Omaha Public Power District

1623 HARNEY ■ OMAHA, NEBRASKA 68102 ■ TELEPHONE 536-4000 AREA CODE 402

December 12, 1979

Director of Nuclear Reactor Regulation
ATTN: Mr. Robert W. Reid, Chief
Operating Reactors Branch No. 4
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Reference: Docket No. 50-285

Gentlemen:

In accordance with Section 3.2.1 of the Fort Calhoun Station fire protection Safety Evaluation Report (SER), issued by the Commission on August 23, 1978, the Omaha Public Power District herewith submits five (5) copies of a quantitative report addressing the effects on safety related equipment of rupture of the fire water piping to be installed at the Fort Calhoun Station. This information supplements a qualitative report previously submitted by the District on June 29, 1979.

Also submitted herewith is a description of a water curtain to be installed in the personnel corridor between Fire Areas 6 and 20 of the Fort Calhoun Station, as required by Section 3.1.28 of the SER.

Sincerely,

W. C. Jones
Division Manager
Production Operations

WCJ/KJM/BJH:jmm

Enclosures

cc: LeBoeuf, Lamb, Leiby & MacRae
1333 New Hampshire Avenue, N. W.
Washington, D. C. 20036

Quantitative Report
Effects of Fire Water Pipe Rupture on
Safety Related Equipment at the
Fort Calhoun Nuclear Power Station

I. INTRODUCTION

In accordance with Section 3.2.1 of the Fort Calhoun Station Fire Protection Safety Evaluation Report (SER) a quantitative pipe rutpure analysis has been performed on the fire water piping relative to the effects on safety related equipment.

A qualitative report Attachment (1) was developed, which listed assumptions to be used to evaluate the effects or safety related systems and design considerations to be employed to mitigate the consequences of a pipe rupture.

II. SCOPE

As a result of the quantitative analysis, seismic supports and spray shields have been developed as follows:

a) Pipe Supports

Sufficient seismic pipe supports and restraints will be installed on the fire protection piping immediately above and adjacent to safety related equipment to provide assurance that the fire protection piping will not fall and damage safety related equipment. The seismic supports and restraints will extend a minimum of two pipe supports beyond the safety related area. Horizontal and vertical piping accelerations and restraint loads will be conservatively calculated from the peak of the applicable amplified response spectra. Piping and support stresses will be within normal OBE allowables for conservatism. All drilled-in concrete anchor bolts and base plates will be designed in accordance with NRC Bulletin 79-02. A typical seismic pipe support is shown on Figure One.

b) Spray Shields

Spray shields will be installed, where necessary, to prevent water spray from the fire protection piping from impinging on or entering safety related electrical equipment. These will be in the form of source shields clamped to the piping at each victaulic coupling in the vicinity of safety related equipment and designed to deflect the spray and control water drainage. A typical spray shield is shown in Figure Two.

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III. PROTECTED AREAS: (See National Fire Sprinkler Corporation construction drawing - Sheet 1 thru 6 for piping arrangements).

a) Fire Area 29 (Elev. 1025'0") HVAC Equipment:

The fire protection piping in this area is located directly over the component cooling water (CCW) pump - AC-3B (see National drawing sheet 5 and figure three). Seismic supports and spray shields will be provided to protect the pump, motors and associated electrical equipment.

b) Fire Area 35B (Elev. 1007'-0") - Diesel Generator No. 2:

The piping in this area is located on the wall directly opposite the control panel AI-133B (see National drawing sheet 4 and figure four). Seismic supports and spray shields will provide the proper protection.

c) Fire Area 6 - (Elev. 989'-0") Personnel Corridor:

The piping in this area runs overhead in the corridor adjacent to Motor Control Center (MCC) 3A2 and 4C2. (See National drawing sheet 2 and OPPD drawing 11405-E-61). Spray shield will be provided to protect the MCC's.

d) Fire Area 32 (Elev. 989'-0") Air Compressor:

The fire protection piping in this area runs overhead and adjacent to the electric driven auxiliary feed pump FW-6. (See National drawing sheet 2 - col. C and 4A). Spray shields will provide the necessary protection in this area.

Qualitative Report
Effects of Fire Water Pipe Rupture on Safety Related Equipment at the Fort Calhoun Unit I Nuclear Power Station

I. The new auxiliary building fire hose system for Fort Calhoun Unit 1 will operate at ambient temperature and at a pressure of 125 psig and is, therefore, classified as moderate energy piping in Branch Technical Position MEB 3-1.

