



PROFESSIONAL LOSS CONTROL, INC.

EVALUATION  
OF  
HYDROSTATIC TESTING OF THE FIRE PROTECTION YARD PIPING  
AT  
FERMI 2  
DETROIT EDISON CO.

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EVALUATION  
OF  
HYDROSTATIC TESTING OF THE FIRE PROTECTION YARD PIPING

BACKGROUND

The fire protection yard piping consists of looped 12 inch carbon steel piping which is coated and wrapped. Most piping connections are welded and a few are flanged. There is one electric motor driven and one diesel driven fire pump, and both are rated at 2500 gpm at 150 psig. These pumps take suction from the general service pump house wetwell which is supplied from Lake Erie. The yard piping is connected and is pressurized by the general service water system with a check valve separating the systems. The fire pumps discharge into two separate connections to the underground 12 inch yard loop.

The general service water pumps maintain a constant pressure of 150 psig on the fire protection yard piping. The fire pumps start automatically on low header pressure. The electric motor driven pump starts at 130 psig and the diesel driven fire pump starts at 110 psig. Both pumps have pressure relief valves set at 170 psig. The yard piping was installed over 10 years ago.

HYDROSTATIC TEST

On September 11, 1982, Detroit Edison Co. subcontractors (Phoenix Co.) performed a hydrostatic pressure test of the 12 inch nominal diameter piping in the yard loop. Dry barrel yard hydrants were included in the test with the valve (valve box) in the 6 inch lateral main opened. The test was conducted at a pressure of 200 psig + 18 for two (2) hours. The water leakage during the two hour test was 151 gallons. This computes to an average flow rate of 1.26 gpm. The allowable leakage per NFPA 24 which was computed by Detroit Edison's Field Engineering, was 75.2 gallons over the two (2) hour test period. The hydrostatic test measurements were made with a commercial water meter rather than measured at the test pressure by pumping from a calibrated container or head tank.

## CONCLUSION

The test results show that the leakage rate of the yard piping system was greater than the specified amount per NFPA 24 which is a standard for new private fire service mains.

However, with an average leakage rate of 1.26 gpm, the system performance is not jeopardized. This leakage rate is quite small when compared to a system capacity of 2500 gpm. This small leakage rate (1.26 gpm) is low for a water piping system that is over 10 years old.

The test pressure was 50 psig over the normal static pressure of 150 psig which is maintained constantly on the system by the general service water pumps. This test pressure was adequate for hydrostatically testing the system.

Even with a loss of offsite power causing a failure of the electric driven fire pump and the failure of the general service water pumps, the diesel driven fire pump (2500 gpm) provides the required water demand (1500 gpm for fire suppression system and 500 gpm for hose streams) plus can compensate for the average water leakage rate of 1.26 gpm.

In conclusion, the leakage ratio of 1.26 gpm will not adversely impact the water supply system adequacy or reliability in protecting nuclear safety related systems.

EVALUATION OF GANGED  
MULTI-DAMPER ASSEMBLIES  
AT  
FERMI 2

## 1.0 Introduction/Problem

A study of Fermi's fire damper assemblies was performed by Detroit Edison to determine the fire rating of multi damper assemblies (gang dampers). Underwriter's Laboratories "Building Materials Directory" lists the size opening Air Balance, Inc. (Fire Damper Supplier) has tested. The sizes and ratings are as follows:

<u>Maximum Opening Size</u>	<u>Position</u>	<u>Fire Rating</u>
120" x 80"	Vertical	1.5 Hours
97" x 42"	Horizontal	1.5 Hours
72" x 72"	Vertical	3 Hours
72" x 36"	Horizontal	3 Hours

A review of Fermi's fire damper assembly sizes indicate all are within the 3 hour test size limits except as follows:

<u>Damper No.</u>	<u>Size</u>	<u>Position</u>
FO 85	74" x 30"	Vertical
FO 90	84" x 84"	Vertical
FO 99	124" x 76"	Horizontal
FO 102	124" x 76"	Horizontal
FO 100	104" x 68"	Vertical
FO 101	104" x 68"	Vertical

An evaluation of each of these damper installations follows:

## 2.0 Division II Control Center HVAC Room (CC HVAC) (Sketch 1)

Dampers FO 99 and FO 100 separate the Control Room from the Division II CCHVAC Room. FO 100 is located in a wall between the two zones. FO 99 is located in the Floor/Ceiling between the two zones.

