BALTIMORE GAS AND ELECTRIC COMPANY
GAS AND ELECTRIC BUILDING
BALTIMORE, MARYLAND 21203

ARTHUR E. LUNDVALL, JR.
VICE PRESIDENT
SUPPLY

July 31, 1979

Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attn: Mr. Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Operating Reactors

Subject: Calvert Cliffs Nuclear Power Plant
Unit No. 1 & 2, Docket No. 50-317 & 50-318
Feedwater System Design Information

Reference: a) NRC letter dated 5/25/79 from Stello to PWR Licensees, same subject.
b) BG&E letter dated 6/19/79 from Lundvall to Reid, same subject.

Gentlemen:

Reference (a) requested that we provide certain design information relative to the feedwater piping at Calvert Cliffs. Reference (b) forwarded the first portion of the requested information, covering the design and part of the fabrication history. The attached pages provide the remaining information, covering the rest of the fabrication history and P/ISI, operation and chemistry control.

Very truly yours,

cc: J. A. Biddison, Esquire
G. F. Trowbridge, Esquire
Mr. E. L. Conner, Jr. - NRC
Mr. J. W. Brothers - Bechtel

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Attachment to A. E. Lundvall, Jr. Letter
dated 7/31/79, Feedwater System

Fabrication History (Per Reference (a))

NRC Question No. 3

Provide the NDE performed during and after fabrication of the weld joints requested in question 2.

Response

Feedwater Piping (Excl. Penetration) - 100% radiograph of seams
and 100% radiograph of
butt welds.

Penetration Piping - 100% radiograph of seams
100% radiograph and liquid penetrant of castings
100% radiograph of buttwelds
100% liquid penetrant of socket welds
and attachment welds
100% radiograph of branch connections over 4"
100% liquid penetrant of branch connection
under 4"

Nozzle-to-Pipe - 100% radiograph of nozzle to pipe

NRC Question No. 4

Provide the Code edition to which the feedwater piping system was fabricated.

Response

Piping (excluding penetration) ANSI B31.1.0 June, 1967 edition
Penetration Piping ANSI B31.7 - 1969 Class II

NRC Question No. 5

State the fracture toughness requirements, if any, for the feedwater piping system.

Response

No fracture toughness requirements.

Preservice/Inservice Inspection and Operating History (Per Reference (a))

NRC Question No. 1

State whether the feedwater system welds received a preservice inspection in accordance with ASME B&PV Code, Section XI.

Response

The applicable ASME B&PV Code, Section XI did not require preservice inspection of feedwater system. However, system integrity and baseline data were established by an augmented inservice inspection program as outlined in section 4.4.10.1.2 of Tech Specs.

NRC Question No. 2

Provide the extent of inservice inspection performed on the feedwater pipe to steam generator nozzle welds. Include the results of the examinations, any corrective actions taken and causes of any failures.

Response

100% volumetric examination of subject welds.

Results of examination were satisfactory. There was no failure and hence no corrective action was necessary.

NRC Question No. 3

Provide the schedule and extent of inservice inspection for the feedwater system for the next inspection interval.

Response

The upcoming inservice inspection of feedwater system is scheduled in October 1979 for Unit II and April 1980 for Unit I. The extent of ISI on feedwater system shall meet the ASME B&PV Code Section XI.

NRC Question No. 4

Provide any history of water hammer or vibration in the feedwater system and design changes and/or actions taken to prevent these occurrences.

Response

Waterhammers have occurred on two occasions:

a. At 9:04 a.m. on May 13, 1975 unit 1 reactor tripped on loss of feedwater. Approximately 40 minutes after the trip 3 waterhammers were experienced

in the feedwater piping. Damage to the motor operators of both feedwater stop valves occurred which rendered the motor operators inoperable. The manual hand wheel for No. 11 header stop valve was also damaged. Abnormal occurrence report 50-317/75/36 describes this event.

To prevent reoccurrence of this event, procedural changes were made such that only the auxiliary feedwater system would be used to recover steam generator level following a reactor trip. Additionally, rate of fill was limited to 1.2"/min with steam generator level between -85" and -30".

b. On may 19, 1976 a test was performed on Unit 2 to determine the effectiveness of the addition of internal standpipes to the new feedring. With the reactor in mode 3 steam generator level decreased to -85" via the blowdown system. Thirteen minutes after securing blowdown feedwater was introduced into 21 steam generator at 5% of full feed flowrate via the main feedring. As water reached the feedring waterhammers began occurring at a frequency of 4 seconds accompanied by a 1/2" displacement of the feedline. The test was immediately terminated and feed secured. Hammering continued at increased severity for some time with a maximum feedline displacement of 3/4". No damage was experienced.

