LIMITING CONDITION FOR OPERATION

3.2.2 MINIMUM REACTOR VESSEL TEMPERATURE FOR PRESSURIZATION

Applicability:

Applies to the minimum vessel temperature required for vessel pressurization.

Objective:

To assure that no substantial pressure is imposed on the reactor vessel unless its temperature is considerably above its Nil Ductility Transition Temperature (NDTT).

Specification:

a. During reactor vessel heat-up and cooldown when the reactor is not critical the reactor vessel temperature and pressure shall satisfy the requirements of Figure 3.2.2.a.

b. During reactor vessel heat-up and cooldown when the reactor is critical the reactor vessel temperature and pressure shall satisfy the requirements of Figure 3.2.2.b, except when performing low power physics testing with the vessel head removed at power levels not to exceed 5 mw(t).

SURVEILLANCE REQUIREMENT

4.2.2 MINIMUM REACTOR VESSEL TEMPERATURE FOR PRESSURIZATION

Applicability:

Applies to the required vessel temperature for pressurization.

Objective:

To assure that the vessel is not subjected to any substantial pressure unless its temperature is greater than its NDTT.

Specification:

a. Reactor vessel temperature and pressure shall be monitored and controlled to assure that the pressure and temperature limits are met.

b. Vessel material surveillance samples located within the core region to permit periodic monitoring of exposure and material properties shall be inspected on the following schedule:

First capsule - one fourth service life
Second capsule - three fourth service life

In the event the surveillance specimens at one quarter of the vessels service life indicate a shift of reference temperature greater than predicted the schedule shall be revised as follows:

Second capsule - one half service life

LIMITING CONDITION FOR OPERATION	SURVEILLANCE REQUIREMENT
c. During hydrostatic testing the reactor vessel temperature and pressure shall satisfy the requirements of Figure 3.2.2.c if the core is not critical and Figure 3.2.2.d if the core is critical. d. The reactor vessel head bolting studs shall not be under tension unless the temperature of the vessel head flange and the head are are equal to or greater than 100F.	

