INTERIM REPORT

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Contract Program or Project Title: Thermal Fuels Behavior Program, EG&G

Subject of this Document: Revision to EGG-TFBP-5221
Loss-of-Coolant Accident Series,TC-3,Experiment Operating Specification

Type of Document: Revision, Interim Report

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Responsible NRC Individual and NRC Office or Division: M.L.Picklesimer, RSR/RES

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INTERIM REPORT

NRC Research and Technical Assistance Report

(1) OPER. NO. _____

FORM EG&G-1844
(Rev. 5-77)

DOCUMENT REVISION REQUEST

(2) REQUESTER	(3) DRR DATE	(4) DRR NO.
T. R. Yackle	1/12/81	275

(5) DOCUMENT NO. (IF APPLICABLE)	DOCUMENT TITLE	DOCUMENT ISSUE DATE
EGG-TFBP-5221	Loss-of-Coolant Accident Test Series, TC-3 EOS	August 1980

(6) CHECK APPLICABLE BLANK
PERMANENT CHANGE X TEMPORARY CHANGE _____ BULLETIN _____

(7) MANAGER APPROVAL R. K. McFarland DATE 1/13/81

(8) PRINT OR TYPE PROPOSED CHANGE — NUMBER EACH CHANGE SEQUENTIALLY IN 1ST COLUMN AND RECORD PAGE AND STEP OR PARAGRAPH NUMBER FOR EACH CHANGE.

(9) FOR WRITER'S USE

ITEM	PAGE	STEP OR PARA.	INSTRUCTIONS: REWRITE PARAGRAPH(S) OR FOR EXTENSIVE CHANGES ATTACH REVISED COPY AND STATE "REVISE PER ATTACHED COPY". FOR NEW DOCUMENT, ATTACH ROUGH DRAFT AND STATE "PREPARE NEW (SP, DOP, ETC.) PER ATTACHED DRAFT".
1	1	2	Include a statement, "This EOS will also apply for TC-4".
2	2	2	Include the sentence, "The TC-4 test will consist of two rods from TC-3 (Rods 01 and 03) and two newly fabricated test rods (Rods 02 and 04) with embedded cladding thermocouples."
3	--	--	Replace the original TC-3 EOS pages with the attached pages.
4	29	2	Change "CLADTC3b6b53+70b02" to "CLADTC4bbb53+70b02."

USE CONTINUATION SHEET AS REQUIRED
NEXT ANTICIPATED NEED FOR DOCUMENT WITH THIS REVISION INCORPORATED: DATE/EVENT _____

(10) JUSTIFICATION: (REASON FOR CHANGE — NUMBER TO CORRESPOND TO ITEM NO. ABOVE):

1-4. TC-3 has been extended to TC-4 with two newly fabricated test rods. The hot leg Henry nozzle size has also been modified to decrease the slug velocity.

(11) OTHER DOCUMENTATION AFFECTED:

