PROCEDURE

TEST TO QUALIFY CABLE AND PIPE PENETRATIONS IN FIRE WALLS AND FLOORS FOR CALVERT CLIFFS NUCLEAR POWER PLANT

A. SCOPE:

Where cable trays, conduit and pipe pass through a floor or wall opening, these openings are sealed with fire retardant materials and are considered to be an integral part of the wall or floor construction. Materials which have been used at Calvert Cliffs Nuclear Power Plant to seal openings and to serve as fire stops will be tested. In addition, other materials and systems which may be utilized in the future for seals or fire stops in fire-rated walls, barriers, and floors will be tested.

B. PURPOSE:

The purpose of the test is to evaluate existing penetration fire stop design and construction and to qualify them by test per ASTM E-119 - 1976 Standard Time-Temperature Curve at an independent test laboratory.

C. DESCRIPTION OF TEST MATERIALS:

1. A fire wall or floor construction having a three-hour fire resistance rating will be constructed (10 feet x 10 feet).

2. The attached Figure 1 shows the configuration of the test. Table 1 describes the system for each seal or fire stop.

3. Cable trays will be approximately 6 feet long x 2 feet wide x 3 inches high. The trays shall be galvanized rigid steel. Cable tray covers will be galvanized and installed as shown on Figure D-2.

4. Cable tray and cable will extend into the furnace a minimum of one foot and at least three feet beyond the wall on the unexposed side.

5. Cable loading in trays will be 50%, consisting of low voltage power, control and instrumentation cables, which will have silicone rubber insulation covered with glass braid and an overall asbestos braid jacket.

6. Conduit is 2 inch diameter rigid steel, galvanized schedule 40 pipe. The system will consist of two penetrations and connecting conduit as shown in Figure 1.

7. Cable in conduit will have silicone rubber insulation covered with glass braid and an overall asbestos braid jacket which will be energized to its design ampacity.

8. Pipe and sleeve penetration fire stop will utilize 6 inch diameter black iron schedule 40 pipe, capped and 10 inch diameter black iron pipe sleeve.

D. DESCRIPTION OF TEST:

1. The fire stop configuration will be tested to the ASTM E-119 - 1976 Standard Time-Temperature Curve for a minimum of 3 hours.

2. Following the fire endurance test of the fire stops, the assembly will be exposed to a hose stream for 2-1/2 minutes per 100 square feet of exposed surface. The hose stream will be a 1-1/2 inch nozzle set at a discharge angle of 30° with a nozzle pressure of 75 psi and a minimum discharge of 75 gpm with the tip of the nozzle a maximum of 10 feet from the exposed surface.

3. A circuit continuity test will be conducted for the conduit/silicone rubber insulated cable assembly. Conductors will be energized to 120 volts and 480 volts and shall be connected to resistive loads before, during, and after the fire exposure and hose stream test.

E. ACCEPTANCE CRITERIA:

The cable tray, conduit and pipe penetration fire stops are acceptable for use provided the following is met:

1. The fire stops withstand the fire endurance test as described without passage of flame and gases hot enough to ignite the cable or other fire stop materials on the unexposed side.

2. The fire stops withstand the hose stream test without the hose stream causing an opening through the test specimen.

3. The conduit/silicone rubber insulated cable assembly shall withstand the fire endurance and hose stream tests to demonstrate circuit continuity to perform its electrical function (i.e., without failing phase to phase or to ground) before, during, and after the fire exposure.

F. DOCUMENTATION:

The results, pass or fail, shall be recorded and supplemented with photographs and a statement of the conclusions drawn made by those conducting the test for the independent laboratory.

Installation methods will be described and will meet Quality Assurance Procedures as applicable to materials and installation methods.

TABLE 1

A. FIRE STOPS FOR CABLE TRAY PENETRATION SYSTEMS THROUGH WALLS AND FLOORS (SEE FIGURE 1):

Tray No. 1: Cable tray fire stops will be constructed to simulate installed fire stops at Calvert Cliffs Nuclear Power Plant. (See Figure D-2)

In case the existing cable tray fire stop design fails the test, the following variations (modifications) will be tested simultaneously to study and modify existing cable tray stops.

Cable tray fire stops will be constructed the same as Tray No. 1 above but the following listed modification will be made prior to the tests.

Tray No. 1A: Variation of Cable Tray Fire Stop Design shown in Tray No. 1. (See Figure D-2.1)

Tray No. 1B: Variation of Cable Tray Fire Stop Design shown in Tray No. 1. (See Figure D-2.2)

Tray No. 2: The void space will be entirely filled with Dow-Corning's Silicone RTV Foam. (See Figure D-2.3)

Tray No. 3: An INTUMESCENT (VIMASCO P.O.F. 62-10) paint will be applied on the outside surface of the fire stops, trays and metal covers, on both exposed and unexposed surfaces.

Tray No. 4: In this test, an additional 6" space will be filled with silicone RTV foam. (See Figure D-2.4)

Tray No. 5: A sheet metal cover will be installed to protect the Flamemastic from impact during the hose stream test. (See Figure D-2.5)

B. FIRE STOPS FOR WIREWAYS AND CONDUITS THROUGH CONTROL ROOM FLOOR (SEE FIGURE 1):

Blockout No. 1: Control Room floor penetrations will be constructed to simulate installed fire stops at Calvert Cliffs Nuclear Power Plant. (See Figure D-3)

In case the existing floor penetration fire stop design fails the test, the following variations (modifications) will be tested simultaneously to study and modify existing floor penetration fire stops.

Floor penetration fire stops will be constructed the same as Blockout No. 1 above but the following listed modifications will be made prior to the tests.

