



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

JUL 7 1980

MEMORANDUM FOR: Those on Attached List

FROM: R. Feit, Research Support Branch  
Division of Reactor Safety Research

SUBJECT: PRELIMINARY FIRE SUPPRESSION TEST DATA

The enclosed graphs and executive summary describe the results of five recent fire suppression tests which have been discussed with some review group members. I will arrange for Leo Klamerus (SANDIA) to discuss these data with the review group as soon as practical (probably the week of July 21, 1980).

All tests utilized a horizontal test configuration and design basis fire developed for earlier cable tray tests. Two propane burners were used in all tests with two 5-minute burn cycles, separated by a 5-minute cooling period. The objective was to obtain a fully-developed cable tray fire in a donor cable tray. A removable barrier was located between the donor tray and an acceptor cable tray above. A second barrier was permanently located above the acceptor cable tray to simulate a third tray in a horizontal stack. The Halon was released after a one-minute delay from the time the barrier was removed between the donor and acceptor cable trays. Reignition was tested by reestablishing normal ventilation (400 cfm in a 9600 cf room) and opening the overhead exhaust damper. The graph for the upper barrier temperature shows the temperature as measured below the fixed barrier simulating the tray above the acceptor tray.

We are considering some additional testing with Halon to cover issues such as vertical cable trays and non-flame-retardant cable. I would like your suggestions at the next review group meeting or before on this testing. After the Halon tests we plan to conduct tests with water and carbon dioxide and your suggestions for these tests are also requested.

*Ronald Feit*  
R. Feit, Chairman  
Fire Protection Review Group

Enclosures:  
1. Four charts  
2. Executive Summary

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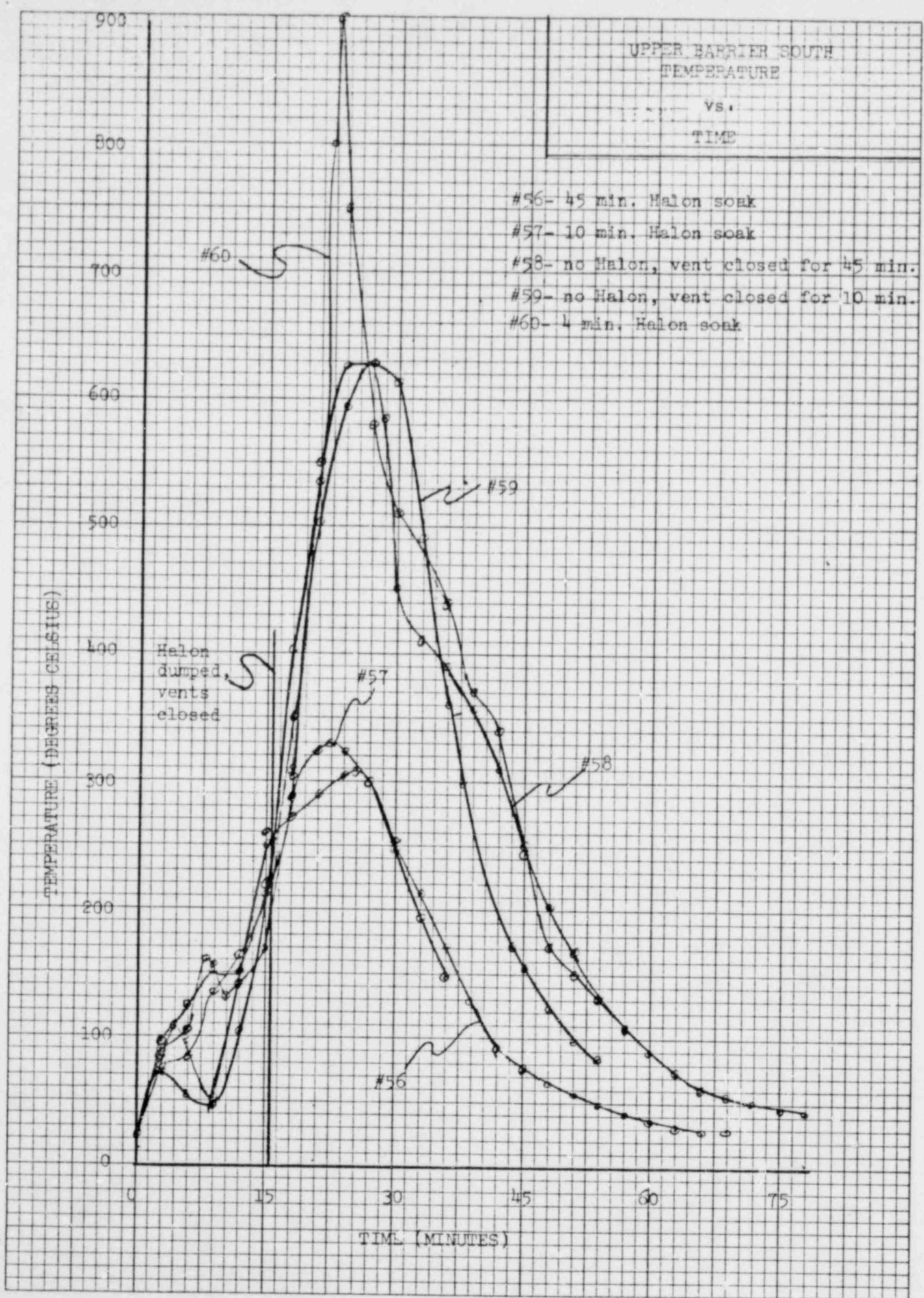
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JUL 7 1980

