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TECHNICAL PROGRESS REPORT
CRBRP SODIUM FIRE TESTS
FOR THE PERIOD
MAY — JUNE 1979

DOE Research and Development Report

*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*

MASTER

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Program:	CRBRP Sodium Fire Tests		
AEC Task:	DRS 26.03/02/94-10 — Sodium Fire Tests		
Program Manager:	R. J. Beeley	Project Manager:	R. T. Lancet
Reporting Period:	April-June 1979	Category:	
General Order:	09351	Subaccount:	20000
		189a Number:	MP0-1

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

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. SPRAY MAXIMIZATION TESTS

The objective of this group of tests is to confirm that sprays resulting from impacting jets provide the most severe spray conditions (minimum droplet diameter and maximum spray conversion). The tests will be performed by discharging water through different orifices and simulated pipe crack configurations.

The results of these tests will be used as a basis for selecting the leak configuration to be used in subsequent large-scale sodium fire tests in inerted and air-filled cells.

C. LARGE-SCALE SODIUM FIRE TEST PLANNING

The objective of this task is to identify the configuration of large scale sodium fire tests based on the experimental results of the small-scale sodium fire suppression and spray maximization tests.

II. TECHNICAL PROGRESS DURING REPORT PERIOD

A. SUBTASK A — SMALL SCALE FIRE SUPPRESSION TESTS

1. Description

The test article to be used for the Small Fire Suppression Tests is comprised of a five-channel (four-trough) assembly constructed similarly to the "Q-floor" material provided by H.H. Robertson Co. (Type FKX). The cross-sectional dimensions of the test article are 2-1/8 in. (trough) by 3-7/8 in. wide (hat) by 4-1/2 in. high by 70 in. long. The "Q-floor" section is supported in a mild steel catch pan which is provided with external heaters and insulated. Also included in the test article are three trough drain pipes, two flange drain pipes and two trough vent pipes, each 1-1/2 in. diameter. Design of the test article is similar to the CRBRP fire suppression deck design of Reference 1. A thin-walled stainless steel containment pan then contains the above components. Figure 1 describes the test article. The entire assembly is positioned in the Large Test Vessel (LTV) for testing.

Instrumentation that will be used during the Small Scale Fire Suppression Tests include: sodium level indicators in the sodium preheat tank and in the test article catch pan, oxygen gas analyzers both in the LTV volume and in the gas space below the "Q-floor," LTV gas pressure sensors, and several temperature sensors to measure the temperature of test components. Test signals obtained from the above sensors will be recorded on strip chart recorders during testing.

A Request for Test⁽²⁾, a Test Plan⁽³⁾, and a Test Procedure⁽⁴⁾ have been prepared for the test series. These documents follow the requirements of the Quality Assurance Program Index⁽⁵⁾ and Design Requirement Specification 26.03/02.04.10⁽⁶⁾ for the Fire Suppression Tests.

2. Next Report Period Activities

The test article described above will be installed in the LTV. Two preliminary tests will be conducted, using water as the test fluid, to determine the liquid flow and draining characteristics. A total of six sodium tests will be conducted with the test article to meet the outlined objectives. The first two tests will involve releasing a predetermined quantity of 1000°F sodium onto the

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Figure 1. "Q" Deck and Catch Pan Arrangement

test article at 15 and 1.5 gpm. The third test details will be determined after evaluating the results from the first two tests.

B. SPRAY MAXIMIZATION TESTS

1. Description

The spray maximization tests will be conducted by discharging approximately 100 ft³ of water through various test articles. These test articles will include an orifice, small and medium width longitudinal cracks, and a circumferential crack. The sprays originating from the orifice will impinge on horizontal pipes and plates and the resulting splash pattern will be determined.

Major components required for the spray maximization test series are being procured and assembly process has been initiated. A schematic of the spray maximization test apparatus is presented in Figure 2. Request for test⁽⁷⁾ and Test Plan⁽⁸⁾ documents have been prepared for the test series.

2. Next Report Period Activities

A test procedure will be written to conduct the tests during the next report period.

C. LARGE-SCALE SODIUM FIRE TEST PLANNING

1. Description

There were no activities this period.

2. Next Report Period Activities

A Request for Test and a Test Plan will be prepared.

REFERENCES

1. CRBRP, System 26A Catch Pan Preliminary Arrangement, N099005307
2. R.P. Johnson, "Request for Test for the CRBRP Fire Suppression "Q-Deck," N001RFT130-001 (May 23, 1979)

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Figure 2. Spray Maximization Test Schematic

3. R.P. Johnson, C.T. Nelson, "Test Plan for Determining the Effectiveness of a Fire Suppression System," N001TP130-001 (May 23, 1979)
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5. E.G. Johnson, "Quality Program Index for Fire Suppression Tests," N001QPI130-001 (to be published)
6. K. Buttrey, "Sodium Fire Tests," N099DRS26001 (September 22, 1978)
7. R.P. Johnson, "Request for Test for the CRBRP Fire Suppression Spray Maximization Tests," N001RFT130-002 (July 2, 1979)
8. B. Perez, R.P. Johnson, "Test Plan for Spray Maximization Tests," N001TP130-002 (July 2, 1979)