Blockout No. 2: The Flamemastic coating at the top level of the floor will be opened to remove the loose vermiculite to a depth of 10 inches and this space filled with silicone RTV foam. (See Figure D-3.1)

Blockout No. 3: A 3 inch noncombustible dam will be installed and filled with silicone RTV foam. (See Figure D-3.2)

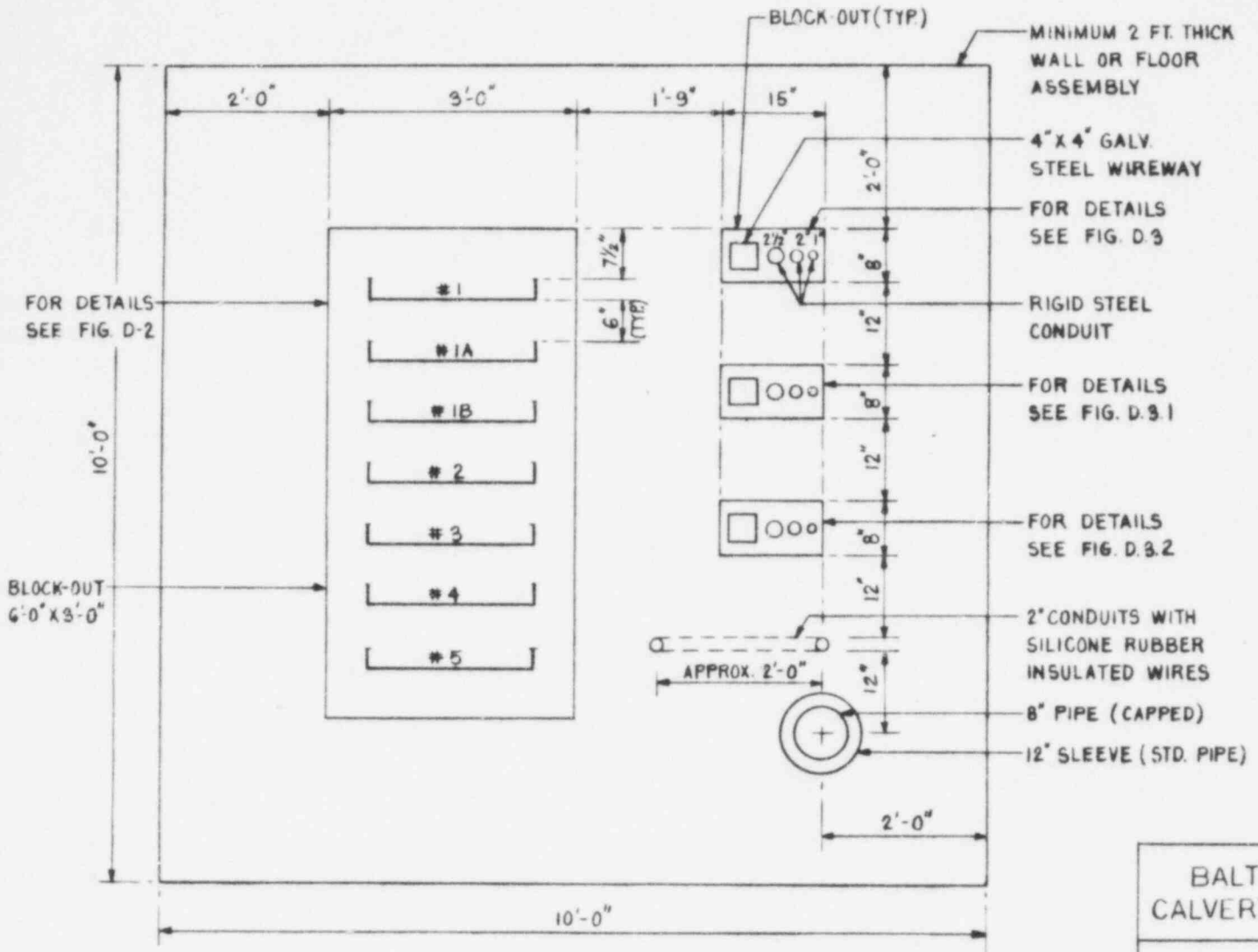
C. CONDUIT/SILICONE RUBBER INSULATED CABLE:

Two rigid steel conduits will be grouted in place and interconnected by conduit two feet long. Multiconductor cable having silicone rubber insulation covered with glass braid and an overall asbestos briad jacket will be pulled in the conduit and will be connected to a power source and energized to its design ampacity to demonstrate its circuit continuity when exposed to flame and heat. (See Figure 1)

D. PIPE PENETRATION FIRE STOPS:

An 8 inch pipe installed in a 12 inch sleeve will be sealed to simulate pipe penetration fire stops at Calvert Cliffs Nuclear Power Plant. (See Figure 1)

TEST LAYOUT



NOTES:

1. ALL TRAYS ARE TO BE GROUTED IN 6'-0"X3'-0" BLOCKOUT.
2. FOR FIRE STOP DETAILS, REFER TO TABLE 1.
3. SILICONE RUBBER INSULATED CABLES WITH ASBESTOS BRAID JACKET WILL BE TESTED IN CONDUIT. CIRCUIT CONTINUITY WILL BE MAINTAINED ONLY ON THESE CABLES.

