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55-5-156

Revision 1

HRT PROCESS FLOWSHEETS

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OAK RIDGE NATIONAL LABORATORY

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OCT 18 1955

OAK RIDGE NATIONAL LABORATORY

Date: October 3, 1955

Subject: HRT Refrigeration and Cold Trap System Flowsheet - D-18333 Revision b

From: F. C. Zapp

To: Distribution

The attached flowsheet is the latest revision as of 7-28-55.

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Attach to
Flowsheet document
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For The Atomic Energy Commission

H. F. Cannon
Chief, Declassification Branch

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CF-55-5-156(Rev. 1)

UNITED STATES ATOMIC ENERGY COMMISSION

HRT PROCESS FLOWSHEETS. Revision I.

By
F. C. Zapp

August 25, 1955

Oak Ridge National Laboratory
Oak Ridge, Tennessee

Technical Information Service Extension, Oak Ridge, Tenn.

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The current series of HRT approved flowsheets (excluding Chemical Processing) is as follows.

<u>Title</u>	<u>Dwg. No.</u>
Low-Pressure Fuel System	D-18295b
High-Pressure Fuel System	D-18296b
High-Pressure Blanket System	D-18297b
Low-Pressure Blanket System	D-18298b
Cooling Water System	D-18240b
Steam System	D-18267b
Waste and Vent System	D-18309b
Refrigeration and Cold Trap System	D-18333a
Steam and Condensate Service System	D-22579a
Flowsheet Identification Code	D-18330b

An Equipment Schedule (Dwg. No. A-18331) is included at the back of this report. A new Flowsheet Line Schedule (Dwg. No. A-18329 - Revision I) will be issued in the near future.

Instrumentation references are as follows.

<u>Title</u>	<u>Dwg. No.</u>
HRT Instrument Application Tabulation	A-20954b
HRT Multipurpose Instruments	D-18360
Instrument Air-Line Schematic I	D-21039
Instrument Air-Line Schematic II	D-21040
Instrument Air-Line Schematic III	D-21041
Instrument Air-Line Schematic IV	D-21042

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008

a General				
NO.	REVISIONS	DATE	APPR.	APPR.
DRAWING NO. D-18309				
DESIGNED	DATE	CHECKED	DATE	APPROVED
DATE	DATE	DATE	DATE	DATE
HEALTH PHYSICS	MEDICAL	OPERATIONS	SAFETY	
FIRE PROTECTION	RESEARCH SHOP	MAINTENANCE		

b General				
NO.	REVISIONS	DATE	APPR.	APPR.
DRAWING NO. D-18309				
DESIGNED	DATE	CHECKED	DATE	APPROVED
DATE	DATE	DATE	DATE	DATE
HEALTH PHYSICS	MEDICAL	OPERATIONS	SAFETY	
FIRE PROTECTION	RESEARCH SHOP	MAINTENANCE		

NOTES:
1. Carbon Steel Pipe in This System is to Be Butt Welded Steel - ASTM-A53.
2. Steam Piping shall Be in Accordance With HRT Specifications JS-1202-1.
3. All Carbon Steel Piping & Fittings Within The Reactor & Chemical Process Cells Are to Be Given A Protective Coating (To Be Specified Later).
4. All Stainless Steel Piping in This System is to Be in Accordance With ASTM-A312 (Seamless Type 304).

HRT Instr. Application Tabulation		A209548
HRT Flow Sheet Identification Code		D-18330
HRT Flow Sheet Line Schedule		D-18329
REFERENCE DRAWINGS		DWG. NO.
HRT		BLDG. 7500
WASTE & VENT SYSTEM FLOW SHEET		
OAK RIDGE NATIONAL LABORATORY		
OPERATED BY		
CARBIDE AND CARBON CHEMICALS COMPANY		
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION		
OAK RIDGE, TENNESSEE		
SUBMITTED	ACCEPTED	APPROVED
DATE	DATE	DATE
3-20-55	3-20-55	3-20-55
W.P. Walker	W.P. Walker	W.P. Walker
PER F.C. JAPP	SCALE:	D-18309

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MATERIALS LIST

ITEM NO.	DWG. NO.	QTY.	NAME	SIZE	MATERIAL
----------	----------	------	------	------	----------

NOTES:

