SOUTH CAROLINA ELECTRIC & GAS COMPANY
POST OFFICE BOX 764
COLUMBIA, S. C. 29218

April 30, 1985

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Virgil C. Summer Nuclear Station
Docket No. 50/395
Operating License No. NPF-12
Reactor Coolant System Flow

Dear Mr. Denton:

In a letter to you dated March 6, 1985, South Carolina Electric & Gas Company (SCE&G) requested a revision to the Virgil C. Summer Nuclear Station Technical Specifications to reduce thermal design flow by 1.9%. As justification for the reduction in thermal design flow, the results of an analysis performed by Westinghouse using the BART code were attached.

After transmittal of the March 6, 1985 letter, Westinghouse notified us of a problem with the input methodology between the BART code and the WREFLOOD code that would require revision. As a result, reanalysis of the large break loss-of-coolant-accident (LOCA) would be required. The Nuclear Regulatory Commission was notified of the input methodology problem by Westinghouse in a letter from Mr. E. P. Rahe, Jr. of Westinghouse to Mr. D. G. Eisenhut of the NRC dated March 22, 1985.

Westinghouse has completed the reanalysis for the 1.9% reduction in thermal design flow at Virgil C. Summer Nuclear Station and has determined that the effect of the input methodology revision will not result in exceeding the peak cladding temperature regulatory limits of 2200°. There is no change to the technical specification revision previously requested as a result of this reanalysis. The results of the Westinghouse reanalysis are provided in the attachment to this letter and should replace the corresponding pages in the attachments to the March 6, 1985 letter referred to above. This reanalysis was done only for the worst case break of the original analysis, therefore tables 15.4.1.1 and 15.4.1.2 are supplied as a supplement to the original submittal and are labeled 15.4.1.1-A and 15.4.1.2-A.

If you have any questions, please advise.

Very truly yours

O. W. Dixon, Jr.

JAW:OWD:rh

Attachment

cc: Page Two

A001
1/1

cc: V. C. Summer
T. C. Nichols, Jr./O. W. Dixon, Jr.
E. H. Crews, Jr.
E. C. Roberts
W. A. Williams, Jr.
D. A. Nauman
J. N. Grace
Group Managers
O. S. Bradham
C. A. Price
C. L. Ligon (NSRC)
K. E. Nodland
R. A. Stough
G. Percival
C. W. Hehl
J. B. Knotts
NPCF
File

<u>Figure 15.4.1-7a through 15.4.1-9c</u>	These figures show the hot spot clad temperature transient and the clad temperature transient at the burst location. The fluid temperature shown is also for the hot spot and burst location. The core flow (top and bottom) is also shown.
<u>Figures 15.4.1-10a through 15.4.1-10f</u>	These figures show the core reflood transient.
<u>Figures 15.4.1-11a through 15.4.1-12c</u>	These figures show the Emergency Core Cooling System flow for all of the cases analyzed. As described earlier, the accumulator delivery during blowdown is discarded until the end of bypass is calculated. Accumulator flow, however, is established in the refill and the reflood calculations. The accumulator flow assumed is the sum of that injected in the intact cold legs.
<u>Figures 15.4.1-13a through 15.4.1-13c</u>	The containment pressure transient is also provided.
<u>Figures 15.4.1-14 a, b, c</u>	These figures show the core power transient.
<u>Figure 15.4.1-16</u>	This figure provides the containment wall condensing heat transfer coefficient for the limiting case break.

In addition to the above, Tables 15.4.1-4 and 15.4.1-5 present the reflood mass and energy release to the containment and the broken loop accumulator mass and energy flowrate to the containment, respectively.

The maximum clad temperature calculated for a large break is 2189.2°F which is less than the Acceptance Criteria limit of 2200°F. The maximum local metal-water reaction is 5.59 percent, which is well below the embrittlement limit of 17 percent as required by 10 CFR 50.46. The total core metal-water reaction is less than 0.3 percent for all breaks, as compared with the 1 percent criterion of 10 CFR 50.46. The clad temperature transient is

TABLE 15.4.1-1a

LARGE BREAK REANALYSIS FOR BART INPUT METHODOLOGY REVISION

TIME SEQUENCE OF EVENTS

	DECLG (C_D = 0.4) (Sec)
START	0.0
Reactor Trip Signal	0.418
S. I. Signal	0.86
Acc. Injection	15.752
End of Blowdown	30.994
Bottom of Core Recovery	43.461
Acc. Empty	49.577
Pump Injection	25.86
End of Bypass	30.927

TABLE 15.4.1-2a

LARGE BREAK REANALYSIS FOR BART INPUT METHODOLOGY REVISION

	DECLG (C_D = 0.4)
Results	
Peak Clad Temp. °F	2189.187
Peak Clad Location Ft.	7.0
Local Zr/H_2O Reaction (max) %	5.58
Local Zr/H_2O Location Ft.	7.0
Total Zr/H_2O Reaction %	<0.3
Hot Rod Burst Time sec	48.2
Hot Rod Burst Location Ft.	6.0

Calculation	
NSSS Power Mwt 102% of	2775
Peak Linear Power kw/ft 102% of	12.632
Peaking Factor (At License Rating)	2.32
Accumulator Water Volume (ft^3)	1000

Fuel region + cycle analyzed	Cycle	Region
UNIT 1	ALL	ALL

6% Steam Generator Tube Plugging in each steam generator is assumed.

TABLE 15.4.1-4

REFLOOD MASS/ENERGY RELEASES* (C_D = 0.4)

TIME (SEC)	TOTAL MASS FLOWRATE (LBM/SEC)	TOTAL ENERGY FLOWRATE 10^5 BTU/SEC
43.461	0.0	0.0
50.046	47.759	0.615
64.946	66.54	0.859
84.146	122.23	1.107
104.246	292.4	1.514
125.746	300.3	1.469
148.846	305.16	1.414

*Accumulator nitrogen was released between 53.0 and 93.0 seconds at a mass flow rate of 96.135 lbm/sec.

TABLE 15.4.1-5

BROKEN LOOP ACCUMULATOR FLOWRATE TO CONTAINMENT FOR LIMITING CASE - DECLG (C_D = 0.4)

TIME (SEC)	MASS FLOWRATE* (LBM/SEC)
0.0	4598.0
3.01	3498.9
4.01	3281.4
5.01	3100.4
8.01	2690.3
11.01	2397.6
16.01	2052.2
21.01	1811.4
24.01	1700.2
24.87	0.0

*Enthalpy of accumulator water is 58 BTU/LBM

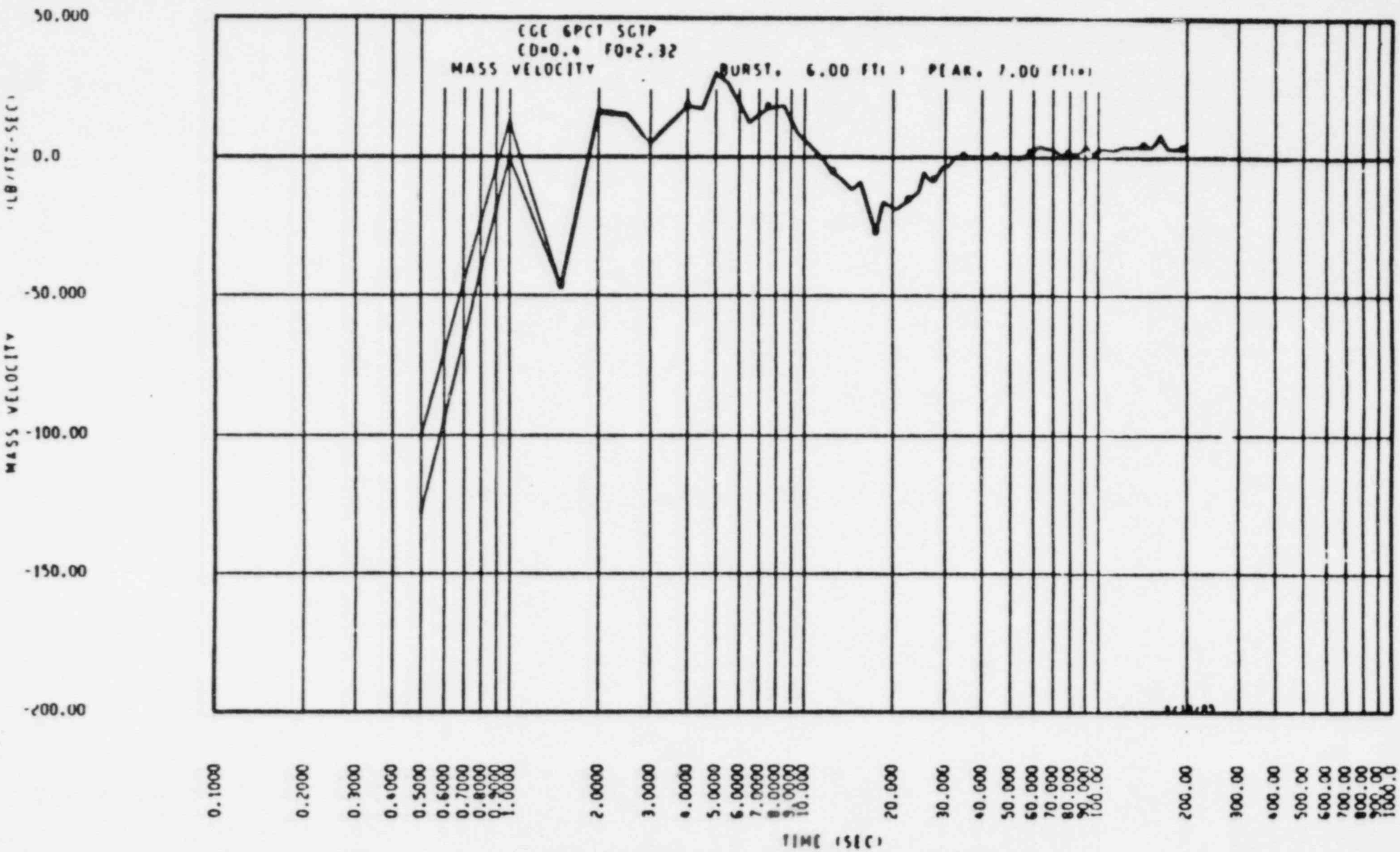

FIGURE 15.4.1-2c. MASS VELOCITY (CD=Ø.4)