FIGURE 1

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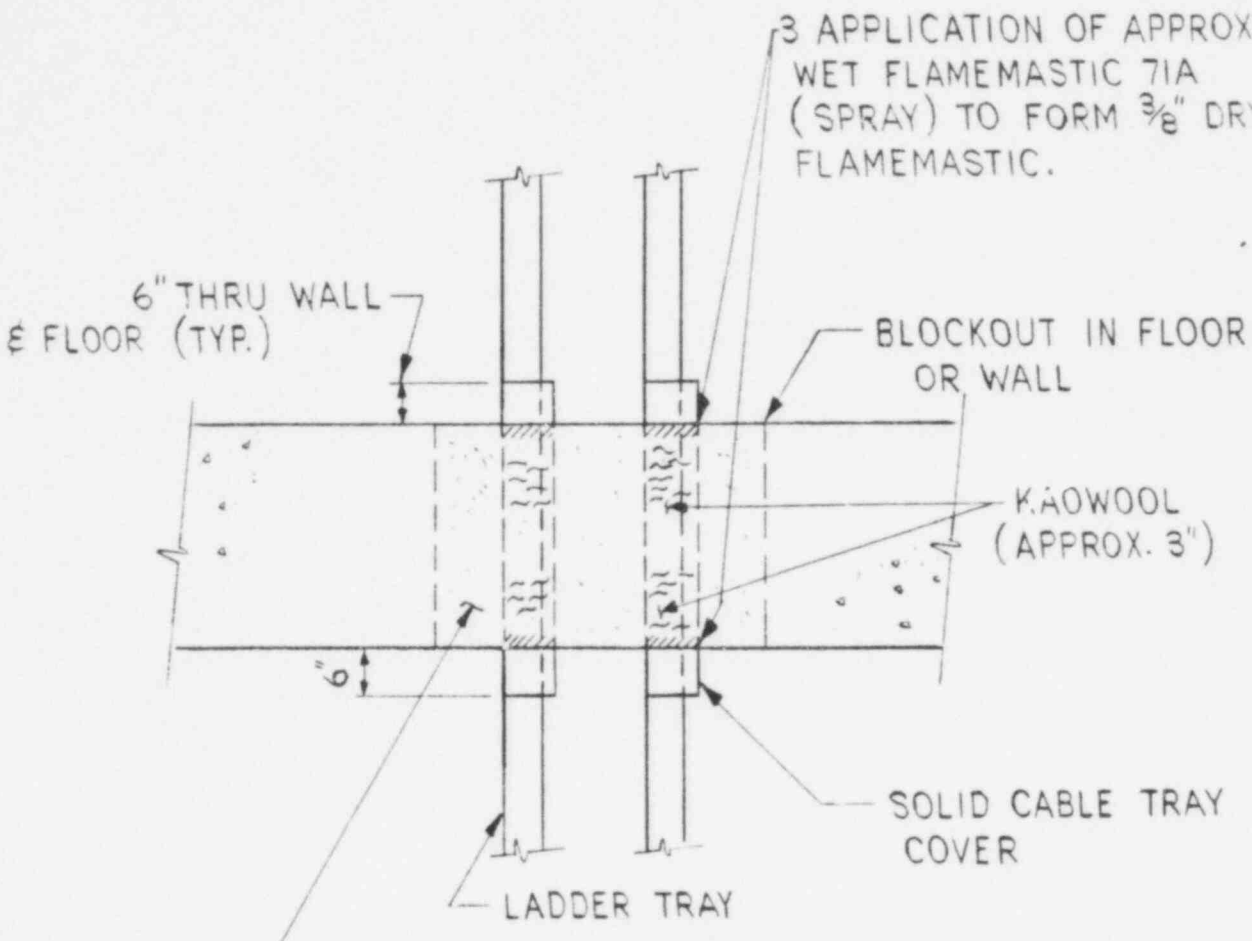
FIRE STOP PENETRATION
TEST SLAB LAYOUT



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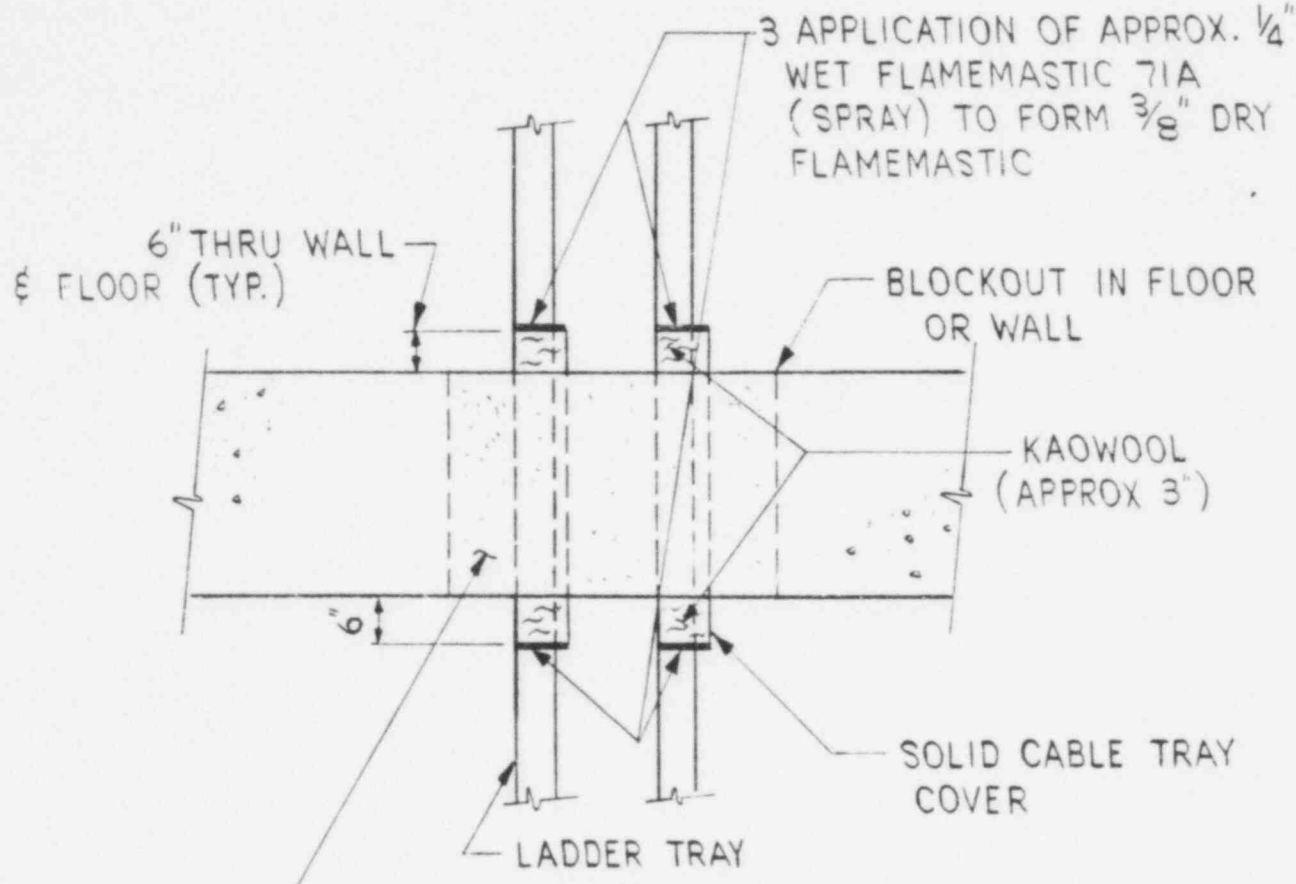
TYPICAL TRAY INSTALLATION THROUGH ELECTRICAL BLOCKOUTS FLOOR AND WALLS
FIGURE D-2



NOTE:

FIRE STOP WILL BE CONSTRUCTED OUTSIDE THE TRAY COVER.

