ENTERGY

Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72801
Tel 501 858-5000

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Subject: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
10CFR50 Appendix R Exemption Request
- Reactor Coolant Pump Lube Oil System

Gentlemen:

Entergy Operations requests an exemption from the requirements of Section III.O of 10CFR50 Appendix R to the extent that it requires oil collection systems for reactor coolant pumps (RCPs) to be capable of collecting lube oil from all potential unpressurized leakage sites, including oil fill lines.

Remote oil addition lines to the Arkansas Nuclear One, Unit 2 (ANO-2) RCP lube oil systems have been installed. These lines, which extend from outside the secondary shield ring wall (D-ring) in the containment building to the oil fill line connections on the RCPs, were installed to reduce dose and personnel hazards to workers who periodically add oil to the RCP lube oil systems during power operation. These remote oil addition lines were not designed for compliance with Section III.O of 10CFR50 Appendix R because they were not considered part of the RCP lube oil systems. However, based upon recent interpretations of the NRC Staff, Entergy Operations has concluded that an exemption request for the remote addition lines is appropriate. The attached information provides justification for a determination that the current configuration of the remote oil addition system meets the purpose of 10CFR50 Appendix R, i.e., the ability to achieve and maintain safe shutdown of the plant in the event of a single fire.

If you have any questions concerning this submittal, please contact me.

A006 1/1

Very truly yours,

Dwight C. Mims
Director, Nuclear Safety

DCM/jjd

attachment

cc: Mr. Leonard J. Callan
Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

NRC Senior Resident Inspector
Arkansas Nuclear One
P.O. Box 310
London, AR 72847

Mr. George Kalman
NRR Project Manager Region IV/ANO-1 & 2
U. S. Nuclear Regulatory Commission
NRR Mail Stop 13-H-3
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

REACTOR COOLANT PUMP REMOTE OIL ADDITION SYSTEM

Remote Oil Addition System Description

As a result of oil consumption during power operations, the need arises to periodically add oil to the reactor coolant pump (RCP) motor lube oil reservoirs. Prior to 1991, this was accomplished by transporting oil into the containment building cavities (inside the D-ring) and adding the oil using the oil fill connection on the motor. This resulted in both ALARA (an estimated 750-1000 mR per entry) and personnel safety concerns (e.g., heat stress and climbing ladders carrying containers of oil).

In an effort to minimize radiation exposure to maintenance personnel and resolve the personnel safety concerns, a temporary modification was initiated and installed on 2P32A reactor coolant pump. This modification installed a funnel at the 426' elevation outside the D-ring and routed a hose to the oil fill connection of the motor upper reservoir. Subsequent temporary modifications were added on 2P32B and 2P32D as the need arose. Oil addition efforts following the installation of these temporary modifications resulted in greatly reduced radiation dose (reduced to 50 - 75 mR per entry).

A permanent remote oil addition system was installed in April 1994. This modification installed a gravity feed system to both RCP motors in each D-ring. The system currently consists of a ten gallon capacity funnel with spill protection, a lubrication oil (LO) addition valve manifold and isolation ball valves (with an oil collection pan underneath), 3/4" stainless steel (SS) tubing, and a SS flexible connection to the RCP motor reservoir fill connections (see sketch on page 6).

From the outlet of the ball valves on the LO addition manifold, lines are routed into the D-ring through the feedwater pipe penetration and to their respective oil fill connection. All lines are seismically mounted to remove any II/I concerns. A 22" SS flexible hose is used between the routed tubing and the vendor supplied oil fill connection to minimize the effect of any translated vibration and thermal movement. Neither the 3/4" SS tubing nor the SS flexible hose are protected by an oil collection system. The connections to the motors are protected by installed oil collection system pans. The maximum oil level in the reservoirs is lower than the oil addition connection.