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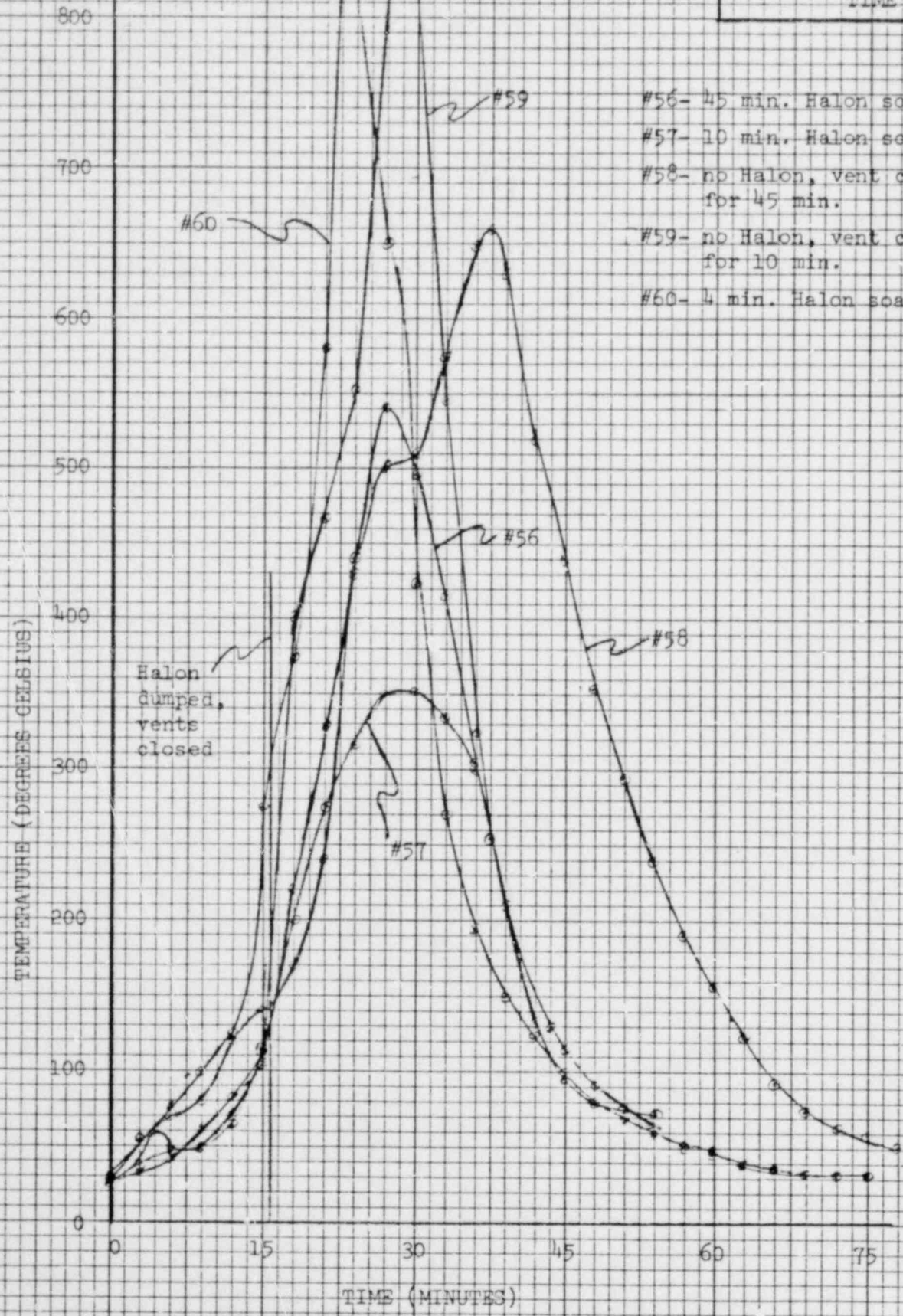
WEIGHT LOSS OF  
LOWER TRAY AT  
SOUTH LOAD CELL  
VS.  
TIME



