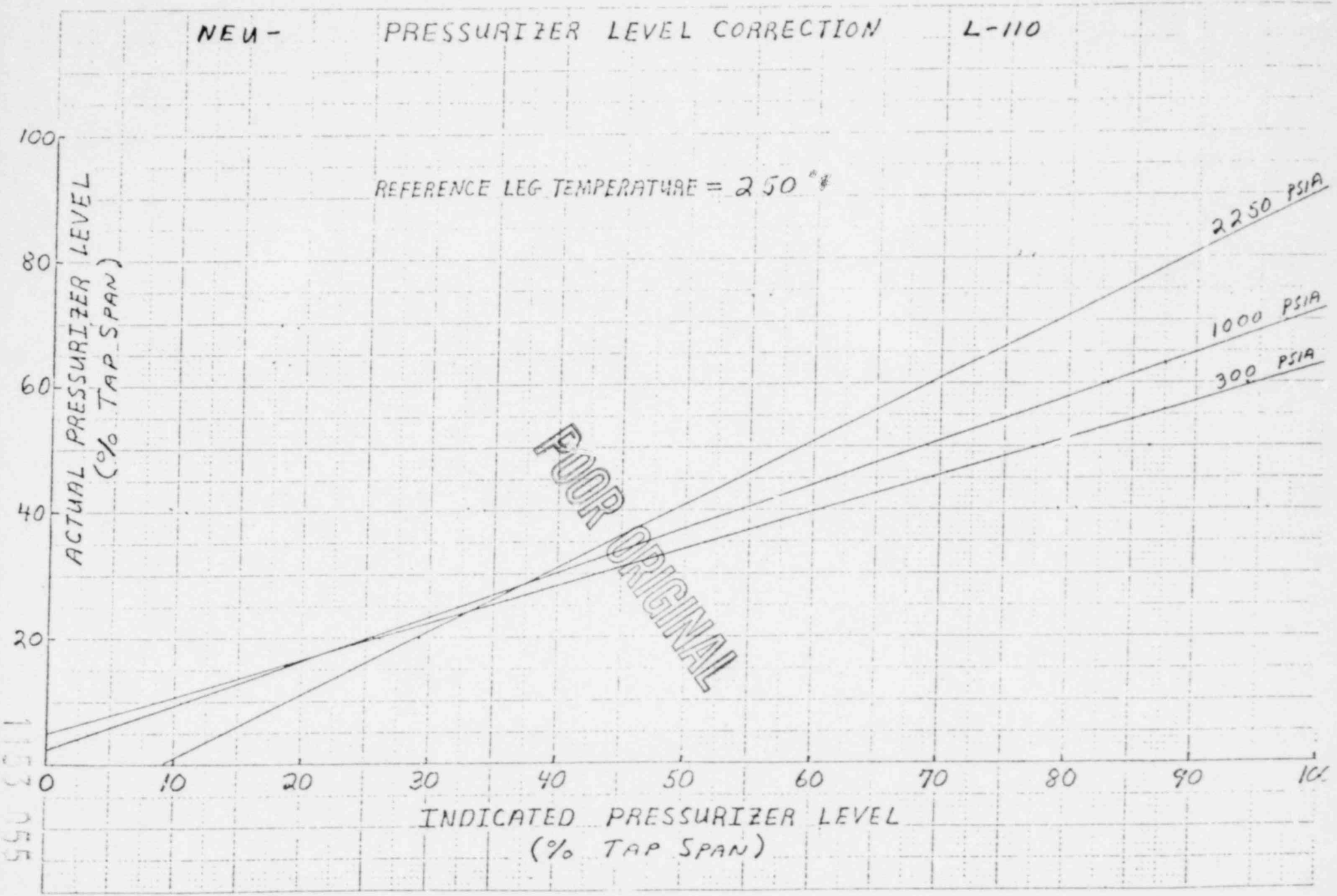

NEW- PRESSURIZER LEVEL CORRECTION L-110
REFERENCE LEG TEMPERATURE = 250 °F
2250 PSIA
1000 PSIA
300 PSIA
ACTUAL PRESSURIZER LEVEL (% TAP SPAN)
INDICATED PRESSURIZER LEVEL (% TAP SPAN)
100
80
60
40
20
0
10
20
30
40
50
60
70
80
90
FOR ORIGINAL