Tubing runs inside the D-ring are connected with compression fittings. Fittings of this type are highly reliable, especially when used in low pressure applications, and not typically subject to leakage. The minimum slope of the installed tubing is 1/4" per 12" run. This ensures the system drains following each use and remains a dry system. Following initial installation of the remote oil addition system, a system flush and a leak test were conducted to ensure the system functioned as designed.

Since the installation of the remote oil addition system, oil has been added to the RCP motor upper oil reservoirs on several occasions. During each oil addition, the appropriate increase in reservoir level has been observed on the plant monitoring system (PMS) computer. In each case, the resultant indicated change in level verified the oil reached the reservoir. This system has been demonstrated leak tight and it is not likely that significant leakage would develop.

No indication of smoke, from either odor or visual observation, has been noted during containment entries to add oil. Additionally, smoke detectors located in the vicinity of each RCP motor have not indicated the presence of smoke after remote oil addition evolutions.

Consequences of Remote Oil Addition System Leakage

The routing of the oil addition tubing, as described above, is from the inside containment wall on the 426′ elevation, under the grating, through the feedwater piping penetration, and through the cavities to the motors. The oil addition tubing is routed such that no leakage from the system could reach any fibrous blanket insulation located in the containment building. All insulation that leakage from the system could come into contact with is a SS reflective type. The expected maximum temperature on this type of insulation is less than 200°F under worst case design conditions and therefore, would not be an ignition source.

Should the system leak from the fittings around the valve manifold, the leakage would be retained in the drip tray located under the manifold. Personnel involved in the filling evolution would then remove the oil before it could become a fire hazard.

The ANO-2 Fire Hazards Analysis for the containment building considers the entire building as a single fire area. However, the containment building was divided into two zones for the purposes of evaluating the effects of fires (see attached drawings). The zones were divided on the basis of clear space without intervening combustibles and provision of fire stops where cables provide a pathway between zones. The north half of the containment building (Zone 2033-K) contains cabling and equipment associated with safe shutdown that is separated by over 30 feet from cabling and equipment in the south half of the containment building (Zone 2032-K). The effects of postulated oil loss outside the D-ring during oil addition evolutions were specifically evaluated for each zone.

Due to the separation of redundant components, the oil addition lines for the "C" and "D" pumps (fire zone 2033-K) pose no threat to the safe shutdown capability.

The oil addition lines for the "A" and "B" pumps are located in fire zone 2032-K. This zone contains redundant channels of instrumentation for safe shutdown. Therefore, the effects of a potential fire from a spill occurring during oil addition were analyzed (even though spill protection is provided at the funnel and manifold). The oil would tend to migrate to the containment floor where it would flow to the containment sump. Any oil

leaked inside the D-ring would flow to the equipment drains under the RCPs. The temperature of the equipment in the area is expected to remain significantly below the autoignition temperature (700°F for R&O 68 oil and 635°F for R&O 32 oil). A pre-action suppression system and ionization smoke detection with control room alarms protect the cable trays in the containment building cable spreading areas. Two ionization type smoke detectors are installed in each RCP area inside the D-ring. The detection system provides early warning of possible fire conditions and the suppression system is designed to control the spread of fire, if it did occur.

The redundant safe shutdown components found in the containment building consist of the reactor coolant system (RCS) high point vents, the low temperature overpressurization (LTOP) valves, the shutdown cooling suction valves, and the following instrumentation: steam generator (SG) level, SG pressure, pressurizer level and pressure, neutron flux monitoring, and RCS temperature.

- The SG level and pressure instruments and their associated cables are located on opposite sides of the reactor vessel and are of sufficient distance apart to preclude a RCP lube oil fire from affecting redundant channels of instrumentation. A similar condition is applicable to the RCS temperature instrumentation and the neutron flux monitors.

