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Subject: Fire Protection - 10CFR50 Appendix R Exemption Request for the Containment Annulus (TAC Number 60995)

Gentlemen:

As a result of the Fire Protection technical meeting held at the NRC offices on April 5, 1990, Toledo Edison is requesting one additional exemption from the technical requirements of 10CFR50 Appendix R. The exemption request involves the method of providing separation for redundant safe shutdown circuits within the Containment Annulus. The attachment provides a statement of the exemption requested, a discussion and evaluation of the request, as well as a discussion of applicable special circumstances in accordance with 10CFR50.12.

If you have any question concerning this matter, please contact Mr. R. W. Schrauder, Manager - Nuclear Licensing, at (419) 249-2366.

Very truly yours,

D C Shelton

DCW/ssg

Attachment

cc: P. M. Byron, DB-1 NRC Senior Resident Inspector
A. B. Davis, Regional Administrator, NRC Region III
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EXEMPTION REQUEST FOR FIRE AREAS A AND AB

EXEMPTION REQUESTED

An exemption is requested from Section III.G.2 of Appendix R to 10CFR50 to the extent it requires the separation of redundant safe shutdown components by a three-hour rated barrier. Specifically, redundant trains of safe shutdown circuits in the Containment Annulus are either: (1) separated within the annulus by greater than 40 feet free of intervening combustibles, (2) separated within the annulus by radiant energy shields, or (3) separated from other Auxiliary Building areas by substantial non-rated fire barriers. The separation provided within the annulus is adequate to meet the separation requirements of III.G.2 for noninerted containments. However, the Containment Annulus area has been analyzed with areas inside the Auxiliary Building. With this combination of areas, the more stringent non-containment Appendix R Section III.G.2 rules are being applied, and an exemption is being requested.

DISCUSSION

The annulus is an approximately 4.5 foot wide space between the Shield Building and the Containment Vessel which extends completely around and above the Containment Vessel and has no internal walls. The wall between the annulus and the Auxiliary Building is approximately 2.5 feet of concrete in thickness which is equivalent to a three hour rated fire barrier. The Containment Vessel forms the other annulus wall and is an ASME Class III Vessel with a minimum 1-1/2 inch steel thickness on the sides and a minimum 13/16 inch steel thickness on the dome. Cables and piping pass through the annulus on their way from the Auxiliary Building to equipment inside the Containment Vessel. Also, an equipment hatch, a personnel lock, an emergency lock, and two fuel transfer tubes pass through the annulus on their way from the Auxiliary Building to inside the Containment Vessel. There are four Emergency Ventilation System (EVS) flow path openings in Fire Areas A and AB to the annulus from the Auxiliary Building and their locations are depicted on the attached Figures 1 through 3.

The annulus has been divided into two fire areas (east and west halves). Each half is combined with separate rooms in the Auxiliary Building. These combinations result in optimized Fire Area A consisting of previous Fire Areas A, C, DB, DJ, and DA (east half) and optimized Fire Area AB consisting of previous Fire Areas AB, DC, DE, HA, Stairwell AB3 and DA (west half). In addition, the annulus is adjacent to separate Auxiliary Building Fire Areas G, V, P, K, CC, DF, X, EE, and DH, and the Containment, Fire Area D.

Containment (Fire Area D) is separated from the annulus by a continuous steel vessel as described above. The Containment Vessel, including the penetrating equipment listed above, is constructed of steel conforming to the requirements set forth by the ASME Boiler and Pressure Vessel Code.

Table 1 lists the non-fire rated penetrations into the annulus from the Auxiliary Building parts of Fire Areas A and AB. In addition, Table 1 also lists the fire areas, rooms, penetration types, the fire loading, and availability of automatic sprinkler system and/or fire detection capability.

Table 2 lists the other various fire areas which are adjacent to the annulus and are separated from the annulus by a three hour equivalent fire barrier with non-fire rated penetrations. Table 2 also lists the fire areas, rooms, penetration types, fire loading, and availability of automatic sprinkler system and/or fire detection capability.