FIGURE 4

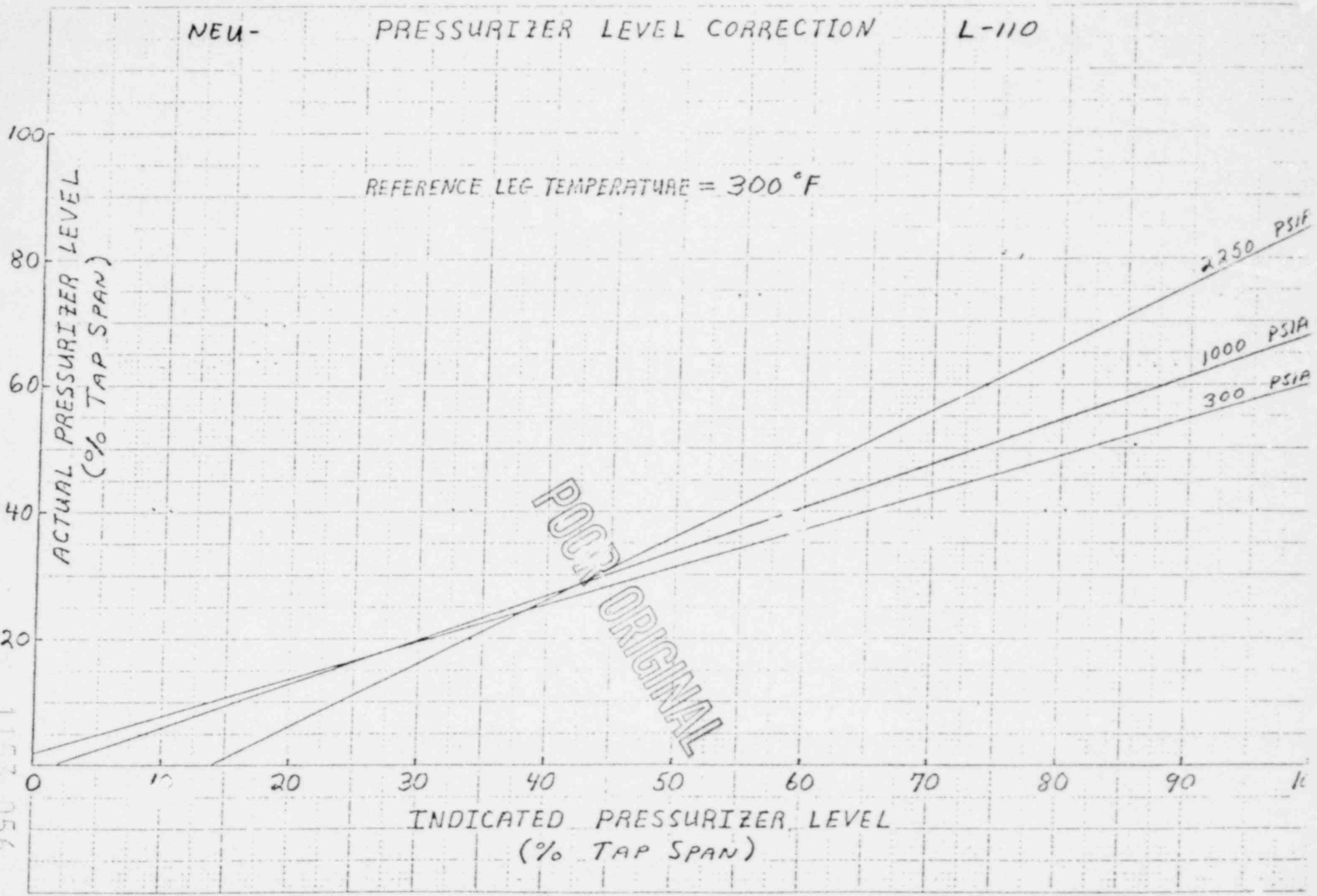

NEU-
PRESSURIZER LEVEL CORRECTION
L-110
REFERENCE LEG TEMPERATURE = 300 °F
2250 PSIA
1000 PSIA
300 PSIA
ACTUAL PRESSURIZER LEVEL (% TAP SPAN)
INDICATED PRESSURIZER LEVEL (% TAP SPAN)
100
80
60
40
20
0
20
30
40
50
60
70
80
90
POOR ORIGINAL