DOC. NO.	DRR NO.	DATE COMPLETED

(12) ORIGINATING DRR NO: _____

(13) REVIEW

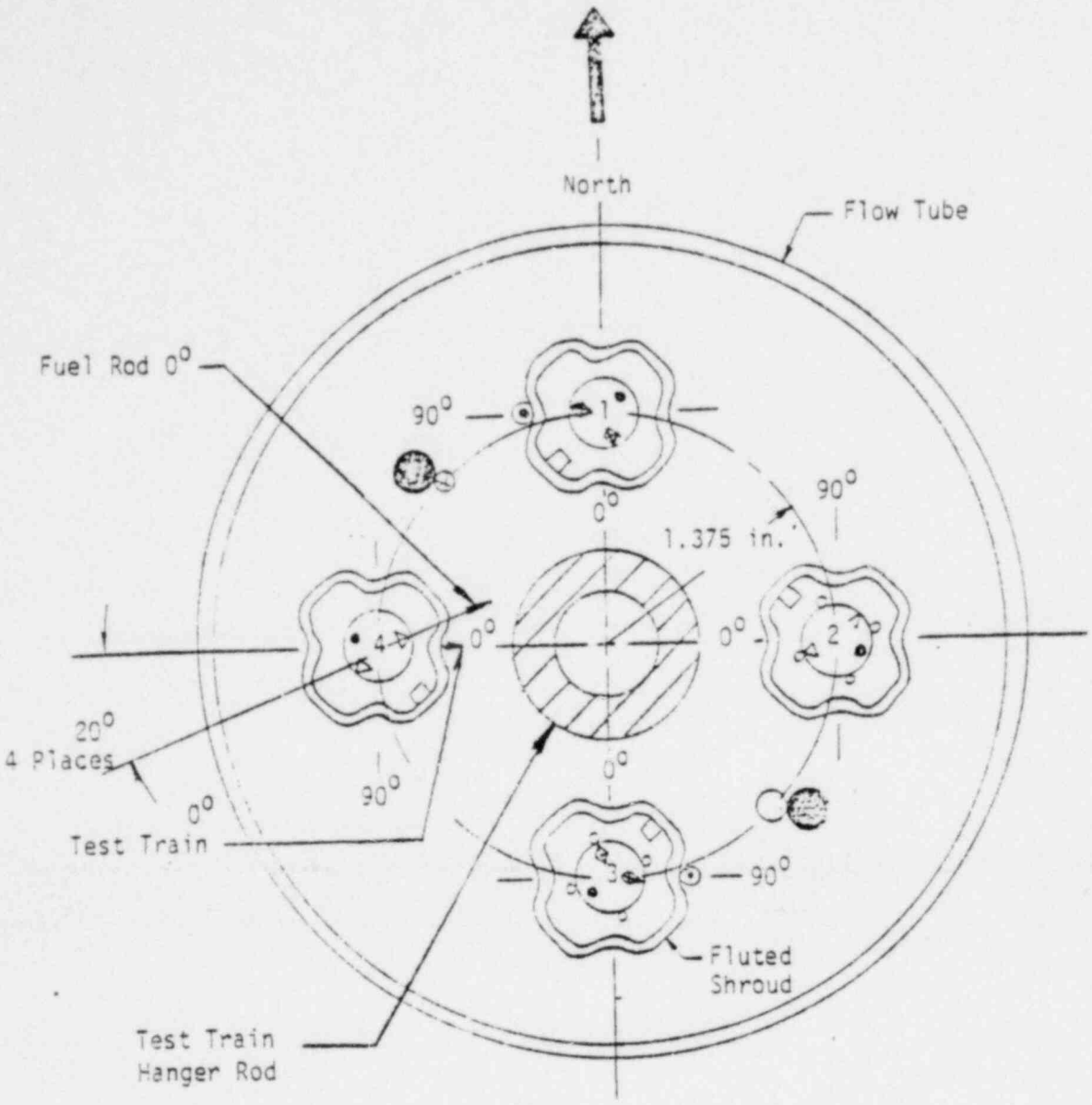
NAME/SIGNATURE	ORG.	DATE	NAME/SIGNATURE	ORG.	DATE	NAME/SIGNATURE	(14) REVIEW CODE	ORG.	DATE
T. Yackle	5910	1/13/81						QUALITY DIV	
D. McCallum COR	5700	1/27/81						SAFETY DIV	
[signature]	5800	1/27/81						PRAC	

(15) COMMENTS:

NRC Research and Technical Assistance Report

(16) ADDITIONAL DRRS IN THIS DOCUMENT REVISION

(17) DOCUMENT CONTROLLER	(18) RELEASE DATE:	(19) DRR COMPLETED DATE:



Rod Location	Rod No.
1	1E1-1
2	1E1-5
3	1E1-3
4	1E1-6

Rod to Rod Pitch - 49.39 mm

- ○ Outer Clad Thermocouple
- ● Pellet Surface Thermocouple
- △ Inner Clad Thermocouple (Embedded)
- □ Inside Shroud Coolant Thermocouple
- ◯ Self-powered Neutron Detector
- Self-powered Gamma Detector
- ⊙ Flux Wire
- Inner Clad Thermocouple (Welded)