DIETZGEN CORPORATION  
MADE IN U.S.A.

NO. 340-10 DIETZGEN GRAPH PAPER  
10 X 10 PER INCH

UPPER TRAY CENTER  
TEMPERATURE  
vs.  
TIME



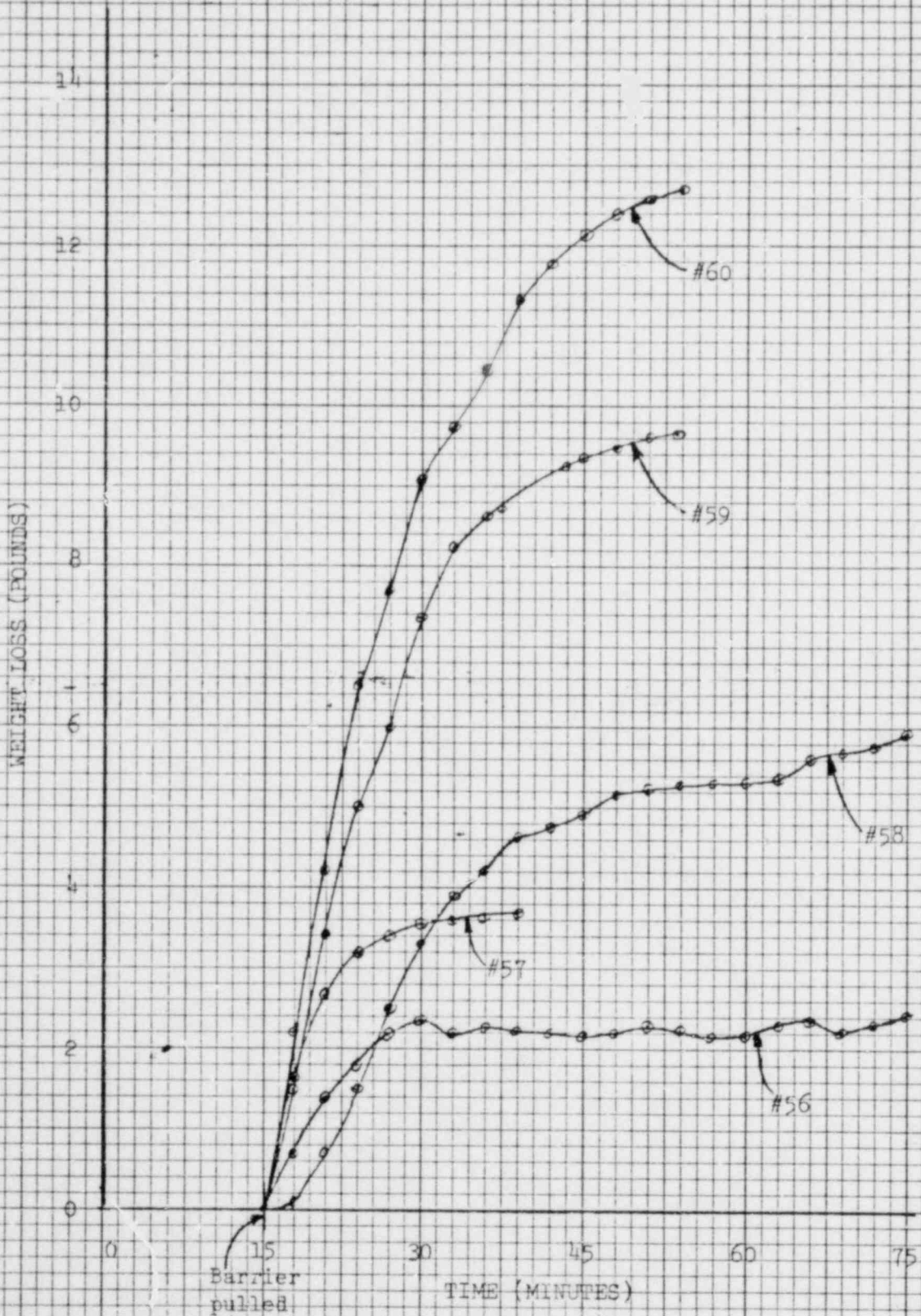
- #56- 45 min. Halon soak
- #57- 10 min. Halon soak
- #58- no Halon, vent closed for 45 min.
- #59- no Halon, vent closed for 10 min.
- #60- 4 min. Halon soak