On October 25, 1978 a similar test was conducted to determine the effectiveness of the addition of J-tubes to the new feedring. No waterhammers were experienced during this test.

NRC Question No. 5

Provide a description of feedwater chemistry controls and a summary of chemistry data.

Response

ATTACHMENTS:
(1) Operational Feedwater Chemistry Specifications
(2) Layup Chemistry - Condensate/Feedwater
(3) Typical Feedwater Chemistry Data Plotted for a 300 day period
(4) Operational Steam Generator Chemistry Specification
(5) Typical Steam Generator Chemistry Data Plotted for the month of October 1978

As identified on reference (1) a request from the NRC for information of a chemistry related origin has reached this person. The data required included:

(1) a description of feedwater chemistry controls
(2) a summary of chemistry data

Attachment (1) and (2), Operational Feedwater Chemistry Specifications and Layup Chemistry Condensate/Feedwater respectively, pertain to item (1) above.

Attachments (3), (4), and (5), Typical Feedwater Chemistry Data, Steam Generator Chemistry Specifications and Steam Generator Chemistry Data refer to item (2) above.

TABLE 1
OPERATIONAL FEEDWATER CHEMISTRY

	ANALYSIS PROCEDURE/METHOD	NORMAL SPECIFICATIONS (4)	ABNORMAL LIMITS (5)	FREQUENCY (1)
1.	Cation Conductivity/901 (umhos/cm, max)(Tech. Spec. 3.7.1.6)	0.3	1.5	1/24 hrs.
2.	pH @ 25°C/902	8.8 to 9.2	-	5/W
3.	Oxygen/904 (ppb)	10	10 max (6)	1/W
5.	Sodium/908 (ppb, max)	5	20	1/W
6.	Hydrazine/910 (ppb)	10 to 50	-	5/W (2)
7.	Suspended Solids/911 (ppm, max)	0.1	-	3/W
8.	Silica/916 (ppb, max)	20	-	1/W
9.	Iron/918 (ppb, max)	10	-	1/W (3)
10.	Copper/919 (ppb, max)	10	-	1/W (3)

(1) Frequency noted is minimum. These may be adjusted upward if conditions warrant. If normal specifications are exceeded the out of spec parameter(s) must be analyzed at least daily. If abnormal limits are exceeded the out of spec parameter(s) must be analyzed at least once per shift.

(2) Also analyze for oxygen if the hydrazine specification (low) is not met.

(3) Copper and iron will also be determined in the Heater Drain Tank(s). The frequency will normally be once per month, but is adjustable based on operating experience.

(4) Normal specifications are those which should be maintained by proper operation of secondary systems.

(5) Abnormal limits indicate a fault condition exists and plant shutdown should be commenced if abnormal limits are exceeded for 4 hours.

(6) During startup and low load (less than 10% power), this specification may not be achievable and under these conditions plant shutdown is not called for.

TABLE 4
CONDENSATE DEMINERALIZER EFFLUENT

	ANALYSIS PROCEDURE/METHOD	SPECIFICATIONS	FREQUENCY
1.	Conductivity/901 (umhos/cm, max)	0.2	As Required
2.	pH @ 25°C/902	6.5 - 7.5	As Required
3.	Sodium/908 (ppb, max)	5	As Required
4.	Silica/916 (ppb, max)	20	As Required

TABLE 5
CONDENSATE STORAGE TANK CHEMISTRY

	ANALYSIS PROCEDURE/METHOD	SPECIFICATIONS	FREQUENCY
1.	pH @ 25°C/902	5.8 - 9.5	As Required
2.	Specific Conductivity/901 (umho/cm, max)	20	As Required

TABLE 6
LAYUP CHEMISTRY - CONDENSATE/FEEDWATER SYSTEM

	ANALYSIS PROCEDURE/METHOD	SPECIFICATIONS	FREQUENCY
1.	pH @ 25°C/902	8.5 - 10.2	As Required
2.	Specific conductivity/901	NS	As Required
3.	Sodium/908	1.0 ppm (max)	As Required

[Attachment 4]

Feedwater Chemistry Specification Compliance Data — 1 January 1978 to 27 October 1978 (300 days)

Steam Generator Manufacturers' Recommended Limits — * Percentage Compliance — Total 97.6%

Normal — Abnormal — Immediate Shutdown — 99.8 — 97.4 — 99.7

pH 8.8-9.2

Iron ppb 30 / 10

Copper ppb 10 / 0

Sodium ppb 20 / 10 / 0

Silica ppb 10 / 0

Ammonia ppm 1 / 0

Hydrazine ppb 1 / 10-50 / 2

Dissolved Oxygen ppb 100 / 10 / 0

Cation Cond. Micro mho 0.5 / 0

* ANALYSIS NOT CONDUCTED.