Table 3 lists the remaining fire areas which are adjacent to the annulus and separated from the annulus by a three hour equivalent fire barrier with no penetrations. Table 3 also lists the fire areas, rooms, fire loading, and availability of automatic sprinkler system and/or fire detection capability.

Fire Area A (including the east half of the annulus) and Fire Area AB (including the west half of the annulus) within the annulus are not separated from each other by a three-hour rated barrier and are not separated from certain other areas in the Auxiliary Building by a three-hour rated barrier. However, a fire will not propagate from one area to the other because of the following:

1. The fire loading in the annulus is very low (approximately 14,500 BTU/ft^2). Approximately 94 percent of the combustible loading in the annulus is due to cable insulation. The cable insulation satisfies the criteria of IEEE 383-1974 or its equivalent and will not sustain combustion unless an external heat source is present. The ignitibility of cables at Davis-Besse was discussed in Toledo Edison letter dated February 8, 1988 (Serial Number 1471). Additionally, the cables are protected by overcurrent devices. The remaining 6 percent of the combustible loading is small amounts of grease enclosed in the gear boxes of motor operators and incidental combustibles such as flexible pipe boot seal material. Due to the high radiation level in the annulus during plant operation, access to the annulus is restricted. This ensures transient combustibles are not introduced into the annulus.

2. The fire loading in the Containment is very low (approximately 16.000 BTU/ft^2). Most of the combustible loading inside the Containment Vessel is located inside the internal shield wall which is a reinforced concrete wall approximately eighteen inches thick. This shield wall provides an additional fire barrier between the combustibles in the Containment Vessel and the annulus.

3. The mechanical penetrations as described in Tables 1 and 2 in Fire Area A are over 40 feet horizontally from the closest mechanical penetration in Fire Area AB. There are no exposed combustible materials or ignition sources in the intervening 40 feet between mechanical penetrations. The mechanical penetrations are sealed by the use of a pipe boot seal material. This pipe boot seal material represents a combustible loading of less than 300 BTU/ft^2. There are no electrical penetrations between the nearest two mechanical penetrations.

4. The electrical penetrations as described in Tables 1 and 2 in Fire Area A are over 100 feet horizontally from the closest electrical penetration in Fire Area AB. The electrical penetrations are further apart than the mechanical penetrations and there are no electrical penetrations between the

mechanical penetrations. Therefore the mechanical penetrations, which are separated by over 40 feet with no intervening exposed combustible material or ignition sources, constitute the most limiting separation condition. An exception exists for the circuits providing redundant safe shutdown functions in Fire Area A (east half of the annulus) for RC200 (Pressurizer Sample Containment Vent Header Valve), RC239A (Pressurizer Vapor Sample Valve), RC2A (Pressurizer PORV), RC4610A and B (Steam Generator 2 High Point Vent Valve), C1-1 (Containment Air Cooler Fan 1) and C1-2 (Containment Air Cooler Fan 2) which are protected with a radiant energy shield. The use of the radiant energy shield in the annulus is discussed in Toledo Edison Letter dated May 27, 1987 (Serial No. 1361).

5. There are two EVS flow path openings on each of the 565 foot and 585 foot elevations, described in Table 1 as open doorways. The closest opening in Fire Area A at the 585 foot elevation is over 85 feet from the opening in Fire Area AB. Since the openings are further apart than the mechanical penetrations, the mechanical penetrations, which are separated by over 40 feet with no intervening exposed combustible material or ignition sources, represent the most limiting condition. The opening in Fire Area A at the 565 foot elevation is over 170 feet from the opening in Fire Area AB and they are not located between the openings at the 585 foot elevation. See attached figures.

6. Electrical cable penetrations in the fire areas described in Table 2 are made through leaktight cable seals. Flexibility of the cables is provided across the annulus so that no damage can occur to the cables or structures due to differential movement between the two structures. Redundant controls, instrumentation, and power circuits are physically separated so that no redundant circuits terminate at the same penetration in the Containment Vessel.

7. The equipment hatch as described in Table 2 is a welded steel assembly with a double gasketed, flanged and bolted cover, made to allow pressurization of the space between the double gaskets to 40 psig. The personnel lock and emergency lock are welded assemblies with provisions made to pressurize the space between the gaskets.