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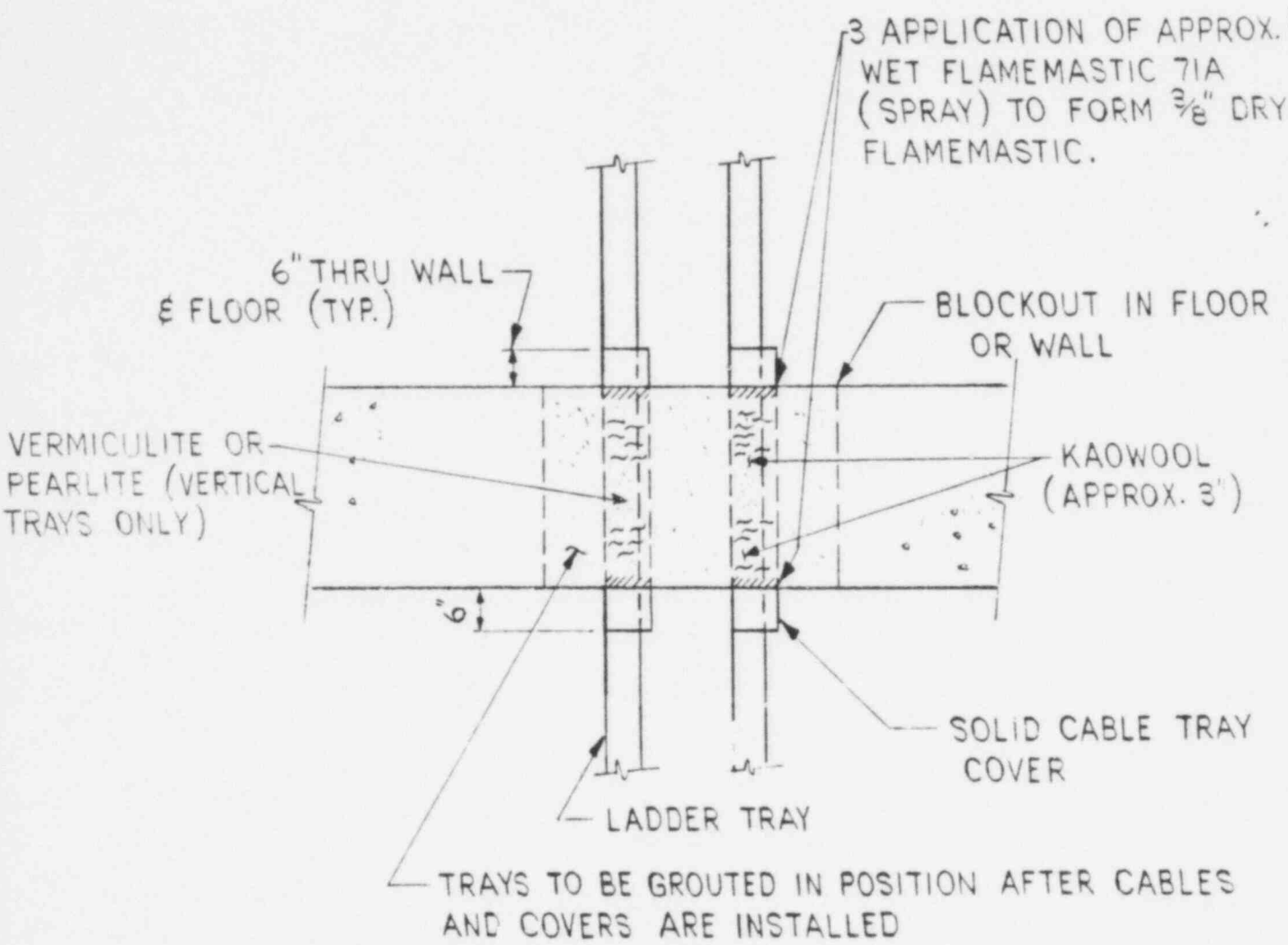
CALVERT CLIFFS NUCLEAR POWER PLANT