F — W CONDITION

J F M A M J J A S O

Total

SPECIFICATIONS AND SURVEILLANCE - STEAM GENERATORS

TABLE 1

OPERATIONAL STEAM GENERATOR CHEMISTRY

	ANALYSIS PROCEDURE/METHOD	NORMAL SPECIFICATION (2)	ABNORMAL LIMITS (3)	FREQUENCY (1)
1.	Specific Conductivity/901 (umhos/cm, max)	4	15	1/24 hrs.
2.	pH @ 25° C/902	8.2 - 9.2	7.5 - 8.2 (4) 9.2 - 9.5	1/24 hrs.
3.	Gross β,γ activity/1001 (Tech Spec. 4.7.1.4)	N.S(5)	-	1/72 hrs.
4.	Sodium/908 (ppm, max)	0.1	-	7/W
5.	Suspended Solids/911 (ppm, max)	1.0	10.0	2/W
6.	I-131 Dose equivalent/1003 (uCi/g, max) (Tech Spec 3.7.1.4)	0.1	-	1/31 D
7.	SiO_2/916 (ppm, max)	1.0	10	1/W
8.	Cl/906 (ppm, max)	0.1	-	7/W

N.S. = Not Specified

(1) Frequency noted is minimum. These may be adjusted upward if conditions warrant. If normal specs are exceeded, the out of spec parameter(s) must be analyzed at least daily. If abnormal limits are exceeded, the out-of-spec parameter(s) must be analyzed at least once per shift. If blowdown is secured, a grab sample must be drawn and analyzed for spec. cond. and pH at least 1/24 hrs

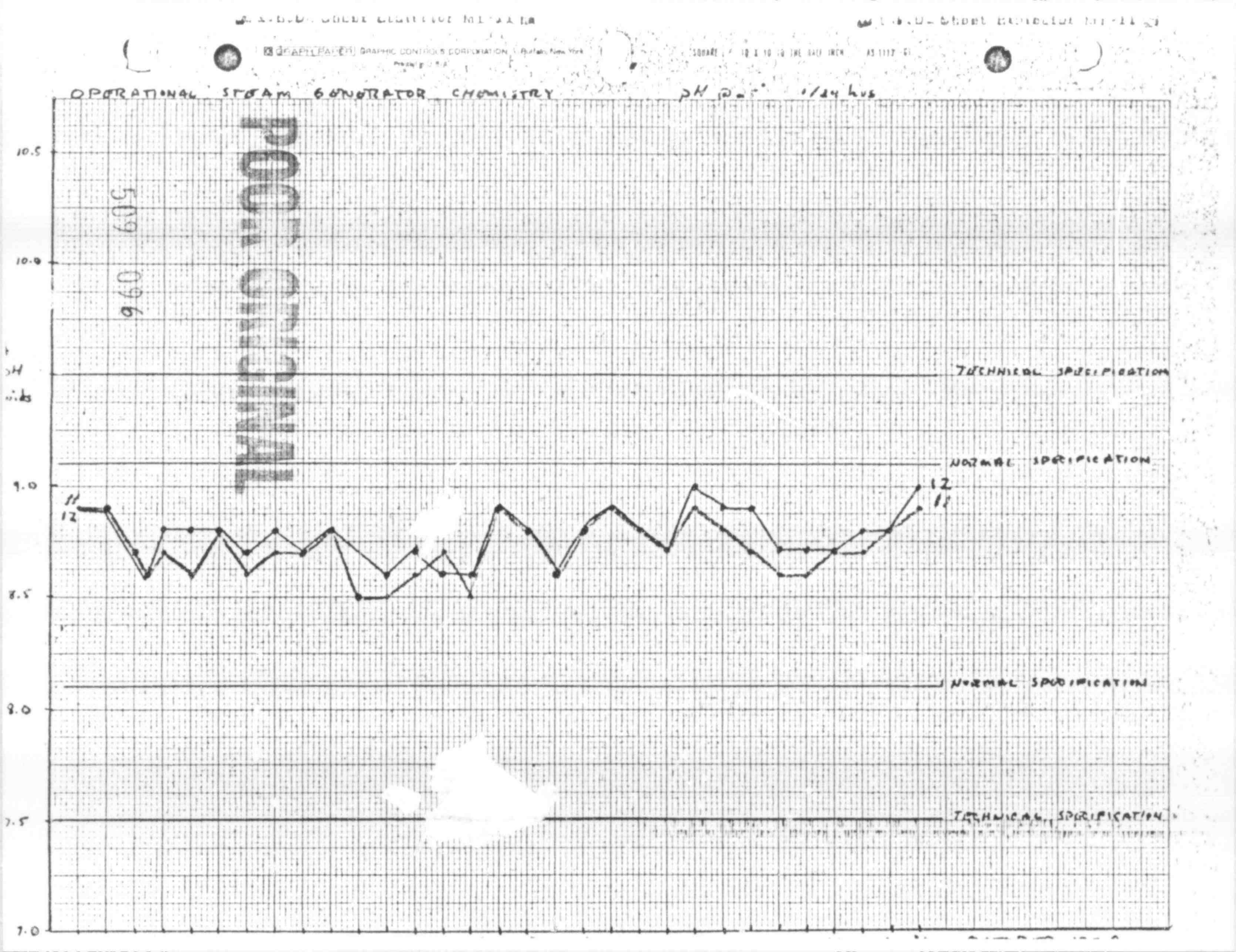
(2) Normal specifications are those which should be maintained during proper operation of secondary systems.