Halon dumped, vents closed

TIME (MINUTES)

TEMPERATURE (DEGREES CELSIUS)

WEIGHT LOSS OF  
UPPER TRAY AT  
SOUTH LOAD CELL  
VS.  
TIME



## Executive Summary

This report prepared for the Division of Reactor Safety Research, U.S. Nuclear Regulatory Commission, is the first of several reports aimed at providing confirmatory data on fire suppression research. Since the Browns Ferry Fire in 1975, a concern about fires has resulted in what has been called a "defense in depth" regulatory policy for nuclear power plant fire protection. This policy has required the use of numerous measures to prevent and control fires, including requirements for automatic suppression.

Recently, five full scale cable tray fire tests have been conducted at Sandia's Fire Research Facility to provide these confirmatory data. Three of the tests used Halon 1301 as a fire suppression agent while two of the tests used a lack of ventilation (oxygen deprivation) as a suppression technique. Results of the three Halon 1301 tests were as follows: 1) A 45-minute soak of 6% Halon concentration did not allow reignition; 2) a 10-minute soak of 6% Halon concentration did not allow reignition; 3) a 4-minute soak of 6% Halon concentration did allow reignition. Results of the two tests which did not use Halon were as follows: 1) A 45-minute "buttoned up" period did not allow reignition when the ventilation system was turned on; 2) a 10-minute "buttoned up" period did allow reignition when the ventilation system was turned on.

These results indicate that at least a 10-minute soak time should be used for Halon suppression systems before the room is entered. The closing of fire dampers in a room is a valuable aid in suppressing the fire, and might be adequate by itself if given sufficient time before the fire brigade enters the room. The critical question is: "How long does it take for the exposed hot surfaces of the cable insulation to cool below its ignition temperature?" The tests described in this report attempted to answer this question by providing temperatures taken at the surface of several exposed cables. Cooling time will be influenced somewhat by the ambient temperature and to a larger extent by internal cable bundle temperatures. These temperatures have also been recorded for the fire tests described.