- In the unlikely event an oil spill did occur from an oil addition operation, it would be administratively limited to two (2) gallons. A fire resulting from a spill of two gallons of oil would have to travel 20 feet to reach the nearest safe shutdown component of interest (pressurizer pressure wide range transmitter). Due to the lack of oil addition system pressurization, the size of the containment building (over 10,500 sq ft), the limited size of the postulated fire (two gallons of oil), the radiant fire scenario (target only sees 40% of the heat generated), and the fact that there is not a direct line of sight from the source to the target, it is not credible that damage will occur to redundant channels of safe shutdown instrumentation outside the D-ring.

- At least two RCS high point vent valves would have to spuriously operate to create an uncontrolled vent path. Although this event is highly improbable, it can be mitigated by isolating letdown and then utilizing a charging pump which is capable of providing make-up in excess of the vent path losses.

- Inside the containment building, the control cabling for the LTOP valves cannot produce a spurious operation. The power cables are deenergized, with the breakers outside containment. Since the valves are normally closed (i.e., their safe shutdown position), a fire cannot cause the valves to fail in the open position.

- The shutdown cooling valves are not required to be opened until cold shutdown conditions. During normal operations, the breakers for these valves are locked open, thus preventing any spurious operations. These valves may be manually operated when required.

- Other safe shutdown components are backed up by their redundant component(s) located outside the containment building. The necessity of the pressurizer heaters was analyzed and determined not to be necessary for safe shutdown.

- RCS pressure boundary components consist of passive mechanical components such as heat exchangers, piping, tanks, manual valves, and check valves. These components are not fire sensitive and will not be damaged by credible plant fires based on the defense-in-depth fire protection philosophy at ANO.

Due to system design (slanting lines that do not retain oil) and the process for adding oil, the likelihood of an oil spill in excess of 2 gallons is very remote. Further, should a leak occur during filling, the amount of the spill would be much less than the contents from one RCP motor, which has been analyzed from a safe shutdown perspective and found to be acceptable. Therefore, in the unlikely event of a fire involving the maximum postulated lube oil leak from one RCP, the ability to achieve and maintain safe shutdown is assured. Additionally, fire suppression equipment is readily available for response to a fire.

Compensatory Measures

In order to minimize the potential for an oil fire due to a leak from the lines of the remote addition system that do not have an oil collection system, the following actions will be taken each time oil is added through this system:

- Initial oil addition will be limited to two gallons.
- The PMS will be utilized to verify that the two gallons has reached the reservoir of the correct RCP motor (the oil level can be determined to within 1/2 gallon).
- Only after confirmation that the initial quantity reached the appropriate reservoir, will any remaining oil be added.
- The total oil volume to be added will be limited to less than the amount calculated to result in an indicated reservoir level of 95%.
- The oil addition funnel will be verified empty prior to closing the LO manifold ball valve after oil has been added.
- Should any oil collect in the drip pan under the LO manifold, it will be removed prior to exiting the containment building.

If at any point during a remote addition operation, it is determined that added oil is not reaching the desired location, the activity will be terminated and a condition report initiated to assess the situation. Personnel responsible for adding oil to the system also inspect for evidence of smoke following the oil addition. If smoke is detected, a fire brigade will be dispatched to the area. Fire suppression equipment is readily available for use in responding to such an event.