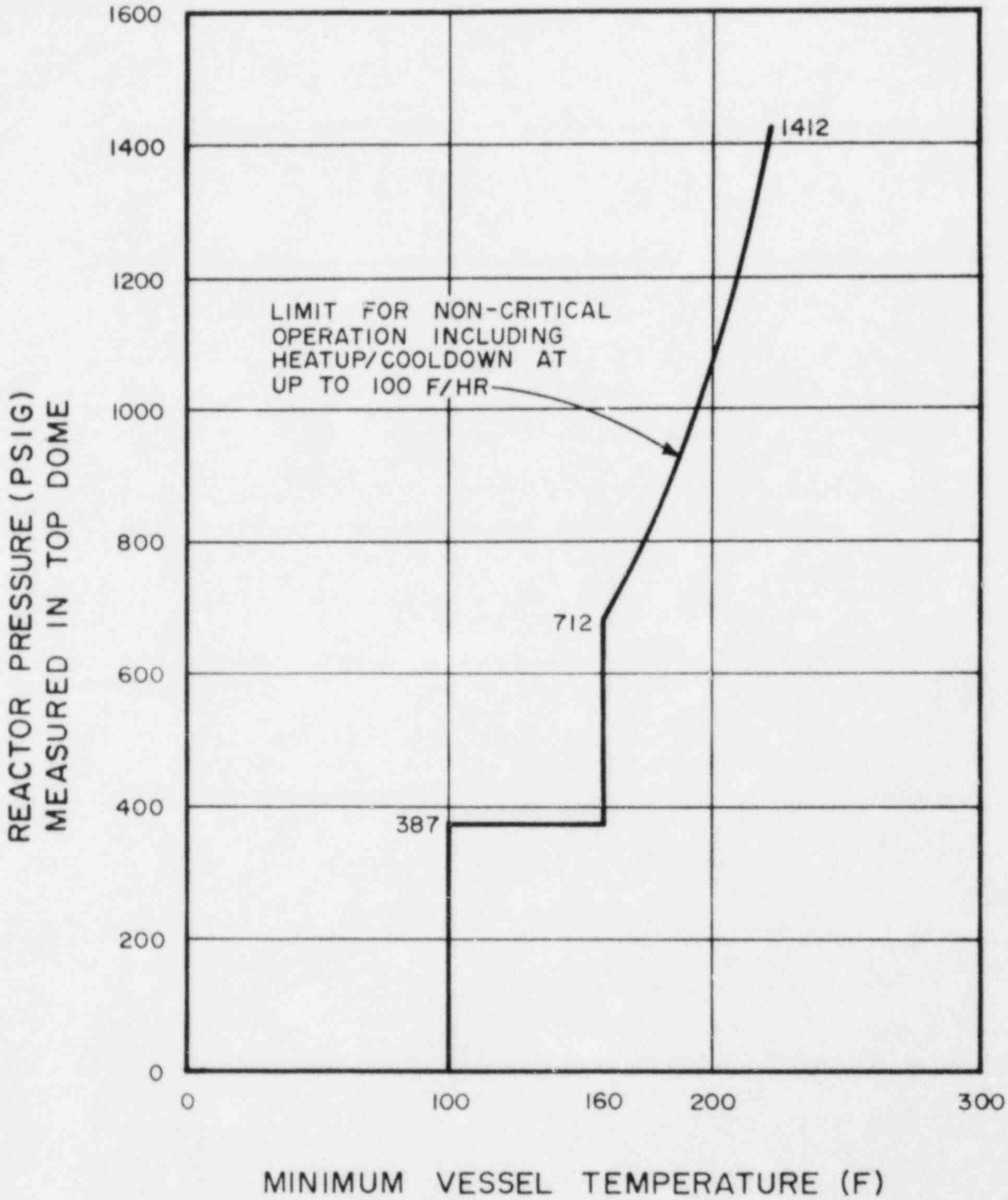

FIGURE 3.2.2.a

MINIMUM TEMPERATURE FOR PRESSURIZATION DURING HEATUP OR COOLDOWN (REACTOR NOT CRITICAL) (HEATING OR COOLING RATE ≤ 100F/HR) FOR UP TO TEN EFFECTIVE FULL POWER YEARS OF CORE OPERATION

LIMIT FOR NON-CRITICAL OPERATION
INCLUDING HEAT-UP/COOLDOWN AT
UP TO 100F/HR

PRESSURE (psig)	TEMPERATURE (F)
387	100
387	100-160
712	160
762	166
812	172
862	177
912	182
962	187
1012	192
1062	196
1112	199
1162	203
1212	207
1312	213
1412	219

TABLE 3.2.2.a

MINIMUM TEMPERATURE FOR PRESSURIZATION DURING
HEAT-UP OR COOLDOWN (REACTOR NOT CRITICAL)
(HEATING OR COOLING RATE 100F/HR)
FOR UP TO TEN EFFECTIVE FULL POWER YEARS OF CORE OPERATION