FIGURE 8

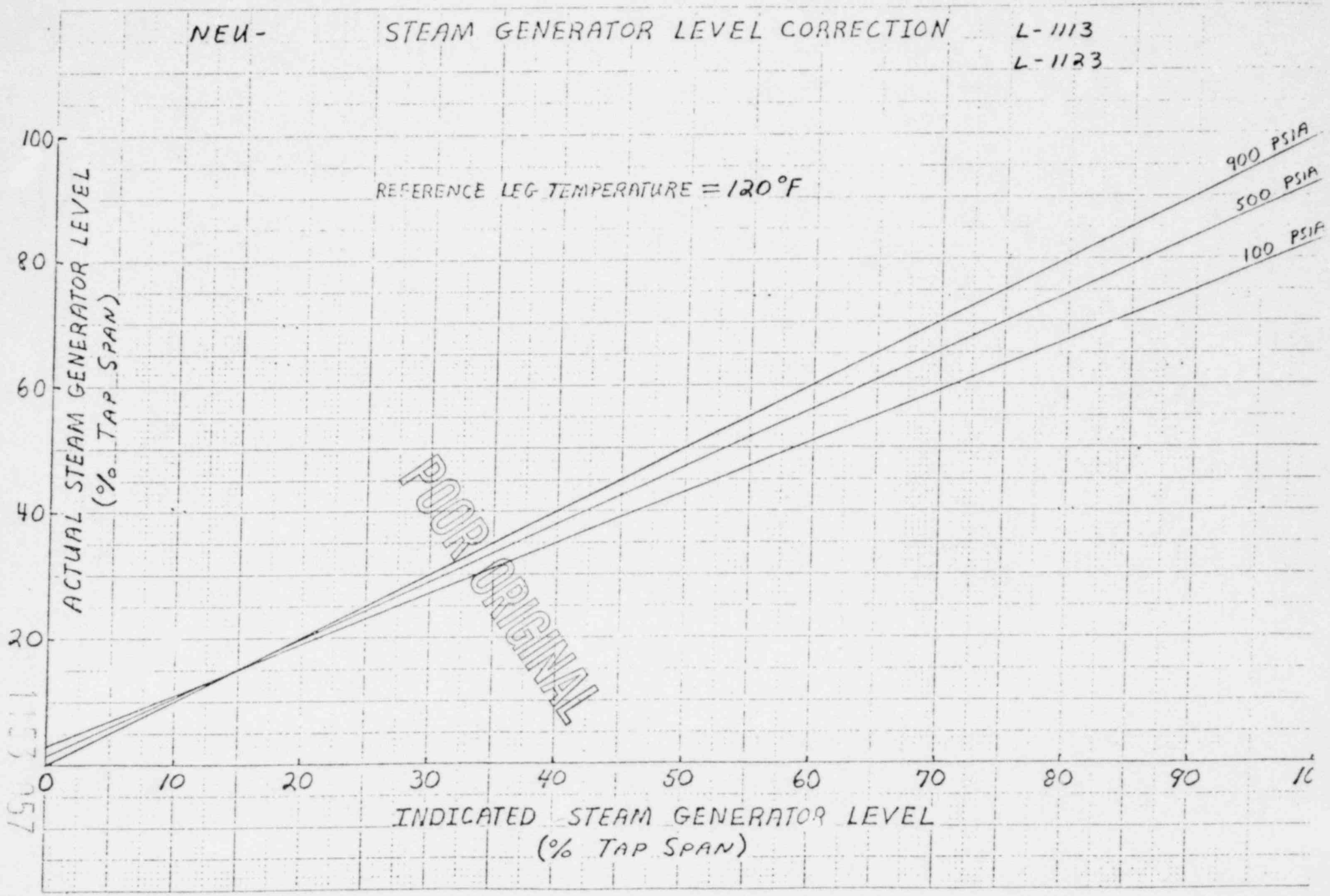

NEU-
STEAM GENERATOR LEVEL CORRECTION
L-1113
L-1123
REFERENCE LEG TEMPERATURE = 120°F
900 PSIA
500 PSIA
100 PSIA
ACTUAL STEAM GENERATOR LEVEL (% TAP SPAN)
INDICATED STEAM GENERATOR LEVEL (% TAP SPAN)
100
80
60
40
20
0
10
20
30
40
50
60
70
80
90
POOR ORIGINAL