1. Recombiners operate with steam @ 250 PSI. & Evaporators with steam @ 75 PSI.
2. The traps (8) serving the Evaporator legs are to be Armstrong No. 882 with built in strainer and a 3/8" orifice (3/8" connections) or equal & the traps (4) serving the recombiner coils are to be Armstrong No. 881 with built in strainers and a #38 orifice (1/2" connections) or equal.
3. Valves in line with the traps are to be gate valves. By-Pass valves & Feed valves are the globe type.
4. The pressure regulator is to be a Mason #11-1"scr. Reduced Pressure 5 to 130* inlet-250*.
5. All steam and condensate lines are to be insulated per specifications JS-HRT-1202-4.
6. This Flowsheet covers service to equip. in Reactor cell only.
7. Piping to be in accordance with specifications - JS-1202-1 & JS-1202-2.

a General	7-25-55	F.C.E.	W.P.B.
NO.	REVISIONS	DATE	APPR.

DRAWING NO. D-

DRAWN	DATE	CHECKED	DATE	APPROVED	DATE
W.P.B.	6-25-55	R.C. BARNETT	6-25-55	W.P.B.	6-25-55
DESIGNED	DATE	SUBMITTED	DATE	APPROVED	DATE
F.C.E.	6-9-55	F.C.E.	6-9-55	W.P.B.	6-9-55

HEALTH PHYSICS	MEDICAL	OPERATIONS	SAFETY
FIRE PROTECTION	RESEARCH SHOP	MAINTENANCE	

REFERENCE DRAWINGS

DWG. NO.

HRT BLDG. 7500

STEAM & CONDENSATE SERVICE
FLOWSHEETOAK RIDGE NATIONAL LABORATORY
OPERATED BY
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NOTE: ALL PROCESS LINE INFORMATION IS FOR OPERATION AT AN
OVERALL GROSS POWER OF 5220 KW.

I. LINE NUMBER NOMENCLATURE

THE LINE SCHEDULE IS DIVIDED INTO FIVE SECTIONS AS FOLLOWS:

1. PROCESS PIPING

A) FUEL SYSTEM - LINES 100-199 INCLUSIVE

INCLUDES ALL LINES NORMALLY CARRYING FUEL SOLUTIONS;
OVERFLOW, VAPOR AND CONDENSATE, TRANSFER AND
SAMPLE LINES.

B) BLANKET SYSTEM - LINES 200-299 INCLUSIVE

INCLUDES ALL LINES NORMALLY CARRYING BLANKET
SOLUTION; OVERFLOW, VAPOR AND CONDENSATE, TRANSFER,
AND SAMPLE LINES.

2. STEAM PIPING

LINES 300-399 INCLUSIVE.

INCLUDES ALL LINES CARRYING STEAM OR CONDENSATE, AND
FEEDWATER SYSTEM.

3. SERVICE PIPING

LINES 400-574; 601-674; 701-949; INCLUSIVE.

INCLUDES ALL STEAM, WATER, VENT, COOLING WATER, AND
REFRIGERANT LINES.

4. PROCESS INSTRUMENT PIPING

LINES 575 - 599 INCLUSIVE
668 - 679 INCLUSIVE
691 - 699 INCLUSIVE

SHOWN IN BOX
575

5. LEAK DETECTION SYSTEM

LINES 1 - 96 INCLUSIVE - FUEL SIDE
18 - 968 INCLUSIVE - BLANKET SIDE
950 - 974 INCLUSIVE - FUEL SIDE
975 - 999 INCLUSIVE - BLANKET SIDE

IA. INSTRUMENT NUMBERING CODE

1. INSTRUMENT PROCESS DIVISIONS

100-199 FUEL HIGH PRESSURE
200-299 BLANKET HIGH PRESSURE
300-399 FUEL LOW PRESSURE
400-499 BLANKET LOW PRESSURE
500-699 STEAM POWER
700-799 OFF GAS
800-899 UTILITIES
900-999 MISCELLANEOUS

2nd AND 3rd DIGITS	FUNDAMENTAL VARIABLE	MULTIPURPOSE NUMBERS
00-04	ANALYSIS	0000-0400
05-14	ELECTRIC	0500-1400
15-34	FLOW	1500-3400
35-44	HAND	3500-4400
45-49	LEVEL	4500-4900
50-59	PRESSURE	5000-5900
60-64	RADIATION	6000-6400
65-94	TEMPERATURE	6500-9400
95-99	WEIGHT	9500-9900