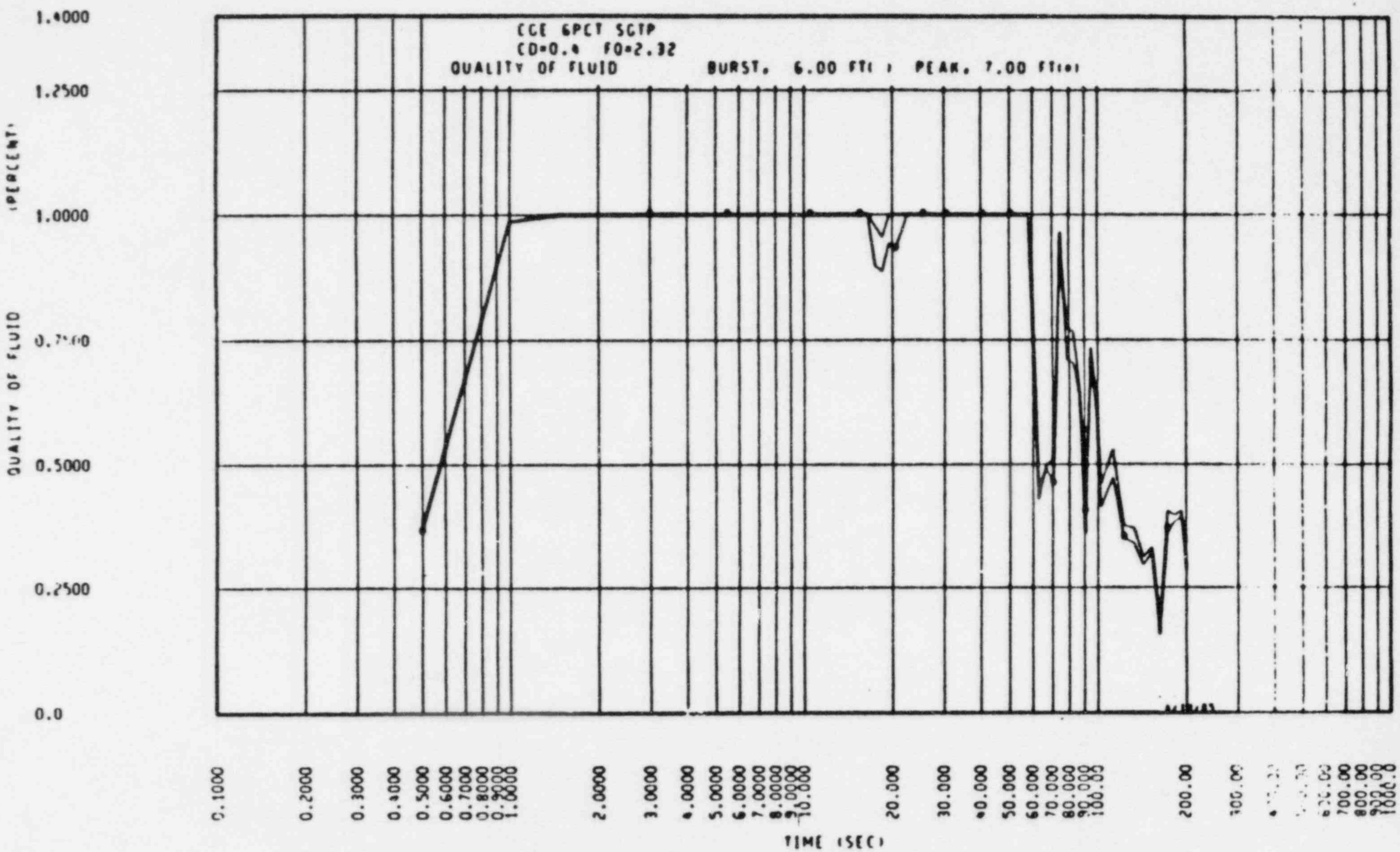

FIGURE 15.4.1-1c. FLUID QUALITY (CD=Ø.4)

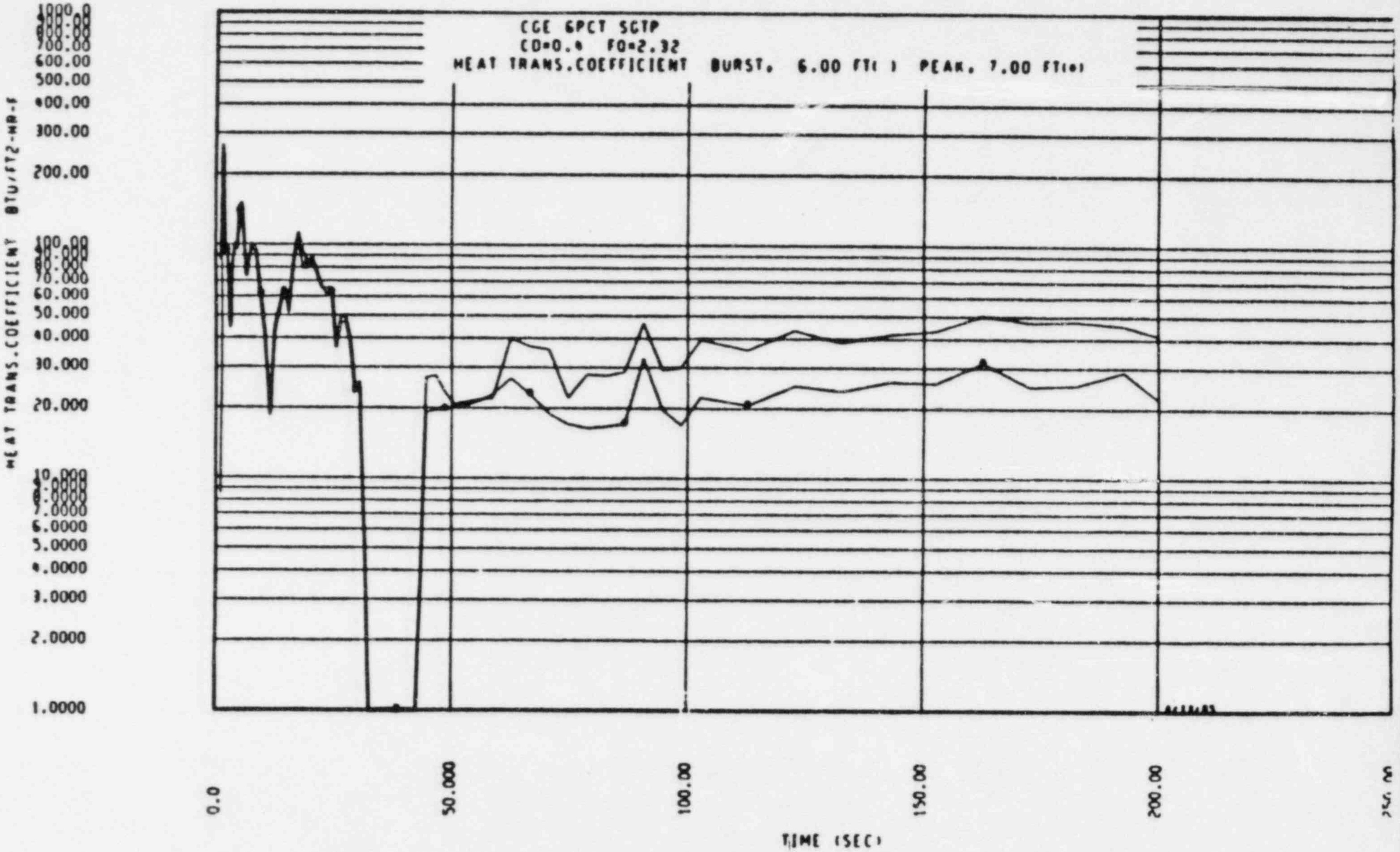

FIGURE 15.4.1-3c. HEAT TRANSFER COEFFICIENT (CD=Ø.4)

