Form 01077 (R7-89) | FORM 101.1 | REVISION 13

CERTIFICATION OF ENGINEERING CALCULATION

STATION AND UNIT NUMBER Oconee Nuclear Station Unit-3

TITLE OF CALCULATION CFT check Values 3CF-11 and 3CF-13 Evaluation (G.L. 89-04)

CALCULATION NUMBER OSC-4976

ORIGINALLY CONSISTING OF:

PAGES 1 THROUGH 18

TOTAL ATTACHMENTS 2 TOTAL MICROFICHE ATTACHMENTS _____

TOTAL VOLUMES _____ TYPE I CALCULATION/ANALYSIS YES ☐ NO ☒

TYPE I REVIEW FREQUENCY _____

THESE ENGINEERING CALCULATIONS COVER QA CONDITION _____ ITEMS. IN ACCORDANCE WITH ESTABLISHED PROCEDURES, THE QUALITY HAS BEEN ASSURED AND I CERTIFY THAT THE ABOVE CALCULATION HAS BEEN ORIGINATED, CHECKED OR APPROVED AS NOTED BELOW:

ORIGINATED BY E.G. Abellana DATE 9/16/92

CHECKED BY Warren F. Wood DATE 11/2/92

APPROVED BY S L Hudson DATE 11-4-92

ISSUED TO TECHNICAL SERVICES DIVISION _____ DATE _____

RECEIVED BY TECHNICAL SERVICES DIVISION _____ DATE _____

MICROFICHE ATTACHMENT LIST: ☐ Yes ☑ No SEE FORM 101.4

REV. NO.	CALCULATION PAGES (VOL)			ATTACHMENTS (VOL)			VOLUMES		ORIG	CHKD	APPR	ISSUE DATE
	REVISED	DELETED	ADDED	REVISED	DELETED	ADDED	DELETED	ADDED	DATE	DATE	DATE	REC'D DATE

FOR INFORMATION ONLY

1.0 PROBLEM:

Generic Letter 89-04 requested that all active check valves which are required to open during accident condition(s) must be tested to the expected maximum full flow. However, for some check valves, this is impractical. Check valves 3CF-11 and 3CF-13 are impractical to test at design accident condition. These valves are designed (emergency condition) to pass 31,300 gpm provided the DP=77.1 psi at 110 deg.F (Ref. OSC-779). The minimum flow coefficient (Cv), derived from this criteria, is 3549.25. This flow coefficient must be met or exceeded in order to consider any flow test to be acceptable.

This calculation will document that the flow test performed (Attachment #1 & 2), verified the check valves can pass the required flow at accident condition.

2.0 RELATION TO NUCLEAR SAFETY:

This calculation is QA Condition 1. The CF system is required to flood the core during a LOCA.

3.0 DESIGN METHOD:

The design flowrate and Dp for the check valves will be used to determine the minimum flow coefficient (Cv) at design condition(s). This Cv will be used as the reference flow coefficient since this value is essentially constant at full flow.

From the test data, average time values of pressure drop, velocity head, and elevation difference will be calculated.

Core Flood Tank flow diagram and piping drawings will be reviewed to determine line loss coefficients and pressure drop. These coefficients will be inputted into the calculation along with average values determined from the test data to determine the head loss across the check valves.

The calculated head loss across the check valve must be less than the expected maximum head loss at test condition; if this the case the test has verified the check valve was fully stroked open and is capable of passing maximum flow.

4.0 APPLICABLE CODES AND STANDARD:

ANSI N45.2-11

5.0 DESIGN INPUTS:

5.1 ANSI N45.2-11 has been reviewed and all applicable inputs are addressed in the appropriate sections of the calculation.

5.2 The check valves were designed to suit normal operating condition which is primarily Core Flood Tank to RCS isolation. However, it is also required to operate under emergency condition. (Ref. OSC-779)

5.3 No instrument inaccuracies will be considered in the calculation.

5.4 Form losses due to elbows, fittings, etc. will not be entered in the calculation to determine line losses.

5.6 The flow test was performed by pressurizing the CFT(s) and discharging the contents to RCS with the transfer canal filled. The pressurizer level indication was used to correlate transfer canal level as shown in the data sheets (Att. #1&2). At the time of the test the pressurizer level stayed essentially constant, for CFT "A" test the initial pressurizer level indicated 314.1", after the test the final level indicated 319.2"; for CFT "B" initial and final were 319.8" and 325.6" respectively.

5.7 The test data shows that linear regression in the curve occurred at time T= 24 sec. to T=27 sec. for "A" CFT test and T=22 sec. to T=25 sec. for "B" CFT test. The calculation will focus on these data points as the valid test points because this it is when the test and system performance is at steady state.

5.8 To determine actual Transfer Canal level during shutdown/refueling, reference Filling and Draining Transfer Canal Procedure OP/1/A/1102/15

*Transfer Canal Full = 0" SFP level = Pressurizer 370"

0" SFP level = 840′ (Ref. 8.10)

6.0 FSAR CRITERIA:

FSAR Chapter 6.3.2.2.3 states that the Core Flooding System provides core protection continuity for intermediate large Reactor Coolant System (RCS) pipe failures. It automatically floods the core when the RCS pressure drops below 600 psig. The combined volume in the two tanks is sufficient to re-cover the core assuming no liquid remains in the reactor vessel following the LOCA.