### 2.1 Description of Fire Damper Location

The Floor Assembly is rated as a 3 hour barrier between the zones and consists of reinforced concrete. The wall is an 8" concrete block wall with a minimum rating of one hour.

## 2.2 Fire Hazards

Combustible loading for the CCHVAC Room is approximately 1 lb/ft<sup>2</sup> consisting of electrical cabling and small amounts of lubricating oil.

The Control Room Area is the air space between the Control Room drop ceiling\* and the reinforced concrete ceiling. The amount of combustibles above the drop ceiling is negligible.

## 2.3 Safe Shutdown Equipment

The CCHVAC Room contains Division II HVAC equipment and Division I and II HVAC Appendix "R" shutdown cables. The Division I cables are enclosed in a 3 hour cable wrap. The Control Room contains all the control and instrumentation necessary for normal safe shutdown.

## 2.4 Fire Protection

Fire detection is provided in both zones. The Control Room is manned 100% of the time. Manual hose is available along with portable extinguishers being located in each area.

## 2.5 Evaluation/Conclusion

F0 100 is located in a wall with a minimum one hour rating. This size opening 104" x 68" has been tested for a 1.5 hour rating which is an acceptable fire rating for the fire loading located in each zone.

F0 99 is located in the floor. Damper installation has been sectioned into 3 sets of 8 dampers each (76" x 41"). This size is within the 1.5 hour rating for horizontal openings. The material sub-dividing the opening is a 6" x 76" 10 gage steel plate. Each damper weighs approximately 14 pounds. This steel bar will provide the necessary fire resistance because of the very low combustible loading in each zone.

In addition, 14 gage steel is typically utilized for the duct sleeves. The Fire Dampers are then attached to this 14 gage sleeve. By anchoring to a 10 gage bar the installation is better than a normal installation anchoring point.

\*Ceiling tile is 3 hour rated.



3.0 Division I Control Center HVAC Room (CCHVAC)  
(Sketch 1)

Dampers FO 101 and FO 102 separates the Control Room from the Division I CCHVAC Room. FO 101 is located in a wall between the two zones. FO 102 is located in the Floor/Ceiling between the two zones.

3.1 Description of Damper Location

The Floor Assembly is rated as a 3 hour barrier between the zones and consists of reinforced concrete. The wall is an 8" concrete block wall with a minimum one hour fire resistance.

3.2 Fire Hazards

Combustible loading for the CCHVAC Room is approximately 1 lb/ft<sup>2</sup> consisting of electrical cabling and small amounts of lubricating oil.

The Control Room Area is the air space between the Control Room drop ceiling\* and the concrete ceiling. The amount of combustibles above the drop ceiling is negligible.

3.3 Safe Shutdown Equipment

The CCHVAC Room contains Division I Appendix "R" shutdown cables and equipment. The Control Room contains all the control and instrumentation for normal shutdown.

3.4 Fire Protection

Fire detection is provided in both zones. The Control Room is manned 100% of the time. Manual fire hose is available along with portable extinguishers in each area.

3.5 Evaluation/Conclusion

FO 101 is located in a wall with a minimum one hour rating. This size opening 104" x 68" has been tested for a 1.5 hour rating which is an acceptable fire rating for the fire loading located in each zone.

FO 102 is located in the floor. The opening has been sectioned into 3 sets of 8 dampers each. (76" x 41") This size is within the 1.5 hour rating for horizontal openings. The material sub-dividing the opening is a 6" x 76" 10 gage steel plate. Each damper weighs approximately 14

\*Ceiling tile is 3 hour rated.

pounds. This steel bar will provide the necessary fire resistance because of the very low combustible loading in the area. Additionally, 14 gage steel is typically utilized for the ducts. The Fire Dampers are then attached to this 14 gage sleeve. By anchoring to a 10 gage bar the installation is better than a normal anchoring point.