Figure 1 : TC-4 Fuel Rod
Orientation and Instrumentation

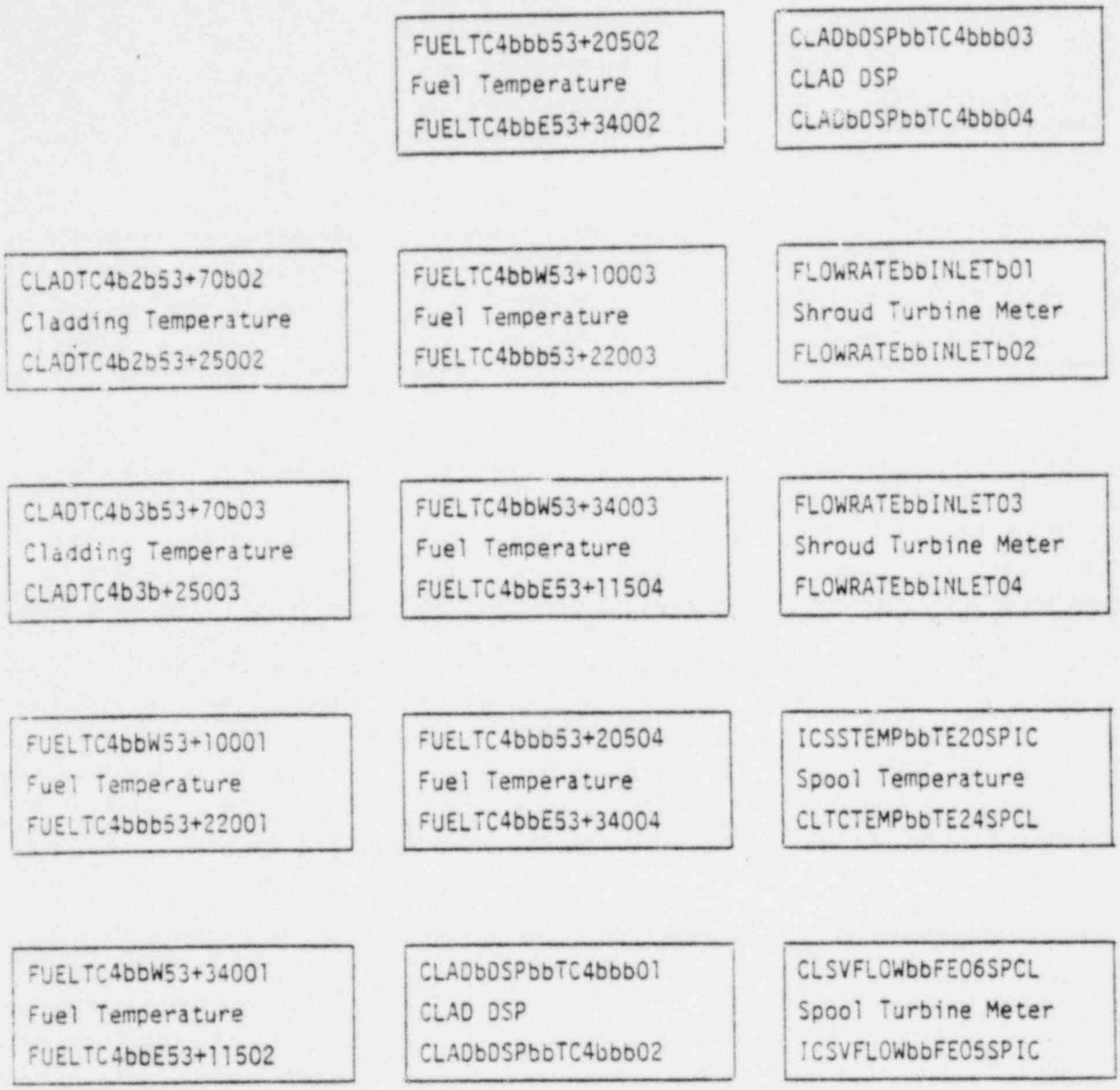


Figure 6. Strip chart setup for Test TC-4.