Piping cracks shall be postulated in the Fort Calhoun Unit 1 auxiliary building fire hose moderate energy fluid system, which during normal plant conditions, will be either in operation or maintained pressurized (above atmospheric pressure) under conditions where both of the following are met:

maximum operating temperature is 200 F or less, and
maximum operating pressure is 275 psig or less

Fluid flow from a crack shall be based on a circular opening of area equal to that of a rectangle one-half pipe diameter in length and one-half pipe wall thickness in width. The flow from the crack shall be assumed to result in an environment that wets all unprotected components within the compartment, with consequent flooding in the compartment and communicating compartments. Flooding effects will be determined on the basis of a conservatively estimated time period required to effect corrective action.

II. Through-wall leakage cracks will be postulated for the Fort Calhoun Unit 1 auxiliary building fire hose moderate energy piping system in accordance with the following criteria:

1. Cracks will be postulated at locations that are isolated or physically remote from essential systems and components.

2. Cracks will not be postulated in pipes of nominal pipe size of 1 in. and less.

3. Cracks will be postulated to occur individually, at locations that result in the maximum effects from fluid spraying and flooding. Only environmental effects that develop from these cracks shall be considered.

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II. (Continued)

Cracks shall be postulated in the fire lines and only environmental effects (flooding, spray, etc.) shall be considered for protection of safety-related components. The flow from a crack is assumed to result in an environment that wets all unprotected components within the compartment, with consequent flooding in the compartment and communicating compartments.

III. The following steps shall be taken during piping design and installation to protect against the effects of pipe cracks:

1. Essential* instruments and components shall be sealed or otherwise capable of operating in a wet environment.

2. Adequate drains, flood barriers, or bulkheads shall be provided to prevent flooding of essential equipment.

3. Essential* instruments and components shall be elevated to minimize the potential for flood damage, as appropriate.

4. The fire protection piping will be located remote from safety-related equipment to the greatest extent possible.

5. Where the piping must be located adjacent to safety-related equipment, the piping and its supports will be seismically designed.

6. Adequate spray shields will be provided where necessary to prevent entrance of spray into existing safety-related electrical panels.

7. Piping will be routed so as to take maximum advantage of existing structure, conduits and cable trays to break-up and disperse spray.

*Equipment necessary to safely shut down the plant and maintain it in a safe shutdown condition.

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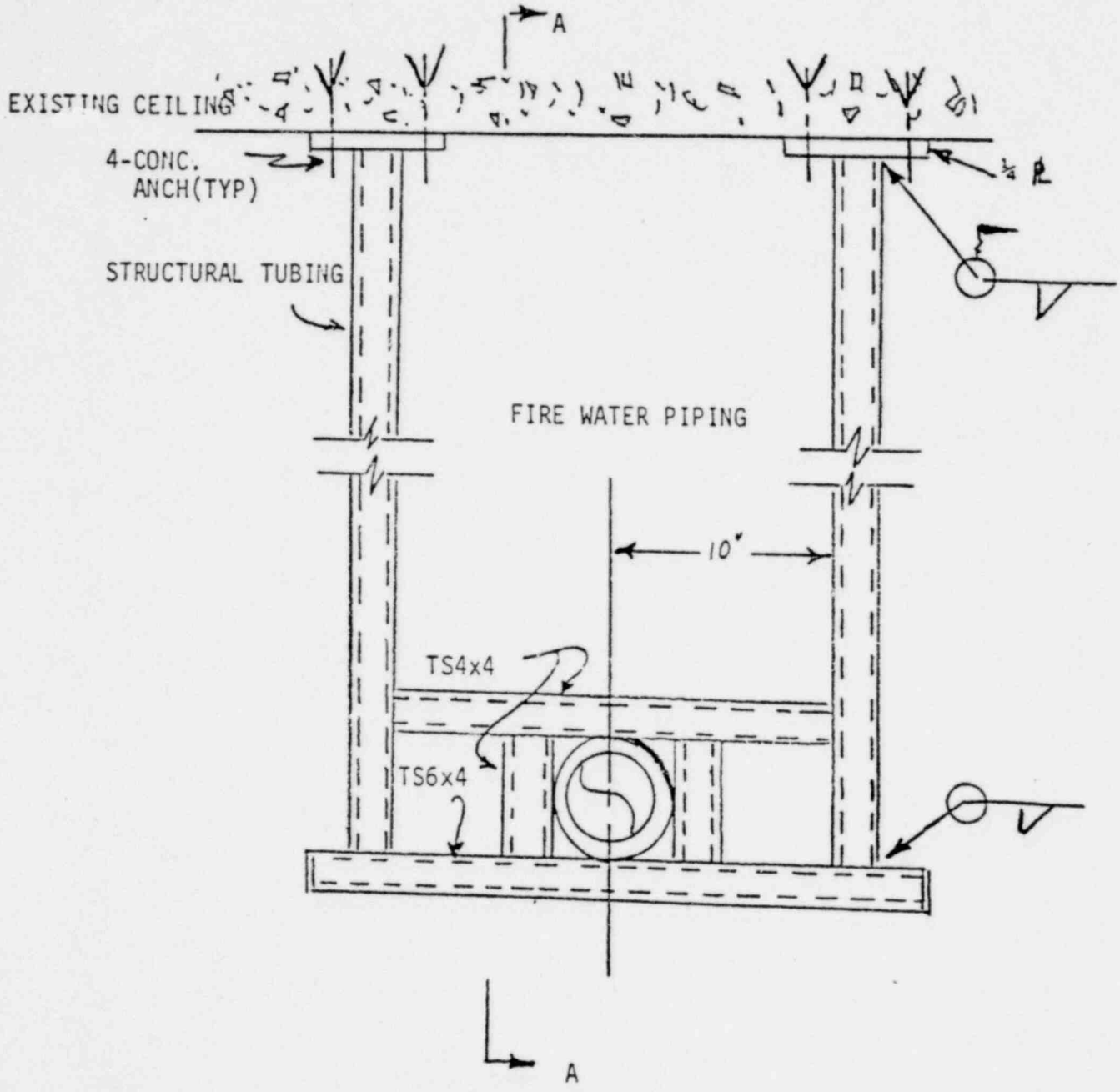
References