8. Two fuel transfer penetrations as described in Table 2 are provided to transport fuel assemblies between the refueling canal and the spent fuel pool during the refueling operations. Each penetration consists of 30 inch diameter stainless steel pipe installed inside a 42 inch sleeve and encased in concrete within the annulus. The inner pipe acts as the transfer tube. Provisions are made to provide an allowance for differential movement between structures.

9. Both the Containment Purge and the Containment Exhaust lines as described in Table 2 penetrate the Containment Vessel with a 48 inch diameter steel pipe that is welded to a flued end. The flued end is welded to the vessel and has a flexible connection (a low pressure seal) at the annulus concrete wall to allow differential movement between the Containment Vessel and the annulus wall.

10. The penetrations in the Containment Vessel are of steel construction, tightly sealed, and provide substantial fire resistance.

EVALUATION

Toledo Edison has evaluated the existing fire protection features for the annulus (i.e., Fire Areas A and AB) and has determined that adequate measures exist that provide a level of protection equivalent to Section III.G of 10CFR50, Appendix R. These measures are:

1. The only significant combustible in the annulus is flame retardant cable insulation amounting to a combustible loading of approximately 13,700 BTU/ft^2 out of a total 14,500 BTU/ft^2. The remaining 800 BTU/ft^2 is comprised of incidental combustibles such as flexible pipe boot material and grease enclosed in the gear boxes of motor operators.

2. The cable insulation in the annulus satisfies the criteria of IEEE 383-1974 or equivalent and would not sustain combustion unless an external heat source is present. Additionally, the cables are protected by overcurrent devices.

3. The grease in the gear box of the motor operators is completely enclosed and is not considered to be a hazard.

4. Due to the restricted access to the annulus during power operation, the accumulation of transient combustibles is not postulated during power operation. During other plant conditions, administrative controls require a transient combustible permit for all transient combustible material introduced into the annulus.

5. If a fire were to occur in one of the four mechanical penetration rooms (in Fire Area A or AB) each of which contains an opening and non-rated penetrations to the annulus, it is not expected to propagate into the annulus because each room has a low combustible loading and is protected by an area wide automatic sprinkler system. However, if a fire were to propagate through the opening or the non-rated penetrations, it would not propagate from the west half of the annulus to the east half of the annulus. The closest mechanical penetrations are over 40 feet apart with no exposed combustible materials or ignition sources in the intervening 40 feet. The nearest opening in the west half is separated by over 85 feet from the opening in the east half. Since the openings are further apart than the mechanical penetrations, the mechanical penetrations, which are separated by over 40 feet with no intervening exposed combustible material or ignition sources, constitute the most limiting separation condition. Some heat and smoke could be dissipated upward through the open doorway into the annulus, but it would not have a significant effect laterally.

6. The mechanical penetrations as described in Table 2 are predominantly non-combustible construction, are sealed, and provide substantial fire resistance. Several mechanical penetrations through the annulus wall do not have fire rated seals because of the need to accomodate relative building movement. However, the penetrations do not represent continuous paths of combustible material through the concrete wall and would not result in a

fire propagation through the subject mechanical penetration. If a fire were to propagate through the non-rated penetrations, it would not propagate from the west half of the annulus to the east half of the annulus. The closest mechanical penetrations are over 40 feet apart with no exposed combustible materials or ignition sources in the intervening 40 feet.

7. If a fire were to occur at an electrical penetration or in the cable in the annulus, it would not propagate from the west half of the annulus (Fire Area AB) to the east half of the annulus (Fire Area A) or vice versa. The closest electrical penetrations or circuits in the west half are over 100 feet from the closest electrical penetration or circuit in the east half. Since the electrical penetrations are further apart than the mechanical penetrations and there are no electrical penetrations between the mechanical penetrations, the mechanical penetrations constitute the most limiting separation condition. Within the east half of the annulus, redundant safe shutdown circuits or electrical penetrations are separated from each other by radiant energy shields which are adequate, given the very low fire loading and the restricted accessibility of the annulus.