II. LINE IDENTIFICATION

LINE NUMBERS 183

SHIELD LINE

PRIMARY PROCESS LIQUID LINE

SECONDARY PROCESS LIQUID LINE

PRIMARY PROCESS GAS OR VAPOR LINE

SECONDARY PROCESS GAS OR VAPOR LINE

STEAM LINE

AIR LINE

ELECTRICAL LINE

OXYGEN

NITROGEN

III. PIPE LINE CODE

TYPICAL CODE ON LINE

1-1/2" SCH. 80 CARBON STEEL PIPE 1-1/2 C80

1" SCH. 40 STAINLESS STEEL PIPE 1 S40 OR 1-40

1/2" SCH. 40 WROUGHT IRON PIPE 1/2 W40

1" SCH. 80 GALVANIZED PIPE 1 G80

IV. GENERAL LEGEND

CONDENSATE DRAIN CD

COOLING WATER CW

COOLING WATER DRAIN CWD

(X - BELOW AIR OPERATED VALVE) - FAILS CLOSED -

(O - BELOW AIR OPERATED VALVE) - FAILS OPEN -

EXAMPLE:

PC-452

P C - 4 5 2

FUNDAMENTAL VARIABLE ALLOCATION NUMBERS

PROCESS DIVISION NUMBER

INSTRUMENT CLASSIFICATION LETTER(S)

FUNDAMENTAL VARIABLE CLASSIFICATION LETTER

HRT FLOWSHEET IDENTIFICATION CODE

V. VALVE AND FITTING SYMBOLS

SAFETY OR RELIEF VALVE

MANUALLY OPERATED VALVE

CHECK VALVE

AIR OPERATED VALVE (COMMERCIAL DIAPHRAGM)

AIR OPERATED VALVE (REMOTELY OPERATED IN RADIATION FIELD)

AIR OPERATED VALVE WITH POSITIONER

MANUALLY OPERATED EXTENSION HANDLE VALVE

GATE VALVE

GLOBE VALVE

VALVE NORMALLY CLOSED

VALVE NORMALLY OPEN

VALVE THROTTLING

SOLENOID VALVE

MECH. COUPLING

REDUCING COUPLING (SCREWED)

REDUCING COUPLING (WELDED)

FLOW RESTRICTOR

FLANGED JOINT

UNION (THREADED)

LOAD CELL

STRAINER

TRAP

FREEZER STATION POSITION

PERMANENT FREEZER STATION

RUPTURE DISC

CALORIMETER CONNECTION

VALVE (3-WAY) WITH NORMALLY BLOCKED PORT

VALVE (3-WAY) WITH COMMON PORT

VI. INSTRUMENTATION AND MISC. SYMBOLS

EQUIPMENT NO. 6

(WHEN SHOWN ON AIR OPERATED VALVES)

FIGURE TO LEFT INDICATES LOWER AIR OPER. PRESSURE

FIGURE TO RIGHT INDICATES UPPER AIR OPER. PRESSURE

INSTRUMENTS WITH SINGLE FUNCTION:

LOCALLY MOUNTED

TURBINE PANEL MOUNTED

INTERMEDIATE MOUNTED

CONTROL PANEL MOUNTED

AUXILIARY MOUNTED

TRANSMITTER

INSTRUMENTS WITH DUAL FUNCTIONS OR

INSTRUMENTS WITH CLOSE MECH. COUPLING

INSTRUMENT NOT COVERED IN CODE

LEADS TO ELECTRICAL CONTROL CIRCUIT ECC

LEADS TO ANNUNCIATOR ANN

INLINE INSTRUMENT

VII. INSTRUMENT CLASSIFICATION CODE

(MEANING OF LETTERS APPEARING IN INST. BALLOONS)

	FIRST LETTER	ANNUNCIATOR	PRIMARY ELEMENT	CONTROLLER	INDICATOR	AMPLIFIER, BOOSTER, RELAY - MODIFIER	RECORDER	TRANSMITTER - TRANSDUCER	SWITCH	RECORDER - CONTROLLER	INDICATOR - CONTROLLER	REMOTE OPERATED VALVE	SELF OR MANUAL OPERATED VALVE	SAFETY VALVE
2ND- 3RD LETTER	A	E	C	I	M	R	T	X	RC	IC	CV	V	SV	
ANALYSIS	A	AA	AE	AC	AI	AM	AR	AT	AX	ARC	AIC	ACV		ASV
ELECTRIC	E	EA	EE	EC	EI	EM	ER	ET	EX	ERC	EIC	ECV	EV	ESV
FLOW	F	FA	FE	FC	FI	FM	FR	FT	FX	FRC	FIC	FCV	FV	FSV
HAND	H	HA		HC		HM			HX		HIC	HCV	HV	
LEVEL	L	LA	LE	LC	LI	LM	LR	LT	LX	LRC	LIC	LCV	LV	LSV
PRESSURE	P	PA	PE	PC	PI	PM	PR	PT	PX	PRC	PIC	PCV	PV	PSV
RADIATION	R	RA	RE	RC	RI	RM	RR	RT	RX	RRC	RIC	RCV		
SPEED	S	SA	SE	SC	SI	SM	SR	ST	SX	SRC	SIC	SCV		
TEMPERATURE	T	TA	TE	TC	TI	TM	TR	TT	TX	TRC	TIC	TCV	TV	TSV
WEIGHT	W	WA	WE	WC	WI	WM	WR	WT	WX	WRC	WIC	WCV		
SPECIAL	X	XA	XE	XC	XI	XM	XR	XT	XX	XRC	XIC	XCV	XV	XSV