(3) Abnormal limits indicate a fault condition exists and plant shutdown should be commenced if abnormal limits are exceeded for 4 hrs.

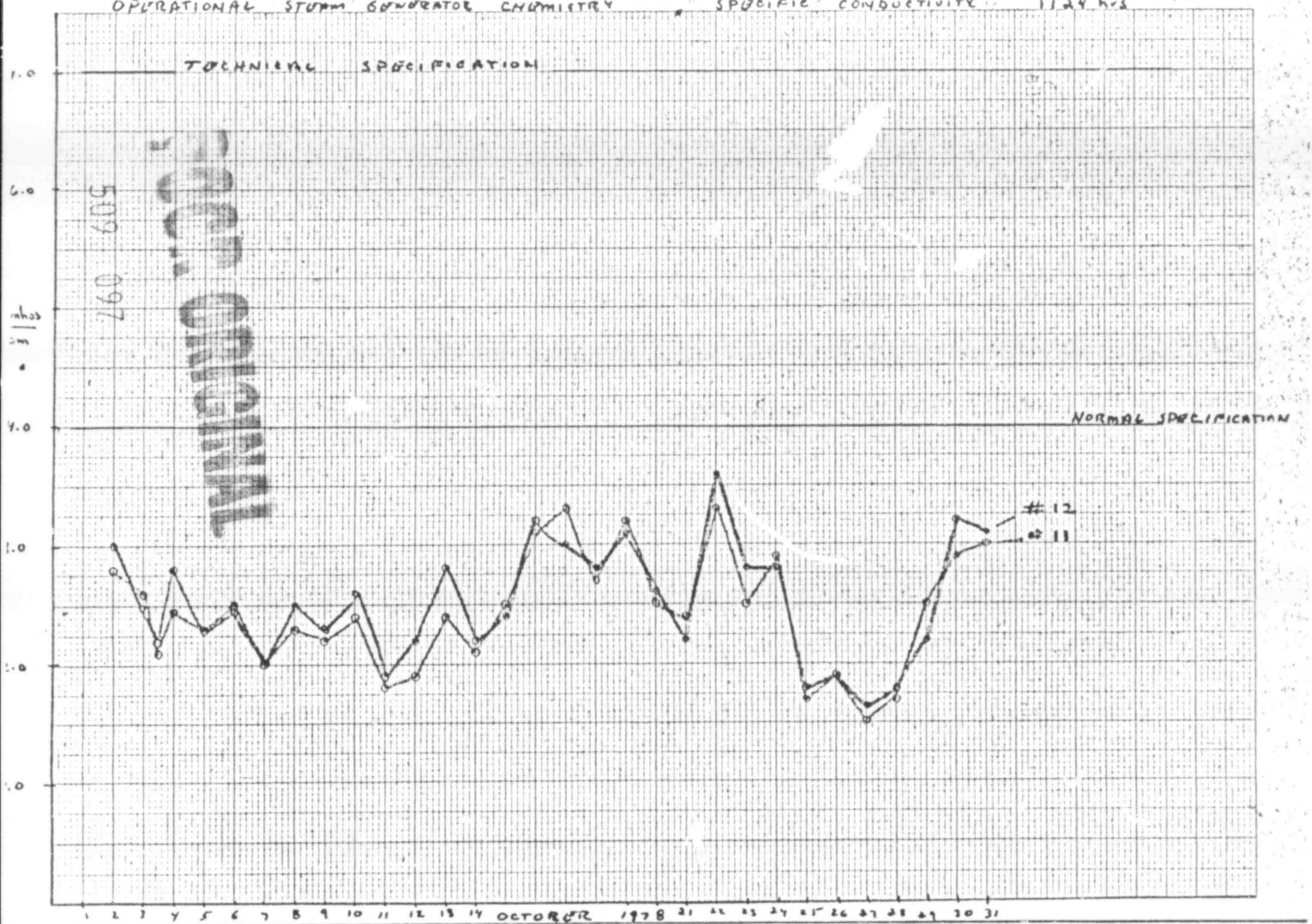
(4) The unit should be immediately shut down when pH exceeds 10.5.