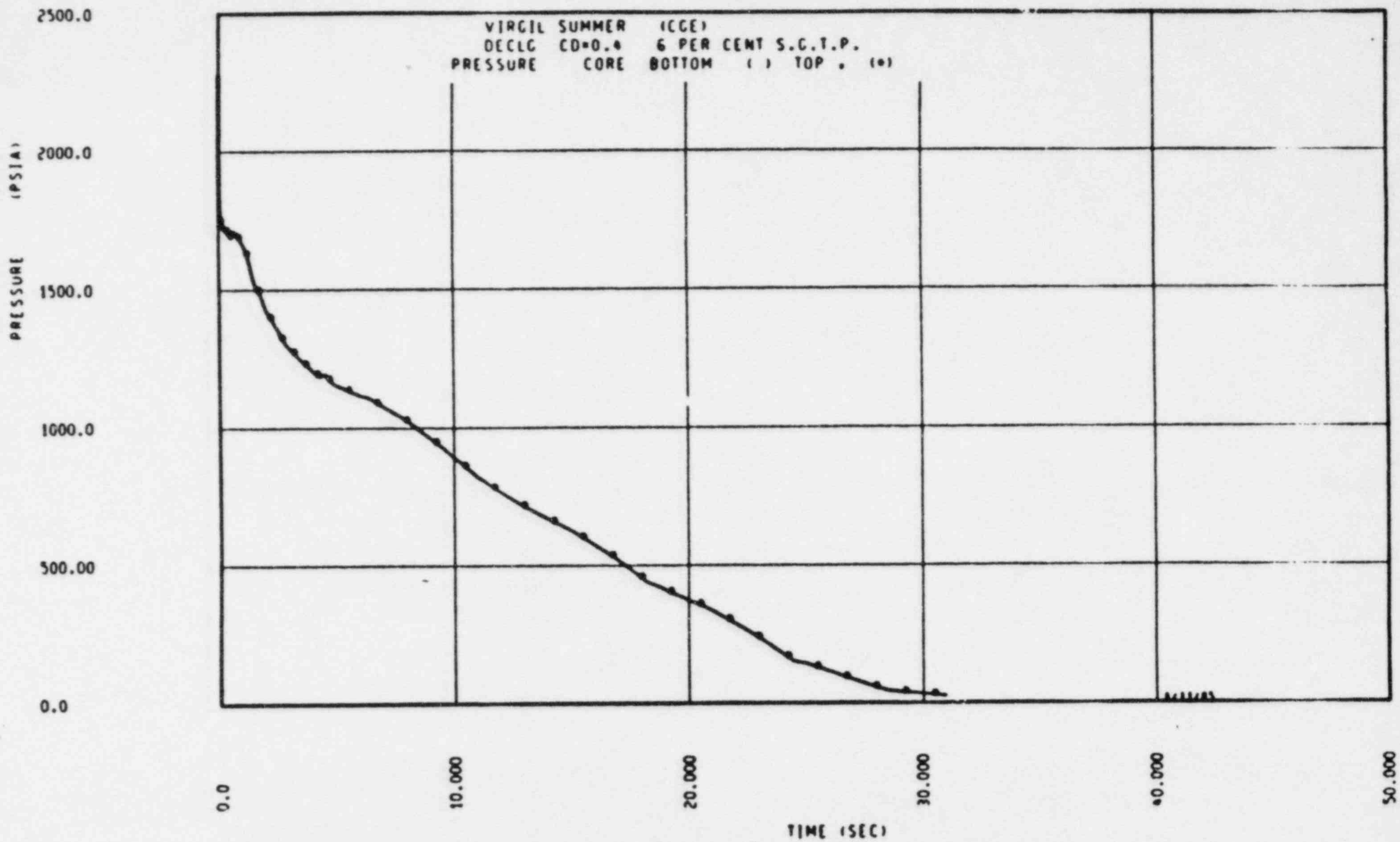

FIGURE 15.4.1-4c. CORE PRESSURE (C_D=Ø.4)

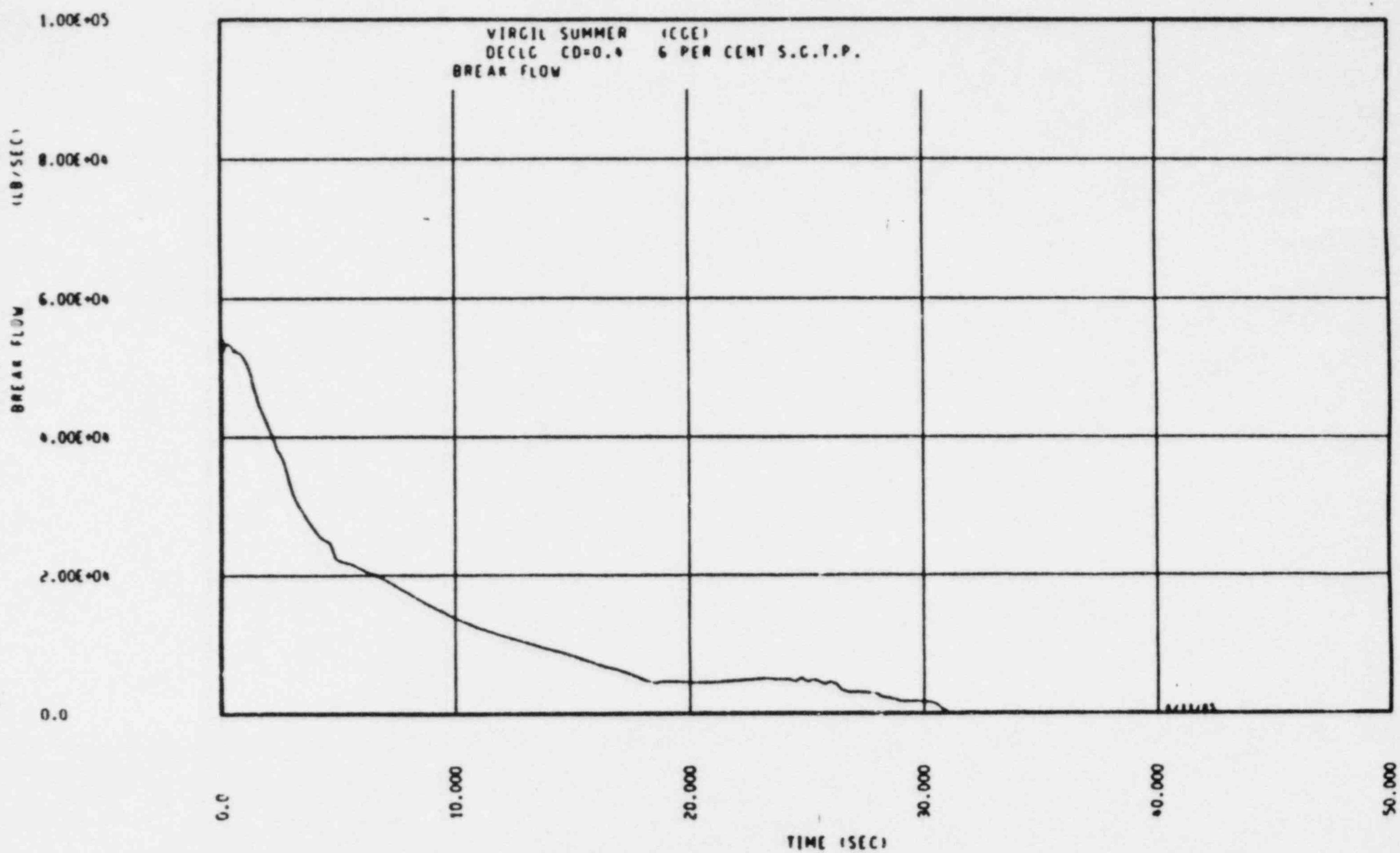

FIGURE 15.4.1-5c. BREAK FLOW RATE ($C_D = \emptyset.4$)