THE FOLLOWING SUBSCRIPTS MAY BE APPLIED TO THE FIRST LETTER.

a - AVERAGE i - CURRENT v - VOLTS

c - CONDUCTIVITY m - MOISTURE w - WATTS

d - DIFFERENTIAL pf - POWER FACTOR

f - FREQUENCY pH - CONCENTRATION

g - SPECIFIC GRAVITY t - TIME

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Drawing No.
A-18331
Sheet 1 of 6

HRT EQUIPMENT SCHEDULE

<u>No.</u>	<u>Name</u>	<u>Code</u>	<u>Flowsheet*</u>
1	Core	K-39	V
2	Fuel Pressurizer	G-38	V
3	Fuel Gas Separator	H-35	V
4	Fuel Heat Exchanger	H-30	V
5	Fuel Circulating Pump	J-34	V
6	Fuel Dump Cooler	M-30	V
7a	Fuel Dump Tank and Evaporator	K-14	V
7b	Fuel Dump Tank and Evaporator	K-14	V
7c	Entrainment Separator	J-15	V
8	Fuel Recombiner Condenser	D-14	V
8a	Fuel Recombiner	D-15	V
9a	Fuel Cold Trap	C-6	V
9b	Fuel Cold Trap	B-6	V
10a	Fission Product Adsorber	A-2	V
10b	Fission Product Adsorber	B-2	V
10c	Fission Product Adsorber	B-2	V
11	Off-Gas Vacuum Pump	E-1	V
12	Stack Filter	L-1	V
13	Stack	K-1	V
13a	Stack Fan	K-1	V
14	Fuel Condensate Tank	E-11	V
15	Reflux Condenser	H-6	V
16a	Fuel Storage Tank and Evaporator	L-7	V
16b	Fuel Storage Tank and Evaporator	L-7	V

*See Page 6

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14.

<u>No.</u>	<u>Name</u>	<u>Code</u>	<u>Flowsheet*</u>
17	Fuel Feed Cooler	M-18	V
18	Fuel Sample Station	E-9	V
19	Fuel Transfer Tank	F-8	V
20	Fuel Letdown Heat Exchanger	E-21	V
21	Fuel Feed Pump	L-21	V
22	Holdup Tank	C-39	V
23	Fuel Purge Pump	H-20	V
24	Fuel Sample Cooler	L-30	V
25	H.P. Fuel Sample Station	H-21	V
26	Fuel Oxygen Supply	M-9	V
27	Fuel Gas Cooler	C-36	V
28	Blanket Circulating Pump	H-45	V
29	Blanket Pressurizer	G-41	V
30	Blanket Gas Separator	H-43	V
31	Blanket Heat Exchanger	H-49	V
32	Pressure Vessel	K-39	V
33	Blanket Dump Cooler	M-49	V
34a	Blanket Dump Tank and Evaporator	K-65	V
34b	Blanket Dump Tank and Evaporator	K-65	V
34c	Entrainment Separator	J-63	V
35	Blanket Recombiner Condenser	D-65	V
35a	Blanket Recombiner	D-63	V
36a	Blanket Cold Trap	C-73	V
36b	Blanket Cold Trap	B-73	V