FIGURE 9

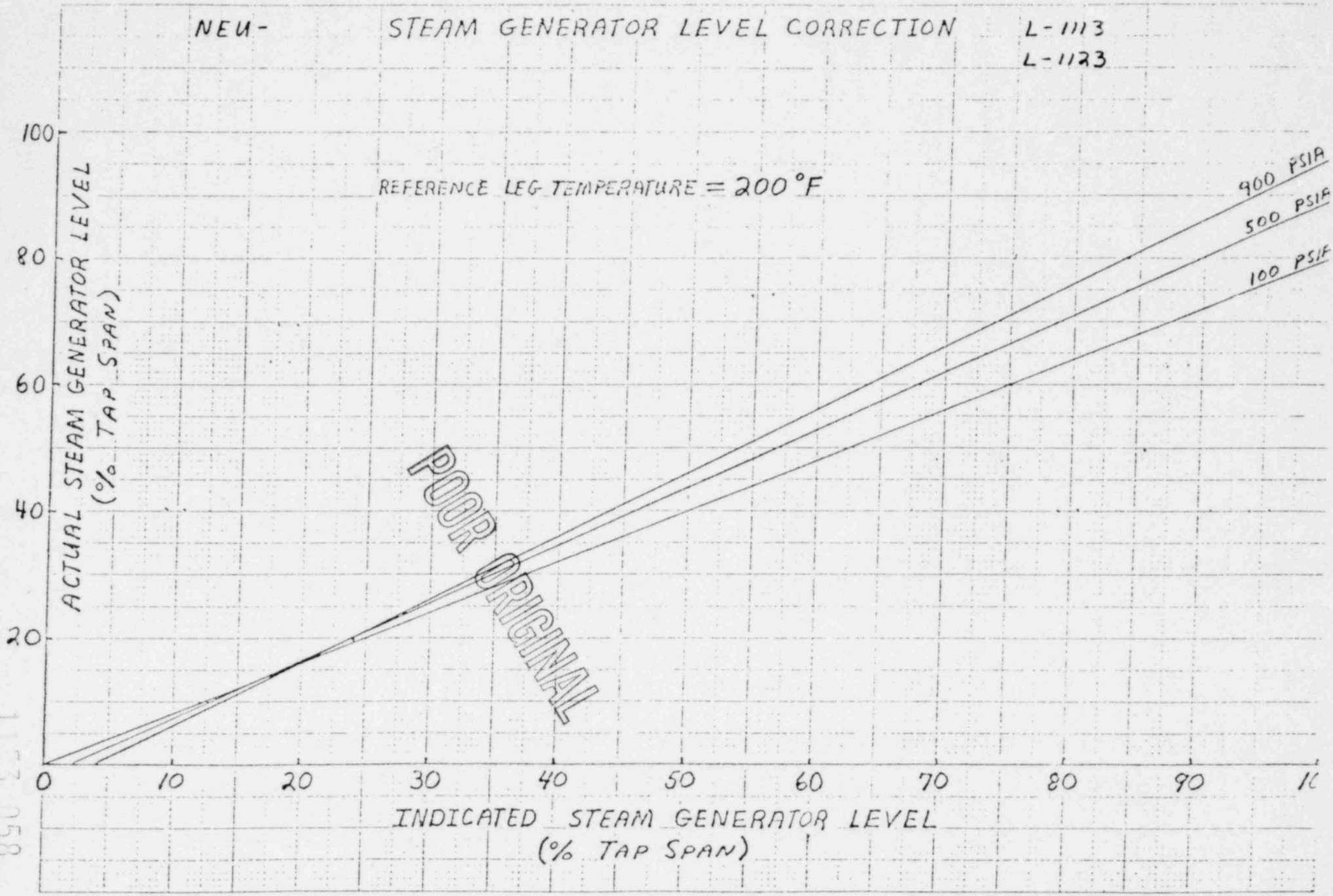

NEU-
STEAM GENERATOR LEVEL CORRECTION
L-1113
L-1123
REFERENCE LEG TEMPERATURE = 200°F
900 PSIA
500 PSIA
100 PSIA
POOR ORIGINAL
ACTUAL STEAM GENERATOR LEVEL
(% TAP SPAN)
INDICATED STEAM GENERATOR LEVEL
(% TAP SPAN)
0
10
20
30
40
50
60
70
80
90
100
20
40
60
80
100

