Form 01077 (R7-89)

FORM 101.1	REVISION 13

CERTIFICATION OF ENGINEERING CALCULATION

STATION AND UNIT NUMBER Oconee Nuclear Station Unit-1

TITLE OF CALCULATION CFT Check valve CF-11 & CF-13 Evaluation (G.L. 89-04)

CALCULATION NUMBER OSC-4500 (Type III)

ORIGINALLY CONSISTING OF:

PAGES 1 THROUGH 18

TOTAL ATTACHMENTS 1 TOTAL MICROFICHE ATTACHMENTS

TOTAL VOLUMES TYPE I CALCULATION/ANALYSIS YES ☐ NO ☒

TYPE I REVIEW FREQUENCY

THESE ENGINEERING CALCULATIONS COVER QA CONDITION 1 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 C. G. Abellana DATE 9/11/91

CHECKED BY John R. [illegible] DATE 1/8/92

APPROVED BY S L Nader DATE 1-9-92

ISSUED TO TECHNICAL SERVICES DIVISION Ch Sparrow DATE 1/10/92

RECEIVED BY TECHNICAL SERVICES DIVISION C E Blakeney DATE 1/15/92

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

INFORMATION ONLY

9211240058 921116
PDR ADOCK 05000269
P PDR

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 1CF-11 and 1CF-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), 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

0040280 0125

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). At the time of the test the pressurizer level stayed essentially constant, for CFT "A" test the initial pressurizer level indicated 308", after the test the final level indicated 308.8"; for CFT "B" initial and final were 300.3" and 301" respectively.

5.7 The test data shows that linear regression in the curve occurred at time T=6sec to T=10sec. The calculation will focus on these data points as the only valid points in the test because this is when the test and system performance is at steady state.

5.8 To determine actual Transfer Canal level during shutdown/refueling, Design Engineering requested Tom Couto (Unit-1 Operating Engineer) to correlate pressurizer level to transfer canal level.

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

0" SFP level = 840' (Ref. 8.10)

*NOTE: Ref. Filling and Draining Transfer Canal Procedure OP/1/A/1102/15

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 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 1CF-11, 1CF-12, 1CF-13 & 1CF-14 manufacturer's drawing.

8.4 OM-201-0163 Rev.DD 1CF-1 & 1CF-2 manufacturer's drawing.

8.5 OFD-102A-1.3 Rev.7 Unit-1 Core Flood Flow Diagram

8.5 O-478A Rev.38

8.6 O-478B Rev.34

8.7 O-479A Rev.44

8.8 O-479B Rev.52

8.9 O-69D Rev.15

8.10 OFD-104-1.1 Rev.12

8.11 O-480 Rev.37

9.0 CALCULATION:

9.1 Design: Cv calc. for 1CF-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 $Q_{avg}(1/H_{Lv\ check})^{1/2}$ must be greater than 3549.25.

Q_{avg} = Average flowrate at the test points

$H_{Lv\ check}$ = Head Loss for each valve (1CF-11,12,13,&14)

9.2 General Equations:

Head Loss calc. for 1CF-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

therefore;