TABLE 2. TEST TC-4 HENRY NOZZLE THROAT DIAMETERS AND LOCATIONS

Nozzle Designation	Location	Throat Diameter (mm)
GB-LM-11-01	Hot leg	9.60
GB-LM-11-02	Hot leg	13.56
GB-LM-LR-C1	Cold leg	12.70
GB-LM-LR-C2	Cold leg	23.90

TABLE 6. PBF BLOWDOWN SYSTEM VALVE TIMING FOR TC-4

Time Event is Initiated (s)	Loop Bypass Valve[a]	Isolation Valve[b]	Hot Leg Blowdown Valves[c]		Cold Leg Blowdown Valves[d]		Quench Water Valve[e]	Warmup Line Valve[f]	Cold Leg Shutoff Valve[g]	Comments
			(1) (9.60 mm)	(2) (13.56 mm)	(3) (12.47 mm)	(4) (23.90 mm)				
--	X[h]	0	X	X	X	X	X	0	0	
-20.0	X	0	X	X	X	X	X	X	0	Operator closes warmup line and verifies test rod coolant flow to 0.8 l/s per shroud. Action is verified by IFBP Project Engineer before initiation of the transient.
-5.0	X	0	X	X	X	X	X	X	0	RELAP initiates function generator routine.
0.00	0	X	X	X	X	X	X	X	0	Isolate loop and open bypass valve. Shut off loop pump.
0.10	0	X	X	X	0	0	X	X	0	Open cold leg valves.
2.00	0	X	X	X	0	0	X	X	0	Maintain 100% of reactor power.
2.00	0	X	X	X	0	0	X	X	0	Linearly reduce reactor power to 13.8% in 0.1 s.

TABLE 6. (continued)

Time Event is Initiated (s)	Loop Bypass Valve[a]	Isolation Valve[b]	Hot Leg Blowdown Valves[c]		Cold Leg Blowdown Valves[d]		Quench Water Valve[e]	Warmup Line Valve[f]	Cold Leg Shutoff Valve[g]	Comments
			(1) (9.62 mm)	(2) (13.56 mm)	(3) (12.47 mm)	(4) (23.90 mm)				
2.10	0	X	X	X	0	0	X	X	0	Maintain reactor power at 13 8%
4.00	0	X	X	X	0	X	X	X	0	Close large cold leg.
5.50	0	(i)	X	X	X	X	X	X	0	Two phase slug phase.
5.56	0	(j)	X	X	X	X	X	X	0	Open isolation valves.
5.67	0	X	0	X	X	X	X	X	0	Close isolation valves/open hot leg.
11.00	0	X	X	X	0	X	X	X	0	Open cold leg, close hot leg.
99.7	0	X	X	X	0	0	X	X	0	Scram reactor.
100.00	0	X	X	X	0	0	X	X	0	Reflood cycle.
240	0	X	0	0	X	X	0	X	X	Quench.

a. VALVbPOSbbLM1107PT
b. VALVbPOSbbLM1105PT and VALVbPOSbbLM1106PT
c. VALVbPOSbbLM1101PT and VALVbPOSbbLM1102PT
d. VALVbPOSbbLMLRC1PT and VALVBPOSbbLMLRC2PT
e VALVbPOSbbLM1108PT
f. VALVbPOSbbLM1116PT
g. VALVbPOSbbLM1118PT
h. X indicates closed, 0 indicates open.
i. Opening of the isolation valves is initiated after small cold leg valve is closed.
j. Closing of the isolation valves is initiated.