Conclusions

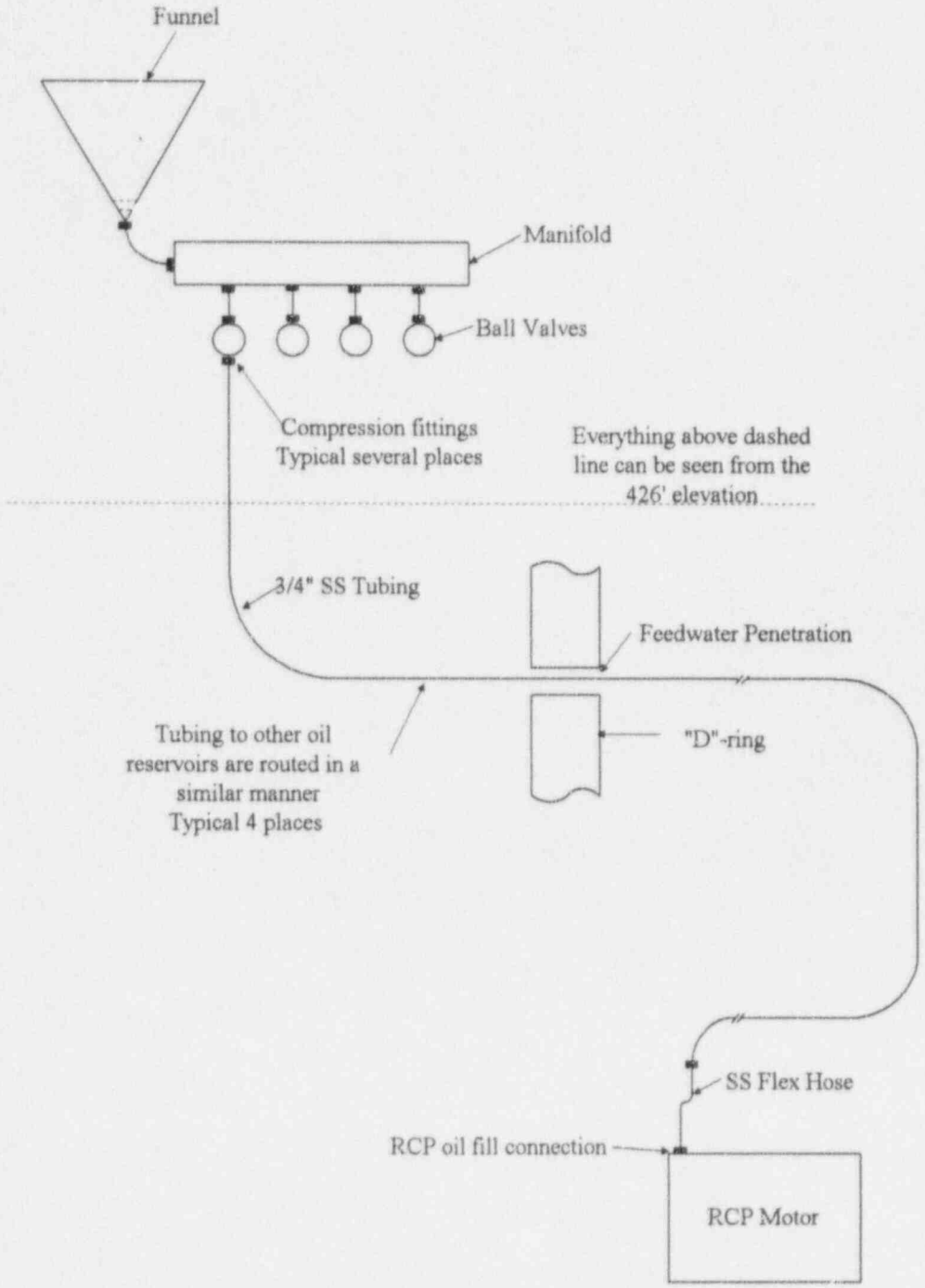
The remote oil addition system is infrequently used during power operation. The system is dry when not in use. When utilized, the unpressurized system is limited to two gallons of oil for initial addition. Only after the oil is verified to have reached the appropriate RCP lube oil reservoir (confirmation of leakage integrity of the system), may additional oil be added.