8. The electrical cables as described in Table 2 and blockouts for the electrical cable penetrations are sealed.

9. Localized fire detection as described in the Fire Hazards Analysis Report (FHAR) is provided within the annulus. Manual suppression capability in the form of portable fire extinguishers and hose stations are available in the fire areas with the open doorways to the annulus.

10. The fire areas listed in Table 3 contain no penetrations into the annulus and are separated by the 2.5 foot thick concrete wall which provides the equivalent of a three hour barrier.

11. The Containment Vessel wall is not a fire rated barrier, but it provides adequate fire resistance for the fire hazards involved.

Consequently, Toledo Edison has determined that the existing fire protection features provided for the Davis-Besse annulus (i.e., Fire Areas A and AB) would ensure that at least one train of systems necessary to achieve and maintain hot standby is free of fire damage and, thereby, provide an equivalent level of fire protection as required by Section III.G of Appendix R. Additionally, the imposition of additional modifications only to satisfy the non-containment methods specified by Appendix R of 10CFR50 would not significantly enhance the level of fire protection currently provided for the annulus.

APPLICABLE SPECIAL CIRCUMSTANCES

Toledo Edison has determined that the requested exemption conforms to the applicable exemption criteria of 10CFR50.12(a). There are no prohibitions of law to preclude the activities that would be authorized by the requested exemption, and the requested exemption, if granted, would have no impact on the common defense and security. Additionally, the requested exemption does not present an undue risk to the public health and safety since an equivalent level of fire protection as that required by Section III.G of Appendix R is provided as described above.

Special circumstances are applicable to the requested exemption in accordance with 10CFR50.12(a)(2)(ii) in that application of the regulation for these particular circumstances is not necessary to achieve the underlying purpose of the rule. Section III.G of 10CFR50, Appendix R specifies methods to ensure one train of systems necessary to achieve and maintain hot standby is free of fire damage. The underlying purpose of the rule is satisfied by the requested exemption since the existing fire protection features described above provide an equivalent level of fire protection as required by Section III.G of Appendix R, and the completion of modifications only to satisfy the methods specified by Appendix R is not necessary.

Additional special circumstances are applicable to the requested exemption in accordance with 10CFR50.12(a)(2)(iii) in that the application of the regulation would represent an unwarranted burden on Toledo Edison resources. Any modification of the current annulus fire protection features would result in considerable expenditure of engineering, construction, and plant staff resources for its installation, maintenance and surveillance. The associated cost would include:

- Engineering the design and installation of the fire protection features such as erecting fire rated barriers between the two fire areas or installing a fire suppression system in the annulus.

- Implementation of increased surveillance and maintenance requirements for the fire protection features.

- Impracticality of design and installation associated with a three-hour fire rated enclosure around the circuits in the annulus because the cables need to expand or contract.

- Impracticality of design and installation associated with a three hour fire barrier over the ventilation openings to the annulus because it conflicts with Emergency Ventilation System design requirements to function following a Loss-of-Coolant Accident.

- Impracticality of the design and installation associated with the addition of a sprinkler system to the annulus because of the height and configuration of the annulus being open around the top of the Containment Vessel.

The costs associated with modifications to the annulus fire protection features would represent an unwarranted burden on Toledo Edison resources, considering the resulting negligible increase in safety benefit and the alternative means of fire protection described above.

In conclusion, Toledo Edison considers that special circumstances in accordance with 10CFR50.12(a)(2)(ii) and 50.12(a)(2)(iii) justify the requested exemption. The completion of additional modifications simply to satisfy the methods specified by Appendix R of 10CFR50 is not necessary to satisfy the underlying purpose of the rule since the existing fire protection features provided for the Davis-Besse annulus would ensure one train of systems necessary to achieve and maintain hot standby is free of fire damage and, thereby, provide an equivalent

level of fire protection as required by Section III.G of Appendix R. Considering the resulting negligible safety benefit, the completion of additional modifications only to satisfy the methods specified by Appendix R of 10CFR50 represents an unwarranted burden on Toledo Edison resources.