7.0 ASSUMPTIONS:

7.1 Assume piping is clean. This a good assumption since the water in the core flood tank is closely controlled.

7.2 In the Design Input form losses are not to be considered, this is conservative, because with these losses the head loss across the check valves will be lower (see General Equation in the calculation).

7.3 Assume the increase level in the transfer canal is a negligible during the portion of the test data examined and should not add to any significant back pressure that could affect the over all result of the calculation. This is valid since the total level increase in both test cases is incrementally small as shown in the data sheets.

8.0 REFERENCES:

8.1 Crane Technical Paper No.410 (24th printing-1988)

8.2 OM-201-2454 Rev.D3 Core Flood Tank Instruction Manual

8.3 OM-245-0001-001 Rev.DB 3CF-11, 3CF-12, 3CF-13 & 3CF-14 manufacturer's drawing.

8.4 OM-2201-0124 Rev.E 3CF-1 & 3CF-2 manufacturer's drawing.

8.5 OFD-102A-3.3 Rev.4 Unit-3 Core Flood Flow Diagram

8.5 O-2478A Rev.26

8.6 O-2478B Rev.19

8.7 O-2479A Rev.32

8.8 O-2479B Rev.21

8.9 OFD-104-3.1 Rev.13

8.10 O- 480A Rev.28

8.11 OSC-779 Rev.0

9.0 CALCULATION:

9.1 Design: Cv calc. for 3CF-11,12,13,&14

*Q = 31,300 gpm *(Ref. OSC-779)
*Dp= 77.1 @ 110 F ($H_{Lv\ check}$)

$Cv = Q\ (p_{110\,F} / Dp\ \{62.4\})^{1/2}$ (Ref. 8.1)

where $p_{110\,F}$ = Density of water @ 110 F
$v_{110\,F}$ = Specific Volume @ 110 F
$p_{110\,F} = 1/v_{110\,F} = 1/.016165 = 61.86\ \#/ft^3$

$= 31{,}300\ (61.86/77.1\{62.4\})^{1/2}$

Cv = 3549.25 This is the Minimum Cv @ Full Flow

NOTE: All Cv resulting from the calculation below (9.3 & 9.4), as derived from $Q_{avg}(p/62.4\ H_{Lv\ check})^{1/2}$ must be greater than 3549.25.

Q_{avg} = Average flowrate at the test points

$H_{Lv\ check}$ = Head Loss for each valve (3CF-11,12,13,&14)

$p_{@Temp.\ F}$ = Density of water

9.2 General Equations:

Head Loss calc. for 3CF-11&12 AND 13&14 ($H_{Lv\ check}$)

$P_1+V_1^2/2g+Z_1 = P_2+V_2^2/2g+Z_2+H_f$ (Ref. 8.1)

P_1 = $P_{avg.\ CFT\ pressure}$ = CFT pressure over time (ft)

V_1 = Velocity of fluid in CFT = 0

Z_1 = $Z_{avg.\ CFT\ level}$ + bottom tap EL.= CFT level over time

P_2 = Transfer Canal level (ft)

V_2 = Velocity of fluid into the RCS

Z_2 = Discharge El. (CFT Disch. nozzle El.) = 811'6"

H_f = Sum of the following losses($H_{L\ pipe}$, $H_{Lv\ gate}$, $2H_{Lv\ check}$)

g = 32.2 ft/sec^2

therefore;

