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SUBJECT: Procedure for Initial Hydrostatic Test on
HRT Fuel and Blanket Systems

TO: R. Van Winkle

FROM: H. E. Williamson

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To: R. Van Winkle
From: H. E. Williamson
Subj: Initial Hydrostatic Test on Reactor System

Attached is a procedure prepared for the hydrostatic testing of the entire reactor system at 750 psi, and the high-pressure system at 3000 psi. I would like to call to your attention the construction status of the instrument lines (675, 676, 677, 678) to the blanket and fuel storage tank level indicators which are unfinished and must be closed off with blanks and with small valves to allow air venting during filling.

H. E. Williamson
H. E. Williamson

HEW:be

Procedure for Initial Hydrostatic Test on HRT Fuel and Blanket Systems

Purpose:

The hydrostatic test of the process piping, equipment, and joints in the reactor complex will reveal leakage and structural weaknesses that may be present. The necessary action is taken when a leak appears so that on completion there is assurance that the system is hydrostatically leak-tight.

Summary:

The entire reactor system is subjected to the low-pressure hydrostatic test of 750 psi; the high-pressure system is isolated and the hydrostatic pressure on it is raised to 3000 psi. Appropriate records are kept of the leaks appearing and the action taken to seal them.

The system is evacuated to remove essentially all of the air, and is then filled with filtered potable water. A check is made for gross leaks at tap-water line pressure, then the pressure in all the reactor piping is raised to 750 psi. The pressure must remain steady around 750 psi for at least 1 hour or long enough for a visual examination of all pipe, vessels, and flanged joints. All flanges are also to be checked with the leak-detector system.

The high-pressure system is isolated and the pressure on it increased to 3000 psi. The pressure must remain steady at around 3000 psi for at least 1 hour or long enough for a thorough visual inspection. The high-pressure flanges are checked with the leak-detector system.

The location of leaks and the amount of torque required to seal a flange is recorded throughout the testing. If the torque exceeds that recommended for the leaking joint the gasket should be removed and sealing surfaces inspected before proceeding. For the test to be effective extreme care must be taken that essentially all the air has been removed from the system.

System Preparation:

1. Remove the following valves and blank the low-pressure system side of the flanges:

<u>Valve</u>	<u>Line</u>	<u>Location</u>
HCV-340	141	Line between fuel dump tanks and Chem. Tech.
HCV-937	162	Line between fuel dump tanks and Chem. Tech.
TCV-786	118	Fuel cold trap discharge
TCV-789	117	Fuel cold trap discharge
HCV-938	262	Line between blanket dump tanks and Chem. Tech.
TCV-787	217	Blanket cold trap discharge
TCV-788	218	Blanket cold trap discharge

2. Remove the following valves and blank the high-pressure system side of the flanges:

<u>Valve</u>	<u>Line</u>	<u>Location</u>
HCV-141	166	Chem. Tech. to high-pressure fuel system
HCV-142	167	High-pressure fuel system to Chem. Tech.
HCV-241	266	Chem. Tech. to high-pressure blanket system
HCV-242	267	High-pressure blanket system to Chem. Tech.

3. Remove the following instruments and cap the connections (3/8-in. autoclave engineer's fittings):

<u>Instrument</u>	<u>Line</u>	<u>Location</u>
PE-350	577	Fuel recombiner inlet
PE-352*	675	Fuel storage tanks vapor header
PdE-751	590	Fuel recombiner condenser discharge
PE-450	578	Blanket recombiner inlet
PE-452*	677	Blanket storage tanks vapor header
PdE-752	592	Blanket recombiner condenser discharge

4. Cap all sampler connections, but provide for venting air from all sampler lines attaching to the storage system (237, 236, 802, 803, 137, 136, 800, 801). (Use autoclave valves as caps.)