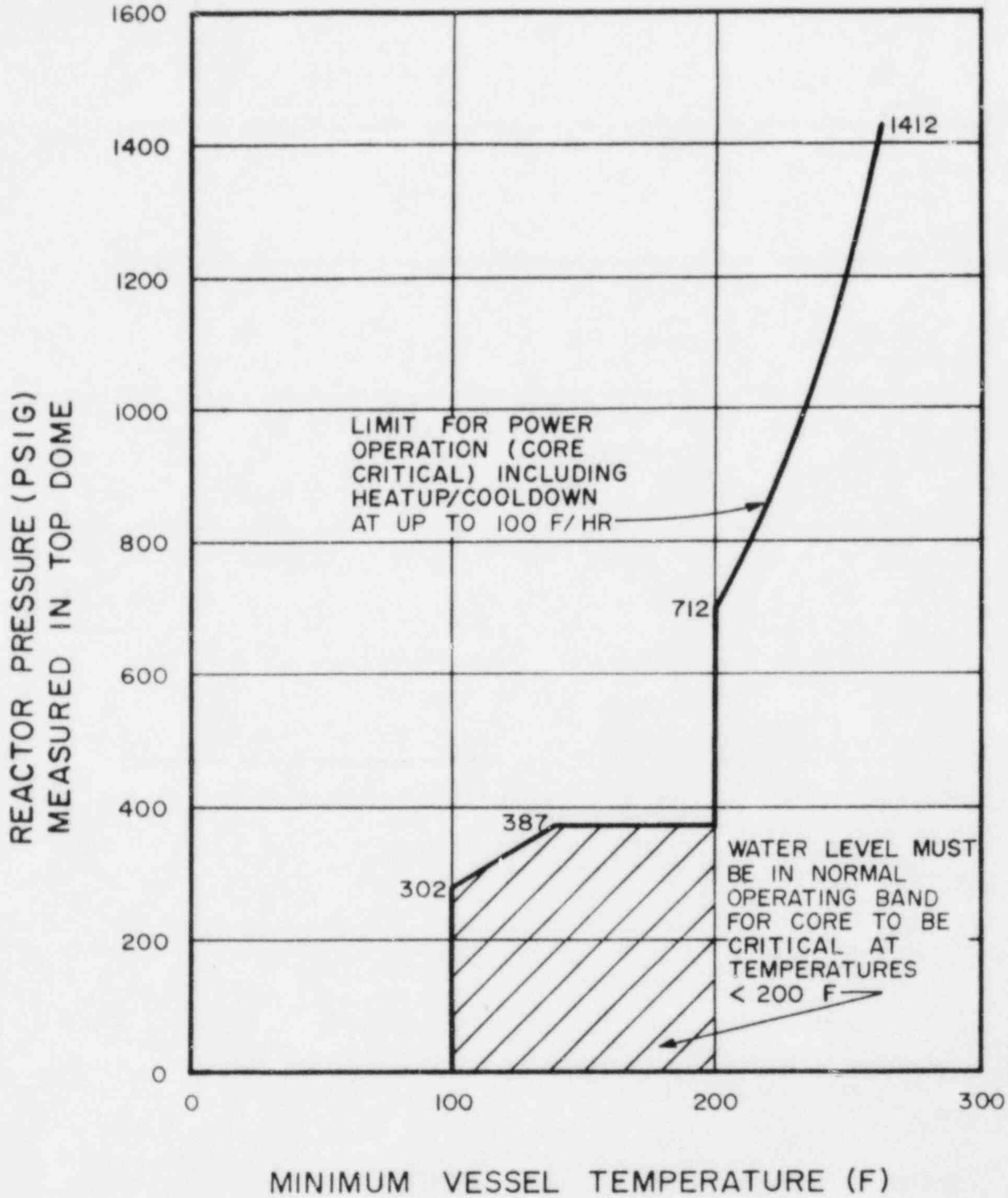

FIGURE 3.2.2.b

MINIMUM TEMPERATURE FOR PRESSURIZATION DURING HEATUP OR COOLDOWN (REACTOR CRITICAL) (HEATING OR COOLING RATE ≤ 100F/HR) FOR UP TO TEN EFFECTIVE FULL POWER YEARS OF CORE OPERATION

LIMIT FOR POWER OPERATION (CORE CRITICAL) INCLUDING HEAT-UP/ COOLDOWN AT UP TO 100F/HR

PRESSURE (psig)	TEMPERATURE (F)
302	100
312	106
362	127
387	136
387	137-200
712	200
762	206
812	212
862	217
912	222
962	227
1012	232
1062	236
1112	239
1162	243
1212	247
1312	253
1412	259

TABLE 3.2.2.b

MINIMUM TEMPERATURE FOR PRESSURIZATION DURING
HEAT-UP OR COOLDOWN (REACTOR CRITICAL)
(HEATING OR COOLING RATE 100F/HR)
FOR UP TO TEN EFFECTIVE FULL POWER YEARS OF CORE OPERATION