$2H_{Lv\ check} = DP+DV+DZ-H_{L\ pipe}-H_{Lv\ gate}$

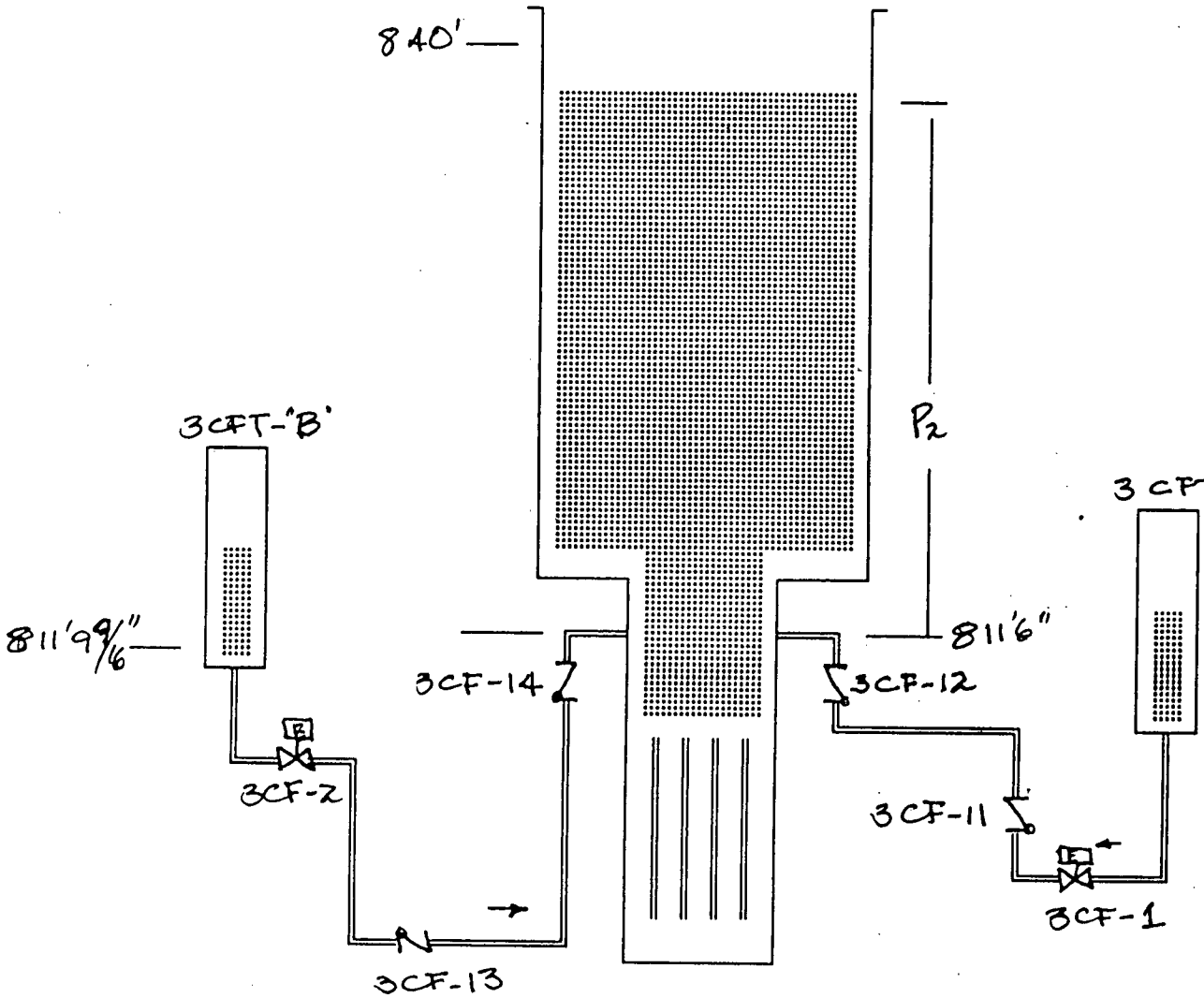
$DP = P_1 - P_2$

$DV = V_1^2/2g - V_2^2/2g$

$DZ = Z_1 - Z_2$

$H_{L\ pipe}$ = Piping Losses (Ref. 8.5 thru 8.8)

$H_{Lv\ gate}$ = Valve Losses (Ref. 8.4)


840'
P2
3CFT-"B"
3CFT-"A"
811'9 9/16"
811'6"
3CF-14
3CF-12
790'3 1/2"
(Bottom Tap Inst. El.
3CF-2
3CF-11
3CF-1
3CF-13

9.3 CALC: CFT "A"

Q_{avg} = (Tank level change)$_{\text{from T=24sec to T=27sec}}$ x CFT Area x 448.8

Tank level change = ft/sec
CFT Area = 67.96 sq.ft (Ref. 8.2)
448.8 = 7.48 gal/cu.ft x 60 sec/min

Q_{avg} = {(11.04 ft.- 9.85 ft.)/3sec}(67.96)(448.8) (Att. #1)

Q_{avg} = 12098.51 gpm or 26.96 ft^3/sec

V_1 = Velocity of fluid in CFT = 0

V_2 = Velocity of fluid into the RCS = Q_{avg} / A
D = 14" sch.140 = 11.50" = .9583 ft
A = 3.14 D^2 / 4
= .72 ft^2

V_2 = (26.96 ft^3/sec) / .72 ft^2 = 37.44 ft/sec

DV = $V_1^2/2g - V_2^2/2g$ = -21.77 ft.

P_1 = $P_{avg.\ CFT\ pressure}$ = CFT pressure over time (ft)

P_1 = ($P_{@T=24sec} + P_{@T=25sec} + P_{@T=26sec} + P_{@T=27sec}$)/4

P_1 = (65.63 + 60.75 + 56.59 + 52.89) / 4 (Att. #1)

P_1 = $P_{avg.\ CFT\ pressure}$ = 58.97 psig or 136.21 ft
(@ 64.9 F Density=62.34) (Att. #1)

P_2 = Transfer Canal level (ft) = 23.84 (Ref. 8.9, 8.10 & Design Input 5.8)

NOTE: The pressure in the Transfer Canal is a function of level above the center line of the CFT disch. nozzle (811.5'). When the Pressurizer is full 370" level, the elevation in the transfer canal is 840'. During the CFT "A" test the Pressurizer level was initially @ 314.1", this is equivalent to 835.34' transfer canal elevation (as derived Transfer Canal level = 840 - (370-314.1)/12 = 835.34).
Therefore P_2 is 835.34 - 811.5 = 23.84 ft.

DP = $P_1 - P_2$ = 136.21 - (835.34 - 811.5) = 112.37 ft

CFT "A"

Z_1 = $Z_{avg.\ CFT\ level}$ + bottom tap EL. (Att.#1 & Ref.8.6)

= ($Z_{@T=20sec}$ + $Z_{@T=21sec}$ + $Z_{@T=22sec}$ + $Z_{@T=23sec}$)/4

= (11.04 + 10.63 + 10.24 + 9.85) / 4 + 790'3 1/2"

= 800.73 ft

Z_2 = Discharge El. (CFT Disch. nozzle El.) = 811'6" (Ref.8.8)

$DZ = Z_1 - Z_2 = -10.77$ ft

$H_{L\ pipe} = f\{L/D\}\{V^2/2g\}$ (Ref.8.1)

$f = f_t = .013$
$L = 97.81$ ft (Ref. 8.5 thru 8.8)
$D = 14"$ sch.140 $= 11.5" = .96$ ft
$V = V_2 = 37.44$ ft/sec

$H_{L\ pipe} = 28.83$ ft.