#### 4.0 Fourth Floor Auxiliary Building (Zone 13) (Sketch II)

The Fourth Floor Auxiliary Building houses the Reactor/Auxiliary building ventilation system exhaust unit. Fire Damper FO 90 is located in a wall separating Zone 13 from a pipe/HVAC duct chase in the southwest corner. Fire Damper FO 85 is located in the wall separating the Control Room (Zone 9) from Zone 13 (see Sketch #2). The Control Room area is the air space between the Control Room drop ceiling\* and the Control Room ceiling.

##### 4.1 Description of Damper Location

The pipe chase is a 12 inch concrete block wall (3 hour equivalent). The wall separating the Control Room from the Fourth Floor Auxiliary Building is reinforced concrete and is a 3 hour fire rating.

##### 4.2 Safe Shutdown Equipment

Zone 13 contains both Division I and II Appendix R cables. Once operational, the 3L alternate shutdown system will be utilized for this zone.

The Control Room contains all the instrumentation and control necessary for normal shutdown.

##### 4.3 Fire Hazards

Combustible loading for Zone 13 is less than 1 lb/ft<sup>2</sup> consisting of electrical cables. The combustibles in the Control Room air space is negligible. The Pipe/HVAC duct chase contains no appreciable amount of combustibles.

##### 4.4 Fire Protection

Fire detection is provided in Zone 13 and the Control Room Air space. The Control Room is manned 100% of the time. A manual fire hose station is available for use by the trained fire brigade. Portable extinguishers are located in each zone.

\*Ceiling tile is 3 hour rated.



#### 4.5 Evaluation/Conclusion

FO 90 is a 84" x 84" assembly which is four inches wider than the 1.5 hour tested assembly. However, the overall assembly area size of FO 90 is 7056 sq. inches, while the test assembly size was 9600 sq. inches. Accordingly, Edison believes the test results of the tested assembly (1.5 hour rating) are applicable to FO 90. This 1.5 hour rating for FO 90 is acceptable for this damper based on the low combustibile loading of zone 13 and the pipe chase.