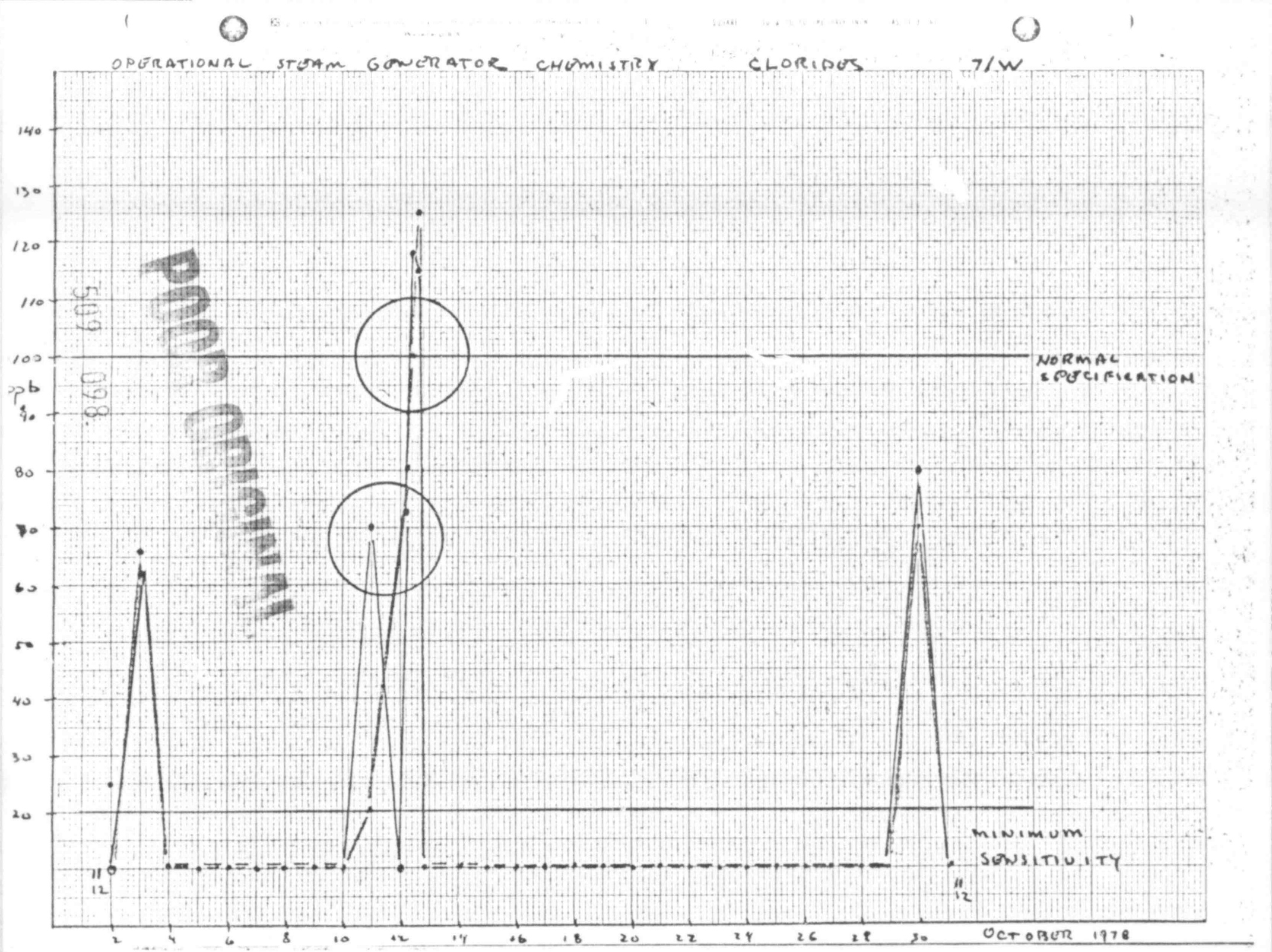
(5) Analysis must achieve detectable concentration of ETS table 2.3.1, item 2a. (10-7 uCi/cc).