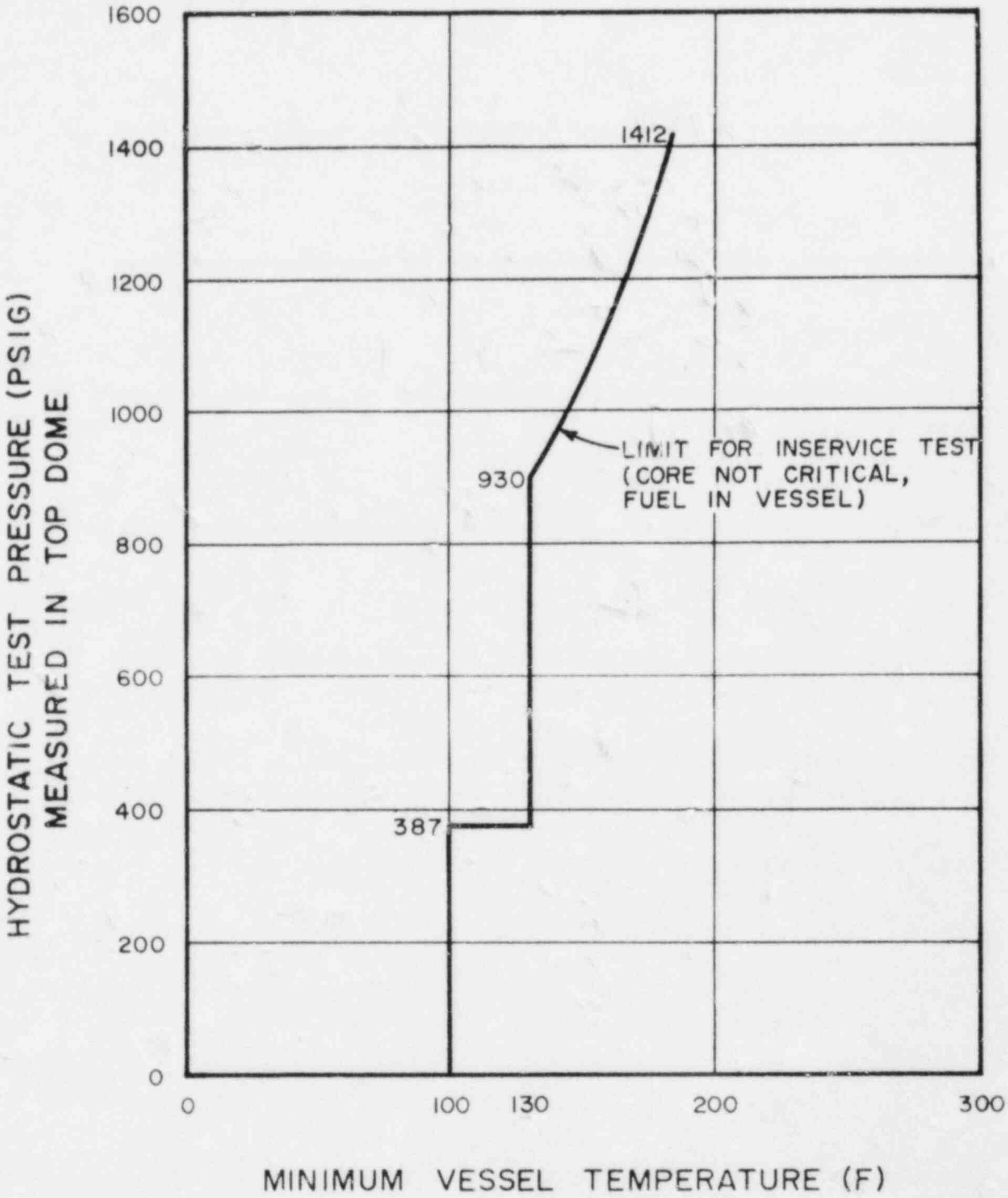

FIGURE 3.2.2.c

MINIMUM TEMPERATURE FOR PRESSURIZATION DURING HYDROSTATIC TESTING (REACTOR NOT CRITICAL) FOR UP TO TEN EFFECTIVE FULL POWER YEARS OF CORE OPERATION

LIMIT FOR IN-SERVICE TEST
(CORE NOT CRITICAL, FUEL
IN VESSEL)

PRESSURE (psig)	TEMPERATURE (F)
387	100-130
930	130
962	135
1012	142
1062	148
1112	153
1212	164
1312	173
1412	181

TABLE 3.2.2.c

MINIMUM TEMPERATURE FOR PRESSURIZATION DURING
HYDROSTATIC TESTING (REACTOR NOT CRITICAL)
FOR UP TO TEN EFFECTIVE FULL POWER YEARS OF CORE OPERATION

