UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
DUKE POWER COMPANY	)	Docket Nos. 50-369
	)	50-370
(William B. McGuire Nuclear	)	
Station, Units 1 and 2)	)	

TESTIMONY OF DAVID L. CANUP, II
REGARDING MCGUIRE CONTAINMENT SYSTEMS

1. Q. What is the scope of this testimony?

   A. This testimony is designed to identify and describe systems in the McGuire containment which may be called upon to mitigate the effects of excessive hydrogen generation which could result from an accident similar to that which occurred at Three Mile Island in March of 1979.

2. Q. Identify and describe such systems.

   A. Within the McGuire containment structure there are the following systems which may be called upon to mitigate the effects of excessive hydrogen generation. I would note that each of these systems is more fully described in the McGuire Final Safety Analysis Report.

   (a) Ice Condenser System:

   The containment vessel utilizes the ice condenser system for the absorption of thermal energy released in the event of an accident for the purpose of limiting the peak pressure in containment.

   The use of the ice condenser requires that the containment vessel be divided into three major volumes: the lower containment which houses the reactor coolant system, the ice condenser and the upper containment. See Figures 1 and 2 which I have attached.

8102120 331

The ice condenser is an insulated cold storage room in which ice is maintained in an array of vertical cylindrical columns. The columns are formed by perforated metal baskets with the space between columns forming the flow channels for steam and air. The ice condenser is contained in the annulus formed by the containment vessel wall and the crane wall. It is cooled to 15°F and kept at about that temperature. The ice bed is sized for an energy absorption capability of more than twice the energy initially released in any design basis event.

Associated with the ice condenser are three sets of insulated doors located, respectively, along the lower crane wall, in the intermediate deck, and in the top deck. If lower containment pressure exceeds ice condenser pressure by more than one pound per square foot, as the result of a loss-of-coolant accident, the lower inlet doors will swing open and allow the evolved steam to flow into the ice condenser. The steam will condense on the ice and chilled structures; but air will pass through the ice bed and open the intermediate and top deck doors, venting to the upper containment.

(b) Containment Air Return System:

The containment air return system, a safety grade system, contains redundant air return fans to return air from the upper containment into the lower containment. Each fan has a capacity of 30,000 cfm.

Both fans are automatically started approximately 10 minutes after containment pressure reaches three psig. They may also be started manually by the operator. The fans blow air from the upper containment to the lower containment, thereby returning the air which was displaced by the primary system blowdown to the lower containment. The fans operate continuously after actuation, circulating air through the containment volume.

(c) Hydrogen Skimmer System:

The function of this safety grade system is to prevent the accumulation of hydrogen in dead-ended volumes within the McGuire containment following a loss-of-coolant accident. This system continuously draws air out of these areas. Redundant hydrogen skimmer fans are provided for this purpose. The hydrogen skimmer fans are automatically started approximately 10 minutes after containment pressure reaches 3 psig. The hydrogen skimmer system may also be started manually by the operator. Each hydrogen skimmer fan has a capacity of 3,000 cfm.

(d) Containment Spray System:

The primary purpose of the containment spray system, a safety grade system, is to continuously spray cool water into the containment atmosphere when appropriate to remove thermal energy released due to an accident in the containment, thus reducing the resultant containment pressure rise.

The containment spray system consists of redundant spray pumps and redundant spray heat exchangers. The spray headers are located in the upper containment dome.

The containment spray system is actuated when the pressure in containment reaches 3 psig. The spray system can also be actuated manually from the control room.

3. Q. In the event of a loss-of-coolant accident (LOCA), please explain the interrelationship and operation of the systems you have referenced in this testimony?

A. Shortly following the LOCA, pressure differential across the ice condenser lower inlet doors will reach 1 lb/ft^2, thus forcing the doors open and allowing flow of steam and hot gases into the ice bed. Steam will be condensed by the ice and the chilled structures. Air and other gases will pass through the ice bed and open the intermediate and top deck doors venting to the upper containment.

When the lower containment pressure reaches 3 psig, the containment spray system is actuated. Spray flow will enter the ring spray headers in the top of the upper containment and be discharged through spray nozzles which break the flow up into droplets less than 700 microns in diameter. These droplets absorb heat from the upper containment atmosphere, thus cooling the containment atmosphere and suppressing the pressure rise.

Approximately 10 minutes after the lower containment reaches 3 psig the air return fans are started automatically and begin circulating air from the upper containment into the lower containment, then into the ice condenser and back to upper containment again.

Approximately 10 minutes after the lower containment reaches 3 psig the hydrogen skimmer system also is started and begins ventilating dead-ended volumes in the lower containment to prevent hydrogen accumulation in these areas.