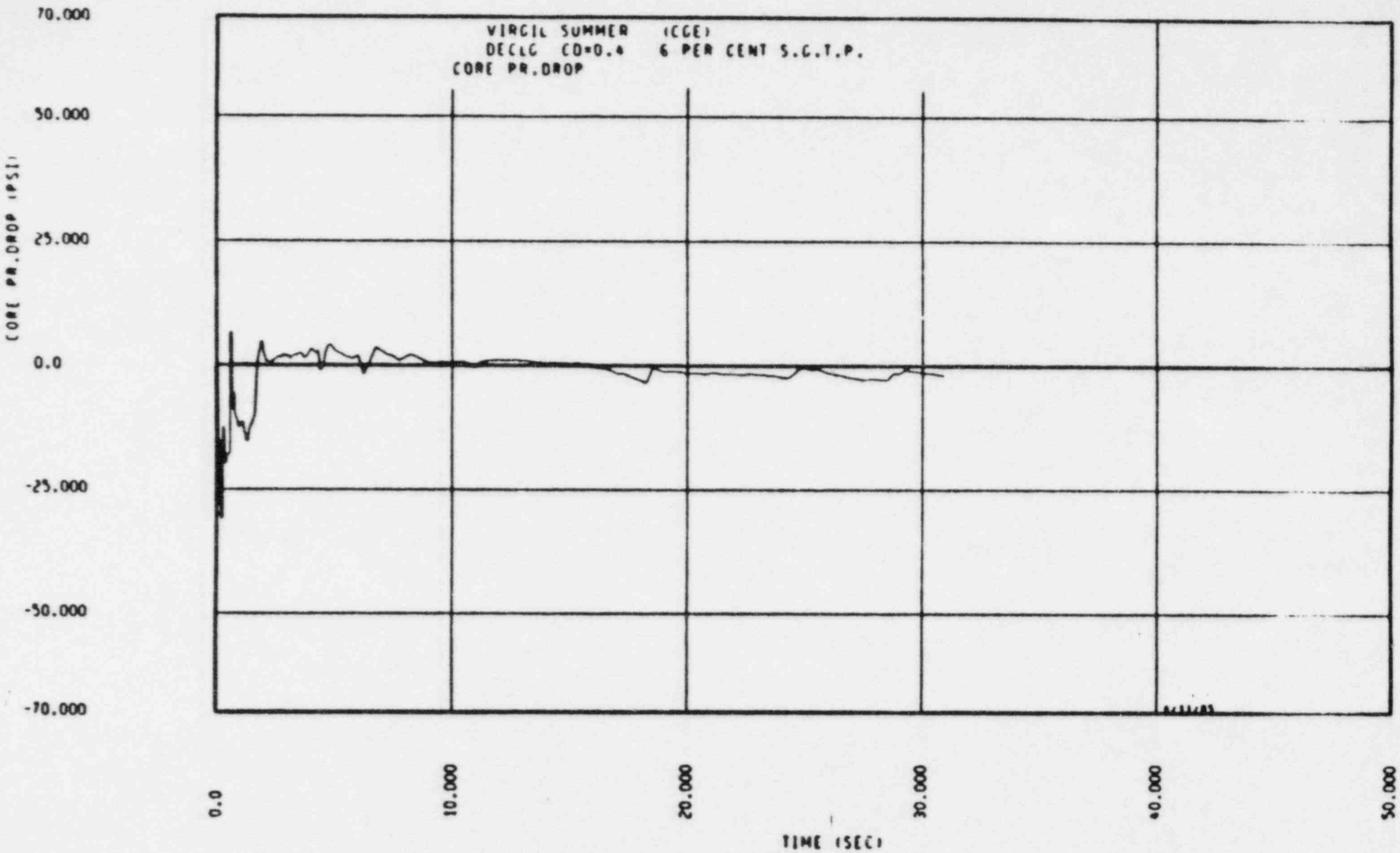

FIGURE 15.4.1-6c. CORE PRESSURE DROP (CD=Ø.4)

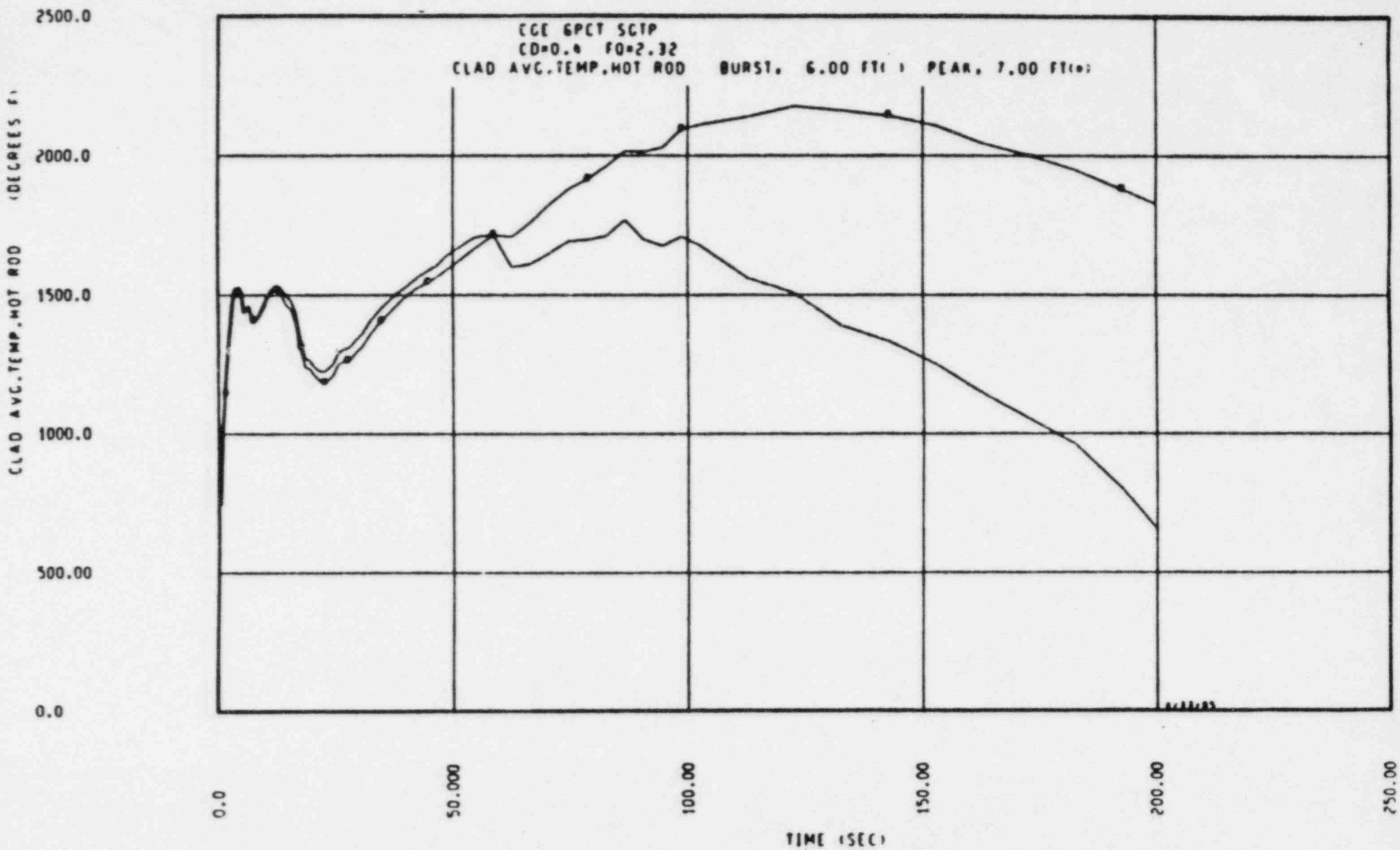

FIGURE 15.4.1-7c. PEAK CLAD TEMPERATURE (CD=Ø.4)

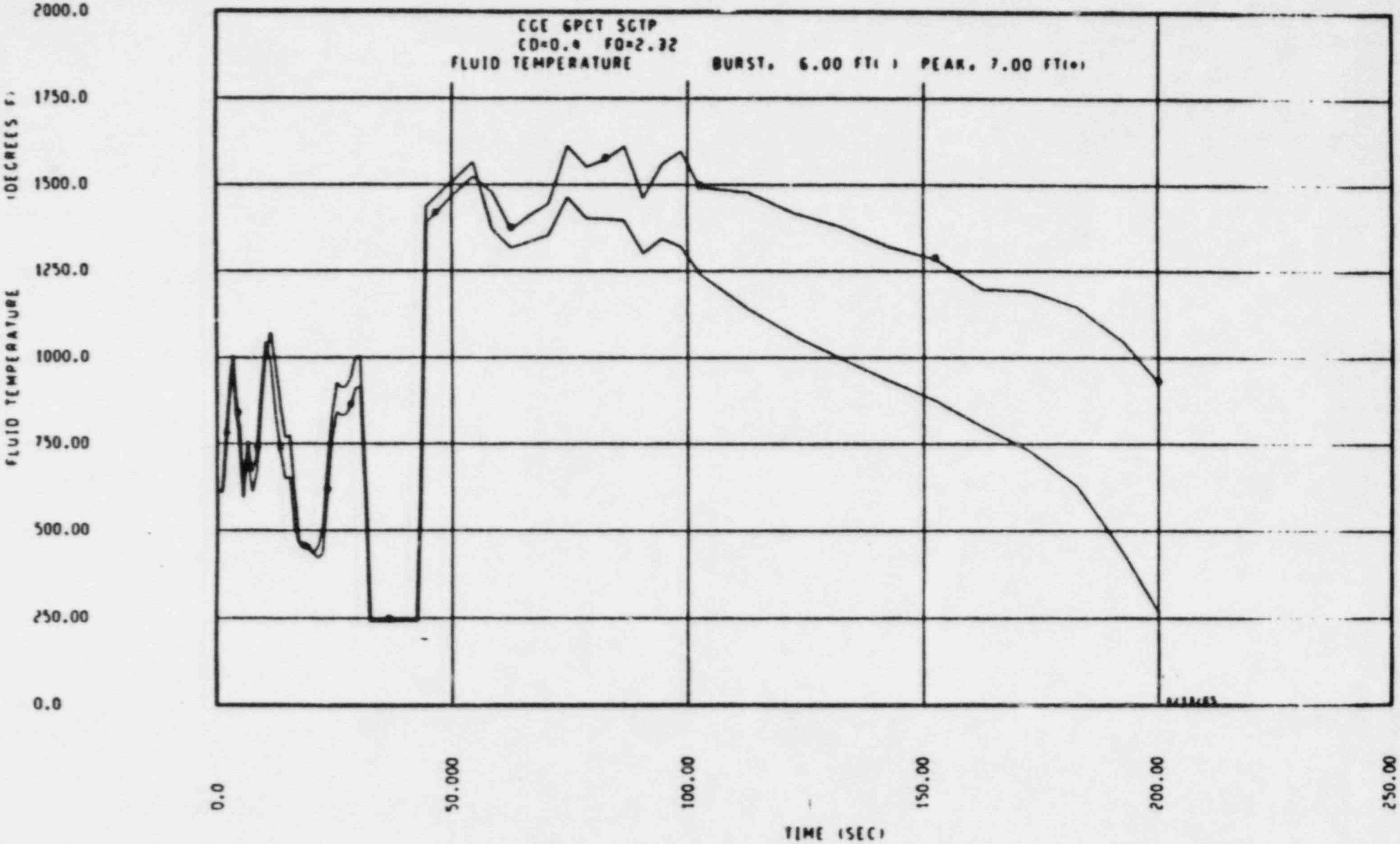

FIGURE 15.4.1-8c. FLUID TEMPERATURE (CD=Ø.4)