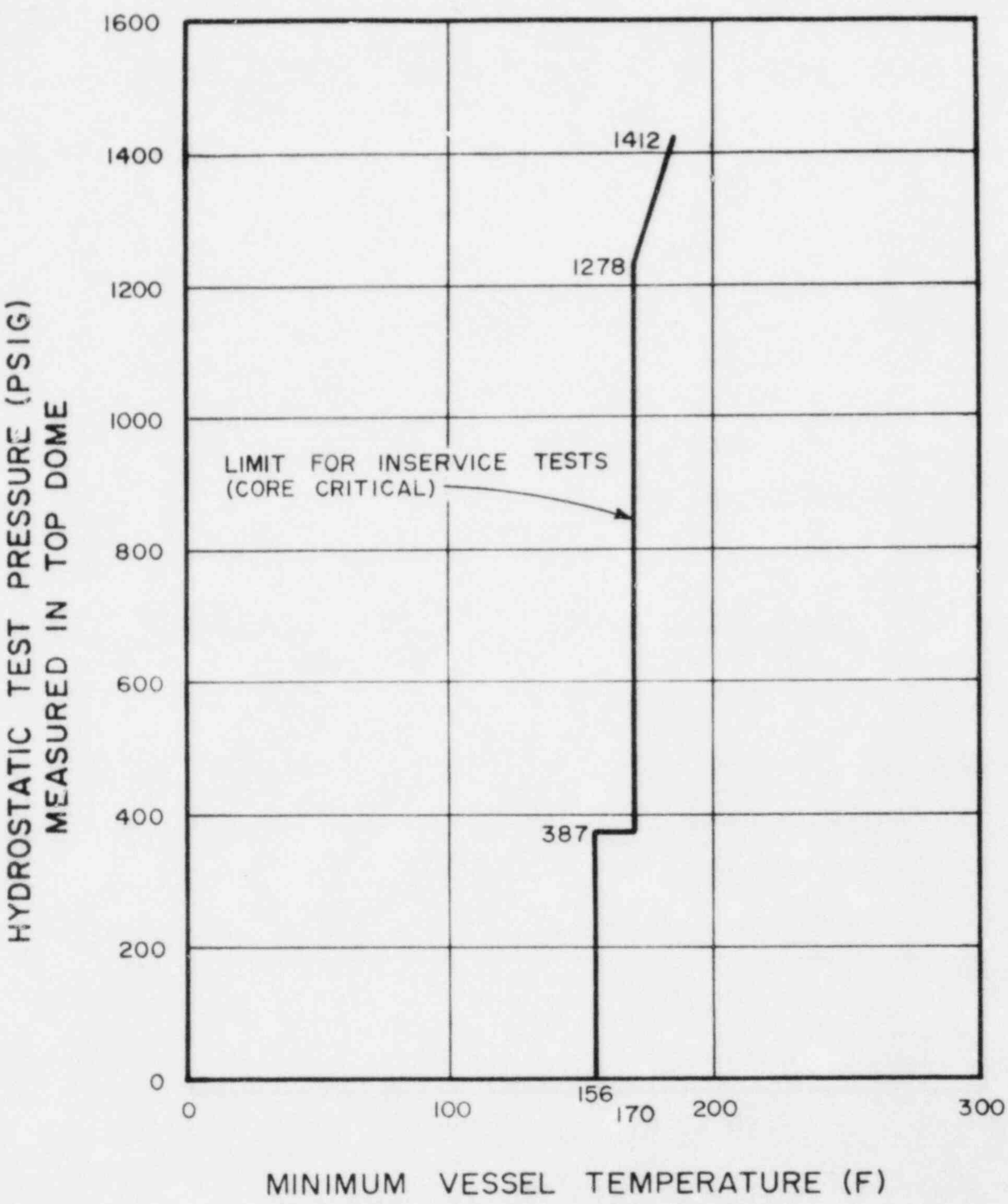

FIGURE 3.2.2.d

MINIMUM TEMPERATURE FOR PRESSURIZATION DURING
HYDROSTATIC TESTING (REACTOR CRITICAL)
FOR UP TO TEN EFFECTIVE FULL POWER YEARS OF CORE OPERATION

LIMIT FOR IN-SERVICE TESTS
(CORE CRITICAL)

PRESSURE (psig)	TEMPERATURE (F)
387	156
1278	170
1312	173
1412	181

TABLE 3.2.2.d

MINIMUM TEMPERATURE FOR PRESSURIZATION DURING
HYDROSTATIC TESTING (REACTOR CRITICAL)
FOR UP TO TEN EFFECTIVE FULL POWER YEARS OF CORE OPERATION