5. Install HV-935 in chemical processing loading pit.

6. Provide 1-in. vacuum hose connections preceded by a block valve as follows:

<u>Location</u>	<u>Piping to Block Valve</u>	<u>Block Valve</u>	<u>Provision</u>
a. Fuel Recombiner Condenser discharge, line 116	3/4-in.sch. 40	3/4-in.	Replace HCV-344 with adapter "tee" (see Fig. 2)
b. Blanket Recombiner Condenser discharge, line 216	3/4-in.sch. 40	3/4-in.	Replace HCV-444 with adapter "tee" (see Fig. 2)
c. Pressurizer Rupture Disc Assembly	3/4-in.sch. 80 tee	3/4-in.	Remove rupture disc assembly internals and replace top flange with flange drilled and tapped with 3/4-in. sch. 80 tee (available).

*Provide for venting air from line, by sealing with autoclave valve instead of plug. (These lines may not be complete by the time the test takes place.)

<u>Location</u>	<u>Piping to Block Valve</u>	<u>Block Valve</u>	<u>Provision</u>
d. Storage Cold Trap Discharge, Line 165	1/2-in. sch. 40	1/2-in.	Replace HCV-743 with bar stock elbow (Fig. 3) so line to charcoal beds will be blocked, but storage cold trap can be evacuated.

7. Attach Sprague hydraulic pump rig to one branch of temporary 3/4-in. tee on top of rupture disc assembly.

8. Replace HCV-440 with a bar stock elbow (Fig. 3) so that line 241 to Chem. Tech. is blanked and water can be injected into the reactor system through line 241.

9. Break the 1/2-in., 1500-lb ring-joint flanges near the feed pumps in the oxygen addition lines, 145b and 245b, and install at each location a vacuum gauge that can be protected from the hydrostatic pressure with a block valve.

10. Remove the 1/2-in., 1500-lb ring-joint blind flanges on the future oxygen addition lines on the high-pressure side of the fuel and blanket feed pumps. Install at the fuel feed pump a pressure recorder or gauge (0-4000 psi) and vacuum gauge, and at the blanket feed pump a vacuum gauge. Provide block valves to protect the vacuum gauges from the hydrostatic pressure.

11. Provide air to operators of the following valves:

PCV-152	PdCV-250A	HCV-732
HCV-339	PdCV-250B	HCV-734
HCV-338	LCV-145	HCV-936
HCV-731	PCV-252	HCV-239
HCV-733	HCV-438	LCV-245
	HCV-439	HCV-139

12. Seal lines 676 in the fuel storage tanks evaporator legs and line 678 on the blanket storage tanks evaporator legs with 1/4-in autoclave valves.

Procedure:

A. Filling

1. Attach the evacuation rig to the vacuum connections (see Fig. 4) at the Fuel Recombiner Condenser, Blanket Recombiner Condenser, and Rupture Disc Assembly.

2. Close

HCV-439 and HCV-339

3. Open HCV-438 HCV-338
 HCV-732 HCV-731
 HCV-734 HCV-733
 HCV-435 HCV-335
 HCV-436 HCV-336
 HCV-936 HV-935
 Valves on holdup tank sightglass
4. Start evacuation.
5. Open water supply valve on line 241.
6. Close water supply valve when water is noticed in the holdup tank sightglass.
7. Continue evacuation for one-half hour after a low constant pressure (less than 20 mm of Hg) has been achieved.
8. Close HCV-731, HCV-733, HCV-732, and HCV-734.
9. Open water supply valve on line 241.
10. Vent air from sampler lines (237, 236, 803, 802, 137, 136, 801, 800) and instrument lines (675, 676, 677, and 678) attaching to the fuel and blanket storage tanks.
11. Open water supply valves at connections installed in place of HCV-337 and HCV-437.
12. Open temporary hand block valves in lines 107 and 207.
13. Open HCV-339 HCV-439
 PCV-152 PCV-252
 LCV-145 LCV-245
 HCV-139 HCV-239
 PdCV-250A PdCV-250B
14. When water is noticed by indication of weight in condensate tanks, close water supply valves at connections installed in place of HCV-337 and HCV-437.
15. As water is noticed in each vacuum pump water trap close block valve on that vacuum connection.
16. When all three vacuum connections have been closed, close water supply block valve feeding line 241.
17. Disconnect the evacuation rig.
18. Replace the block valves on the Blanket Recombiner Condenser, Fuel Recombiner Condenser, and Pressurizer Rutpure Disc Assembly with caps. Do not let air into the system.