TABLE 7. TEST IC-4 FUEL TRAIN INSTRUMENT IDENTIFICATION, DATA CHANNEL RECORDING, AND DISPLAY REQUIREMENTS

Measurement	Instrument Type	Location[a]	Rod Number	Instrument Identifier[b]	Recording ranges	Required (Hz)[c]
Fuel Rod						
Cladding surface temperature[d]	Type K thermocouple	0.053 m - 70°	2	CLADTC4bbb53+70b02	300 to 1500 K	10
		-160°	2	CLADTC4bbb53+16002		
		-250°	2	CLADTC4bbb53+25002		
		-340°	2	CLADTC4bbb53+34002		
		0.053 m - 70°	3	CLADTC4bbb53+70b03		
		-160°	3	CLADTC4bbb53+16003		
		-250°	3	CLADTC4bbb53+25003		
		-340°	3	CLADTC4bbb53+34003		
Internal fuel temperature[d]	Type K thermocouple	0.053 m -100°	1	FUELTC4bbW53+10001	300 to 1500 K	10
		-220°	1	FUELTC4bbb53+22001		
		-340°	1	FUELTC4bbW53+34001		
		0.053 m -100°	2	FUELTC4bbE53+11502		
		-220°	2	FUELTC4bbb53+20502		
		-340°	2	FUELTC4bbE53+34002		
		0.053 m -100°	3	FUELTC4bbW53+10003		
		-220°	3	FUELTC4bbb53+22003		
		-340°	3	FUELTC4bbW53+34003		
		0.053 m -100°	4	FUELTC4bbE53+11504		
		-220°	4	FUELTC4bbb53+20504		
		-340°	4	FUELTC4bbE53+34004		
Cladding axial strain[d]	LVDT	End of fuel rod	1	CLADbDSPbbIC2bbb01	-12 to 12 mm	100
			2	CLADbDSPbbIC2bbb02		
			3	CLADbDSPbbIC2bbb03		
			4	CLADbDSPbbIC2bbb04		

a. All elevations are measured from axial midplane of the fuel stack. The positive direction is with the coolant flow. Radial orientations are defined by Figure 1.

b. b denotes blank.

c. Minimum recording frequency is calculated from required instrument response time. Final designation of the instrument response time will be determined by the Instrument and Data section.

d. Required instruments for data qualification.

TABLE A-1. MEASUREMENT STATUS CHECK PRIOR TO TEST TC-4

REACTOR POWER _____ KW
COOLANT TEMPERATURE _____ K (Average of test train inlet TC's)
COOLANT PRESSURE _____ MPa (Heise)
SHROUD FLOW RATE _____ l/s (Average of test train inlet flowmeters)

PARAMETER ID	PBF/DARS READING		REQUIRED RANGE	INSTRUMENT IS WITHIN RANGE
CLADTC4b2b53+70b02	_____	K	Temperature ± 4 K	_____
CLADTC4b2b53+16002	_____	K	Temperature ± 4 K	_____
CLADTC4b2b53+25002	_____	K	Temperature ± 4 K	_____
CLADTC4b2b53+34002	_____	K	Temperature ± 4 K	_____
CLADTC4b3b53+70b03	_____	K	Temperature ± 4 K	_____
CLADTC4b3b53+16003	_____	K	Temperature ± 4 K	_____
CLADTC4b3b53+25003	_____	K	Temperature ± 4 K	_____
CLADTC4b3b53+24003	_____	K	Temperature ± 4 K	_____
FUELTC4b1W53+10001	_____	K	Temperature ± 4 K	_____
FUELTC4b1b53+22001	_____	K	Temperature ± 4 K	_____
FUELTC4B1W53+34001	_____	K	Temperature ± 4 K	_____
FUELTC4b2W53+10002	_____	K	Temperature ± 4 K	_____
FUELTC4b2b53+22002	_____	K	Temperature ± 4 K	_____
FUELTC4b2W53+34002	_____	K	Temperature ± 4 K	_____
FUELTC4b3b53+10003	_____	K	Temperature ± 4 K	_____
FUELTC4b3b53+22003	_____	K	Temperature ± 4 K	_____
FUELTC4b3W53+34003	_____	K	Temperature ± 4 K	_____
FUELTC4b4W53+10004	_____	K	Temperature ± 4 K	_____
FUELTC4b4b53+22004	_____	K	Temperature ± 4 K	_____
FUELTC4b4W53+34004	_____	K	Temperature ± 4 K	_____
CLADbDSPbbTC4bbb01	_____	mm	1.0 ± 0.5 mm	_____
CLADbDSPbbTC4bbb02	_____	mm	1.0 ± 0.5 mm	_____
CLADbDSPbbTC4bbb03	_____	mm	1.0 ± 0.5 mm	_____
CLADbDSPbbTC4bbb04	_____	mm	1.0 ± 0.5 mm	_____
INLTbTMPbbTC4bbb01	_____	K	Temperature ± 4 K	_____