TABLE 1

OPTIMIZED FIRE AREAS A AND AB

FIRE AREA	PENETRATION LOCATION	PENETRATION TYPE	FLOOR ELEVATION	FIRE LOADING (BTU/SQ. FT.) AUX BLDG/ANNULUS	AUTOMATIC SUPPRESSION AUX BLDG/ANNULUS	DETECTION AUX BLDG/ANNULUS
AB	No. 1 Mechanical Penetration Room (208) into Annulus (127)	a. Mechanical b. Open doorway	565	5,700/14,500	Yes/No	Yes/Yes
A	No. 2 Mechanical Penetration Room (236) into Annulus (127)	a. Mechanical b. Open doorway	565	15,900/14,500	Yes/No	Yes/Yes
AB	No. 3 Mechanical Penetration Room (303) into Annulus (127)	a. Mechanical b. Open doorway c. Electrical	585	11,000/14,500	Yes/No	Yes/Yes
A	No. 4 Mechanical Penetration Room (314) into Annulus	a. Mechanical b. Open doorway c. Electrical	585	47,600/14,500	Yes/No	Yes/Yes

TABLE 2

OPTIMIZED FIRE AREAS ADJACENT TO ANNULUS WITH PENETRATIONS

FIRE AREA	ROOM NO.	PENETRATION LOCATION	TYPE PENETRATION	FLOOR ELEVATION	FIRE LOADING (BTU/SQ. FT.)	AUTOMATIC SUPPRESSION	DETECTION
DG	402	No. 1 Electrical Penetration Room	a. Mechanical b. Electrical	603	63,100	Yes	Yes
DF	427	No. 2 Electrical Penetration Room	a. Mechanical b. Electrical c. Containment Purge Exhaust	603	61,200	Yes	Yes
DH	600	Purge Inlet Room	Containment Purge Supply	643	600	No	Yes
DH	601	Main Steam Line Room	Main Steam Line	643	2,800	No	Yes
DH	602	Main Steam Line Room	Main Steam Line	643	3,600	No	Yes
V	222	Fuel Transfer Tube Room	Fuel Transfer Tubes	565	3,400	No	No
V	400	Corridor	Equipment Hatch	603	67,200	No	Yes
CC	426	Personnel Lock Area	Personnel Lock	603	5,500	No	No
CC	422B	Ladder Space	Mechanical	603	400	No	No
None	317A	Emergency Lock Enclosure	Emergency Lock	585	Negligible	No	No

TABLE 2

OPTIMIZED FIRE AREAS ADJACENT TO ANNULUS WITH PENETRATIONS (CONTINUED)

FIRE AREA	ROOM NO.	PENETRATION LOCATION	TYPE PENETRATION	FLOOR ELEVATION	FIRE LOADING (BTU/SQ. FT.)	AUTOMATIC SUPPRESSION	DETECTION
AB	225	Makeup Pump	Mechanical	565	18,600	No	Yes
EE	515	Purge Exhaust Room	Containment Purge Exhaust	623	54,000	No	Yes
K	318	Diesel Generator Room	Mechanical	585	76,000	Yes	Yes
G	221	Top/Transtube Shield Room	Electrical	565	8,500	No	Yes

TABLE 3

OPTIMIZED FIRE AREAS ADJACENT TO ANNULUS WITH NO PENETRATIONS

FIRE AREA	ROOM NO.	ROOM DESCRIPTION	FLOOR ELEVATION	FIRE LOADING (BTU/SQ. FT.)	AUTOMATIC SUPPRESSION	DETECTION
G	209	Corridor	565	27,700	Yes	Yes
V	304	Corridor	585	72,300	Yes	Yes
V	405	Storage	603	26,000	Yes	Yes
V	406	Hot Instrument Shop	603	36,000	No	Yes
P	321	Charge Room	585	3,300	No	Yes
P	322	Passage	585	51,700	No	Yes
X	428	Low Voltage Switchgear Room	603	52,700	No	Yes
X	428B	No. 1 Electric Isolation Room	603	4,400	No	No
EE	500	Radwaste/Fuel Handling Area	623	2,000	No	Yes
EE	501	Radwaste Exhaust Fan Room	623	6,400	Yes	Yes