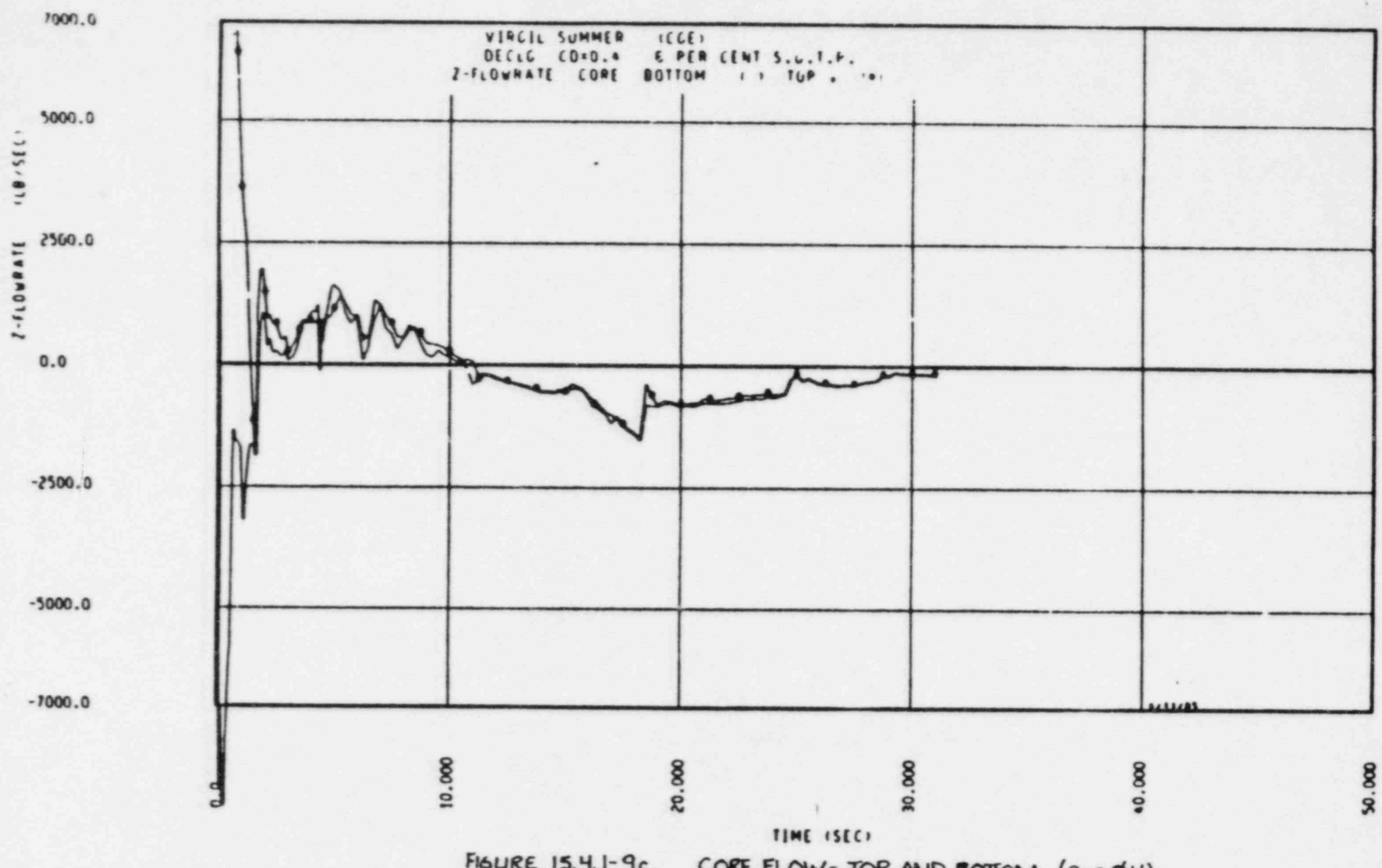

FIGURE 15.4.1-9c. CORE FLOW - TOP AND BOTTOM ($C_D = \phi.4$)

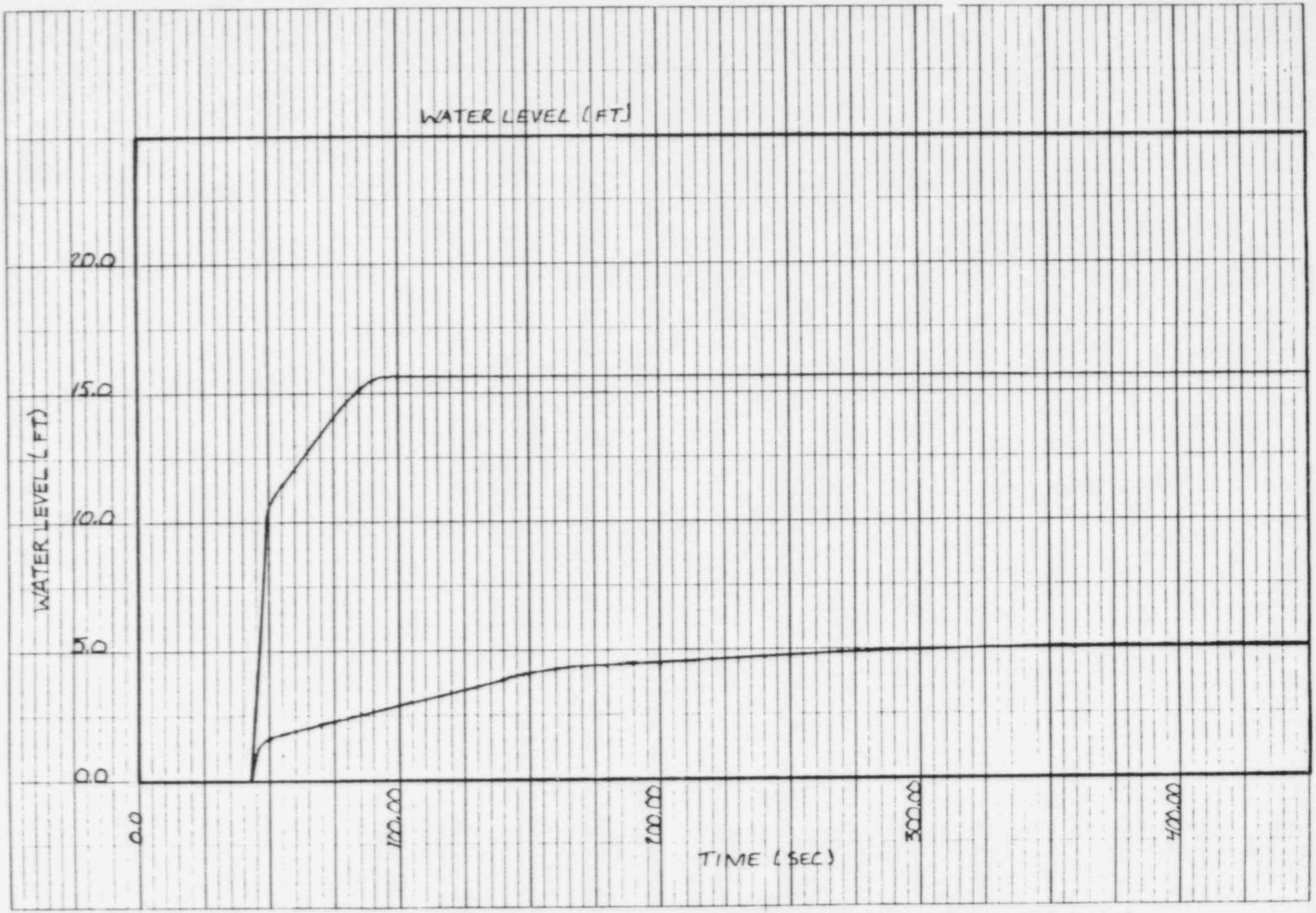

FIG. 15.4.1-10c. REFLOOD TRANSIENT DOWNCOMER AND CORE WATER LEVELS (C_D=0.4)