TYPICAL TRAY INSTALLATION THROUGH ELECTRICAL BLOCKOUTS FLOOR AND WALLS
FIGURE D-2.1



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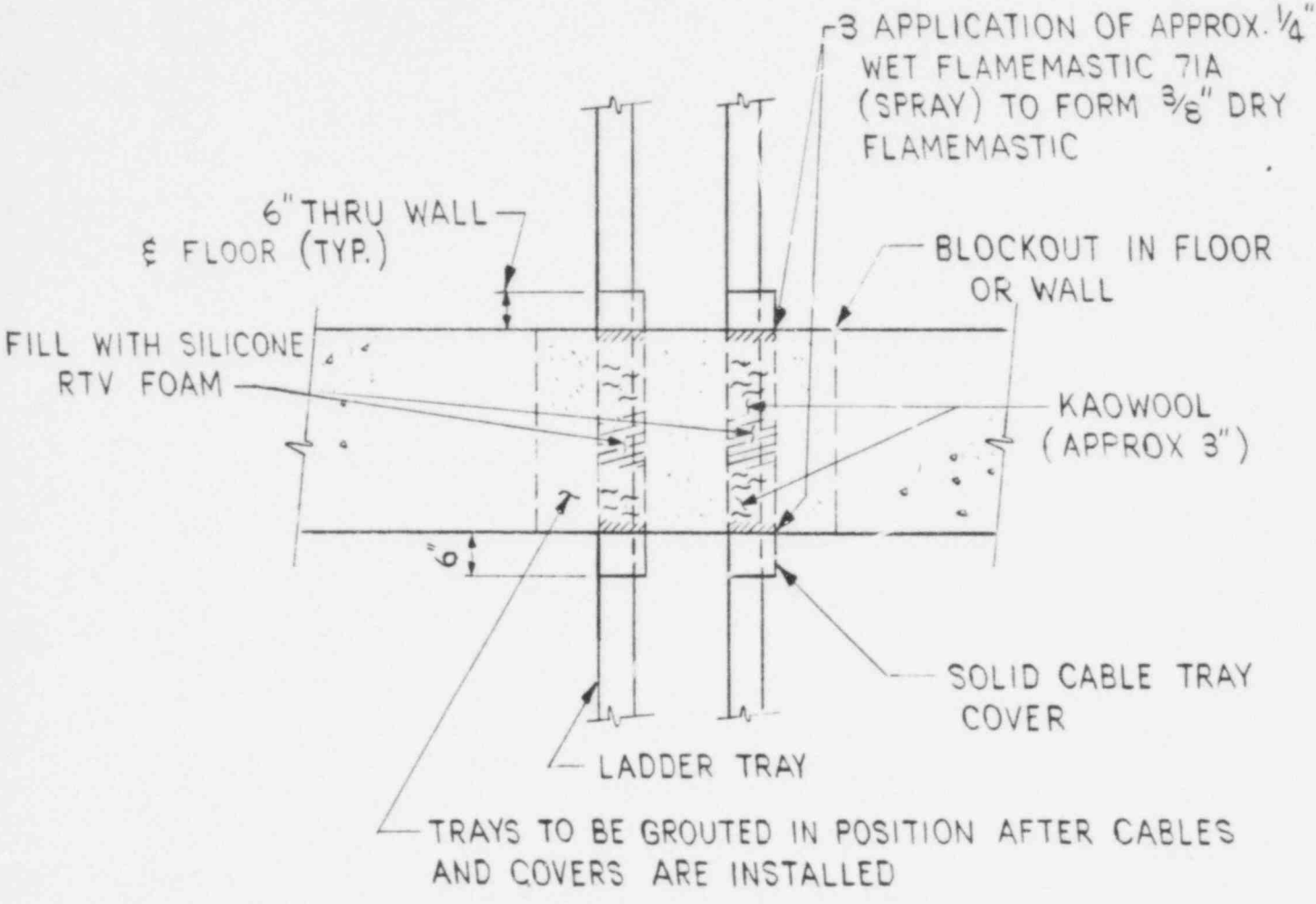
TYPICAL TRAY INSTALLATION THROUGH ELECTRICAL BLOCKOUTS FLOOR AND WALLS
FIGURE D-2.2



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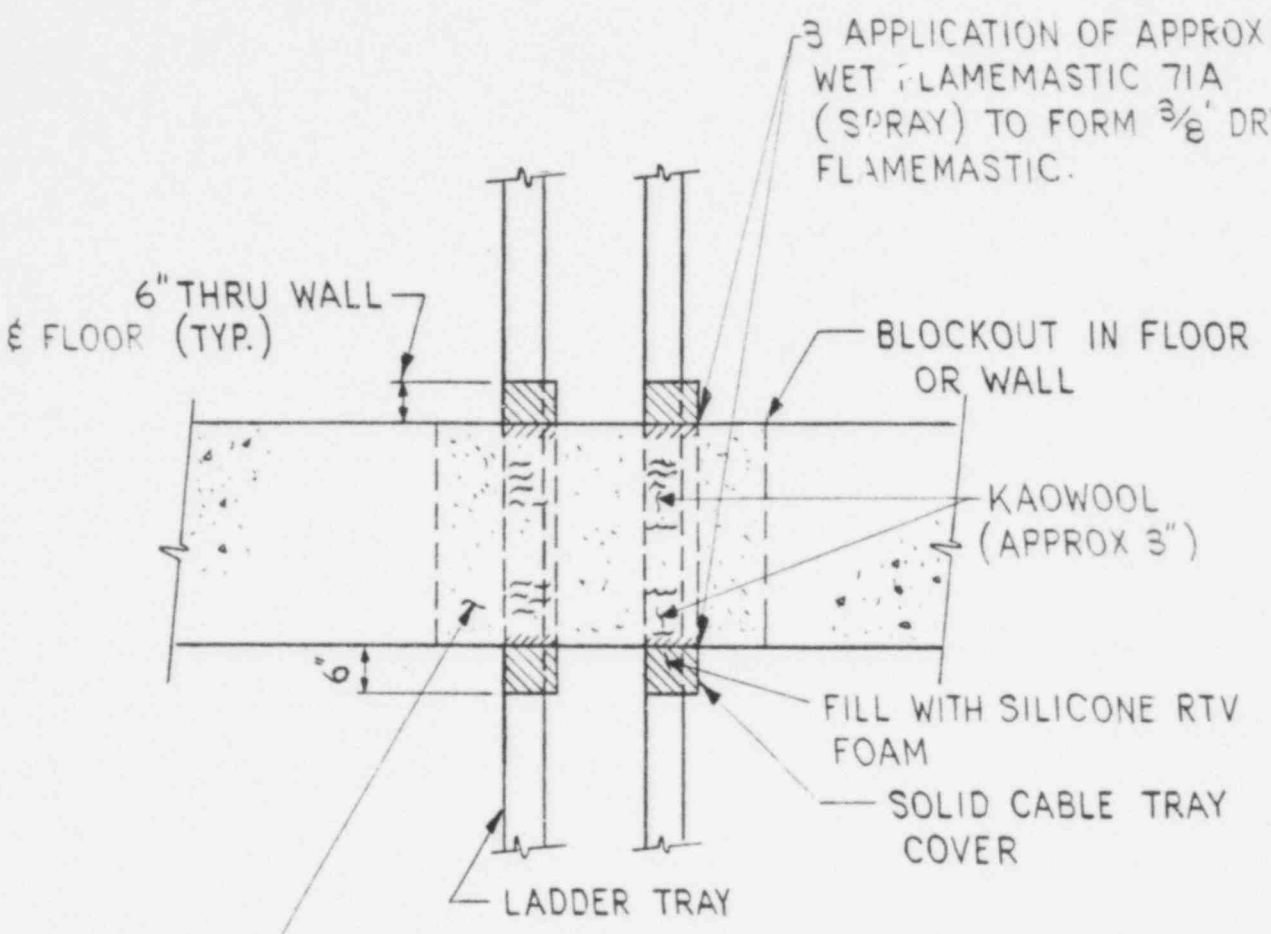
TYPICAL TRAY INSTALLATION THROUGH ELECTRICAL BLOCKOUTS FLOOR AND WALLS
FIGURE D-2.3