$H_{Lv\ gate} = K\ \{V^2/2g\}$ (Ref.8.1, 8.4)

$K = K_2 = [K_1 + \text{Sin}\ \phi/2\ \{.8(1-B^2)+2.6(1-B^2)^2]\ /\ B^4$

$K_1 = 8f_t = 8(.013) = .104$

Assume $\phi = 45°$

$B = d_1 / d_2 = .91$

$B^2 = .83$ & $B^4 = .69$

where; $d_1 = 10.50" = .875$ ft (Ref.8.4) Per Steve Adams the ID is 10.5" as provided by Velan Co.

$d_2 = 11.5" = .96$ ft

$K_2 = .27$

$V = Q_{avg}/A = (26.96\ ft^3/sec) / (3.14\{.96\}^2)/4$
A = valve seat area
$V = 37.25$ ft/sec

$H_{Lv\ gate} = .27(37.25)^2 / 64.4 = 5.82$ ft

CFT "A"

$2H_{Lv\ check} = DP+DV+DZ-H_{L\ pipe}-H_{Lv\ gate}$

$H_{Lv\ check}$ = (112.37 - 21.77 -10.77 - 28.83 - 5.82) / 2

= 22.59 ft = 9.78 psi

To verify if Q_{avg} was adequate to fully open the check valve the above head loss must result in a Cv greater than 3549.25.

$Cv = Q_{avg}(p/62.4\ H_{Lv\ check})^{1/2}$

= 12098.51 gpm (62.34/62.41{9.78} psig)$^{1/2}$

= 3866.51 THIS IS GREATER THAN THE REFERENCE Cv, THEREFORE THE FLOW TEST VERIFIED THE CHECK VALVE CAN PASS FULL FLOW.

9.4 CALC: CFT "B"

Q_{avg} = (Tank level change)$_{\text{from T=22sec to T=25}}$ x CFT Area x 448.8

Tank level change = ft/sec
CFT Area = 67.96 sq.ft (Ref. 8.2)
448.8 = 7.48 gal/cu.ft x 60 sec/min

Q_{avg} = {(11.32 ft.-10.21 ft.)/3sec}(67.96)(448.8) (Att. #2)

Q_{avg} = 11285.17 gpm or 25.15 ft^3/sec

V_1 = Velocity of fluid in CFT = 0

V_2 = Velocity of fluid into the RCS = Q_{avg} / A
D = 14" sch.140 = 11.50" = .9583 ft
A = 3.14 D^2 / 4
= .72 ft^2

V_2 = (25.15 ft^3/sec) / .72 ft^2 = 34.93 ft/sec

DV = $V_1^2/2g - V_2^2/2g$ = -18.95 ft.

P_1 = $P_{avg.\ CFT\ pressure}$ = CFT pressure over time (ft)

P_1 = ($P_{@T=22sec} + P_{@T=23sec} + P_{@T=24sec} + P_{@T=25sec}$)/4

P_1 = (43.56 + 39.92 + 36.89 + 34.48) / 4 (Att. #2)

P_1 = $P_{avg.\ CFT\ pressure}$ = 38.71 psig or 89.43 ft
(@ 68.7 F Density=62.4) (Att. #2)

P_2 = Transfer Canal level (ft) = 24.32 (Ref. 8.9, 8.10 & Design Input 5.8)

NOTE: The pressure in the Transfer Canal is a function of level above the center line of the CFT disch. nozzle (811'6"). When the Pressurizer is full 370", level the elevation in the transfer canal is 840'. During the CFT "B" test the Pressurizer level was initially @ 319.8", this is equivalent to 835.82' in transfer canal elevation (as derived below). Transfer Canal level = 840 - (370-319.8)/12 = 835.82
Therefore P_2 is equal to 835.82 - 811.5 = 24.32 ft.

CFT "B"

$DP = P_1 - P_2 = 89.43 - 24.32 = 65.11$ ft

$Z_1 = Z_{avg.\ CFT\ level}$ + bottom tap EL. (Att.#1 & Ref.8.6)

$= (Z_{@T=22sec} + Z_{@T=23sec} + Z_{@T=24sec} + Z_{@T=25sec})/4$ + 811'9 9/16"

$= (11.32 + 10.95 + 10.57 + 10.20) / 4$ + 811'9 9/16"

$= 822.56$ ft

Z_2 = Discharge El. (CFT Disch. nozzle El.) = 811'6" (Ref.8.8)

$DZ = Z_1 - Z_2 = 11.06$ ft

$H_{L\ pipe} = f\{L/D\}\{V^2/2g\}$ (Ref.8.1)

$f = f_t = .013$

$L = 75.35$ ft (Ref. 8.5 thru 8.8)

$D = 14$" sch.140 $= 11.5" = .96$ ft

$V = V_2 = 34.93$ ft/sec

$= .013\{75.35/.96\}\{34.93^2/2(32.2)\}$

$H_{L\ pipe} = 19.33$ ft.