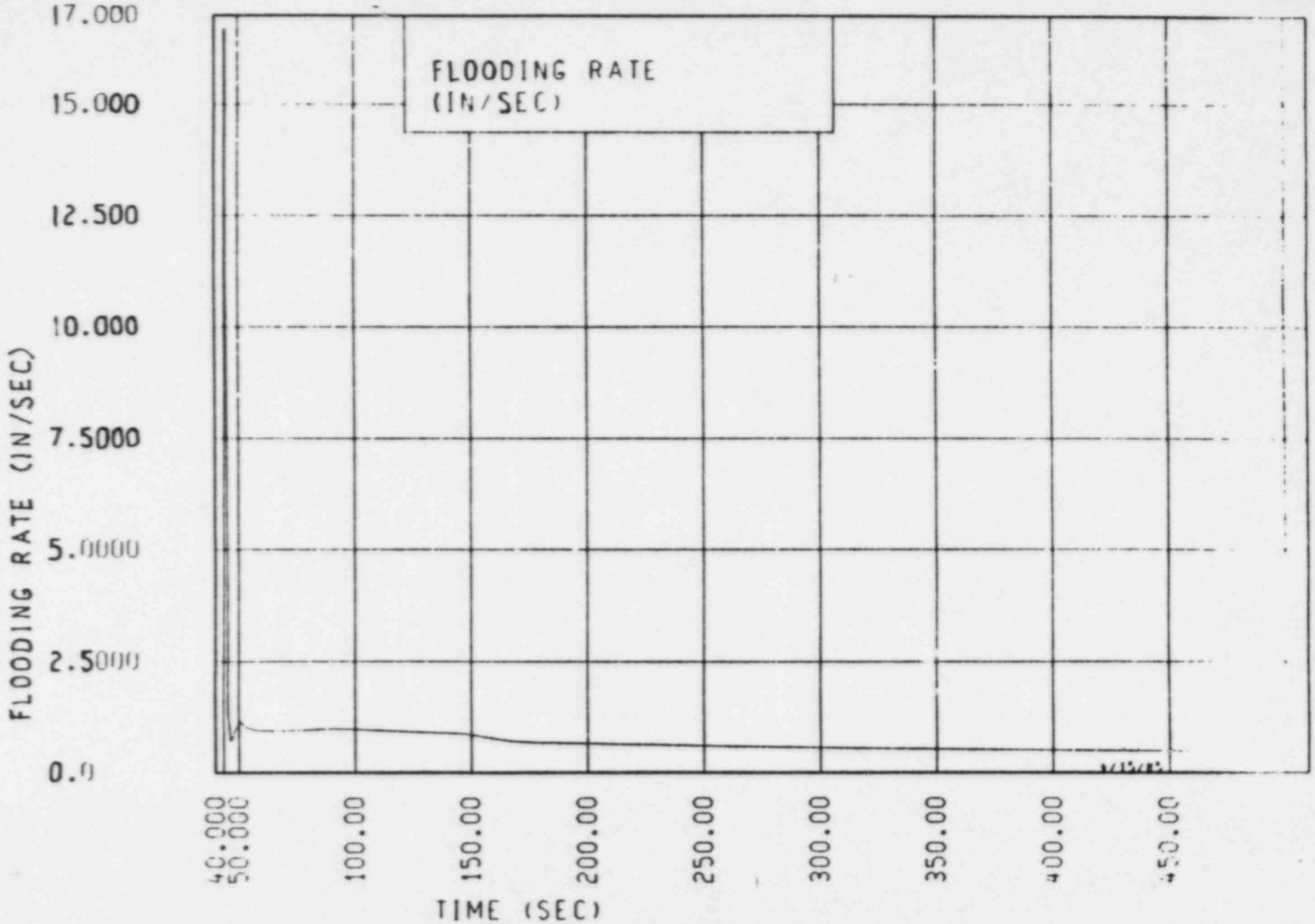

FIGURE 15.4.1-10F. REFLOOD TRANSIENT CORE INLET VELOCITY (CD=Ø.4)

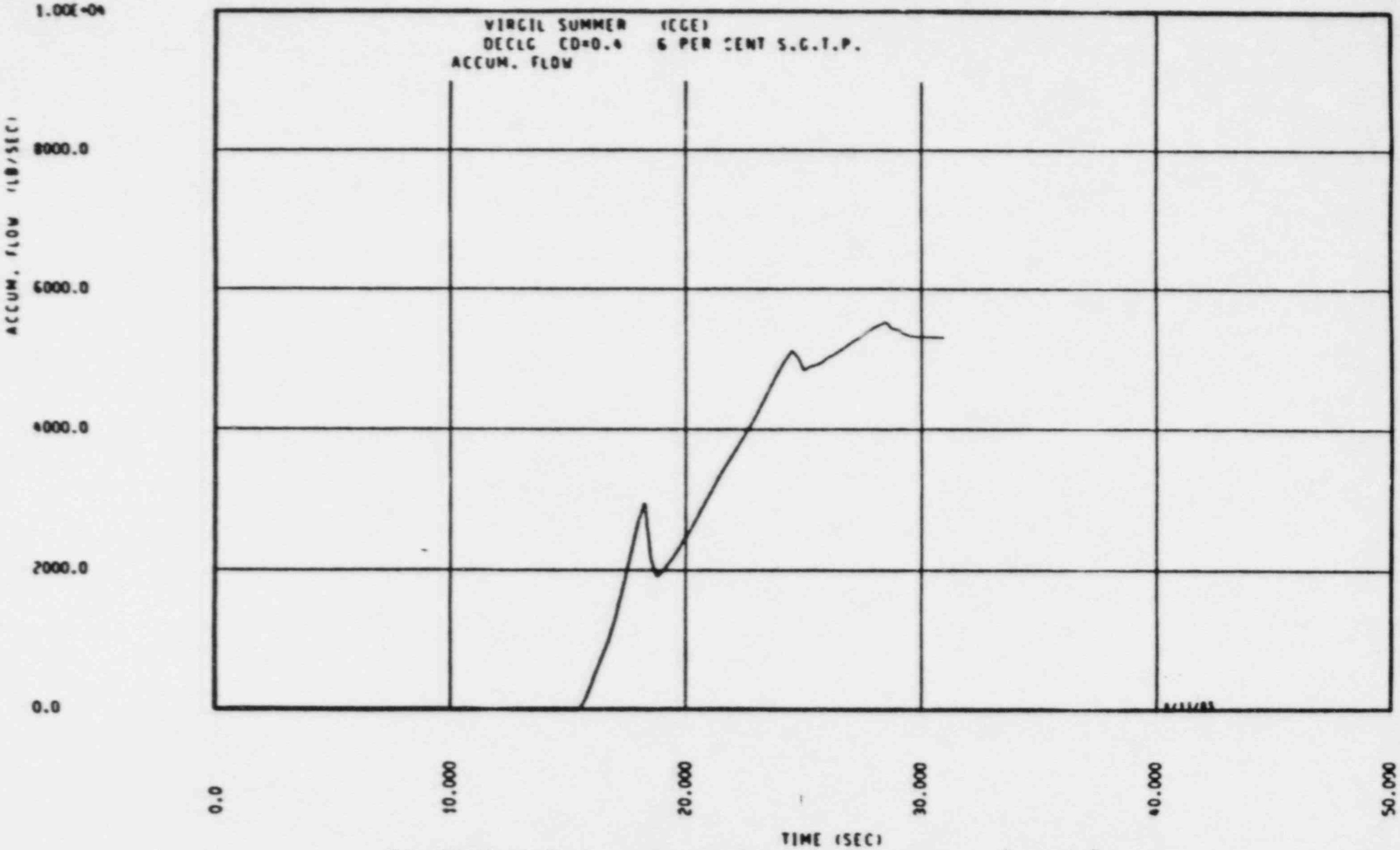

FIGURE 15.4.1-11c. ACCUMULATOR FLOW- BLOWDOWN (CD=Ø.4)