*See page 6

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<u>No.</u>	<u>Name</u>	<u>Code</u>	<u>Flowsheet*</u>
37	Blanket Condensate Tank	E-67	V
38	H.P. Blanket Sample Station	H-58	V
39	Blanket Reflux Condenser	H-73	V
40	Blanket Feed Cooler	M-61	V
41	Blanket Feed Pump	L-57	V
42	Blanket Transfer Tank	E-71	V
43	Blanket Sample Cooler	L-49	V
44	Blanket Sample Station	E-69	V
45	Blanket Letdown Heat Exchanger	E-57	V
46	Blanket Gas Cooler	C-43	V
47	Future Compressor	B-3	V
48	Blanket Purge Pump Cooler	F-64	V
49a	Blanket Storage Tank and Evaporator	L-72	V
49b	Blanket Storage Tank and Evaporator	L-72	V
50	Storage Cold Trap	B-35	V
51	Fuel Storage Recombiner	F-5	V
52	Blanket Storage Recombiner	F-73	V
53	Fuel Steam Drum	C-4	X
54	Blanket Steam Drum	C-6	X
55	Steam Calorimeter		
56	Steam Separator	F-15	X
57	Steam Turbine	F-16	X
58	Generator	F-18	X
59	Steam Condenser	H-17	X

*See page 6

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<u>No.</u>	<u>Name</u>	<u>Code</u>	<u>Flowsheet*</u>
60	Auxiliary Steam Condenser	H-21	X
61	Cooling Tower	C-5	W
62	Cooling Tower Pump	D-7	W
63	Hotwell Pump	K-16	X
64	Deaerator and Feedwater Storage Tank	L-12	X
65a	Feedwater Pump	M-10	X
65b	Feedwater Pump	N-10	X
66	Packaged Boiler System	G-11	X
67a	Oxygen Accumulator	L-10	V
67b	Axygen Accumulator	L-11	V
68	Fuel Purge Pump Cooler	F-15	V
69	Refrigerant Compressor	N-17	Z
70	Refrigerant Sub-Cooler	L-13	Z
71	Chiller and Storage Tank	M-9	Z
72	Heater and Storage Tank	L-3	Z
73	Cold F-11 Pump	O-8	Z
74	Warm F-11 Pump	N-3	Z
75	Refrigerant Condenser	M-12	Z
76	H.P. Fuel Loop Piping		
77	H.P. Blanket Loop Piping		
78	H.P. Valves and Fittings		
79	L.P. Piping, Valves and Fittings		
80a	Waste Evaporator	B-21	Y
80b	Waste Evaporator	C-21	Y
81	Decontamination System		
82a	Space Cooler	G-11	W

*See page 6

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<u>No.</u>	<u>Name</u>	<u>Code</u>	<u>Flowsheet*</u>
82b	Space Cooler	H-11	W
82c	Space Cooler	G-13	W
82d	Space Cooler	H-13	W
83	Freezer		
84	Corrosion Sample Retainers and Corrosion Study Facilities		
85	Source Tube and Thimble		
86	Handling Tools		
87	Leak Detector System		
88a	Feedwater Accumulator	M-9	X
88b	Feedwater Accumulator	N-9	X
89a	Chemical Vent Vacuum Pump	F-15	Y
89b	Reactor Vent Vacuum	G-15	Y
90	Waste Evaporator Condenser	E-21	Y
91	Reactor Vessel Cooler	K-12	W
92	Thermal Shield Cooler	K-12	W
93	1000 Gal. Waste Condensate Tank	G-20	Y
94	12000 Gal. Waste Tank	L-20	Y
95	Waste Pond	P-14	Y
96	Off Gas Filter	H-1	V
97	Thermal Insulation (in cell)		
98	Reactor Blast Shield		
99	Dewatering Pump	M-8	Y
100	Dump Tank Weighbeam Assembly		
101	Condensate Weighbeam Assembly		
102	Cell Air Monitor Blower	B-3	Y
103	Condensate Receiver Tank	B-7	U
104	Blanket Purge Pump	D-61	V

*See page 6

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<u>No.</u>	<u>Name</u>	<u>Code</u>	<u>Flowsheet*</u>
105	Heat Exchanger Blast Shield		
106	Dryer	L-2	Z
107	Dryer	M-7	Z

*Flowsheet Code References

-(Code gives location of equipment on following flowsheets)

	<u>Abcissa Range</u>
V Low Pressure Fuel System Flowsheet - D-18295b	(1 thru 19)
V High Pressure Fuel System Flowsheet - D-18296b	(20 thru 39)
V High Pressure Blanket System Flowsheet - D-18297b	(40 thru 56)
V Low Pressure Blanket System Flowsheet - D-18298b	(57 thru 78)
W Cooling Water System Flowsheet - D-18240b	
X Steam System Process Flowsheet - D-18267b	
Y Waste and Vent System Flowsheet - D-18309b	
Z Refrigeration and Cold Trap System Flowsheet - D-18333a	
U Steam and Condensate Service Flowsheet - D-22579a	

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