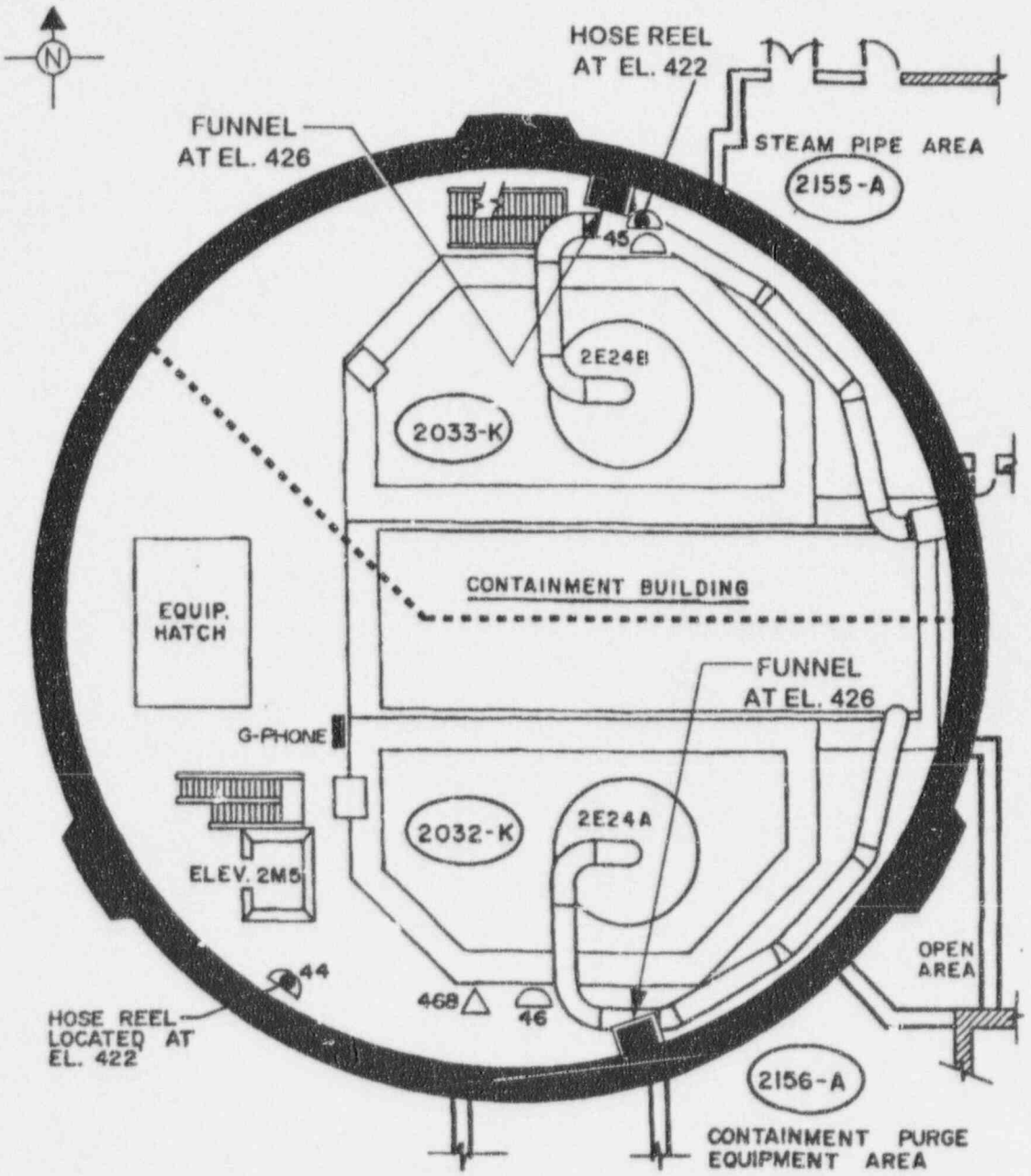
Oil that may leak from this system could fall onto metal reflective insulation protecting RCS piping. The maximum temperature of the surface of this insulation is well below the autoignition temperature of the oil. Therefore, no credible ignition source is present.

Should a fire occur, no redundant trains of safe shutdown equipment will be affected due to the limited amount of oil available (two gallons) and the configuration of safe shutdown equipment.

Based on the above, the intent of 10CFR50 Appendix R (the ability to achieve and maintain safe shutdown of the plant in the event of a single fire) is accomplished without having a full oil collection system on the RCP remote oil addition system.