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

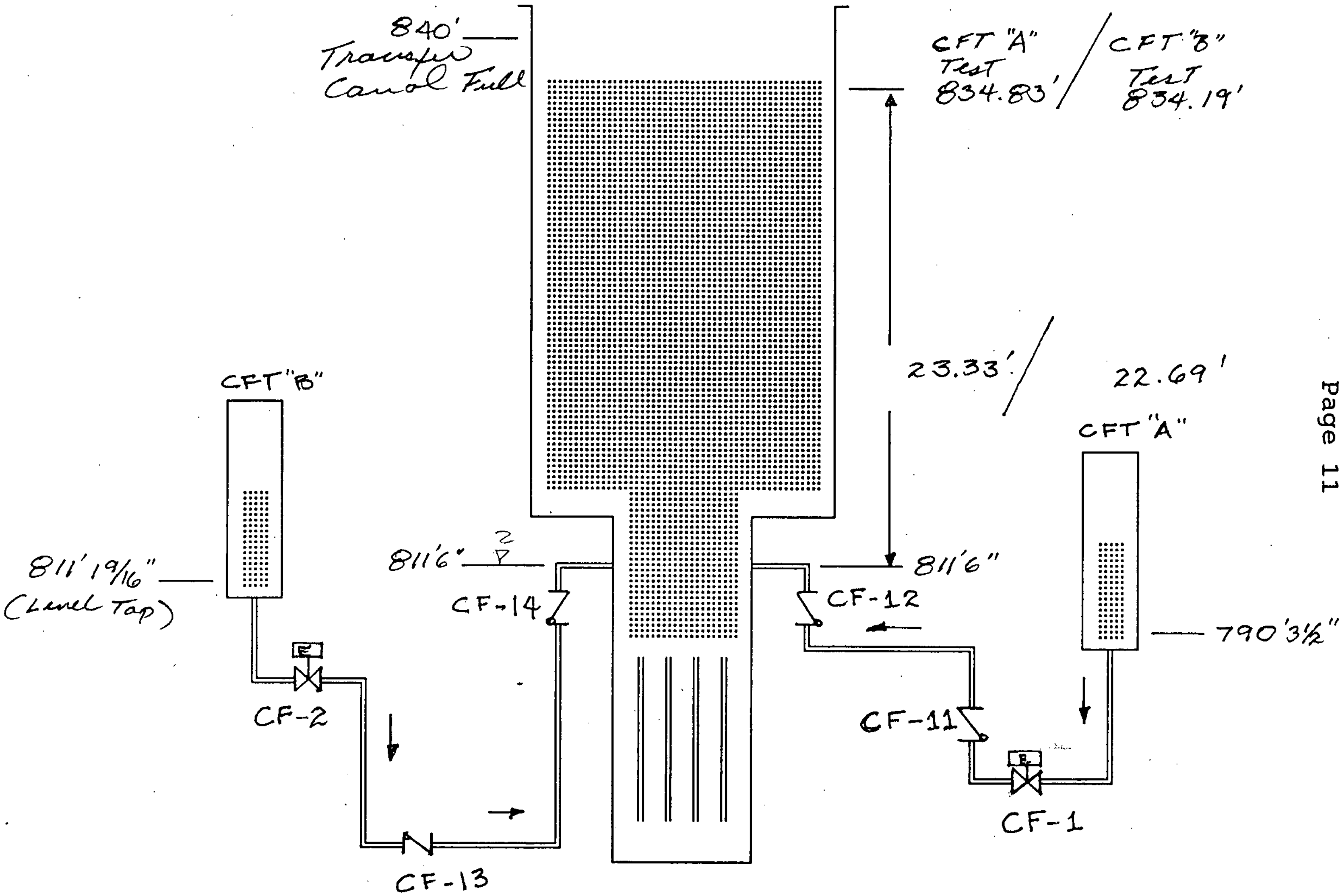
$DP = P_1 - P_2$

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

$DZ = Z_1 - Z_2$

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

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


840'
Transfer Canal Full
CFT "A" Test 834.83'
CFT "B" Test 834.19'
23.33'
22.69'
CFT "B"
CFT "A"
811' 1 9/16"
(Level Tap)
811'6"
811'6"
790'3½"
CF-14
CF-12
CF-2
CF-11
CF-1
CF-13

9.3 CALC: CFT "A"

Q_{avg} = (Tank level change)$_{\text{from T=7sec to T=9sec}}$ x CFT Area x 448.8

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

Q_{avg} = {(10.49 ft.-9.74 ft.)/2sec}(67.96)(448.8) (Att. #1)

Q_{avg} = 11438 gpm or 25.49 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 = (25.49 ft^3/sec) / .72 ft^2 = 35.39 ft/sec

DV = $V_1^2/2g - V_2^2/2g$ = -19.44 ft.