1. NRC Standard Review Plan, Section 3.6.1, March 1975, entitled "Plant Design for Protection Against Postulated Piping Failures in Fluid Systems Outside Containment", containing Branch Technical Position APCSB 3-1.

2. NRC Standard Review Plan, Section 3.6.2, March 1975, entitled "Determination of Break Locations and Dynamic Effects Associated With the Postulated Rupture of Piping", containing Branch Technical Position MEB 3-1.

3. Letter from A. Giambusso, Deputy Director for Reactor Projects, to NUSCO President, December 1972, requiring consideration of piping system break outside the containment.



TYPICAL PIPE SUPPORT

Notes;1. structural tubing and conc. anch. size and length will determine ondesign stage

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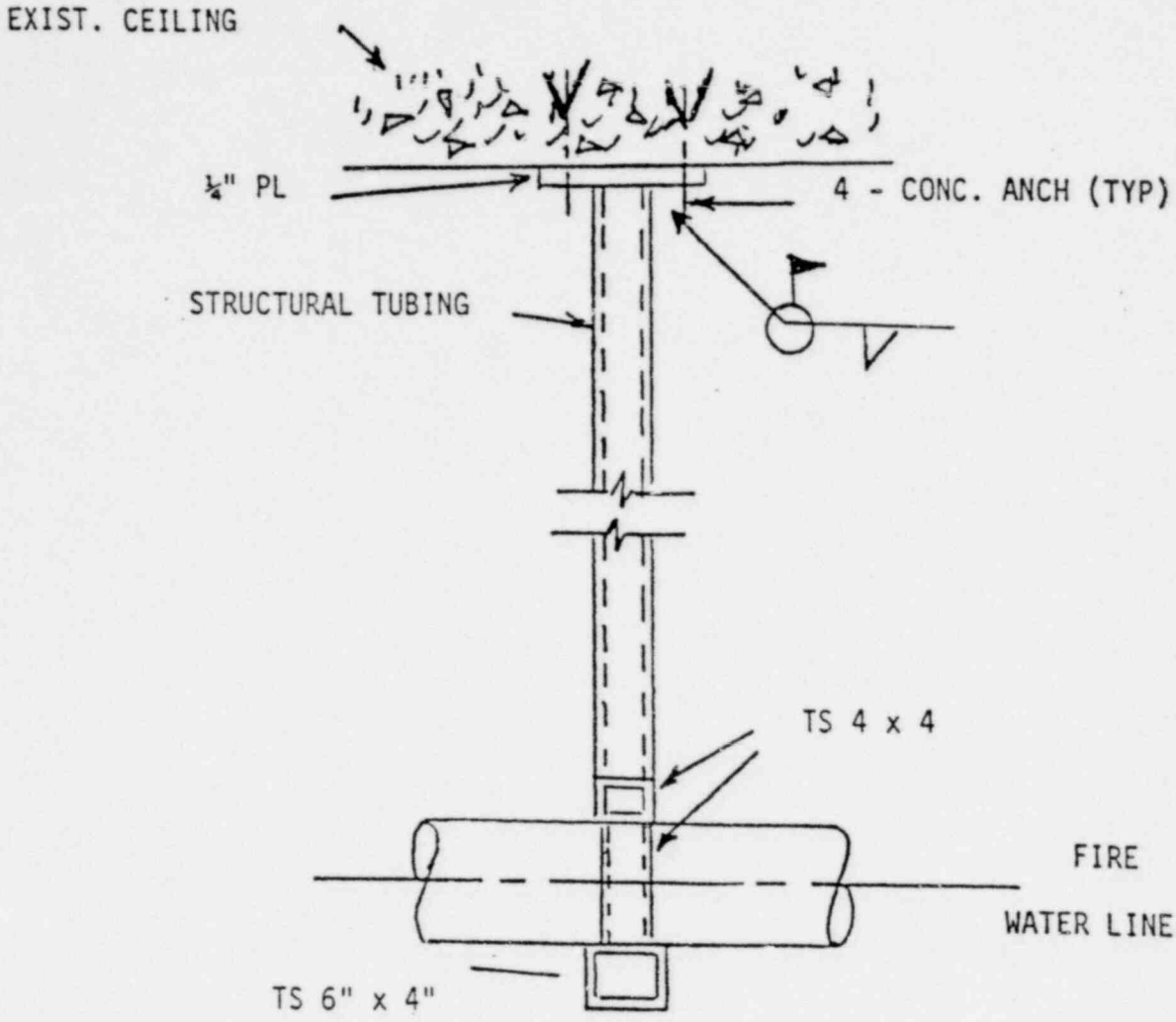
FIGURE ONE