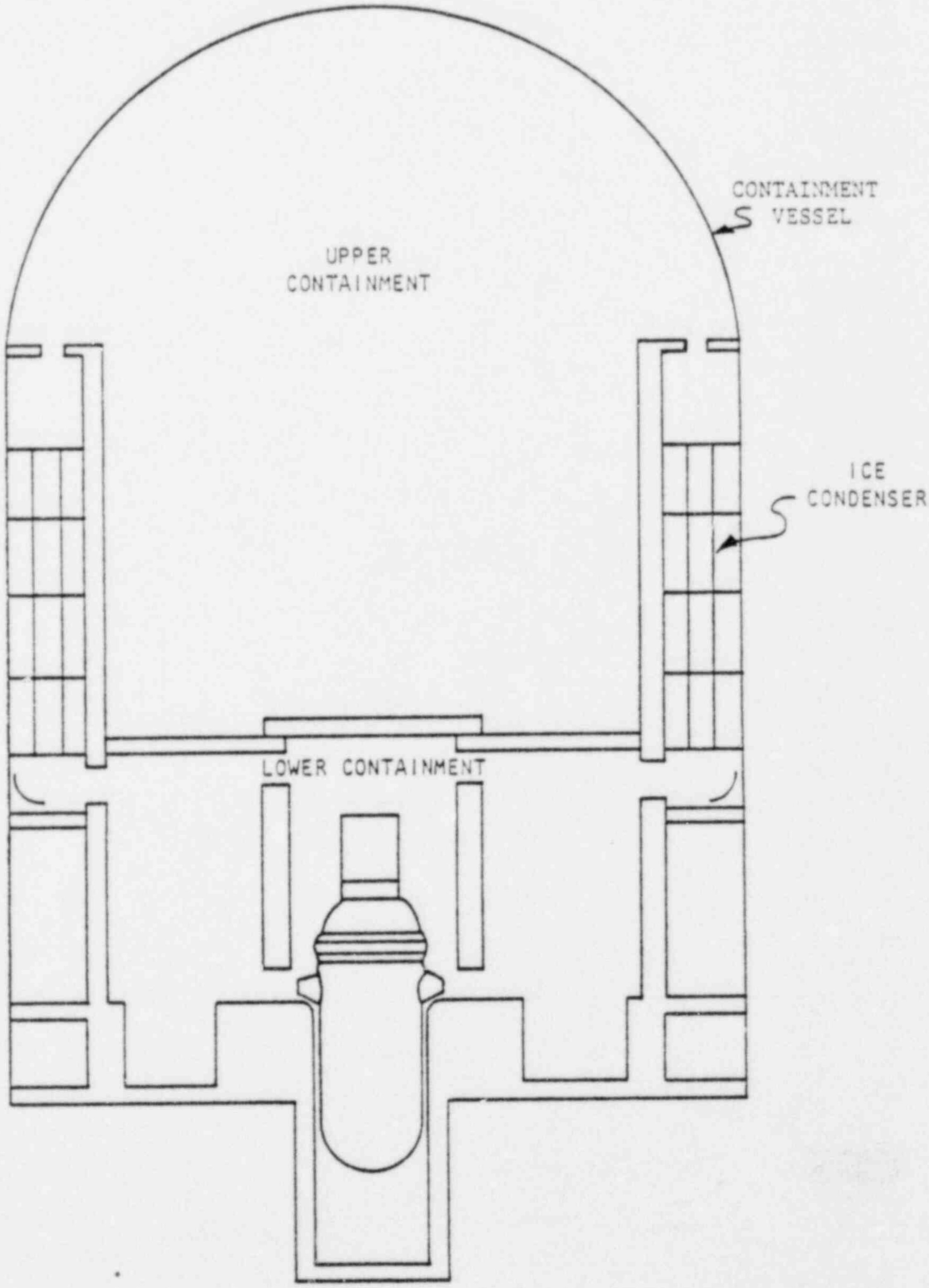
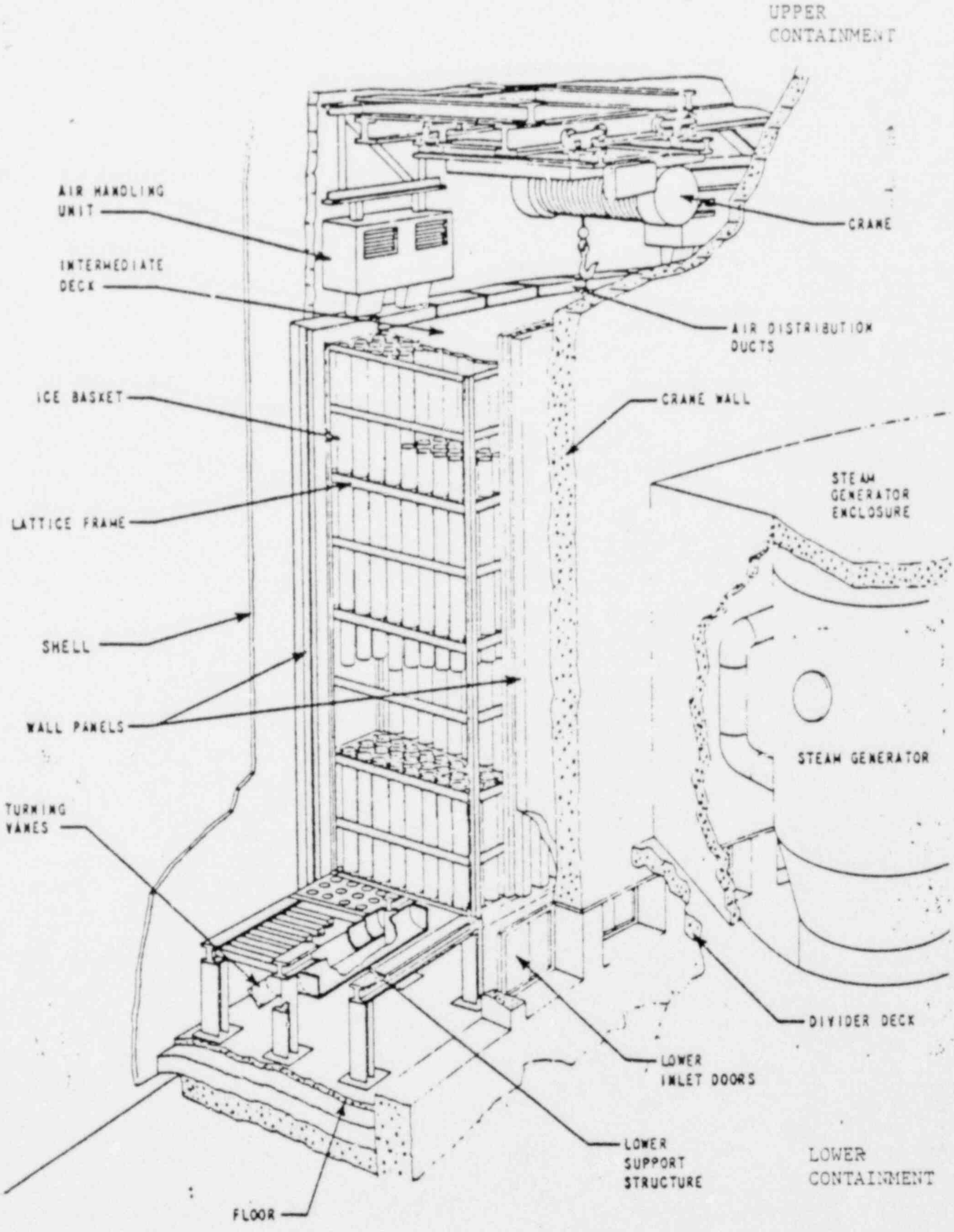