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

$P_{initial}\ V_{initial} = P_{T=7sec}\ V_{T=7sec} = P_{T=8sec}\ V_{T=8sec} = ..P_{T=xsec}\ V_{T=xsec}$

$P_{initial}$ =73.70 psig (Att. #1)

$V_{initial}$ = CFT Total Vol. - CFT Liquid Vol.
= 1410 ft^3 - (12.117 ft)(67.96 ft^2) (Ref. 8.2, Att. #1)
= 586.53 ft^3

$P_{T=7sec}$ = (73.70)(586.53) /{1410 - (10.49)(67.96)}
= 62.01 psi

$V_{T=7sec}$ = 1410 - (10.94)(67.96) = 666.52

$P_{T=8sec}$ = (64.85)(666.52) /{1410 - (10.11)(67.96)}
= 59.79

$V_{T=8sec}$ = 722.92

$P_{T=9sec}$ = (59.79)(722.92) / {1410 - (9.74)(67.96)}
= 57.78

CFT "A"

$V_{T=9sec}$ = 748.07

$P_{avg.\ CFT\ pressure}$ = (62.01 + 59.79 + 57.78) / 3
= 59.86 or 138.28 ft(assume 68 F/Density=62.4)

P_2 = Transfer Canal level (ft) = 23.33 (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 "A" test the Pressurizer level was essentially constant @ 308", this is equivalent to 834.83' in transfer canal elevation (as derived below). Therefore P_2 is equal to 834.83 - 811.5 = 23.33 ft.

Transfer Canal level = 840 - (370-308)/12 = 834.83

DP = P_1 - P_2 = 138.28 - 23.33 = 114.95 ft

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

= ($Z_{T=7sec}$ + $Z_{T=8sec}$ + $Z_{T=9sec}$) / 3 + 790'3 1/2"

= (10.49 + 10.11 + 9.74) / 3 + 790'3 1/2"

= 800.41 ft

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

DZ = Z_1 - Z_2 = -11.09 ft

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

f = f_t =.013
L = 98.64 ft (Ref. 8.5 thru 8.8)
D = 14" sch.140 =11.5" = .96 ft
V = V_2 = 35.39 ft/sec

$H_{L\ pipe}$ = 25.98 ft.

CFT "A"

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

$K = K_2 = [K_1 + \text{Sin}\ 0/2\ \{.8(1-B^2)+2.6(1-B^2)^2] / B^4$

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

Assume $\theta = 45°$

$B = d_1 / d_2 = .89$

$B^2 = .79$ & $B^4 = .63$

where; $d_1 = 10.19" = .85$ ft (Ref.8.4)

$d_2 = 11.5" = .96$ ft

$K_2 = .34$

$V = Q_{avg}/A = (25.49\ ft^3/sec) / (3.14\{.85\}^2)/4$
A = valve seat area

$V = 44.92$ ft/sec

$H_{Lv\ gate} = .34(44.92)^2 / 64.4 = 10.65$ ft

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

$H_{Lv\ check} = (114.95 - 19.44 - 11.09 - 25.98 - 10.65) / 2$

$= 23.90$ ft $= 10.35$ 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.

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

$= 11438\ gpm\ (1/10.35\ psig)^{1/2}$

= 3556.25 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)$_{\text{from T=8sec to T=10sec}}$ x CFT Area x 448.8

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

Q_{avg} = {(11.35 ft.-10.70 ft.)/2sec}(67.96)(448.8) (Att. #1)

Q_{avg} = 9913 gpm or 22.09 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 = (22.09 ft^3/sec) / .72 ft^2 = 30.68 ft/sec

$DV = V_1^2/2g - V_2^2/2g = -14.62$ ft.