19. Attach the evacuation rig to the vacuum connection on the storage cold trap discharge.
20. Open water supply block valve on line 241.
21. Open HCV-731, HCV-732, HCV-733, and HCV-734.
22. Close HV-935 and water supply block valve as soon as water emits from HV-935.
23. Close HCV-731, HCV-732, HCV-733, and HCV-734.
24. Evacuate to less than 20 mm of Hg.
25. Open water supply block valve on line 241.
26. Open HCV-731, HCV-732, HCV-733, and HCV-734.
27. When water is noticed in the vacuum pump water trap close the block valve on the storage cold trap discharge.
28. Close water supply block valve and disconnect the evacuation rig.
29. Replace the block valve on the storage cold trap discharge with a cap. Do not let air into the system.

B. Testing

30. Open water supply block valve exerting tap water line pressure to system.
31. Check for leaks, and record location and magnitude of torque required to seal a flange if in excess of that prescribed.
32. Close water supply block valve; replace valve with cap. Do not let air into system.
33. Raise hydrostatic pressure to 750 psi with Sprague hydraulic pump.
34. Check for leaks; pressure must remain steady at around 750 psi for at least one hour, or as long as required for thorough visual inspection of system.
35. Record location and magnitude of torque required to seal a flange if in excess of that prescribed.
36. Check all flanges with leak detector systems at 1000 psi and 750 psi in the reactor piping. Repeat step 35.
37. Close

HCV-139	HCV-239
PdCV-250A	PdCV-250B
LCV-145	LCV-245
PCV-152	PCV-252
38. Strap dry ice to pipes or use refrigeration system if operable to freeze plugs on the high-pressure side of these valves, and the feed and purge pump check valves.

39. Drain low-pressure system (relieve pressure through HV-935).
40. Increase hydrostatic pressure on high-pressure system to 3000 psi.
41. Check for leaks; pressure must remain constant at around 3000 psi for at least one hour, or as long as required for a thorough visual inspection of the system.
42. Repeat step 35.
43. Relieve pressure to 2000 psi through LCV-245 (plug must be thawed first).
44. Check high-pressure flanges with leak detector system at 2500 psi. Repeat step 35.
45. Drain system and return it to original condition.

Apparatus:

1. Evacuation provision (see Fig. 4).
2. Sprague pump.
3. Three 3/4-in block valves.
4. Two 1/2-in. block valves.
5. One 4-in., 2500 psi, ring-joint flange drilled and tapped with 3/4-in. schedule 80 pipe (available).
6. Three 3/4-in pipe caps.
7. Two 1/2-in. pipe caps.
8. Eight 1-in., 300 psi ring-joint blank flanges.
9. Four 1/2-in., 1500 psi ring-joint blank flanges.
10. Four 1/2-in., 1500 psi ring-joint flanges with 1/4-in. autoclave tubing connections.
11. Four 1/4-in. autoclave engineer's valves (possible ten additional).
12. Two tees (see Fig. 2).
13. Two bar stock elbows (see Fig. 3).
14. Three 48-liter glass carboys.
15. Forty feet of 2-in. vacuum hose.

16. Twenty feet of 1-in. vacuum hose.
17. Seventy feet of heavy walled water hose.
18. Two 2-in. tubing tees.

Instrumentation:

1. Four vacuum gauges.
2. Pressure recorder or gauge (0-4000 psi).

Simplified Flowsheet

Figure 1

ORNL-LR-Dwg-13400

NOTES:

1. MATERIAL - STEEL
2. FINISH ENDS OF 1" PIPE
3. TWO REQUIRED (FOUR GASKETS)
4. OPERATING PRESSURE 750 PSI

TEE - FIGURE 2

426 013

ORNL-LR-Dwg-13401

NOTES:

1. MATERIAL - STEEL
2. FINISH ENDS OF BAR STOCK
3. TWO REQUIRED (FOUR GASKETS)
4. OPERATING PRESSURE 750 PSI

426 014

BAR STOCK ELBOW - FIGURE 3

Notes:

1. Locate carboy as near to vacuum connection on Reactor System as possible, to minimize length of 1" vacuum hose.
2. It may be necessary to slightly flatten 1" tubing for insertion into carboy.

Evacuation Provision .

Figure 4