FIGURE 1 - McGUIRE
CONTAINMENT COMPARTMENTALIZATION



FIGURF 2 - MCGUIRE
ICE CONDENSER GENERAL
ARRANGEMENT

Professional Qualifications
of
DAVID L. CANUP, II
Design Engineer
Duke Power Company

My name is David L. Canup, II. My business address is 442 South Church Street, Charlotte, North Carolina, 28242.

I received a Bachelor of Science Degree in Mechanical Engineering from North Carolina State University in January, 1969. From February, 1969 until May, 1971, I was employed by Pratt and Whitney Aircraft Company in West Palm Beach, Florida, where I was engaged in the design and development of jet aircraft engines.

Since June, 1971, I have been employed by Duke Power Company's Design Engineering Department in the Mechanical Systems Sub-group working on the design of fluid process systems for the McGuire Nuclear Station. I have been the supervisor of this sub-group since June, 1974 and, as such, I have had lead responsibility for engineering of Duke designed fluid process systems, including definition of system functions, boundaries, and classifications; conduct of analyses necessary to define design parameters and equipment performance requirements; identification of necessary process control functions; and preparation and issue of flow diagrams, system descriptions, and other documentation required to support this engineering. I have also been responsible for preparation of major portions of the McGuire PSAR and FSAR.

I was a member of a technical team assigned by Duke Power Company to conduct an indepth review of design, equipment, controls, and procedures for Duke nuclear stations in light of the TMI-2 accident of March, 1979.

I am a member of the American Nuclear Society and am a Registered Professional Engineer in North Carolina.