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

$P_{initial}\ V_{initial} = P_{T=8sec}\ V_{T=8sec} = P_{T=9sec}\ V_{T=9sec} = \ldots P_{T=xsec}\ V_{T=xsec}$

$P_{initial}$ = 42.40 psig (Att. #1)

$V_{initial}$ = CFT Total Vol. - CFT Liquid Vol.
= 1410 ft^3 - (12.58 ft)(67.96 ft^2) (Ref. 8.2, Att. #1)
= 555.06 ft^3

$P_{T=8sec}$ = (42.40)(555.06) / {1410 - (11.34)(67.96)}
= 36.81 psig

$V_{T=8sec}$ = 1410 - (11.34)(67.96) = 639.34

$P_{T=9sec}$ = (36.81)(639.34) / {1410 - (11.04)(67.96)}
= 35.67

$V_{T=9sec}$ = 659.72

$P_{T=10sec}$ = (35.67)(659.72) / {1410 - (10.70)(67.96)}
= 34.46

CFT "B"

$V_{T=9sec}$ = 682.83

$P_{avg.\ CFT\ pressure}$ = (36.81 + 35.67 + 34.46) / 3
= 35.65 or 82.34 ft (assume 68 F/Density=62.4)

P_2 = Transfer Canal level (ft) = 22.69 (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 essentially constant @ 300.3", this is equivalent to 834.19' in transfer canal elevation (as derived below). Therefore P_2 is equal to 834.19 - 811.5 = 22.69 ft.

Transfer Canal level = 840 - (370-300.3)/12 = 834.19

DP = P_1 - P_2 = 82.34 - 22.69 = 59.65 ft

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

= ($Z_{T=8sec}$ + $Z_{T=9sec}$ + $Z_{T=10sec}$) / 3 + 811'1 9/16"

= (11.34 + 11.04 + 10.70) / 3 + 811'1 9/16"

= 822.16 ft

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

DZ = Z_1 - Z_2 = 10.66 ft

$H_{L\ pipe}$ = f{L/D}{V^2/2g} (Ref.8.1)
f = f_t =.013
L = 71.71 ft (Ref. 8.5 thru 8.8)
D = 14" sch.140 =11.5" = .96 ft
V = V_2 = 30.68 ft/sec

$H_{L\ pipe}$ = 14.19 ft.

CFT "B"

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

$K = K_2 = [K_1 + \text{Sin } 0/2 \{.8(1-B^2)+2.6(1-B^2)^2] / B^4$

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

Assume $0 = 45°$

$B = d_1 / d_2 = .89$

$B^2 = .79$ & $B^4 = .63$

where; $d_1 = 10.19" = .85$ ft (Ref.8.4)

$d_2 = 11.5" = .96$ ft

$K_2 = .34$

$V = Q_{avg}/A = (22.09\ ft^3/sec) / (3.14\{.85\}^2)/4$
A = valve seat area

V = 38.93 ft/sec

$H_{Lv\ gate} = .34(38.93)^2 / 64.4 = 8.00$ ft

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

$H_{Lv\ check} = (59.65 - 14.62 + 10.66 - 14.19 - 8.00) / 2$

= 16.75 ft = 7.25 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.