$H_{Lv\ gate} = K\ \{V^2/2g\}$ (Ref.8.1, 8.4)

$K = K_2 = [K_1 + \sin \phi/2\ \{.8(1-B^2)+2.6(1-B^2)^2] / B^4$

$K_1 = 8f_t = 8(.013) = .104$

Assume $\phi = 45°$

$B = d_1 / d_2 = .91$

$B^2 = .83$ & $B^4 = .69$

where; $d_1 = 10.50" = .875$ ft (Ref.8.4) See Note CFT "A" Calc. Section 9.3

$d_2 = 11.5" = .96$ ft

$K_2 = .27$

CFT "B"

$V = Q_{avg}/A = (25.15\ ft^3/sec) / (3.14\{.96\}^2)/4$

A = valve seat area

V = 34.75 ft/sec

$H_{Lv\ gate} = .27(34.75)^2 / 64.4 = 5.06$ ft

$2H_{Lv\ check} = DP+DV+DZ-H_{L\ pipe}-H_{Lv\ gate}$

$H_{Lv\ check} = (65.11 - 18.95 + 11.06 - 19.33 - 5.06) / 2$

$= 16.42$ ft $= 7.11$ psi

To verify if Q_{avg} was adequate to fully open the check valve the above head loss must result in a Cv greater than 3549.25.

$Cv = Q_{avg}(p/62.4\ H_{Lv\ check})^{1/2}$

$= 11285.17$ gpm $(62.34/62.41\{7.11\}$ psig$)^{1/2}$

= 4229.90 THIS IS GREATER THAN THE REFERENCE Cv, THEREFORE THE FLOW TEST VERIFIED THE CHECK VALVE CAN PASS FULL FLOW

10.0 CONCLUSION:

The flow test is considered a valid verification that the valves can pass the required flow at accident condition. This verification is valid for 3CF-11 & 12 and 3CF-13 & 14.

Attachment 1 # 1
Pg 1/3
OSC-4976

PT/3/A/0150/45
Attachment 2
8/9/92

"3A" CFT Temperature at beginning of test = 64.9 F At end of test = 64.9 F
Pressurizer level at beginning of test = 314.1 inches At end of test = 319.2

TIME	A1 CFT LVL	A2 CFT LVL	A1 CFT PRESS	A2 CFT PRESS
0	12.9976	12.9528	101.9375	95.7425
1	12.9955	12.9528	101.878	95.557
2	12.9976	12.9507	101.9375	95.823
3	12.9976	12.9507	101.9585	95.6165
4	12.9955	12.9507	101.8185	95.76
5	12.9976	12.9528	101.899	95.5955
6	12.9955	12.9528	101.9165	95.76
7	12.9976	12.9507	101.9165	95.536
8	12.9955	12.9507	101.9795	95.8615
9	12.9976	12.9528	101.9165	95.5955
10	12.9976	12.9528	101.878	95.9035
11	12.9976	12.9486	101.9165	95.4345
12	12.9976	12.9528	101.878	95.8825
13	12.9976	12.9528	101.878	95.515
14	12.9976	12.9528	101.9585	95.655
15	12.9976	12.9528	101.9585	95.6165
16	12.99935	12.9507	102.0775	95.76
17	12.96295	12.91605	101.9585	95.676
18	12.8919	12.84885	99.806	93.3415
19	12.73965	12.69065	95.676	89.278
20	12.50585	12.45685	90.006	83.4435
21	12.19505	12.14395	83.65	76.5975
22	11.83525	11.7887	77.1855	70.5425
23	11.445	11.39425	71.1305	64.12
✓24	✓11.04075	10.99385	✓ 65.625	58.737
✓25	✓ 10.6323	10.59135	✓60.7495	53.7985
✓26	✓ 10.2382	10.1934	✓56.5845	49.574
✓27	✓ 9.8518	9.80525	✓ 52.885	45.8955
28	9.4801	9.4416	49.6335	42.665
29	9.12485	9.0881	46.9105	39.942
30	8.7871	8.75035	44.6775	37.4815
31	8.46405	8.4273	42.399	35.35
32	8.15535	8.08815	40.712	33.4775
33	7.86065	7.7651	38.927	31.871
34	7.5824	7.4704	37.4605	30.45
35	7.31395	7.2065	36.2215	29.008
36	7.05985	6.95415	35.042	27.8915
37	6.8201	6.71475	34.09	26.8345
38	6.59085	6.48515	33.278	25.8405
39	6.37105	6.2657	32.137	25.067

