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ESG-DOE-13312

QUARTERLY TECHNICAL PROGRESS REPORT

CRBRP SODIUM FIRE TESTS

OCTOBER – DECEMBER 1979

DOE Research and Development Report

MASTER

*Prepared for the United States
Department of Energy,
Clinch River Breeder Reactor Plant Project Office,
under P.O. Number MPO-1
under Contract Number DE-AM-03-76SF00824*

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Printed in the United States of America
Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161

NTIS price codes

Printed copy: ~~\$4.00~~ A02

Microfiche copy: A01

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The preceding Progress Report was ESG-DOE-13308

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CONTRACT: P.O. MPO-1, Contract DE-AM-03-76SF00824
ISSUED: FEBRUARY 29, 1980

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DOE Task:	DRS 26.03/02.04-10 — Sodium Fire Tests		
Program Manager:	R. J. Beeley	Project Manager:	R. T. Lancet
Reporting Period:	October-December 1979	Category:	
General Order:	09351	Subaccount:	26100
		189a Number:	MP0-1

Principal Investigators: R. P. Johnson, C. T. Nelson

I. PROJECT OBJECTIVES

A. SMALL-SCALE FIRE SUPPRESSION TESTS

The objective of this group of tests is to demonstrate that sodium will drain from the surface of the fire suppression deck into the catch pan without interference during a spill event, and to demonstrate that burning is terminated following the spill event by the accumulation of combustion products inside the drain pipes.

The results of this series of tests will be used to validate the catch pan fire suppression deck design concept based on the criteria that sodium will drain freely from the surface of the fire suppression deck and that burning is terminated in an acceptably short time (≤ 36 h).

B. LARGE-SCALE SODIUM FIRE TESTS

The objective of this group of tests is to provide experimental data on the consequences of sodium spills using prototypic leak rates and to demonstrate the effectiveness of a large-scale fire suppression Q-deck assembly.

II. TECHNICAL PROGRESS DURING REPORT PERIOD

A. SMALL-SCALE FIRE SUPPRESSION TESTS

Preparations were made in the Large Test Vessel (LTV) to accommodate the small-scale fire suppression test article for a sodium splash test configuration. This configuration required fabrication of a multiple-nozzle sodium pipe header

extension which was connected to the intermediate sodium preheat tank. Preliminary tests were conducted with this pipe extension to determine the correct size of inlet orifice to result in a water release of 10 to 15 gpm. The accepted configuration was a 0.125-in. orifice inlet to the header and an array of 13 each, 0.125-in.-diameter nozzle openings machined into the underside of the header. This produced a series of liquid streams exiting from the header at 13 gpm. The velocity of each stream was found to be ~ 30 ft/s. The height of the header above the Q-deck test article was adjusted to 4 ft so that, upon impact on the Q-deck, the liquid streams covered $\sim 30\%$ of the surface area.

During this report period, all preparations and checkout were completed for the small-scale fire suppression sodium splash test.

B. LARGE-SCALE FIRE SUPPRESSION TESTS

Design efforts were initiated for the support components required for the large-scale fire suppression tests. The major components required for this test series include:

- 1) A high-pressure source of GN_2 , nitrogen accumulator tanks, and nitrogen distribution manifold
- 2) Sodium fill and cold trap station
- 3) A 6600-gal sodium storage and preheat tank
- 4) Sodium transfer and recirculating piping
- 5) Associated trace heating and control stations
- 6) An exhaust gas absorber system.

All of these systems, except Items 1 and 6, will be located within a sheet metal structure adjacent to the T100 Large-Scale Fire Suppression Test Facility.

A P&I diagram of the large-scale fire suppression test support equipment is shown in Figure 1. The design specification for these systems requires delivery of preheated sodium at 1000°F to the facility test cell at rates up to 1200 gpm. During pretest operation, an EM pump provides recirculation capability to transfer sodium from the supply tank, through a cold trap, then return the sodium to the supply tank. To reclaim the sodium after a large-scale fire suppression

REVISIONS			
LTN	DESCRIPTION	DATE	APPROVED

NOTES: UNLESS OTHERWISE SPECIFIED

- ① ALL SODIUM LINES AND TANKS ARE INSULATED AND HEAT TRACED
- ② ALL HCD LINES ARE INSULATED AND HEAT TRACED

Figure 1. Large-Scale Fire
Suppression Tests – P&I
Diagram
(Dwg 351000001)

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test is completed, sodium is returned from the test cell to the storage tank under slight vacuum conditions in preparation for cleanup.

During this report period, specifications for the support system were completed and design completed to a 90% level. Agreements were made with Burns and Roe to specify the design of the fire suppression Q-deck and jet impingement test articles.

III. NEXT REPORT PERIOD ACTIVITIES

A. SMALL-SCALE FIRE SUPPRESSION TESTS

The small-scale fire suppression test series in the LTV will continue.

B. LARGE-SCALE FIRE SUPPRESSION TESTS

The following activities will be initiated or completed for the Large-Scale Fire Suppression Test Facility:

- 1) Complete facility and system design
- 2) Release design package for bid
- 3) Complete design of fire suppression Q-deck test article
- 4) Release test article design package for bid.