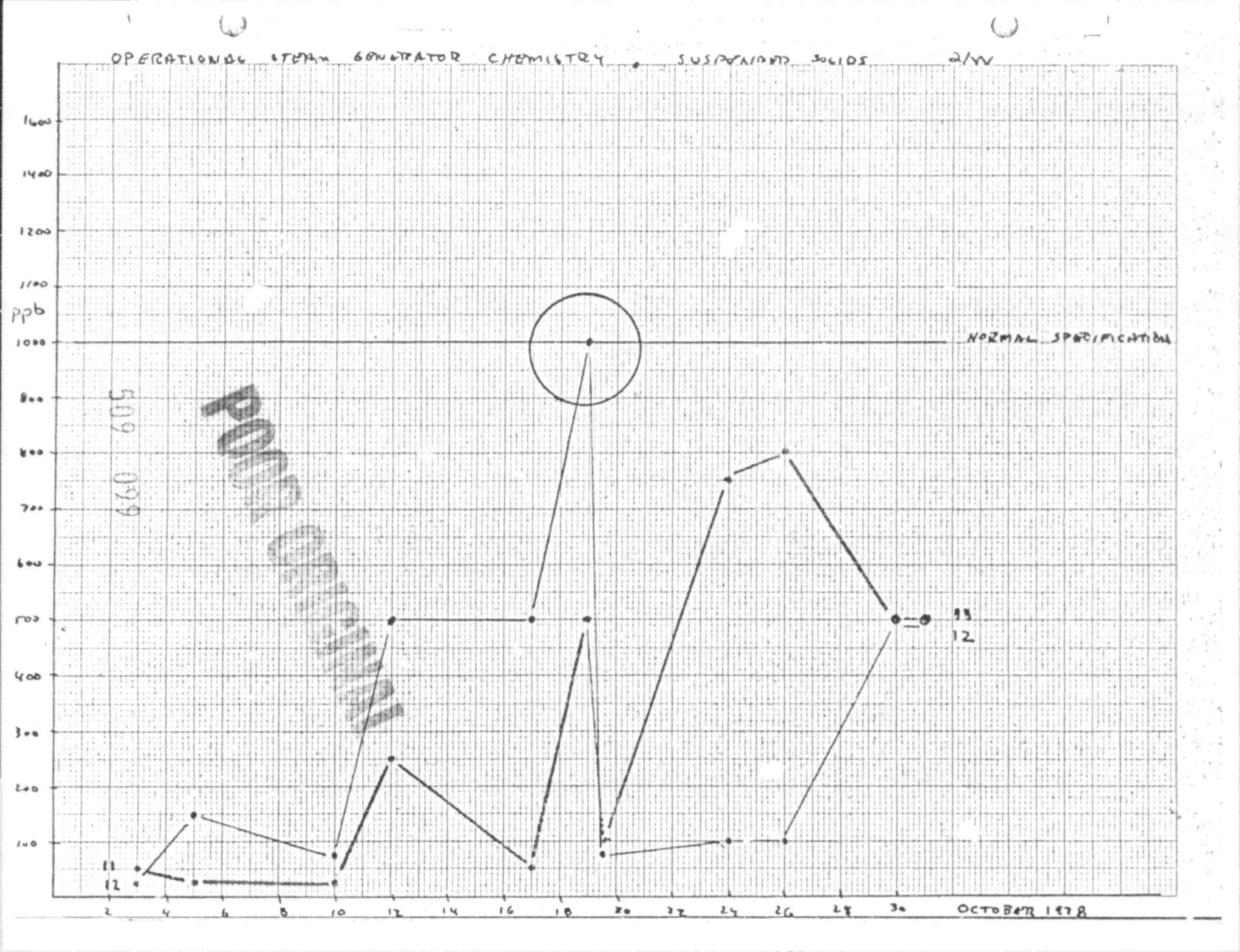
(6) May be increased to 10 for the first 24 hrs. during startup from Hot shutdown.