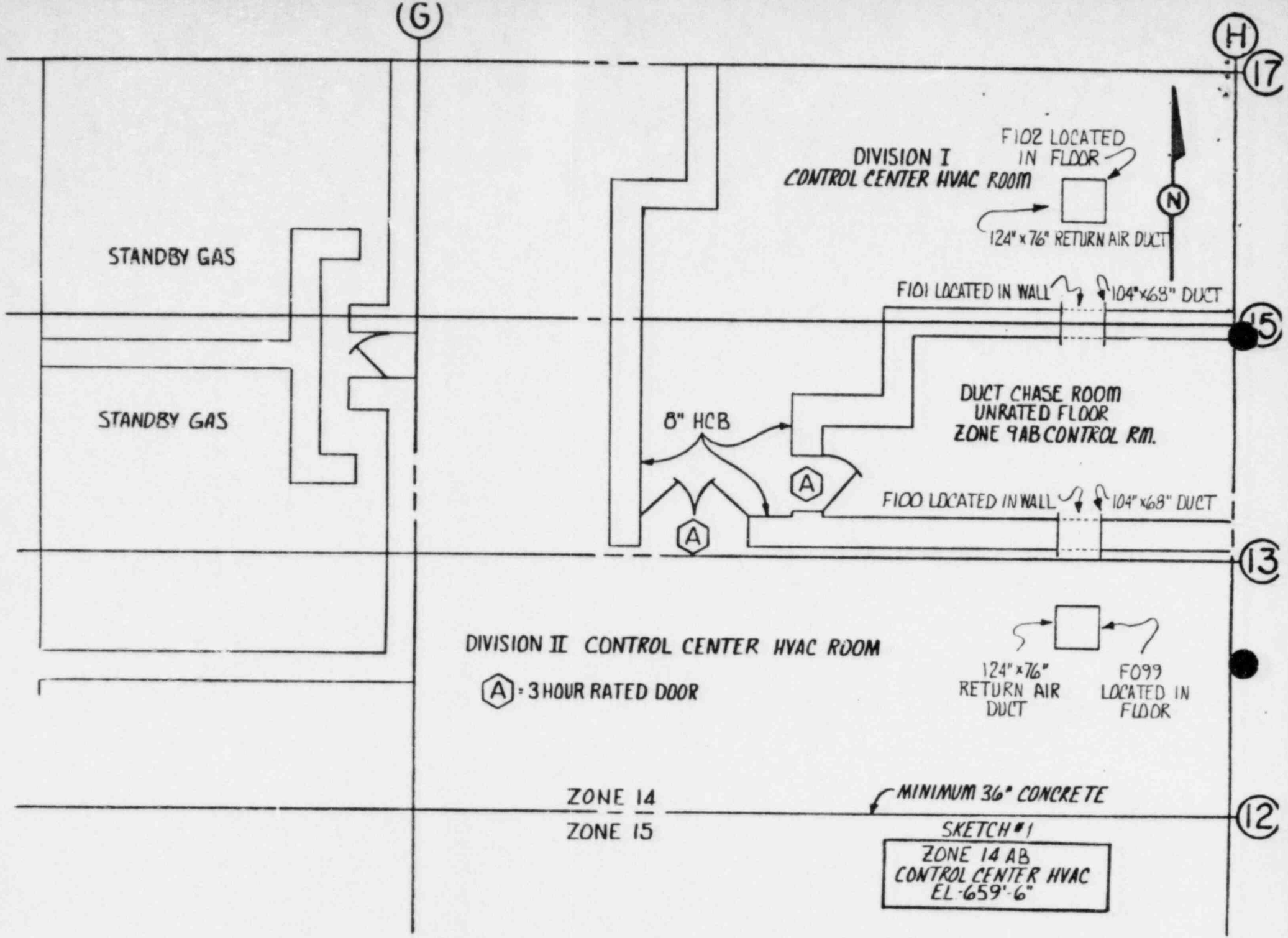
FO 85 is a 74" x 30" assembly which is 2 inches wider than the 3 hour tested assembly. However, the overall assembly area size of FO 85 is 2220 sq. inches, while the test assembly area size was 5184 sq. inches. Accordingly, Edison believes the test results of the tested assembly (3 hours) are applicable to FO 85. Another consideration is that the tested assembly size for 1.5 hours is 120" x 80". The 1.5 hour rating is acceptable because of the low combustibile loadings of zones 13 and 9.

#### 5.0 Additional Fire Damper Information

The following vertical damper installations consist of two 1/2 hour dampers in series instead of three hour dampers:

FO 81 A,B  
FO 82 A,B  
FO 83 A,B  
FO 84 A,B

The dampers were purchased in 1977. They are located in the 3 hour rated zone boundary wall between the fourth floor Auxiliary Building and the Control Room. (Air space between Control Room drop ceiling and concrete ceiling). Even though a specific design test is not available, it is Edison's position that the 2 1/2 hour dampers will prevent any postulated fires from spreading and is equivalent to a 3 Hour Fire Damper.



DIVISION II CONTROL CENTER HVAC ROOM

(A) = 3 HOUR RATED DOOR

DIVISION I CONTROL CENTER HVAC ROOM

F102 LOCATED IN FLOOR

124" x 76" RETURN AIR DUCT

F101 LOCATED IN WALL

104" x 68" DUCT

DUCT CHASE ROOM UNRATED FLOOR ZONE 9 AB CONTROL RM.