FIGURE 1

Fire Area A/AB Boundaries on Elev. 565

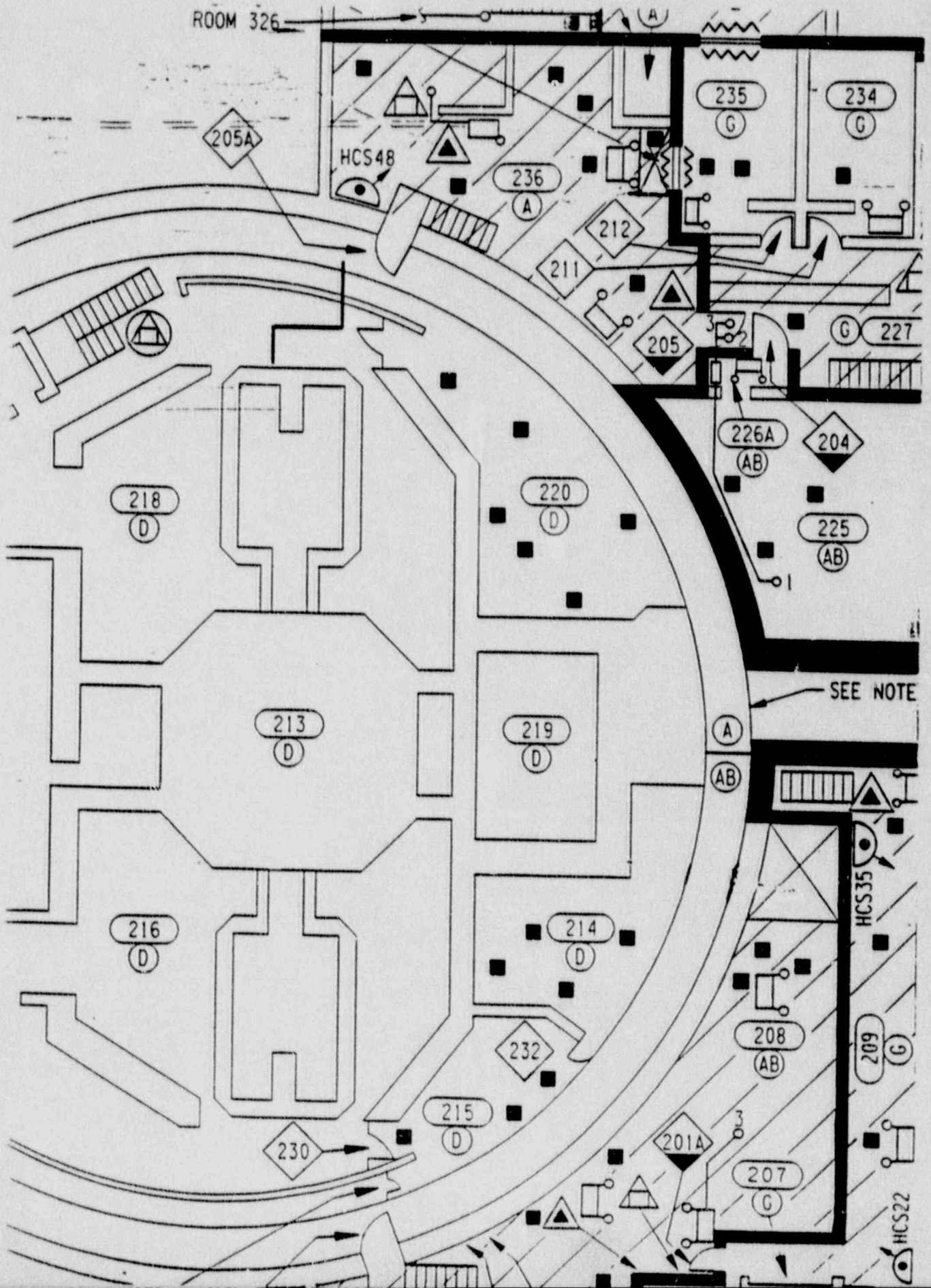

FIGURE 2