SHT 1 OF 2



SECTION A-A

PIPE SUPPORT

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FIGURE ONE

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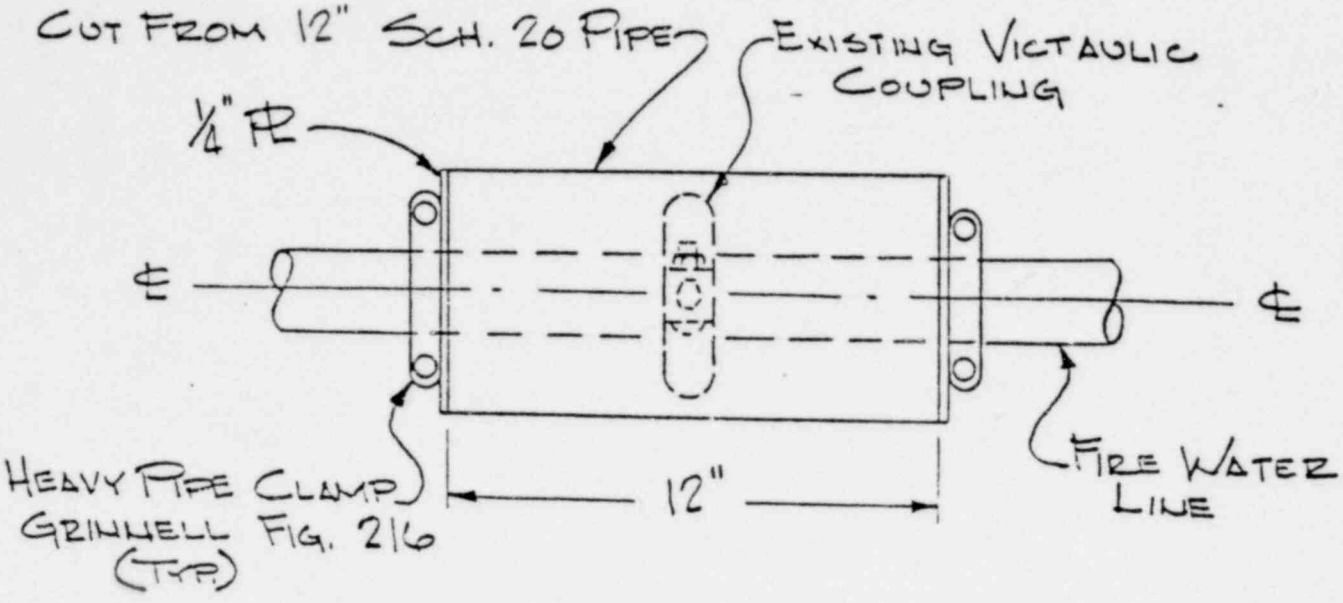
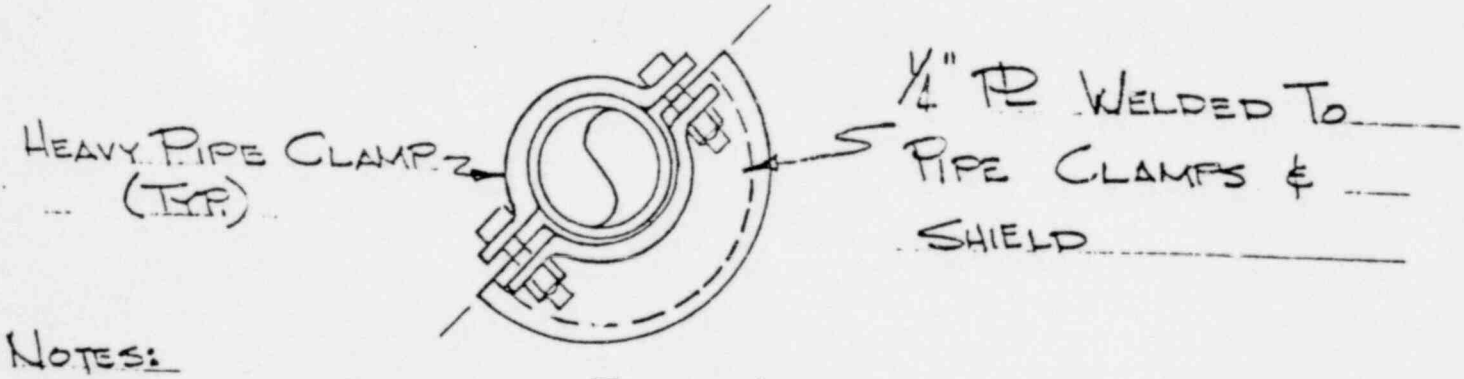
SHT. 2 OF 2