Remote Oil Addition System





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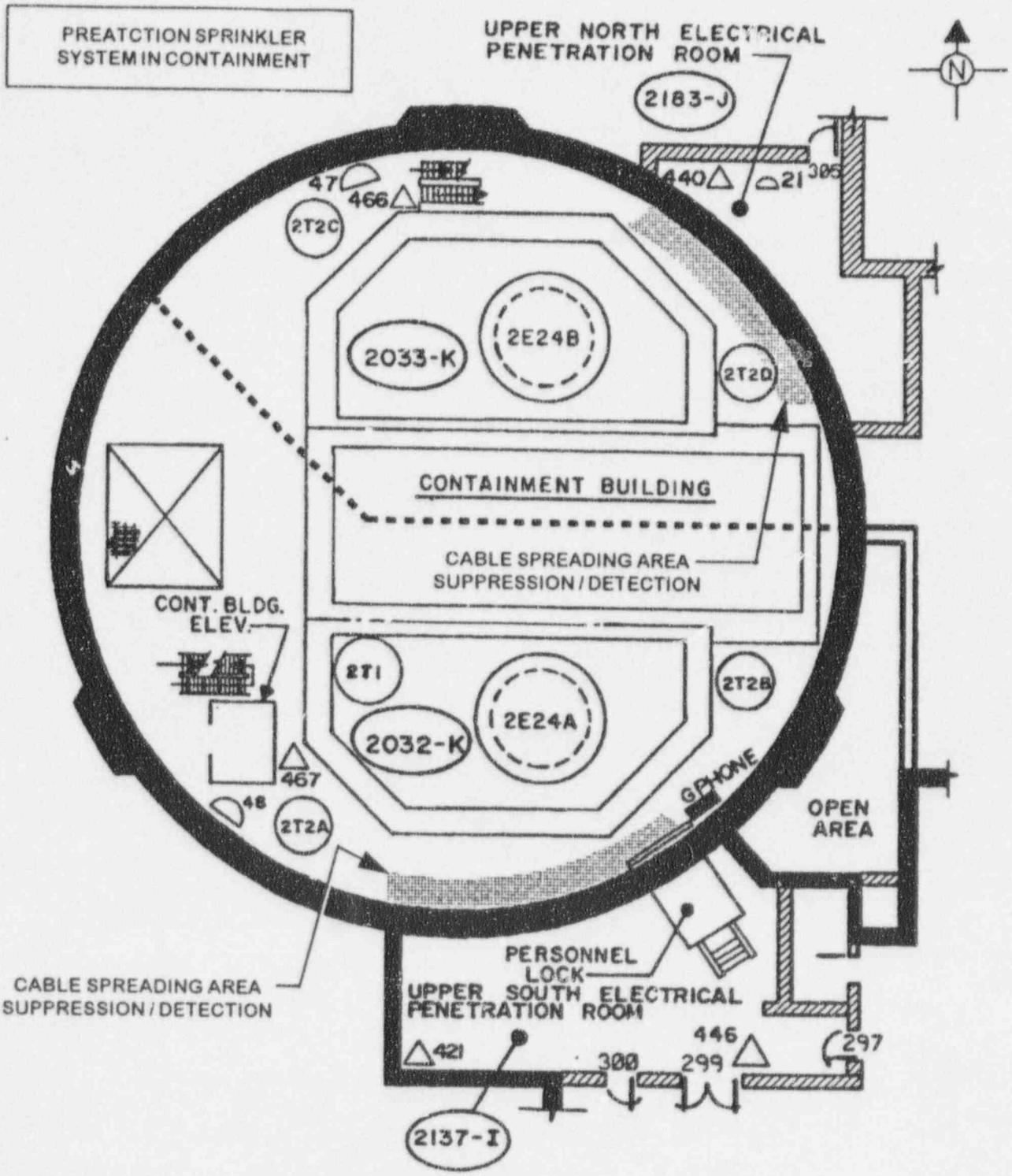