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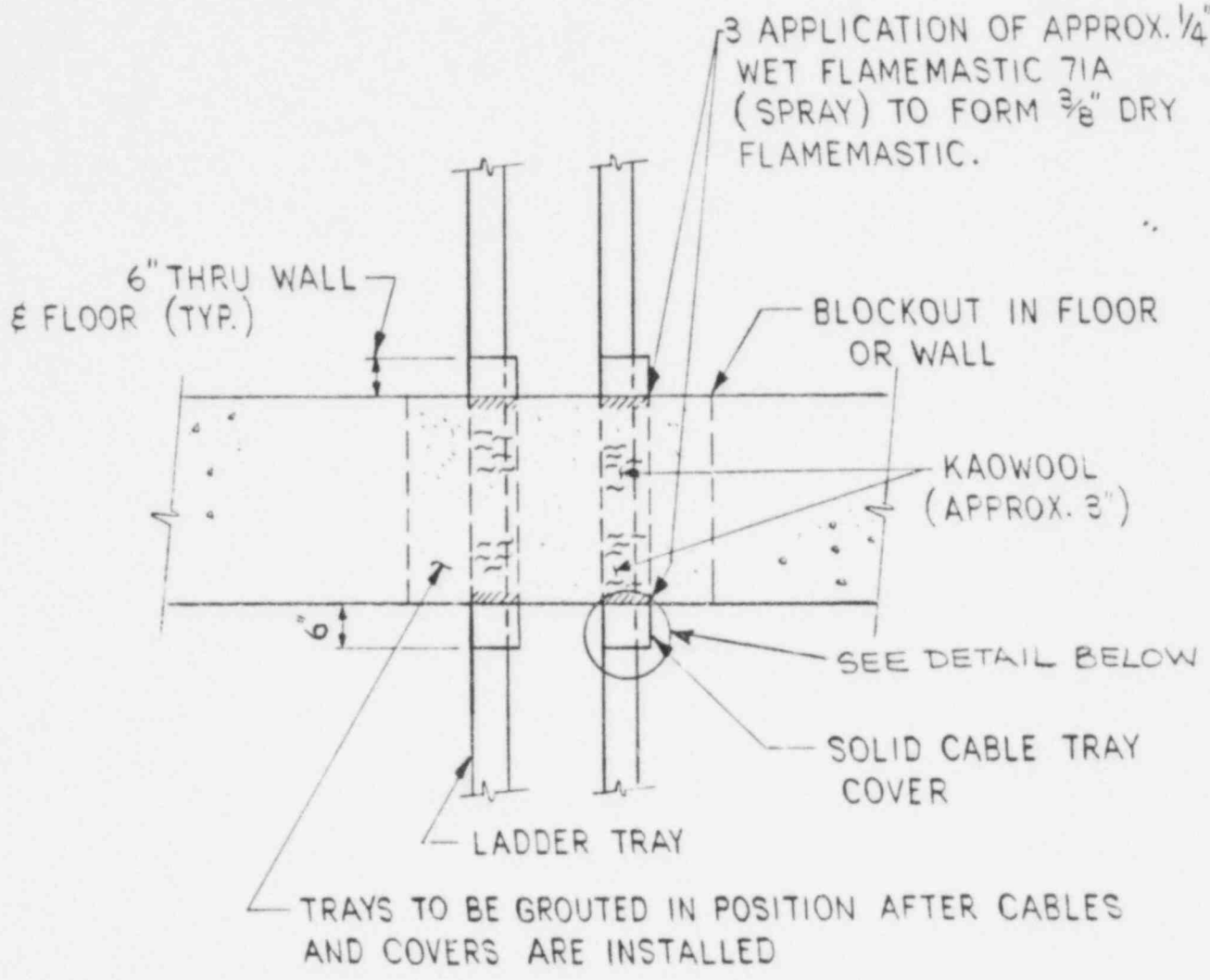
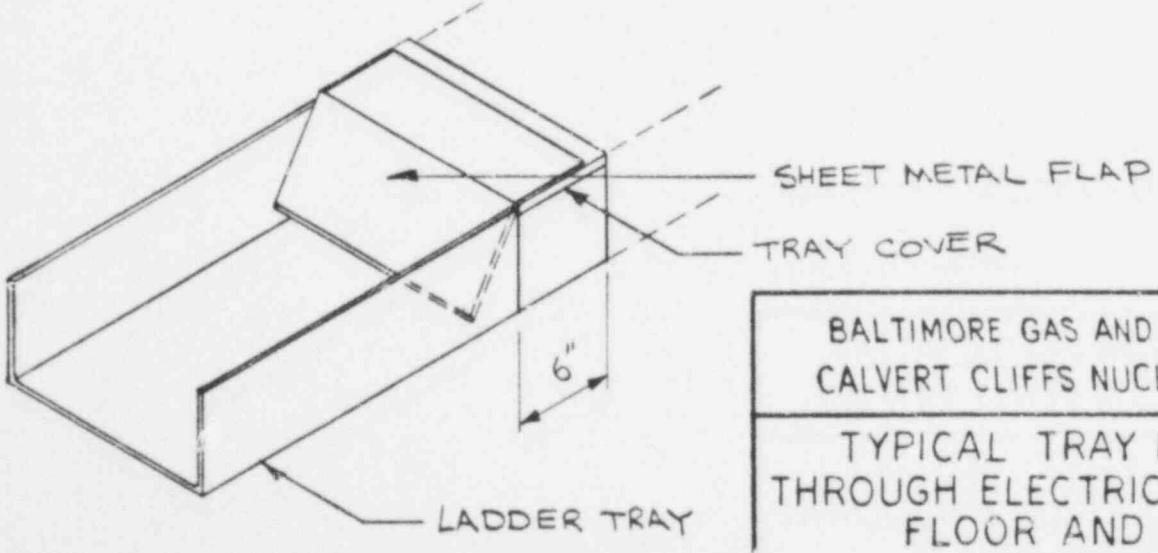
TYPICAL TRAY INSTALLATION THROUGH ELECTRICAL BLOCKOUTS FLOOR AND WALLS
FIGURE D-2.4