Figures 3.2.2.a and 3.2.2.b are plots of pressure versus temperature for a heat-up and cool down rate of 100F/hr. maximum. (Specification 3.2.1). Figures 3.2.2.c and 3.2.2.d are plots of pressure versus temperature for hydrostatic testing. These curves are based on calculations of stress intensity factors according to Appendix G of Section III of the ASME Boiler and Pressure Vessel Code 1980 Edition with Winter 1982 Addenda. In addition, temperature shifts due to integrated neutron flux at ten effective full power years of operation were incorporated into the figures. These shifts were calculated from the formula presented in Regulatory Guide 1.99, Revision 1 and the copper/phosphorus content of the reactor vessel. These curves are applicable to the beltline region at low and elevated temperatures and the vessel flange at intermediate temperatures. Reactor vessel flange/reactor head flange boltup is governed by other criteria as stated in Specification 3.2.2.d. The pressure readings on the figures have been adjusted to reflect the calculated elevation head difference between the pressure sensing instrument locations and the pressure sensitive area of the core beltline region.

The reactor vessel head flange and vessel flange in combination with the double "O" ring type seal are designed to provide a leak-tight seal when bolted together. When the vessel head is placed on the reactor vessel, only that portion of the head flange near the inside of the vessel rests on the vessel flange. As the head bolts are replaced and tensioned, the vessel head is flexed slightly to bring together the entire contact surfaces adjacent to the "O" rings of the head and vessel flange. Both the head and vessel and flange have a NDT temperature of 40F and they are not subject to any appreciable neutron radiation exposure. Therefore, the minimum vessel head and head flange temperature for bolting the head flange and vessel flange is established as 40 + 60F or 100F.

Figures 3.2.2.a, 3.2.2.b, 3.2.2.c and 3.2.2.d have incorporated a temperature shift due to the calculated integrated neutron flux. The integrated neutron flux at the vessel wall is calculated from core physics data and has been measured using flux monitors installed inside the vessel. The curves are applicable for up to ten effective full power years of operation.

Vessel material surveillance samples are located within the core region to permit periodic monitoring of exposure and material properties relative to control samples. The material sample program conforms with ASTM E 185-66 except for the material withdrawal scheduled which is specified in Specification 4.2.2.b.

LUKENS STEEL
Lukens Steel Company
Coatesville, PA 19320

June 30, 1983

Mr. M. Mosier
Niagara Mohawk Power Corporation
300 Erie Boulevard, West
Syracuse, NY 13202

Dear Sir:

Attached are copies of the Lukens Steel Company "Chemical Laboratory Heat Analysis" records.

All non-applicable information has been deleted from these copies.

We hope this will satisfy your request.

Sincerely,

LUKENS STEEL COMPANY

John P. Sunukjian
Supt., Q.A. Inspection

JPS:wlk

Attachments

4/28/64

CHEMICAL LABORATORY HEAT ANALYSIS

4301-45-524

HEAT NO.	MILL CODE	INV. GRADE CODE	C	MN	P	S	CU	NI	CR	MO	SI	V	TI	Sn	AL	B
P2074	6H43	04643	18	1.45	018	034	20	48	10	45	26				030	

4/29/64

CHEMICAL LABORATORY HEAT ANALYSIS

4301-45-524

HEAT NO.	MILL CODE	INV. GRADE CODE	C	MN	P	S	CU	NI	CR	MO	SI	V	TI	Sn	AL	B
P2076	6H43	04643	20	1.28*	019	030	27*	53	15	52	21				031	

CHEMICAL LABORATORY HEAT ANALYSIS

5/07/64

4301-45-524

HEAT NO.	MILL CODE	INV. GRADE CODE	C	MN	P	S	CU	NI	CR	MO	SI	V	TI	Cu	AI	B
P2091	6H43	04643	20	1.43	018	026	22	51	12	50	26				042	

5/18/64

CHEMICAL LABORATORY HEAT ANALYSIS

4301-45-524

HEAT NO.	MILL CODE	INV. GRADE CODE	C	MN	P	S	CU	NI	CR	MO	SI	V	TI	Sn	AL	B
P2112	6H43	04643	19	1.34	021	028	23	51	13	45	21				038	

5/29/64

CHEMICAL LABORATORY HEAT ANALYSIS

4301-45-524

HEAT NO.	MILL CODE	INV. GRADE CODE	C	MN	P	S	CU	NI	CR	MO	SI	V	TI	Cb	AL	B
P2130	6H43	02643	20	1.16*	012	027	18	56	09	47	17				030	