FIGURE 10

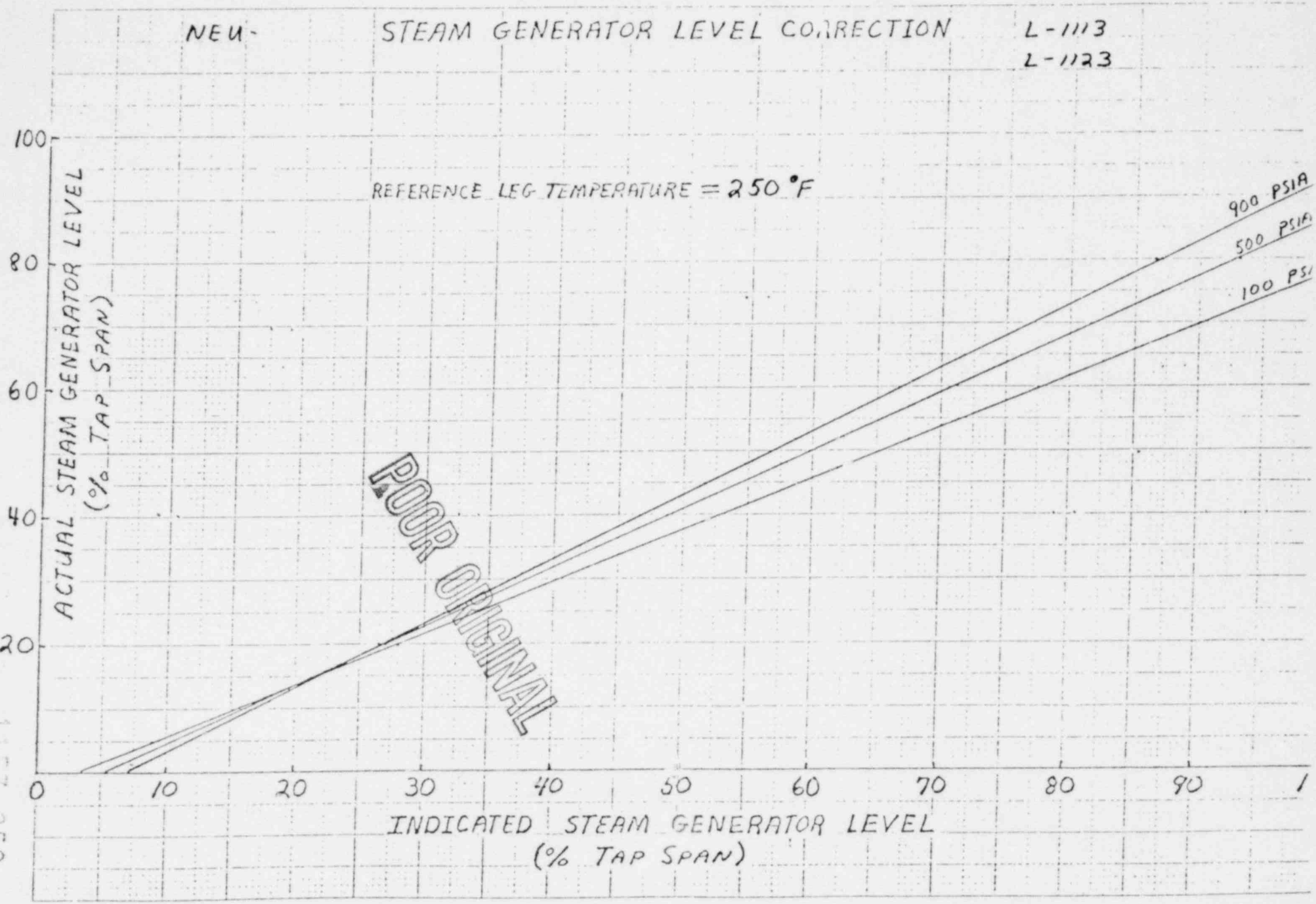
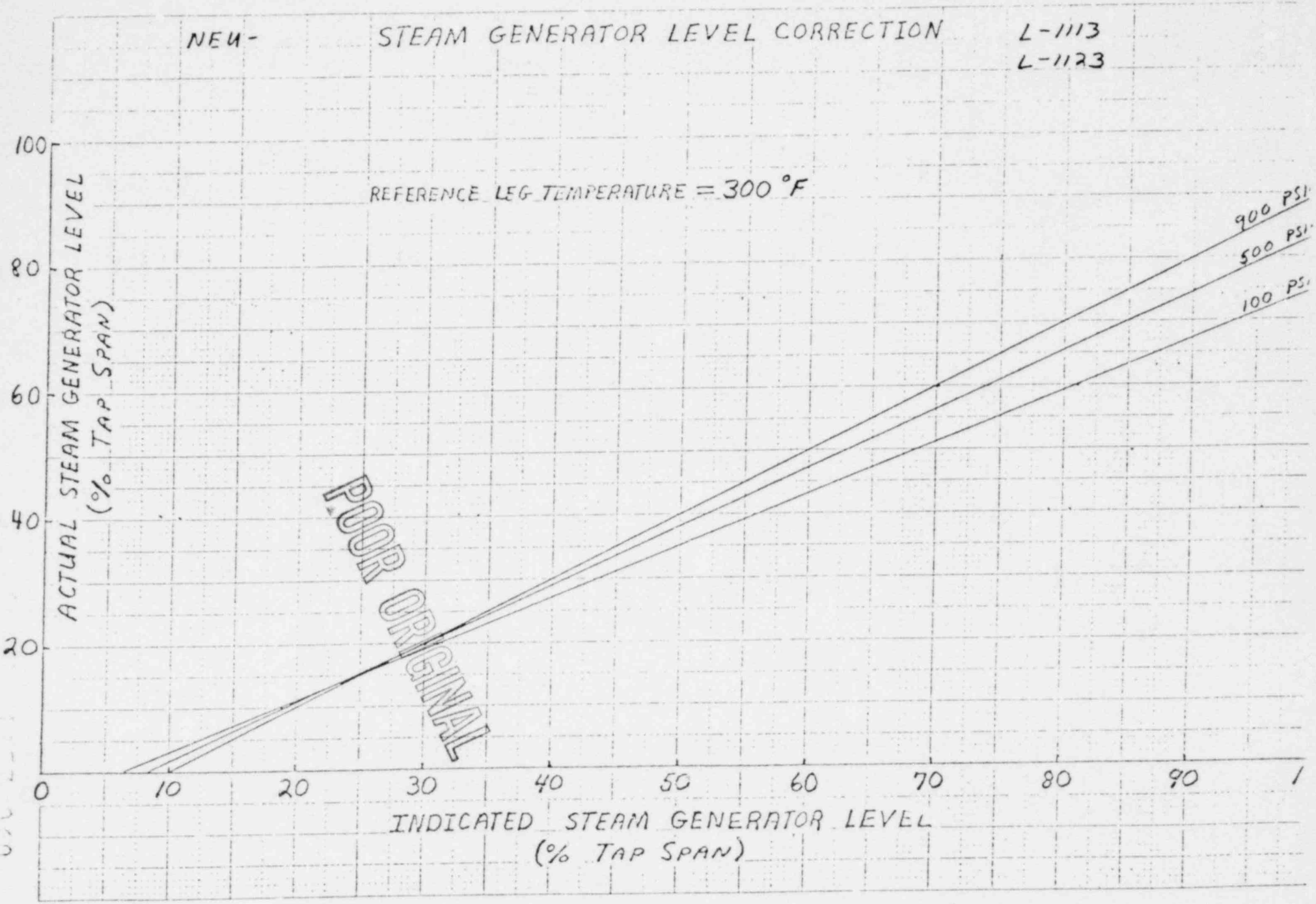

NEU-
STEAM GENERATOR LEVEL CORRECTION
L-1113
L-1123
REFERENCE LEG TEMPERATURE = 250 °F
900 PSIA
500 PSIA
100 PSI
ACTUAL STEAM GENERATOR LEVEL (% TAP SPAN)
INDICATED STEAM GENERATOR LEVEL (% TAP SPAN)
100
80
60
40
20
0
10
20
30
40
50
60
70
80
90
1
POOR ORIGINAL

FIGURE 11


NEW-
STEAM GENERATOR LEVEL CORRECTION
L-1113
L-1123
REFERENCE LEG TEMPERATURE = 300 °F
900 PSI
500 PSI
100 PSI
POOR ORIGINAL
ACTUAL STEAM GENERATOR LEVEL
(% TAP SPAN)
INDICATED STEAM GENERATOR LEVEL
(% TAP SPAN)
100
80
60
40
20
0
10
20
30
40
50
60
70
80
90