OPERATIONAL STEAM GENERATOR CHEMISTRY
pH @ 25°
1/24 hrs
10.5
10.0
9.0
8.5
8.0
7.5
7.0
TECHNICAL SPECIFICATION
NORMAL SPECIFICATION
NORMAL SPECIFICATION
TECHNICAL SPECIFICATION
11
12
12
11

OPERATIONAL STEAM GENERATOR CHEMISTRY — SPECIFIC CONDUCTIVITY — 1/24 hrs



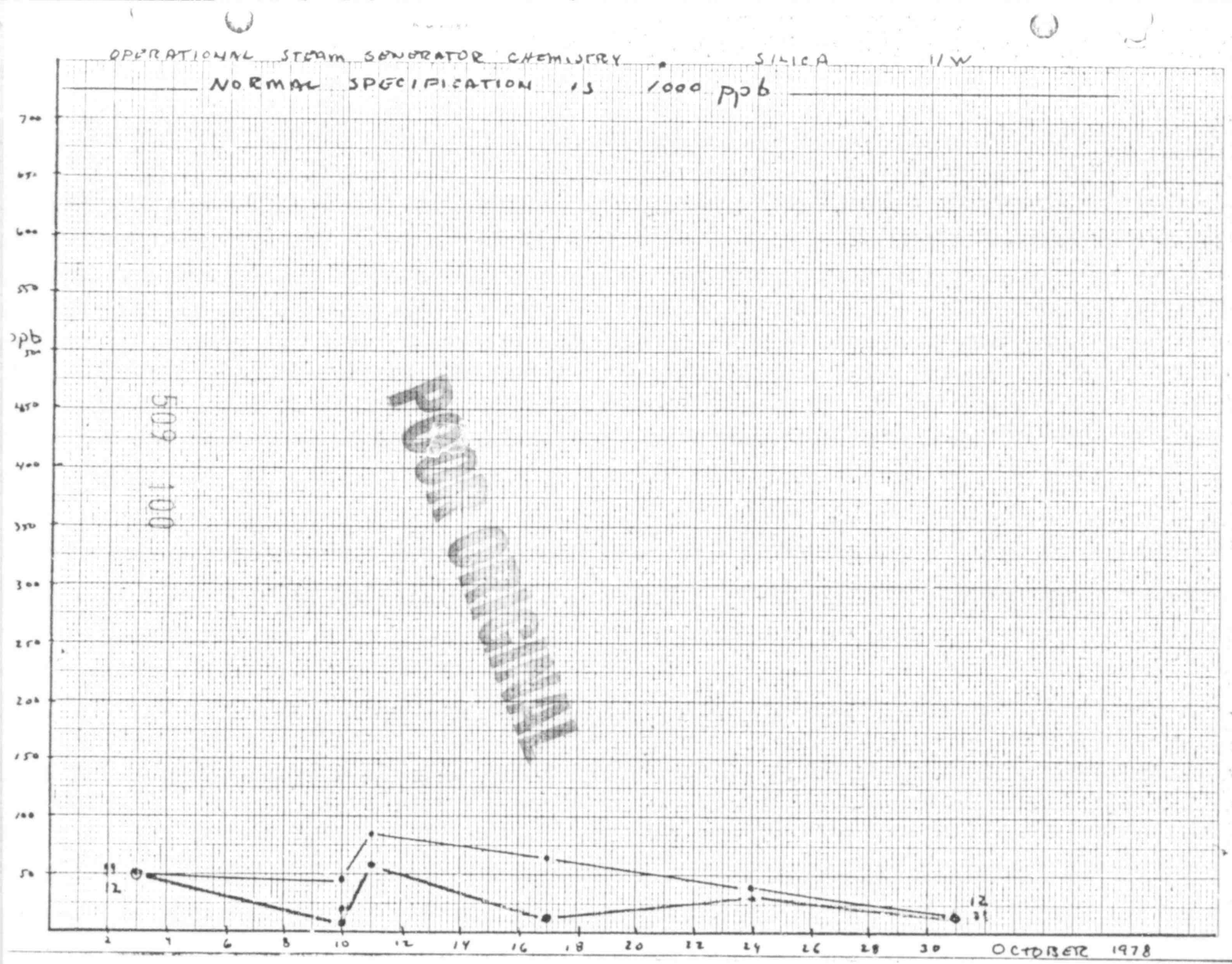

OPERATIONAL STEAM GENERATOR CHEMISTRY CLORIDES T/W
140
130
120
110
100
90
80
70
60
50
40
30
20
ppb
NORMAL SPECIFICATION
MINIMUM SENSITIVITY
11 12
11 12
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
OCTOBER 1978