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

$= 9913$ gpm $(1/7.25\ psig)^{1/2}$

= 3681.49 THIS IS GREATER THAN THE REFERENCE Cv, THEREFORE THE FLOW TEST VERIFIED THE CHECK VALVE CAN PASS FULL FLOW

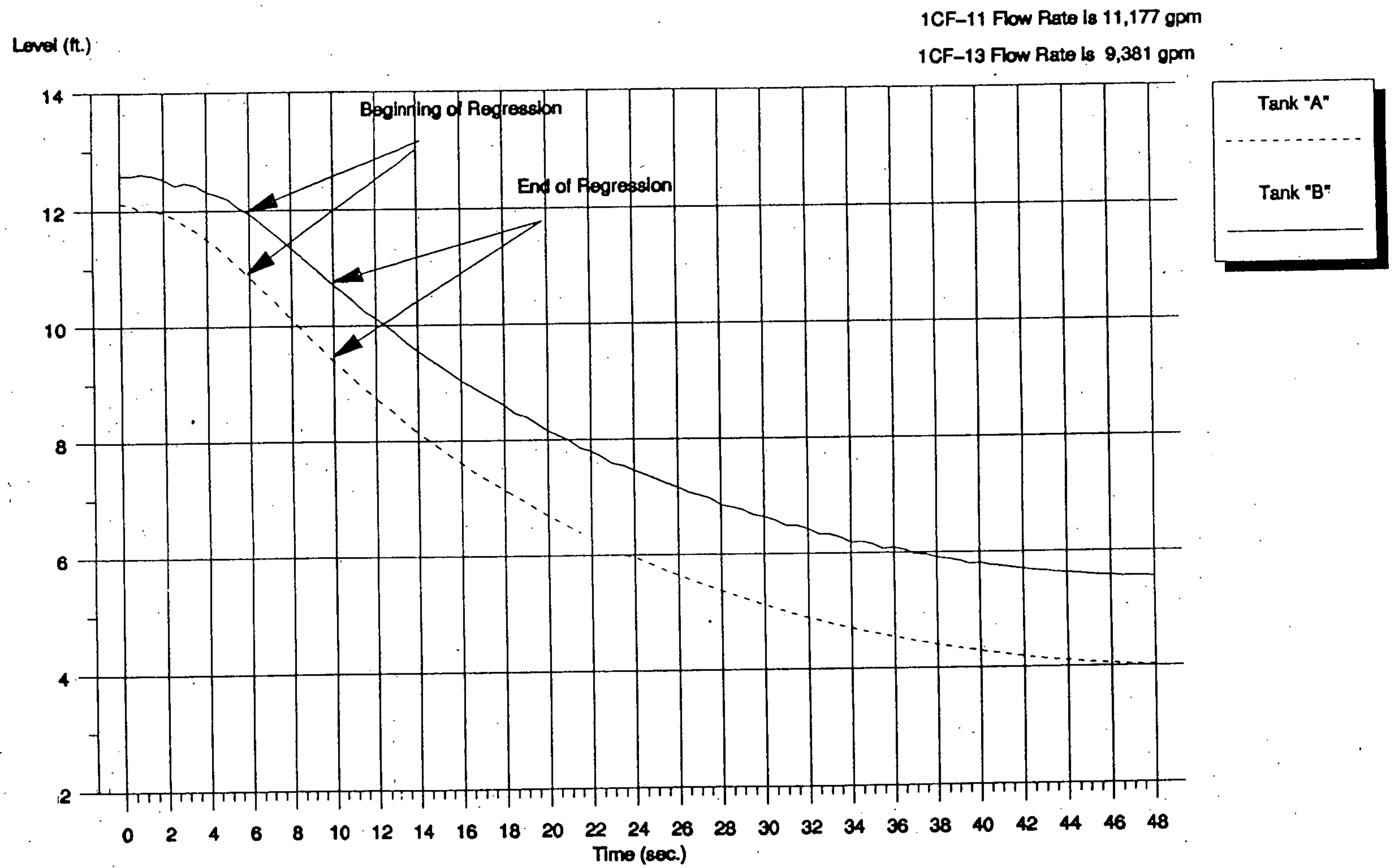
0040280135

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 CF-11 & 12 and CF-13 & 14.