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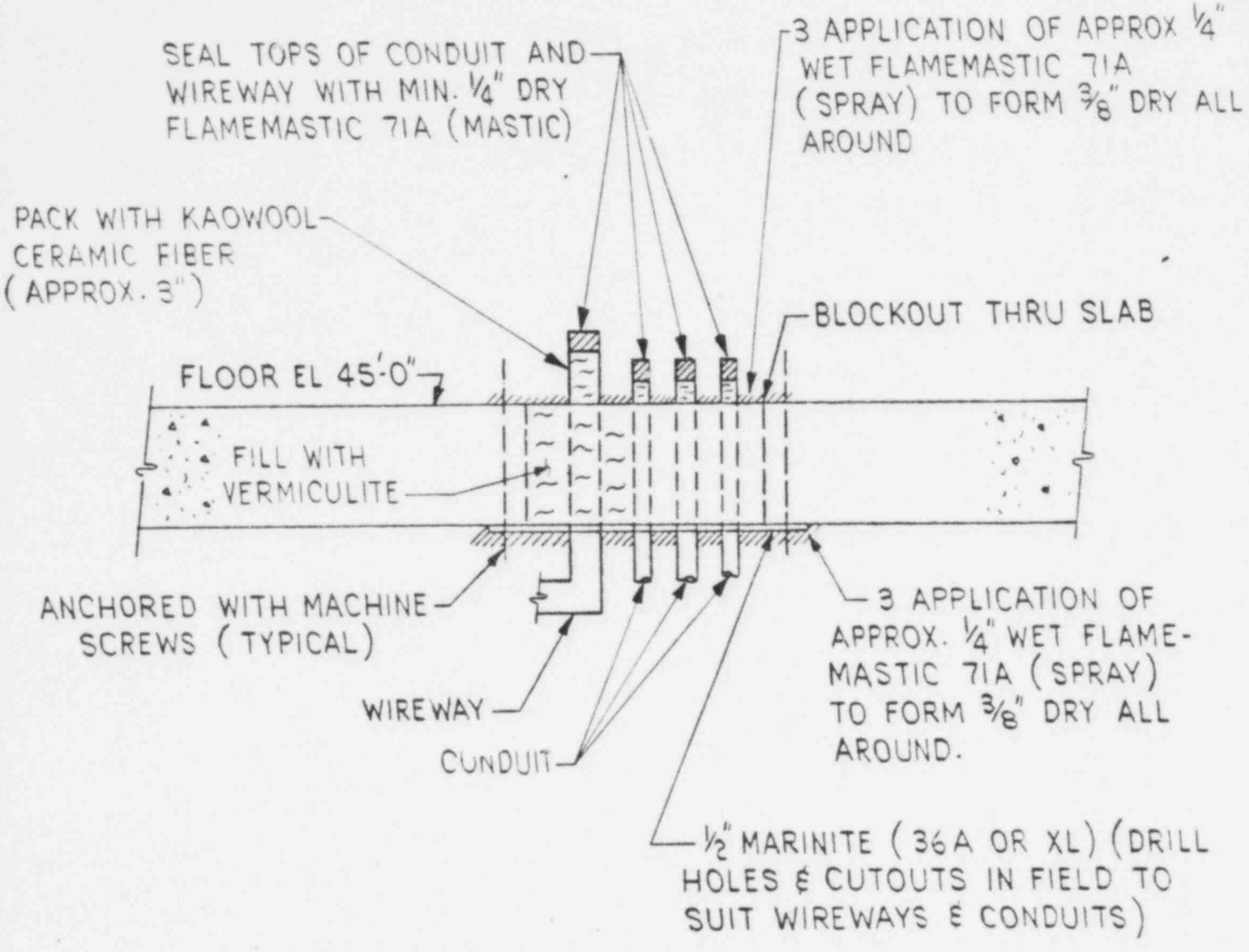
CALVERT CLIFFS NUCLEAR POWER PLANT

TYPICAL TRAY INSTALLATION THROUGH ELECTRICAL BLOCKOUTS FLOOR AND WALLS
FIGURE D-2.5



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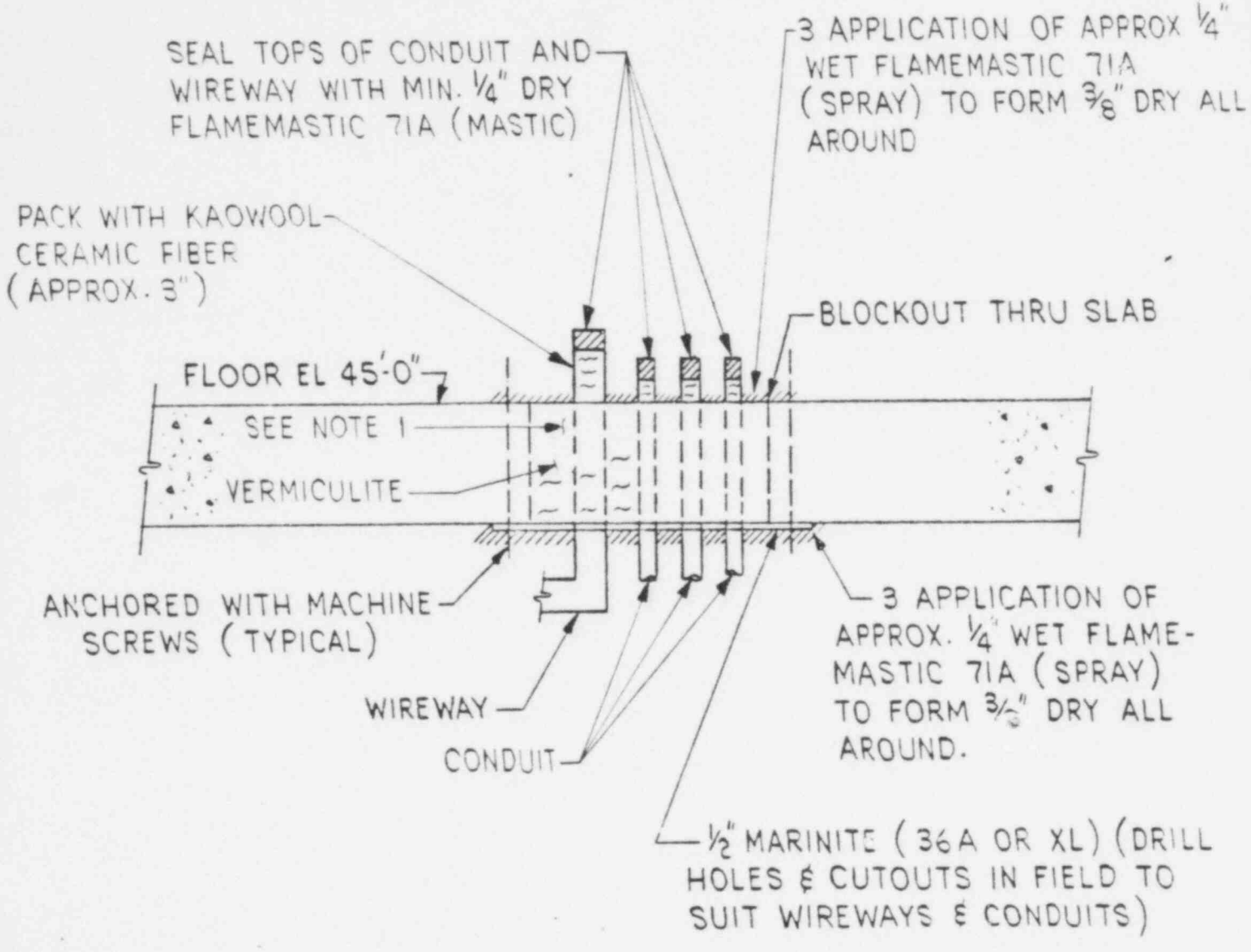
CALVERT CLIFFS NUCLEAR POWER PLANT