END VIEW

NOTES:

1. SHIELD ORIENTATION TO SUIT ACTUAL CONDITIONS.

TYP. SPRAY SHIELD

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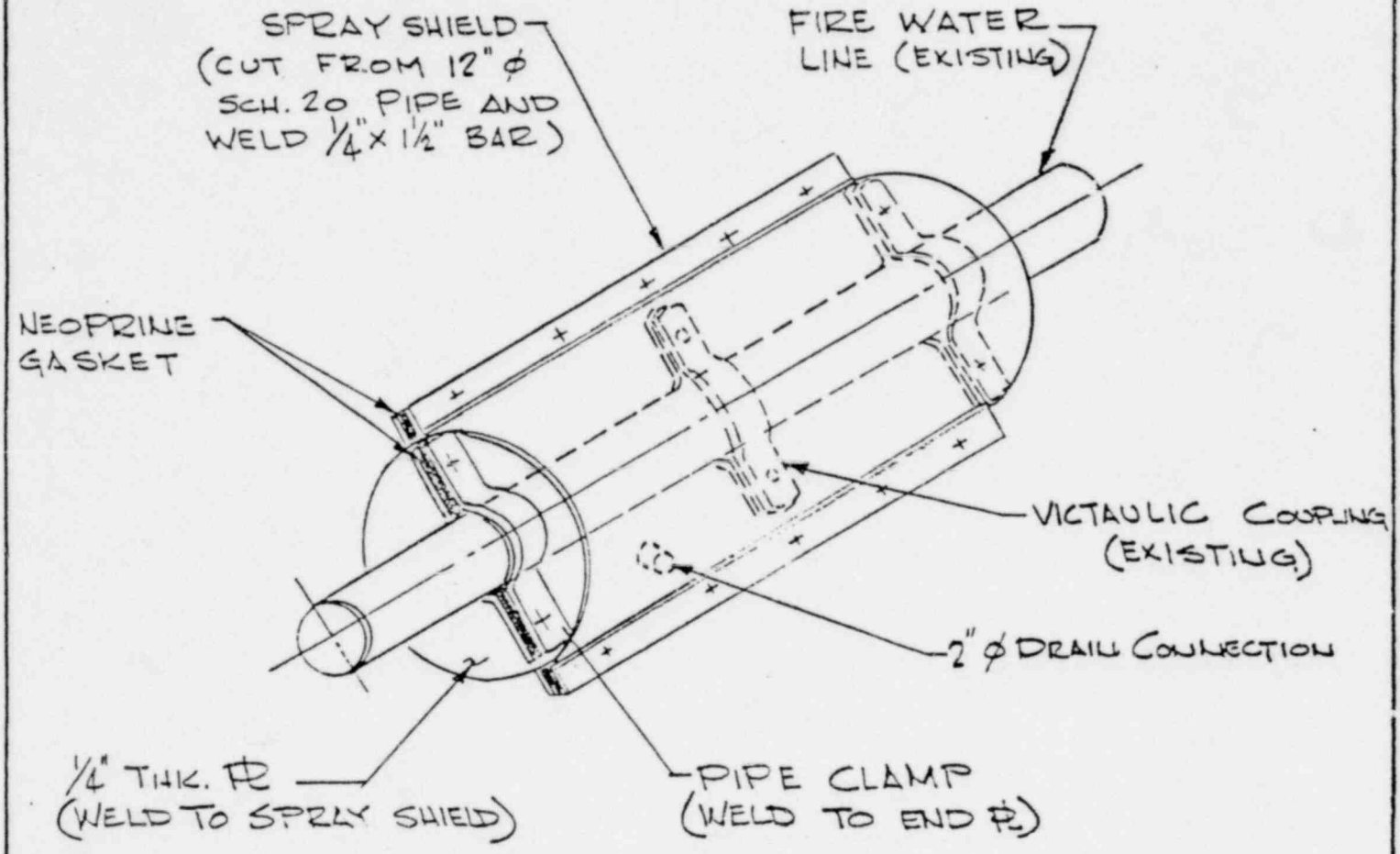
FIGURE TWO