0402800140

Unit 1 CF Tank A and B Level Change



OSC-4590
Attach. #1
P.1/5

OSC-4500
Attach. #1
P. 2/5

Clock Time	Elapsed time	"A" Volts	"A" Level
00:09:15:37.453	0	8.655	12.1170
00:09:15:37.953	0.5	8.639	12.0946
00:09:15:38.453	1	8.564	11.9896
00:09:15:38.953	1.5	8.574	12.0036
00:09:15:39.453	2	8.536	11.9504
00:09:15:39.953	2.5	8.475	11.8650
00:09:15:40.453	3	8.393	11.7502
00:09:15:40.953	3.5	8.319	11.6466
00:09:15:41.453	4	8.223	11.5122
00:09:15:41.953	4.5	8.124	11.3736
00:09:15:42.453	5	8.001	11.2014
00:09:15:42.953	5.5	7.885	11.0390
00:09:15:43.453	6	7.752	10.8528
00:09:15:43.953	6.5	7.616	10.6624
00:09:15:44.453	7	7.494	10.4916
00:09:15:44.953	7.5	7.357	10.2998
00:09:15:45.453	8	7.224	10.1136
00:09:15:45.953	8.5	7.093	9.9302
00:09:15:46.453	9	6.959	9.7426
00:09:15:46.953	9.5	6.835	9.5690
00:09:15:47.453	10	6.708	9.3912
00:09:15:47.953	10.5	6.589	9.2246
00:09:15:48.453	11	6.469	9.0566
00:09:15:48.953	11.5	6.354	8.8956
00:09:15:49.453	12	6.242	8.7388
00:09:15:49.953	12.5	6.132	8.5848
00:09:15:50.453	13	6.025	8.4350
00:09:15:50.953	13.5	5.92	8.2880
00:09:15:51.453	14	5.815	8.1410
00:09:15:51.953	14.5	5.719	8.0066
00:09:15:52.453	15	5.62	7.8680
00:09:15:52.953	15.5	5.521	7.7294
00:09:15:53.453	16	5.436	7.6104
00:09:15:53.953	16.5	5.343	7.4802
00:09:15:54.453	17	5.259	7.3626
00:09:15:54.953	17.5	5.174	7.2436
00:09:15:55.453	18	5.097	7.1358
00:09:15:55.953	18.5	5.016	7.0224
00:09:15:56.453	19	4.936	6.9104
00:09:15:56.953	19.5	4.858	6.8012
00:09:15:57.453	20	4.782	6.6948
00:09:15:57.953	20.5	4.709	6.5926
00:09:15:58.453	21	4.636	6.4904
00:09:15:58.953	21.5	4.567	6.3938
00:09:15:59.453	22		
00:09:15:59.953	22.5		
00:09:16:00.453	23		
00:09:16:00.953	23.5	4.287	6.0018
00:09:16:01.453	24	4.255	5.9570
00:09:16:01.953	24.5	4.196	5.8744

A" Tank Linear
Regression Output:

Constant		13.0488089
Std Err of Y Est		0.00578218
R Squared		0.99988384
No. of Observations		9
Degrees of Freedom		7
X Coefficient(s)	-0.366473333333	ft/sec
Std Err of Coef.	0.00149295134	

Flow = Ft./sec. x 67.96 sq. ft. x 7.48 gal/cu. ft. x 60 sec/min

Flow = 11178 gpm

Note: Regression based on seconds 6 through 10

During the test the following beginning/ending pressures were noted:

	Beginning	Ending
Press. Ch. 1	73.70	22.70
Press. Ch. 2	75.20	24.00
PZR Level(A1717)	308.00	308.80