Attachment # 1
Pg 1/5
OSC-4976

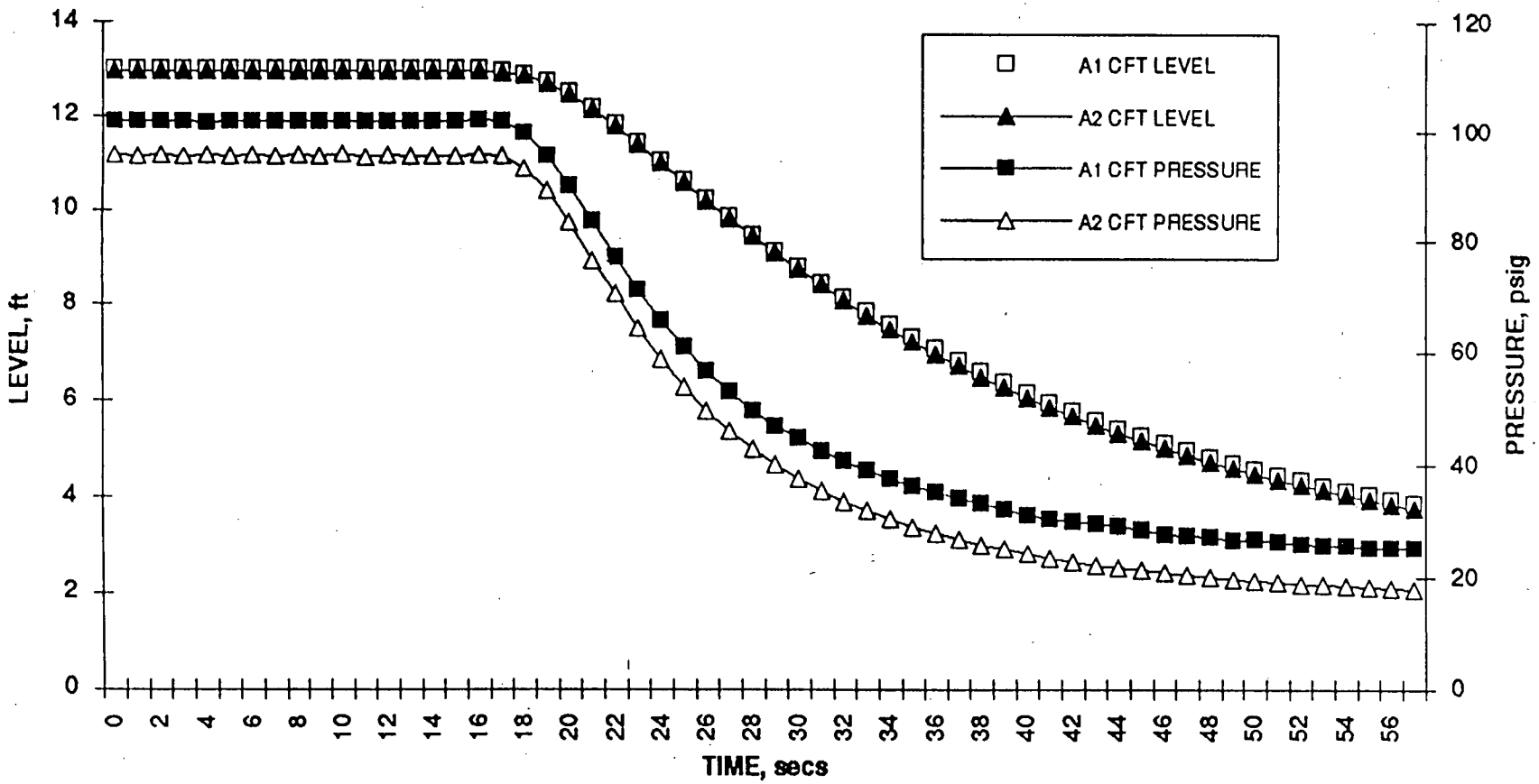
PT/3/A/0150/45
Attachment 2
8/9/92

"3A" CFT Temperature at beginning of test = 64.9 F At end of test = 64.9 F
Pressurizer level at beginning of test = 314.1 inches At end of test = 319.2

TIME	A1 CFT LVL	A2 CFT LVL	A1 CFT PRESS	A2 CFT PRESS
40	6.16	6.0585	31.1045	24.255
41	5.9626	5.8611	30.5515	23.541
42	5.77395	5.6742	30.044	22.869
43	5.5909	5.4936	29.617	22.302
44	5.4201	5.3228	29.092	21.714
45	5.2577	5.16215	28.6055	21.308
46	5.1051	5.0078	27.769	20.8635
47	4.95915	4.86325	27.447	20.391
48	4.8188	4.72535	27.181	20.09
49	4.6865	4.59515	26.6945	19.684
50	4.5626	4.47125	26.754	19.397
51	4.445	4.3533	26.348	19.131
52	4.3351	4.24165	26.103	18.872
53	4.2294	4.13805	25.8195	18.6865
54	4.12965	4.0404	25.697	18.5045
55	4.0383	3.94905	25.4345	18.298
56	3.95115	3.8619	25.3085	18.137
57	3.86785	3.78035	25.3085	18.018

Attachment #1
P3/3
OSC-4976

3 A CFT PRESSURE AND LEVEL VS TIME



PT/3/A/0150/45
Attachment 3
8/9/92

Attachment #2
Pg 1/6
OSC-4976

"3B" CFT Temperature at beginning of test = 68.7 F At end of test = 68.8 F
Pressurizer level at beginning of test = 319.8 inches At end of test = 325.6