NOTE:

1. SHIELD ORIENTATION TO SUIT ACTUAL CONDITIONS.

TYP. SPRAY SHIELD
FULLY ENCLOSED

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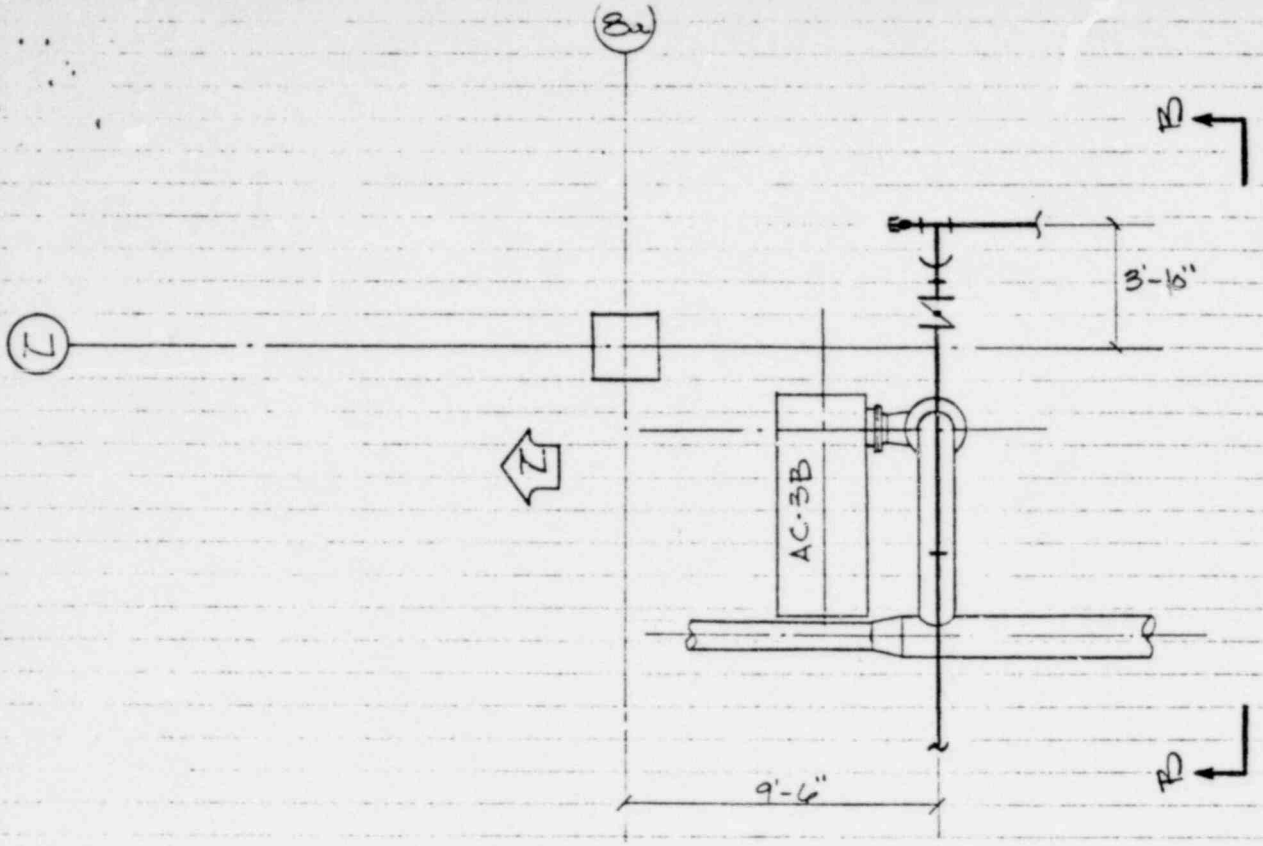
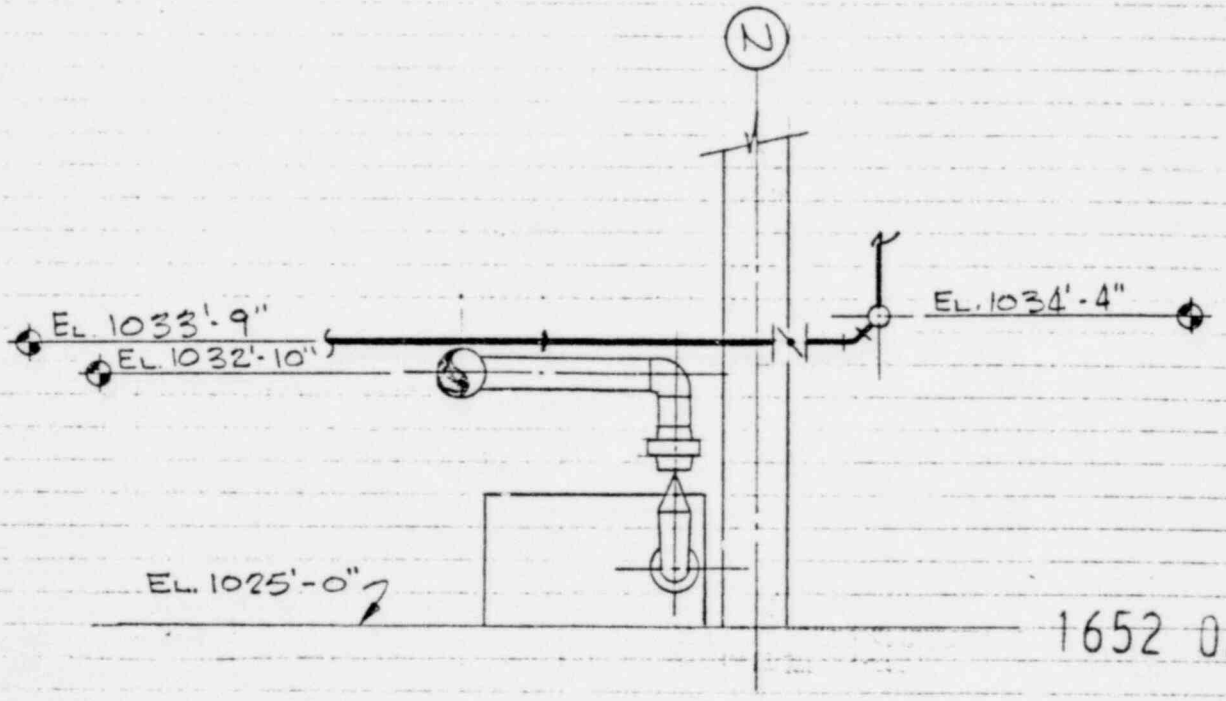
FIGURE TWO