OSC-4500
Attach. #1
P. 3/5

00:09:16:02.453	25	4.14	5.7960
00:09:16:02.953	25.5	4.084	5.7176
00:09:16:03.453	26	4.031	5.6434
00:09:16:03.953	26.5	3.978	5.5692
00:09:16:04.453	27	3.928	5.4992
00:09:16:04.953	27.5	3.878	5.4292
00:09:16:05.453	28	3.83	5.3620
00:09:16:05.953	28.5	3.783	5.2962
00:09:16:06.453	29	3.738	5.2332
00:09:16:06.953	29.5	3.695	5.1730
00:09:16:07.453	30	3.651	5.1114
00:09:16:07.953	30.5	3.609	5.0526
00:09:16:08.453	31	3.568	4.9952
00:09:16:08.953	31.5	3.528	4.9392
00:09:16:09.453	32	3.491	4.8874
00:09:16:09.953	32.5	3.457	4.8398
00:09:16:10.453	33	3.423	4.7922
00:09:16:10.953	33.5	3.389	4.7446
00:09:16:11.453	34	3.359	4.7026
00:09:16:11.953	34.5	3.327	4.6578
00:09:16:12.453	35	3.297	4.6158
00:09:16:12.953	35.5	3.269	4.5766
00:09:16:13.453	36	3.241	4.5374
00:09:16:13.953	36.5	3.214	4.4996
00:09:16:14.453	37	3.188	4.4632
00:09:16:14.953	37.5	3.163	4.4282
00:09:16:15.453	38	3.14	4.3960
00:09:16:15.953	38.5	3.118	4.3652
00:09:16:16.453	39	3.096	4.3344
00:09:16:16.953	39.5	3.075	4.3050
00:09:16:17.453	40	3.055	4.2770
00:09:16:17.953	40.5	3.036	4.2504
00:09:16:18.453	41	3.018	4.2252
00:09:16:18.953	41.5	3.001	4.2014
00:09:16:19.453	42	2.985	4.1790
00:09:16:19.953	42.5	2.969	4.1566
00:09:16:20.453	43	2.954	4.1356
00:09:16:20.953	43.5	2.94	4.1160
00:09:16:21.453	44	2.928	4.0992
00:09:16:21.953	44.5	2.915	4.0810
00:09:16:22.453	45	2.905	4.0670
00:09:16:22.953	45.5	2.895	4.0530
00:09:16:23.453	46	2.886	4.0404
00:09:16:23.953	46.5	2.88	4.0320
00:09:16:24.453	47	2.874	4.0236
00:09:16:24.953	47.5	2.871	4.0194
00:09:16:25.453	48	2.869	4.0166
00:09:16:25.953	48.5	2.869	4.0166
00:09:16:26.453	49	2.868	4.0152
00:09:16:26.953	49.5	2.868	4.0152

DSC-4500 attach. #1 P. 4/5

Core Flood Tank "B" Page 1 of 2

Clock Time	Elapsed time	"B" Volts	"B" Level
00:09:51:15.953	0	8.988	12.5832
00:09:51:16.453	0.5	8.990	12.5860
00:09:51:16.953	1	9.013	12.6182
00:09:51:17.453	1.5	8.992	12.5888
00:09:51:17.953	2	8.950	12.5300
00:09:51:18.453	2.5	8.871	12.4194
00:09:51:18.953	3	8.899	12.4586
00:09:51:19.453	3.5	8.871	12.4194
00:09:51:19.953	4	8.798	12.3172
00:09:51:20.453	4.5	8.751	12.2514
00:09:51:20.953	5	8.703	12.1842
00:09:51:21.453	5.5	8.601	12.0414
00:09:51:21.953	6	8.524	11.9336
00:09:51:22.453	6.5	8.425	11.7950
00:09:51:22.953	7	8.319	11.6466
00:09:51:23.453	7.5	8.215	11.5010
00:09:51:23.953	8	8.104	11.3456
00:09:51:24.453	8.5	7.992	11.1888
00:09:51:24.953	9	7.884	11.0376
00:09:51:25.453	9.5	7.763	10.8682
00:09:51:25.953	10	7.646	10.7044
00:09:51:26.453	10.5	7.542	10.5588
00:09:51:26.953	11	7.428	10.3992
00:09:51:27.453	11.5	7.306	10.2284
00:09:51:27.953	12	7.234	10.1276
00:09:51:28.453	12.5	7.127	9.9778
00:09:51:28.953	13	7.024	9.8336
00:09:51:29.453	13.5	6.921	9.6894
00:09:51:29.953	14	6.824	9.5536
00:09:51:30.453	14.5	6.725	9.4150
00:09:51:30.953	15	6.635	9.2890
00:09:51:31.453	15.5	6.547	9.1658
00:09:51:31.953	16	6.445	9.0230
00:09:51:32.453	16.5	6.379	8.9306
00:09:51:32.953	17	6.296	8.8144
00:09:51:33.453	17.5	6.222	8.7108
00:09:51:33.953	18	6.143	8.6002
00:09:51:34.453	18.5	6.043	8.4602
00:09:51:34.953	19	5.995	8.3930
00:09:51:35.453	19.5	5.918	8.2852
00:09:51:35.953	20	5.825	8.1550
00:09:51:36.453	20.5	5.772	8.0808
00:09:51:36.953	21	5.702	7.9828
00:09:51:37.453	21.5	5.611	7.8554
00:09:51:37.953	22	5.570	7.7980
00:09:51:38.453	22.5	5.502	7.7028
00:09:51:38.953	23	5.415	7.5810
00:09:51:39.453	23.5	5.389	7.5446
00:09:51:39.953	24	5.330	7.4620
00:09:51:40.453	24.5	5.281	7.3934
00:09:51:40.953	25	5.222	7.3108
00:09:51:41.453	25.5	5.170	7.2380
00:09:51:41.953	26	5.120	7.1680
00:09:51:42.453	26.5	5.058	7.0812
00:09:51:42.953	27	5.019	7.0266
00:09:51:43.453	27.5	4.978	6.9692
00:09:51:43.953	28	4.896	6.8544
00:09:51:44.453	28.5	4.871	6.8194
00:09:51:44.953	29	4.838	6.7732
00:09:51:45.453	29.5	4.770	6.67[illegible]0
00:09:51:45.953	30	4.745	6.6[illegible]30
00:09:51:46.453	30.5	4.702	6.5828
00:09:51:46.953	31	4.633	6.4862
00:09:51:47.453	31.5	4.633	6.4862
00:09:51:47.953	32	4.591	6.4274
00:09:51:48.453	32.5	4.522	6.3308
00:09:51:48.953	33	4.523	6.3322