OPERATIONAL STEAM GENERATOR CHEMISTRY • SUSPENDED SOLIDS 2/W
1600
1400
1200
1100
ppb
1000
NORMAL SPECIFICATION
800
700
600
500
400
300
200
100
11
12
13
12
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
OCTOBER 1978

OPERATIONAL STEAM GENERATOR CHEMISTRY • SILICA 11 W

NORMAL SPECIFICATION IS 1000 ppb

700
650
600
550
ppb 500
450
400
350
300
250
200
150
100
50

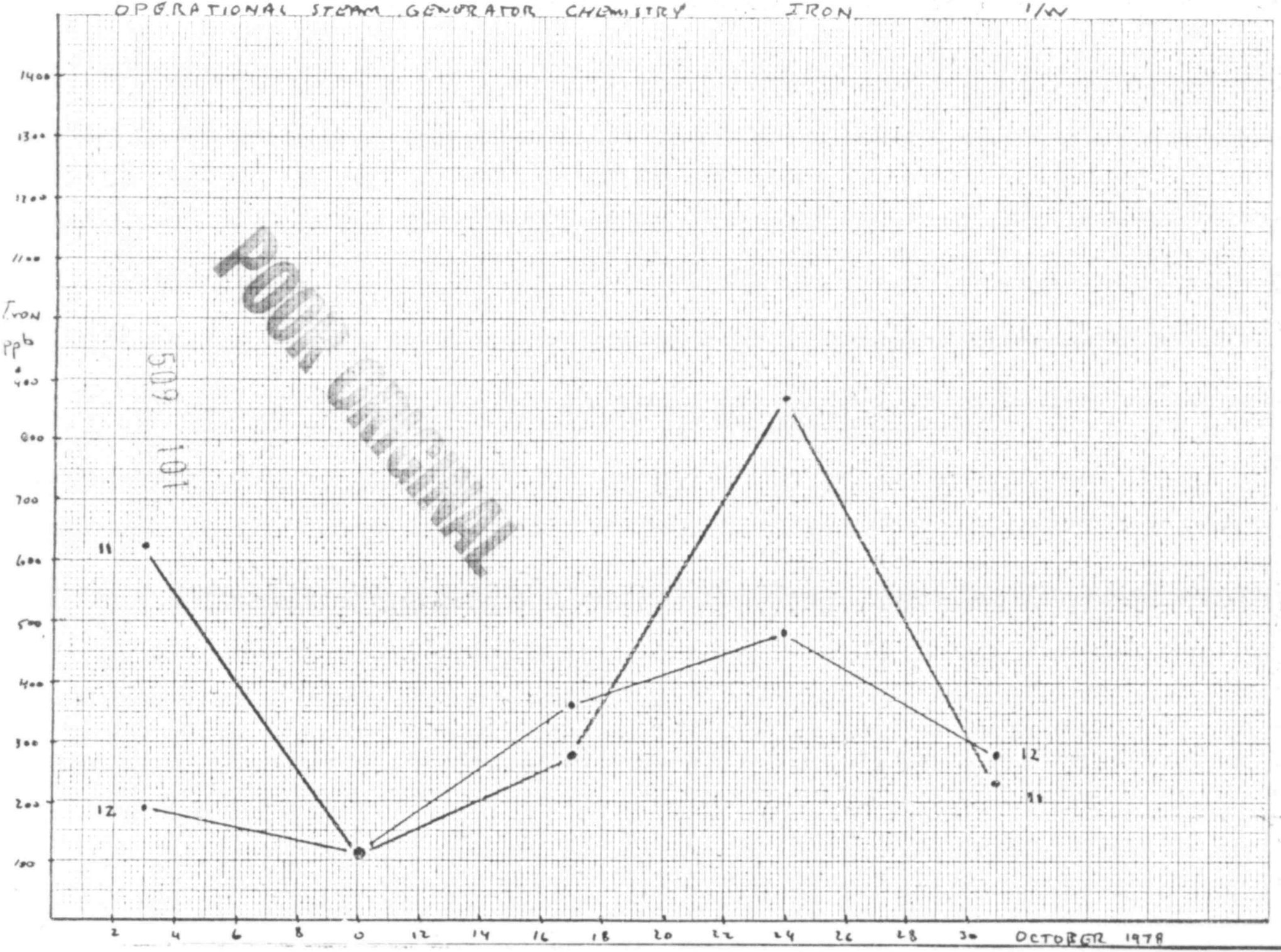


99
12

12
31

2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 OCTOBER 1978

OPERATIONAL STEAM GENERATOR CHEMISTRY IRON 1/W



OPERATIONAL STEAM GENERATOR CHEMISTRY — Copper — I/W