SHT. 2 OF 2



PLAN



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SECTION B-B

NOTES:

1.) SEE NATIONAL DWG. SHT 5-COL N FOR ARRANGEMENT

2.) SEE FIG. ONE AND TWO FOR TYP. SUPPORTS & SPRAY SHIELDS.

FIGURE THREE

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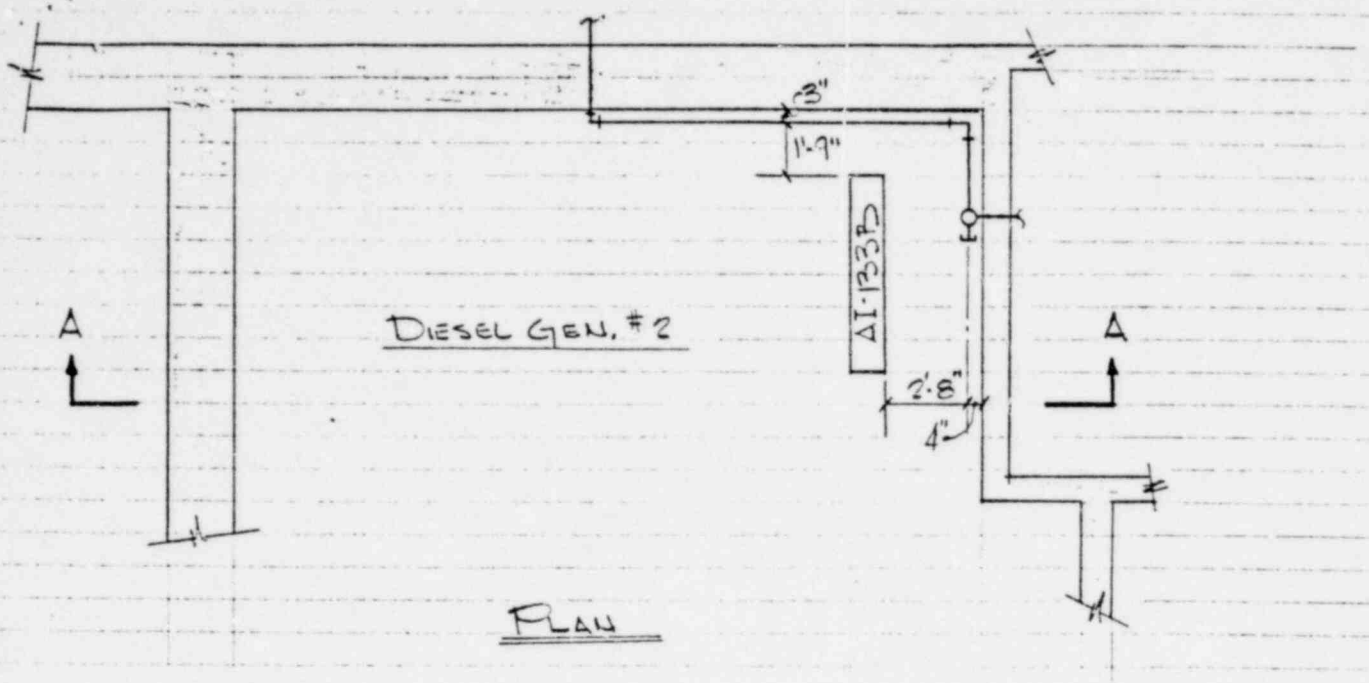
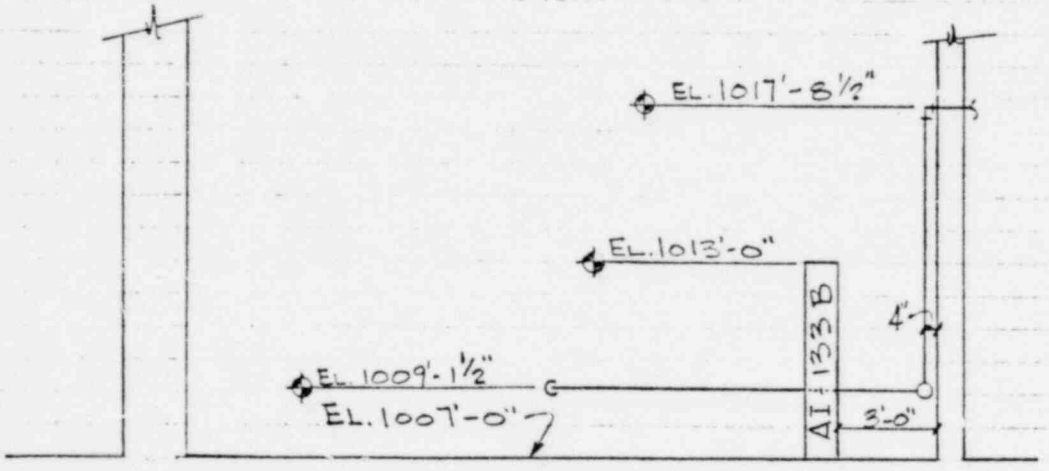


PLAN



SECTION A-A

NOTES: 1.) SEE NATIONAL DWG, SHT 4 - COL 26/D FOR ARRANGEMENT

2.) SEE FIG. ONE AND TWO FOR TYP. SUPPORTS & SPRAT SHIELDS

FIGURE FOUR

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Water Curtain Description

FIRE PROTECTION - CORRIDOR 6 AND 20

Scope

This technical description covers the installation of the detection/actuation systems and associated controls and alarms for the deluge system in the stairwell and hatch opening between corridors 6 and 20.

Detection/Actuation

During a fire, ionization detectors in each protected area provide a signal to a solenoid valve on each deluge system.

The detectors' 120 AC power originates in AI-54A off the load side of the existing throw-over switch, which supplies AI-54A/B for the existing high-voltage detection system. The detector is self contained and generates the necessary internal DC voltage and annunciation circuits for fire alarm and trouble supervision.

To preclude inadvertent actuation of the deluge system in the radiation area, the detectors are crossed-zoned; that is, each zone would have to go into alarm before the deluge system actuated.

Each solenoid valve receives 125V DC control power from AI-54A, which is fed from AI-41A.

Alarm

Once a deluge system is actuated, a pressure switch on each system provides indication annunciation to the Control Room.

Miscellaneous

A reset switch is provided at each detector module. However, a remote reset shall be provided, which can be operated from a convenient location.

In addition, each deluge system can be manually actuated at the valve.

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