FIRE STOP & SEAL
FOR WIREWAYS & CONDUIT
THROUGH CONTROL ROOM FLOOR
FIGURE D-3



NOTE 1. REMOVE VERMICULITE TO A DEPTH OF 10 INCHES & FILL THE SPACE WITH SILICONE RTV FOAM.

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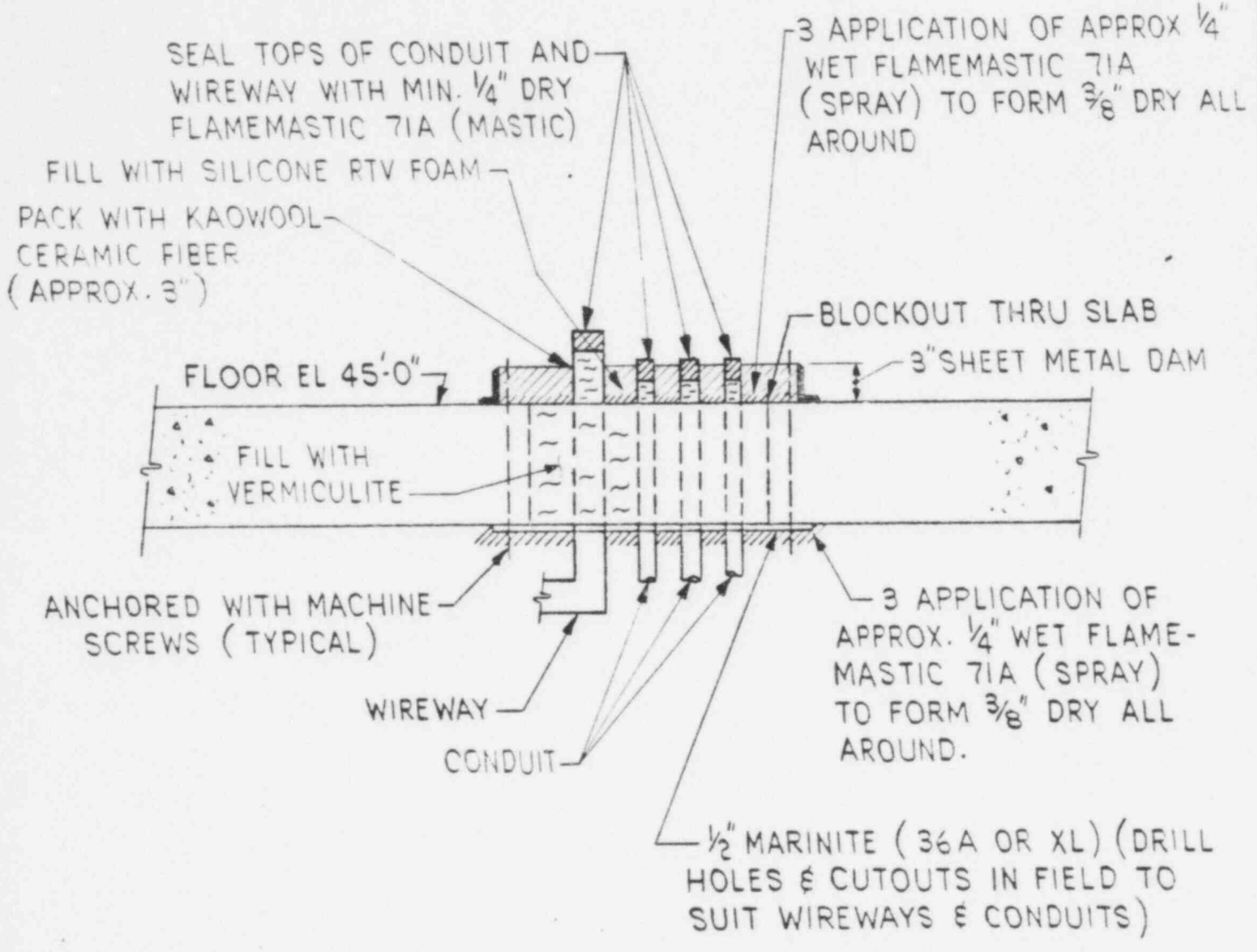
FIRE STOP & SEAL
FOR WIREWAYS & CONDUIT
THROUGH CONTROL ROOM FLOOR
FIGURE D-3.1



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CALVERT CLIFFS NUCLEAR POWER PLANT

FIRE STOP & SEAL
FOR WIREWAYS & CONDUIT
THROUGH CONTROL ROOM FLOOR
FIGURE D-3.2