Fire Area A/AB Boundaries on Elev. 585

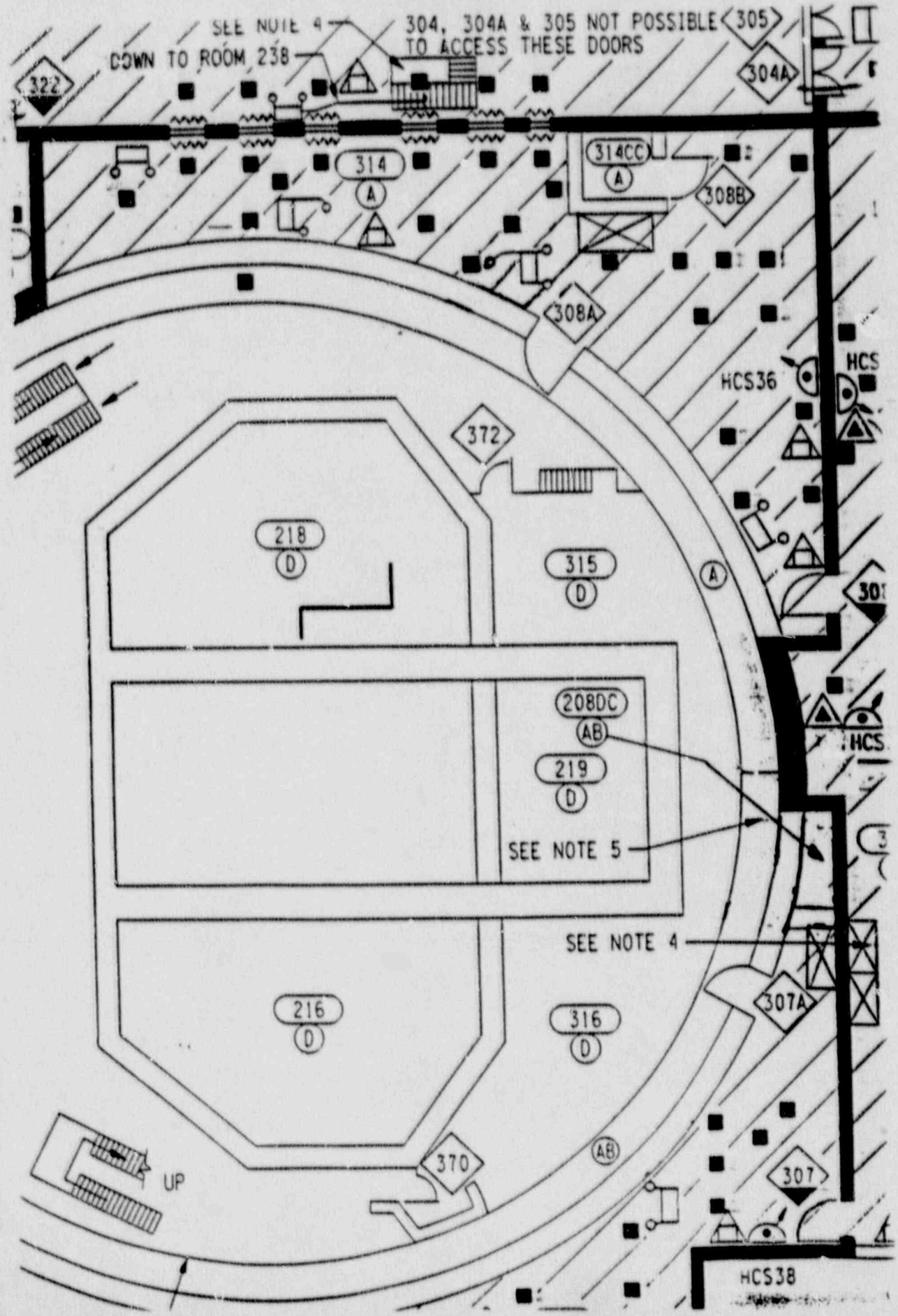

FIGURE 3

Fire Area A/AB Boundaries on Elev. 603