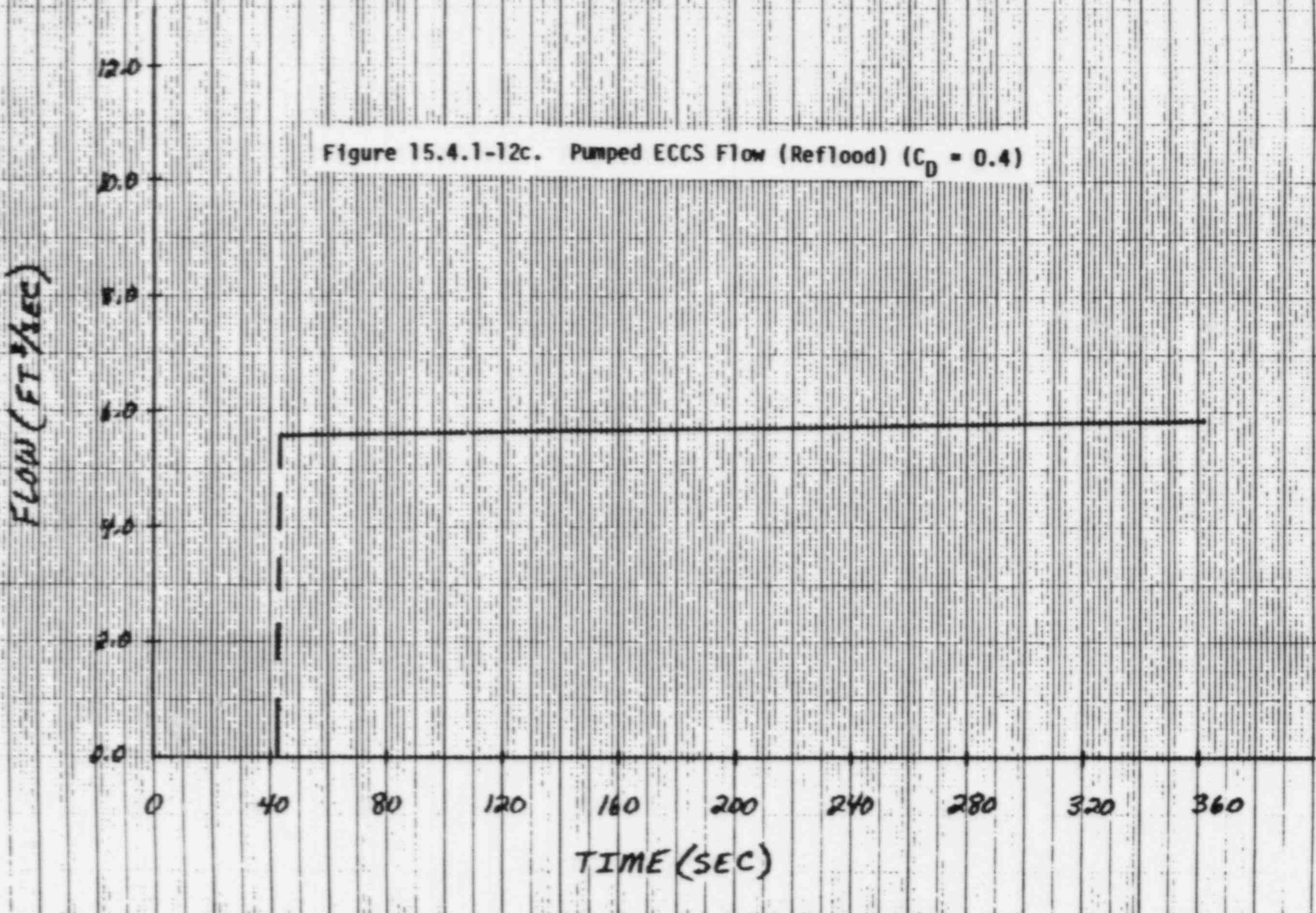

Figure 15.4.1-12c. Pumped ECCS Flow (Reflood) (C_D = 0.4)

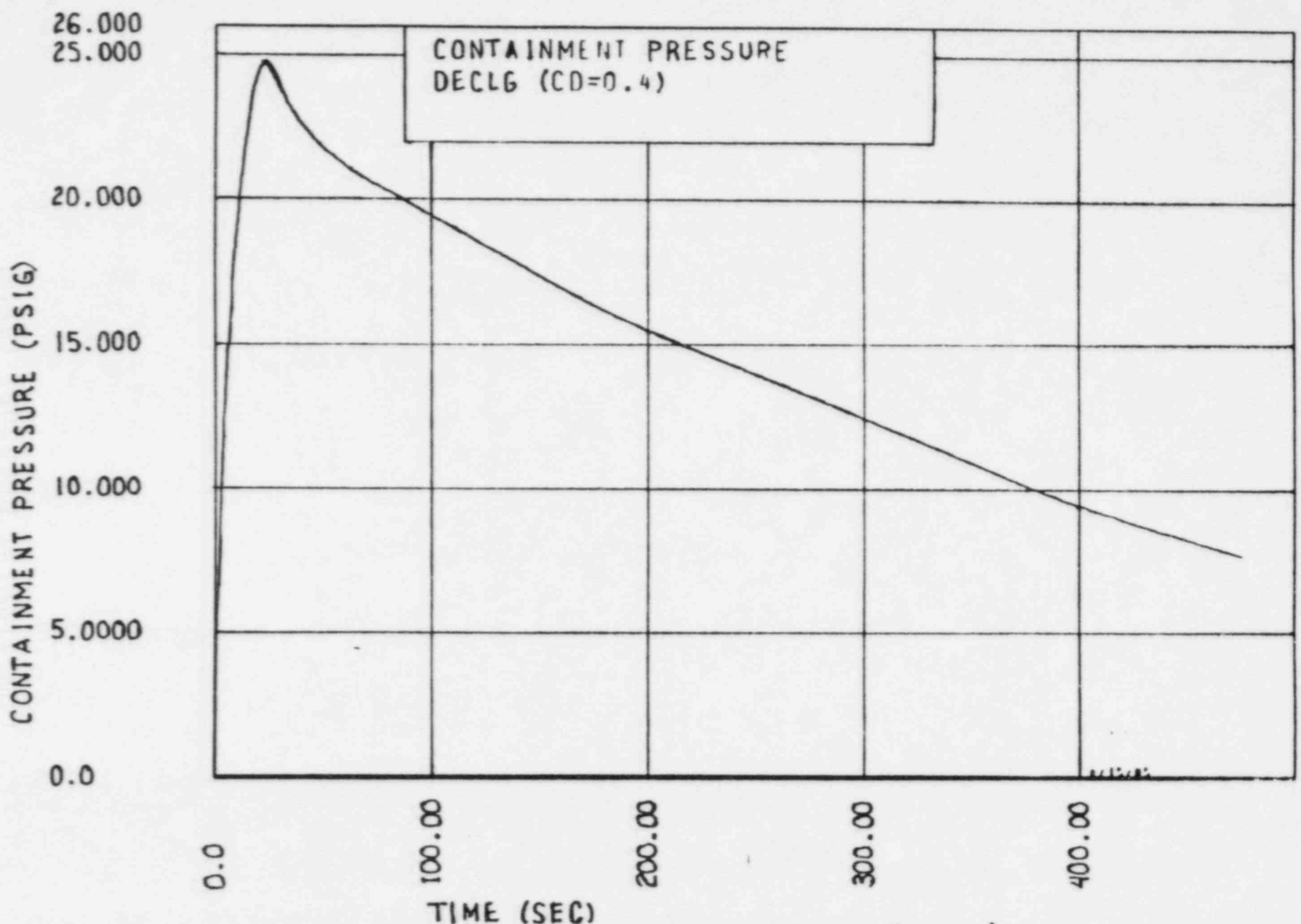

FIGURE 15.4.1-13c. CONTAINMENT PRESSURE (C_D= Ø.4)

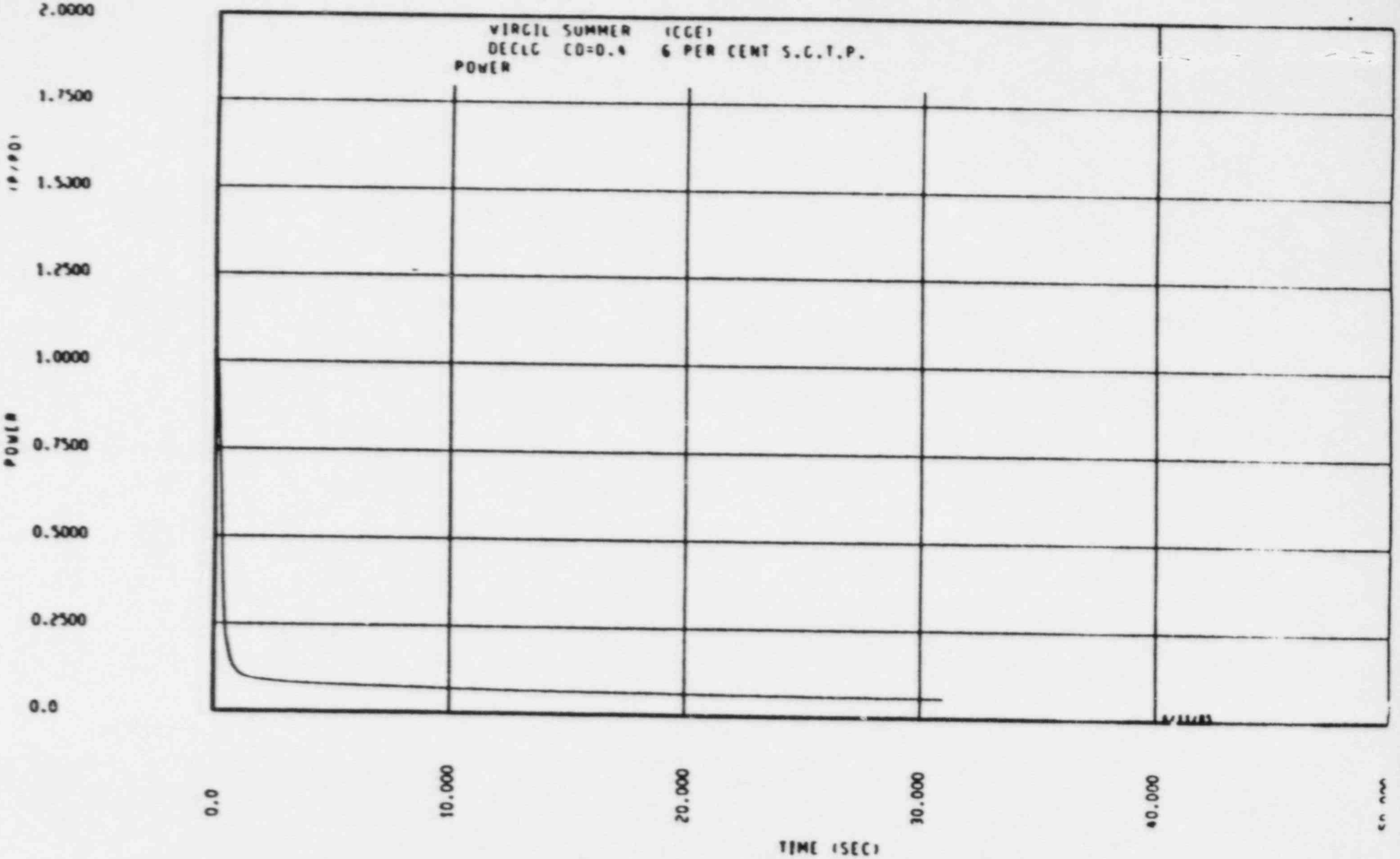

FIGURE 15.4.1-14c. CORE POWER TRANSIENT (C_D=Ø.4)