INLTbTMPbbTC4bbb02	_____	K	Temperature ± 4 K	_____
INLTbTMPbbTC41bb03	_____	K	Temperature ± 4 K	_____
INLTbTMPbbTC4bbb04	_____	K	Temperature ± 4 K	_____
OUTbTEMPbbTC4bbb01	_____	K	Temperature ± 4 K	_____
OUTbTEMPbbTC4bbb02	_____	K	Temperature ± 4 K	_____
OUTbTEMPbbTC4bbb03	_____	K	Temperature ± 4 K	_____
OUTbTEMPbbTC4bbb04	_____	K	Temperature ± 4 K	_____
DELbTEMPbb135bbb01	_____	K	± 0.05 K	_____
DELbTEMPbb135bbb02	_____	K	± 0.05 K	_____
DELbTEMPbb135bbb03	_____	K	± 0.05 K	_____
DELbTEMPbb135bbb04	_____	K	± 0.05 K	_____
FLOWRATEbbINLETb01	_____	l/s	Flow ± 0.001 l/s	_____
FLOWRATEbbINLETb02	_____	l/s	Flow ± 0.001 l/s	_____
FLOWRATEbbINLETb03	_____	l/s	Flow ± 0.001 l/s	_____
FLOWRATEbbINLETb04	_____	l/s	Flow ± 0.001 l/s	_____
FLOWRATEbbOUTLET01	_____	l/s	Flow ± 0.001 l/s	_____
FLOWRATEbbOUTLET02	_____	l/s	Flow ± 0.001 l/s	_____
FLOWRATEbbOUTLET03	_____	l/s	Flow ± 0.001 l/s	_____
FLOWRATEbbOUTLET04	_____	l/s	Flow ± 0.001 l/s	_____
NEUTbFLXbb-34.3bTT	N/A		N/A	N/A
NEUTbFLXbb-22.9bTT	N/A		N/A	N/A
NEUTbFLXbb-11.4bTT	N/A		N/A	N/A
NEUTbFLXbbbb0.0bTT	N/A		N/A	N/A
NEUTbFLXbb+14.2bTT	N/A		N/A	N/A
NEUTbFLXbb+22.9bTT	N/A		N/A	N/A
NEUTbFLXbb+34.3bTT	N/A		N/A	N/A
BYPbTEMPbbNO.1bLTT	_____	K	Temperature ± 4 K	_____
BYPbTEMPbbNO.2bbTT	_____	K	Temperature ± 4 K	_____
BYPbTEMPbbNO.3bUTT	_____	K	Temperature ± 4 K	_____
BYPbTEMPbbNO.4bUTT	_____	K	Temperature ± 4 K	_____
BYPbTEMPbbNO.5bUTT	_____	K	Temperature ± 4 K	_____
PLATbTMPbbbbbbbbLTT	_____	K	Temperature ± 4 K	_____
SYSbPRESbb69EGbLTT	_____	MPa	Heise ± 3.5 MPa	_____
SYSbPRESbb17EGbLTT	_____	MPa	Heise ± 0.7 MPa	_____