F100 LOCATED IN WALL

104" x 68" DUCT

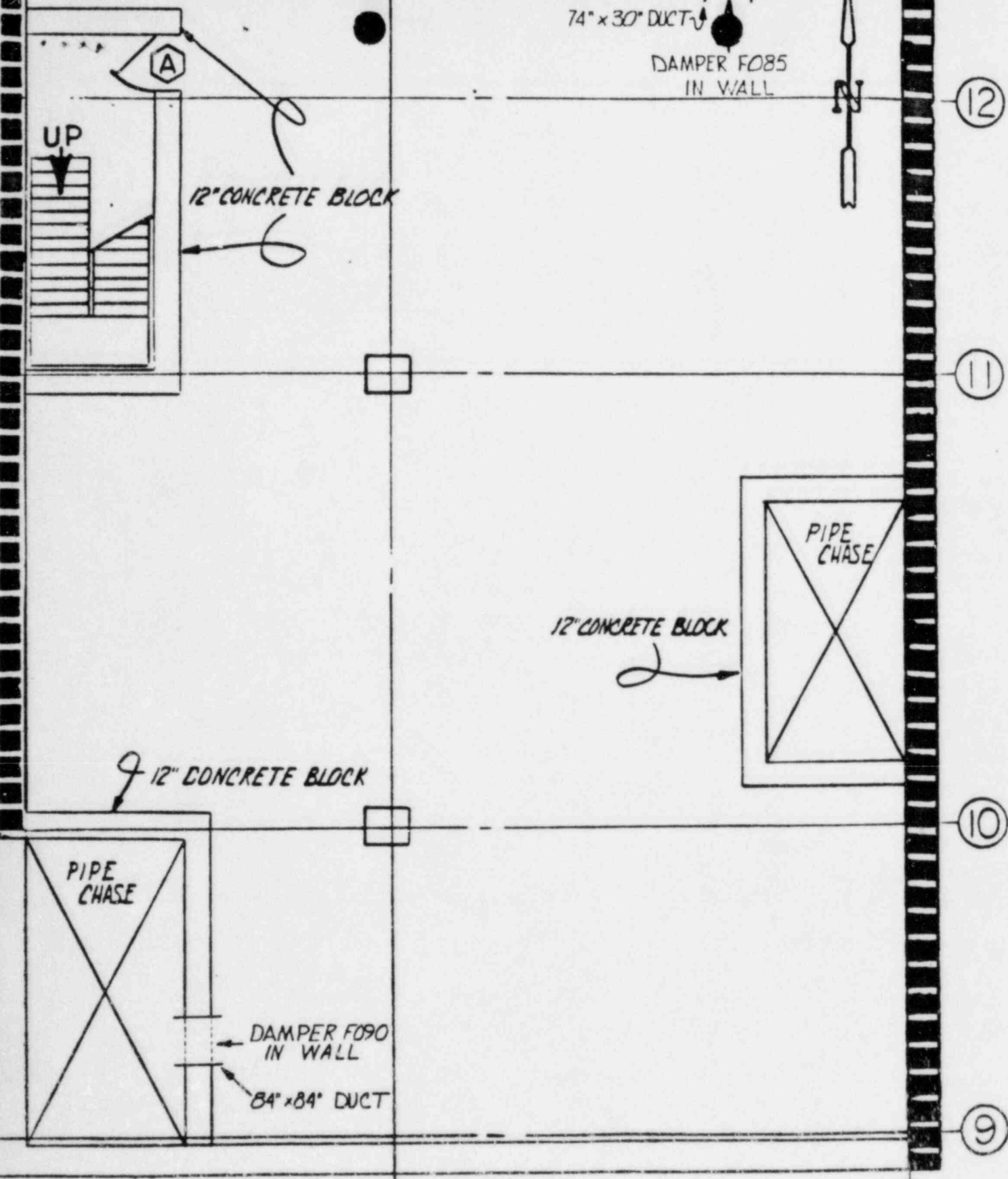
124" x 76" RETURN AIR DUCT

F099 LOCATED IN FLOOR

MINIMUM 36" CONCRETE

ZONE 14  
ZONE 15

SKETCH #1  
ZONE 14 AB  
CONTROL CENTER HVAC  
EL. 659'-6"



74" x 30" DUCT

DAMPER F085  
IN WALL

A

UP

12" CONCRETE BLOCK

12

11

PIPE CHASE

12" CONCRETE BLOCK

12" CONCRETE BLOCK

10

PIPE CHASE

DAMPER F090  
IN WALL

84" x 84" DUCT

9

G

H

A : 3 HOUR DOOR

SKETCH #2  
 ZONE 13AB  
 VENTILATION EQUIP. AREA  
 EL. - 659'-6"