B" Tank Linear
Regression Output:

Constant		13.7962844
Std Err of Y Est		0.0118267
R Squared		0.99931053
No. of Observations		9
Degrees of Freedom		7
X Coefficient(s)	-0.30758	ft/sec
Std Err of Coef.	0.0030536414207	

Flow = Ft./sec. x 67.96 sq. ft. x 7.48 gal/cu. ft. x 60 sec/min

Flow = 9381 gpm

Note: Regression based on seconds 6 through 10

During the test the following beginning/ending pressures were noted:

	Beginning	Ending
Press. Ch. 1	42.40	41.70
Press. Ch. 2	7.20	6.40
PZR Level(A1717)	300.30	301.00

OSC-4500
a Tach. #1
P. 5/5

00:09:51:49.453	33.5	4.485	6.2790
00:09:51:49.953	34	4.417	6.1838
00:09:51:50.453	34.5	4.426	6.1964
00:09:51:50.953	35	4.397	6.1558
00:09:51:51.453	35.5	4.339	6.0746
00:09:51:51.953	36	4.347	6.0858
00:09:51:52.453	36.5	4.324	6.0536
00:09:51:52.953	37	4.270	5.9780
00:09:51:53.453	37.5	4.261	5.9654
00:09:51:53.953	38	4.227	5.9178
00:09:51:54.453	38.5	4.207	5.8898
00:09:51:54.953	39	4.188	5.8632
00:09:51:55.453	39.5	4.141	5.7974
00:09:51:55.953	40	4.147	5.8058
00:09:51:56.453	40.5	4.121	5.7694
00:09:51:56.953	41	4.111	5.7554
00:09:51:57.453	41.5	4.089	5.7246
00:09:51:57.953	42	4.075	5.7050
00:09:51:58.453	42.5	4.054	5.6756
00:09:51:58.953	43	4.046	5.6644
00:09:51:59.453	43.5	4.026	5.6364
00:09:51:59.953	44	4.017	5.6238
00:09:52:00.453	44.5	4.008	5.6112
00:09:52:00.953	45	3.995	5.5930
00:09:52:01.453	45.5	3.984	5.5776
00:09:52:01.953	46	3.982	5.5748
00:09:52:02.453	46.5	3.972	5.5608
00:09:52:02.953	47	3.969	5.5566
00:09:52:03.453	47.5	3.967	5.5538
00:09:52:03.953	48	3.964	5.5496