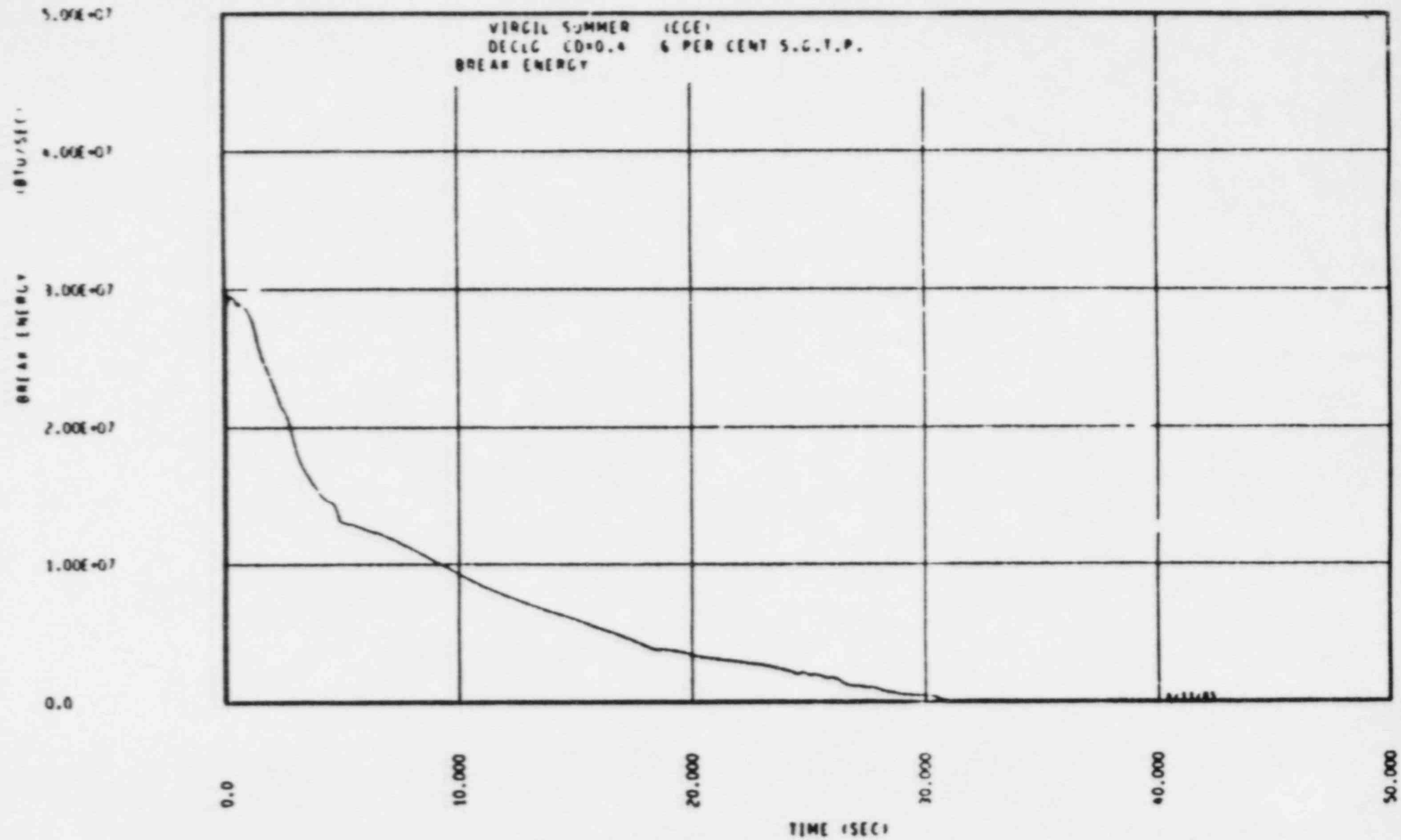

FIGURE 15.4.1-15c. BREAK ENERGY RELEASED TO CONTAINMENT (CD= Ø.4)

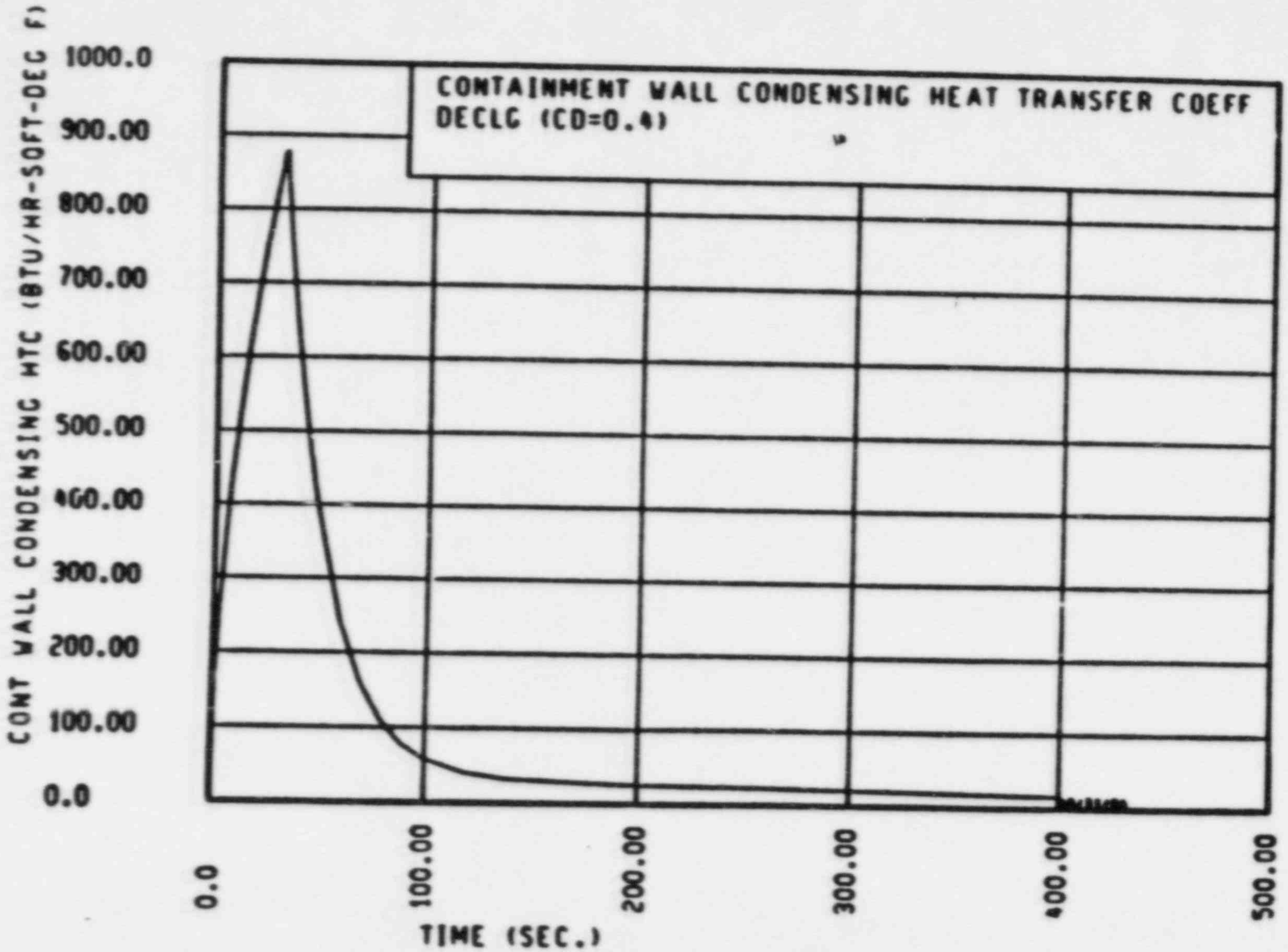

Figure 15.4.1-16. Containment Wall Heat Transfer Coefficient (C_D = 0.4)