TIME	B1 CFT LVL	B2 CFT LVL	B1 CFT PRESS	B2 CFT PRESS
0	13.1334	13.349	67.0915	61.8695
1	13.1313	13.35285	67.053	61.9115
2	13.1292	13.34445	67.1335	61.929
3	13.1334	13.349	67.0915	61.8905
4	13.1313	13.34445	67.0915	61.95
5	13.1313	13.349	67.1125	61.971
6	13.1313	13.3511	67.1125	61.9115
7	13.1313	13.349	67.0915	61.8905
8	13.1313	13.3511	67.1125	61.95
9	13.1334	13.3469	67.0915	61.8905
10	13.1313	13.34445	67.074	61.8695
11	13.1334	13.3511	67.1125	61.95
12	13.1334	13.34445	67.1335	61.9115
13	13.1313	13.3469	67.1335	61.95
14	13.1334	13.3469	67.032	61.8485
15	13.10295	13.31015	66.6855	61.5055
16	13.04205	13.23525	64.9565	59.7975
17	12.91185	13.0438	62.237	56.952
18	12.69275	12.83065	58.758	53.3365
19	12.43025	12.53595	55.02	49.455
20	12.089	12.215	50.9565	45.227
21	11.69875	11.85135	46.711	41.4085
22	11.3148	11.4954	43.561	37.5235
23	10.9452	11.12965	39.9245	34.195
24	10.5651	10.7639	36.897	31.2865
25	10.20355	10.4006	34.4785	28.588
26	9.8497	10.059	32.3855	26.25
27	9.51055	9.73175	29.988	24.136
28	9.19135	9.4192	28.056	22.4315
29	8.88475	9.1203	26.4495	20.741
30	8.58795	8.8256	25.13	19.2815
31	8.30725	8.5491	24.0135	18.0005
32	8.0395	8.27925	22.792	16.821
33	7.777	8.01885	21.98	15.8235
34	7.5355	7.777	20.622	14.931
35	7.3038	7.54565	19.768	13.937
36	7.07595	7.3199	19.362	13.223
37	6.85685	7.10465	18.6095	12.5335
38	6.65735	6.89745	17.7135	11.823
39	6.45645	6.70005	17.1885	11.2525
40	6.2657	6.5135	16.842	10.6855
41	6.08265	6.33045	16.2295	10.178
42	5.91395	6.1579	15.7045	9.772

Attachment #2
P2/6
OSC-4976

"3B" CFT Temperature at beginning of test = 68.7 F At end of test = 68.8 F
Pressurizer level at beginning of test = 319.8 inches At end of test = 325.6

43	5.74945	5.99305	15.2145	9.282
44	5.59265	5.8345	14.91	8.834
45	5.4404	5.684	14.644	8.554
46	5.2962	5.54015	14.2625	8.1655
47	5.1583	5.40155	13.895	7.8995
48	5.02775	5.2717	13.65	7.574
49	4.90595	5.1478	13.3665	7.3115
50	4.7859	5.02985	13.104	7.049
51	4.6725	4.9182	12.859	6.8425
52	4.57065	4.8146	12.698	6.7025
53	4.46915	4.7131	12.6175	6.475
54	4.37745	4.61755	12.411	6.335
55	4.2861	4.52795	12.1905	6.153
56	4.20105	4.4429	12.1065	6.055
57	4.1237	4.36345	12.005	5.908
58	4.04635	4.2903	11.8825	5.789
59	3.9774	4.2189	11.7845	5.7085
60	3.9123	4.15205	11.739	5.6665
61	3.84965	4.08905	11.6585	5.523
62	3.7884	4.03235	11.578	5.481
63	3.73555	3.9774	11.459	5.4215
64	3.68515	3.92455	11.4765	5.4215
65	3.6358	3.87765	11.3785	5.362
66	3.5952	3.8332	11.417	5.341
67	3.55075	3.7905	11.3575	5.3025
68	3.51015	3.75165	11.3575	5.362
69	3.4692	3.71525	11.333	5.2815
70	3.4349	3.6806	11.312	5.32
71	3.40445	3.6484	11.2735	5.2605
72	3.374	3.61795	11.2945	5.236
73	3.3474	3.59345	11.312	5.236
74	3.3271	3.57315	11.333	5.2815
75	3.31065	3.5567	11.396	5.341
76	3.29665	3.54445	11.459	5.362
77	3.2886	3.5364	11.4765	5.383
78	3.28475	3.53045	11.5185	5.4635
79	3.28055	3.52835	11.4975	5.523
80	3.2781	3.5266	11.578	5.6035
81	3.2781	3.5266	11.718	5.628
82	3.2767	3.5266	11.7635	5.6665
83	3.2767	3.5266	11.844	5.768
84	3.28055	3.5266	11.865	5.8275
85	3.28055	3.5266	11.9665	5.908
86	3.2767	3.5266	12.005	5.908

Attachment # 2
P3/6
OSC-4976

"3B" CFT Temperature at beginning of test = 68.7 F At end of test = 68.8 F
Pressurizer level at beginning of test = 319.8 inches At end of test = 325.6

87	3.27215	3.5245	12.0645	6.034
88	3.2683	3.52205	12.1065	6.0095
89	3.2662	3.51855	12.1065	6.055
90	3.26025	3.51015	12.1275	6.153
91	3.2501	3.5021	12.1275	6.195
92	3.2354	3.48775	12.166	6.1355
93	3.21755	3.4713	12.2115	6.174
94	3.20145	3.4531	12.2115	6.153
95	3.1808	3.4307	12.2115	6.153
96	3.15665	3.40445	12.1905	6.0725
97	3.12795	3.37785	12.166	6.1145
98	3.1017	3.3474	12.0645	6.0935
99	3.0688	3.31485	12.1065	6.055
100	3.0366	3.28265	12.047	5.9885
101	3.0023	3.248	11.984	5.929
102	2.96765	3.21545	11.9455	5.929
103	2.933	3.1808	11.9245	5.8695
104	2.89835	3.14615	11.9035	5.8485
105	2.8637	3.11395	11.7985	5.768
106	2.8294	3.0793	11.6795	5.747
107	2.79895	3.04675	11.7005	5.6665
108	2.7685	3.0163	11.7005	5.7085
109	2.7398	2.9855	11.7005	5.642
110	2.71145	2.9596	11.6375	5.6665
111	2.68695	2.933	11.6375	5.6035
112	2.66245	2.90885	11.7005	5.544
113	2.6404	2.8861	11.6375	5.6035
114	2.6159	2.8658	11.578	5.523
115	2.5977	2.8497	11.5395	5.523
116	2.57915	2.8315	11.4765	5.523
117	2.56515	2.81715	11.5185	5.502
118	2.555	2.8049	11.4975	5.5825
119	2.54485	2.79475	11.5185	5.544
120	2.53645	2.78495	11.62	5.502
121	2.5284	2.77655	11.6375	5.544
122	2.52245	2.7685	11.599	5.6035
123	2.5165	2.7643	11.6585	5.5615
124	2.51055	2.76045	11.6795	5.6665
125	2.50635	2.75835	11.7635	5.7085
126	2.50425	2.75625	11.6585	5.7085
127	2.50425	2.75625	11.7635	5.789
128	2.50635	2.75415	11.718	5.747
129	2.50425	2.75415	11.7005	5.747
130	2.50425	2.75415	11.7985	5.789

Attachment #2
P4/6
OSC-4976

"3B" CFT Temperature at beginning of test = 68.7 F At end of test = 68.8 F
Pressurizer level at beginning of test = 319.8 inches At end of test = 325.6

131	2.5025	2.75415	11.823	5.8275
132	2.50425	2.7524	11.9665	5.789
133	2.50425	2.7524	11.9035	5.8695
134	2.5004	2.7524	11.9245	5.8485
135	2.5004	2.7503	11.9665	5.908
136	2.49585	2.7482	11.9665	5.908
137	2.49585	2.74575	11.9035	5.95
138	2.4899	2.74435	12.005	5.887
139	2.4878	2.7398	12.026	5.929
140	2.48185	2.73595	12.026	5.9885
141	2.47975	2.72755	12.026	5.95
142	2.4738	2.7216	12.026	5.9675
143	2.46365	2.71355	12.1065	5.9885
144	2.4493	2.70165	12.047	5.9885
145	2.43705	2.68695	12.047	5.95
146	2.42515	2.67505	12.0855	5.929
147	2.4087	2.6565	11.9665	5.887
148	2.3905	2.6404	12.026	5.929
149	2.37195	2.62185	11.984	5.887
150	2.35375	2.6019	11.9455	5.8065
151	2.33135	2.5816	11.9455	5.789
152	2.3114	2.56305	11.865	5.768
153	2.29075	2.5431	11.8825	5.747
154	2.27255	2.52245	11.865	5.747
155	2.25645	2.50425	11.844	5.747
156	2.23615	2.48395	11.823	5.6875
157	2.22005	2.46785	11.718	5.6875
158	2.20325	2.4493	11.823	5.642
159	2.1833	2.4332	11.7005	5.642
160	2.1693	2.4171	11.7005	5.6035
161	2.15285	2.40065	11.6795	5.544
162	2.1385	2.3863	11.578	5.628
163	2.12625	2.37405	11.6585	5.544
164	2.114	2.3618	11.62	5.5615
165	2.10385	2.352	11.6795	5.6035
166	2.0958	2.34185	11.6375	5.544
167	2.08565	2.33345	11.6585	5.6035
168	2.0776	2.3275	11.6375	5.5615
169	2.0713	2.3212	11.6585	5.5615
170	2.06745	2.31735	11.6375	5.5825
171	2.06955	2.31735	11.7635	5.6035
172	2.06325	2.31525	11.62	5.628
173	2.06745	2.31525	11.718	5.628
174	2.06535	2.31525	11.6795	5.642

Attachment # 2
P5/6
OSC-4976

"3B" CFT Temperature at beginning of test = 68.7 F At end of test = 68.8 F
Pressurizer level at beginning of test = 319.8 inches At end of test = 325.6

175	2.06535	2.31525	11.7635	5.628
176	2.06325	2.31525	11.739	5.6665
177	2.06325	2.31315	11.7635	5.642
178	2.06325	2.31525	11.6795	5.6875
179	2.06325	2.31315	11.739	5.726
180	2.06325	2.31315	11.6795	5.6875
181	2.06325	2.31315	11.844	5.747
182	2.06535	2.31315	11.739	5.8065
183	2.06325	2.31315	11.823	5.7085
184	2.0594	2.3114	11.9035	5.747
185	2.0615	2.3114	11.8825	5.768
186	2.0594	2.3093	11.865	5.768
187	2.0573	2.3093	11.984	5.789
188	2.0573	2.3093	11.9245	5.8065
189	2.0573	2.3093	11.9455	5.8275
190	2.0552	2.3072	11.9035	5.8485
191	2.05345	2.3072	11.9035	5.8695
192	2.05345	2.3051	11.9035	5.8485
193	2.05135	2.303	11.9035	5.8695
194	2.04925	2.303	11.9455	5.908
195	2.05135	2.29915	11.8825	5.8695
196	2.0447	2.29705	11.9245	5.887
197	2.0468	2.2946	11.9665	5.929
198	2.04085	2.29075	11.9455	5.908

Attachment # 2
Pg 16
OSC - 4976

3B CFT PRESSURE AND LEVEL VS TIME