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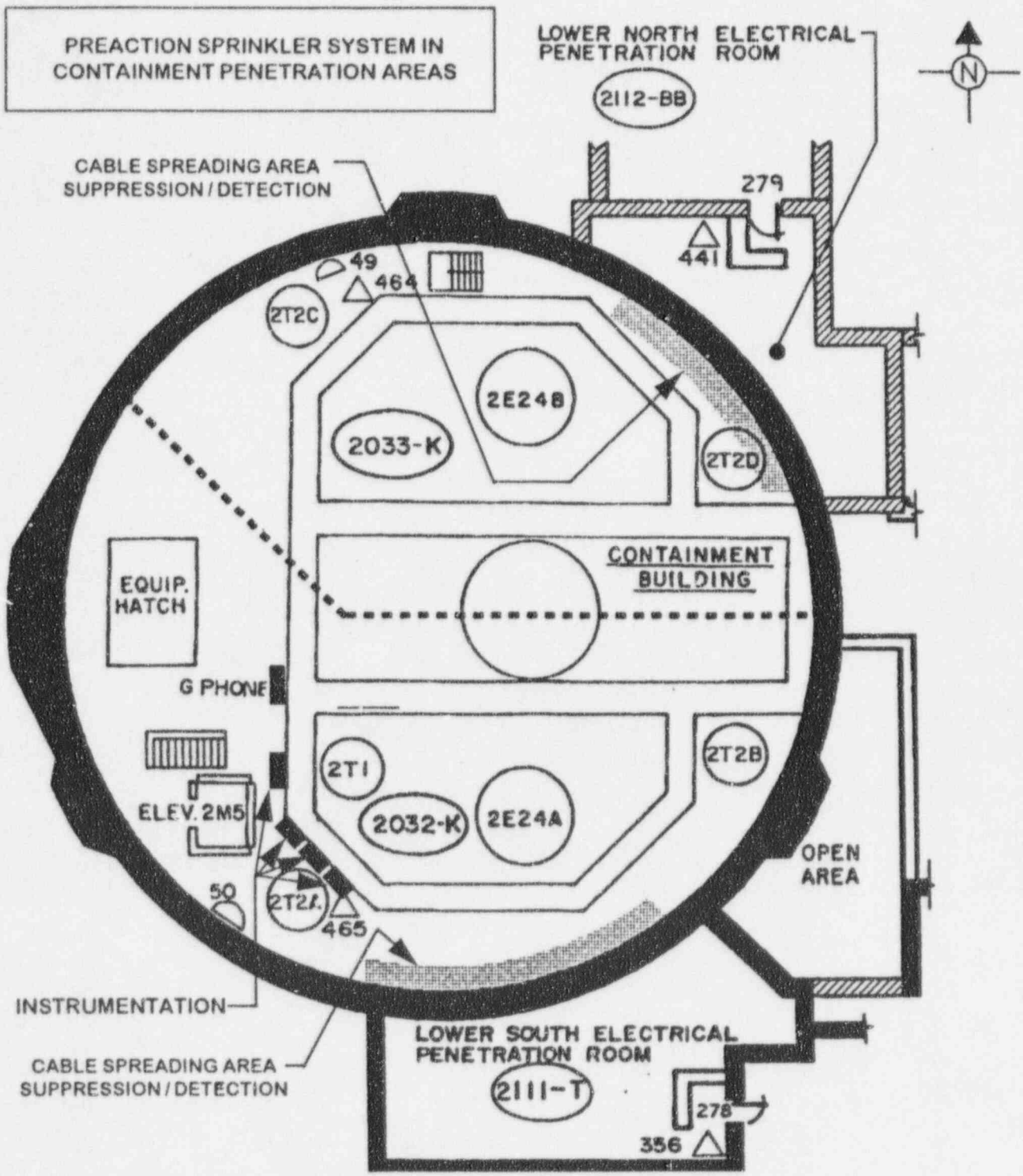

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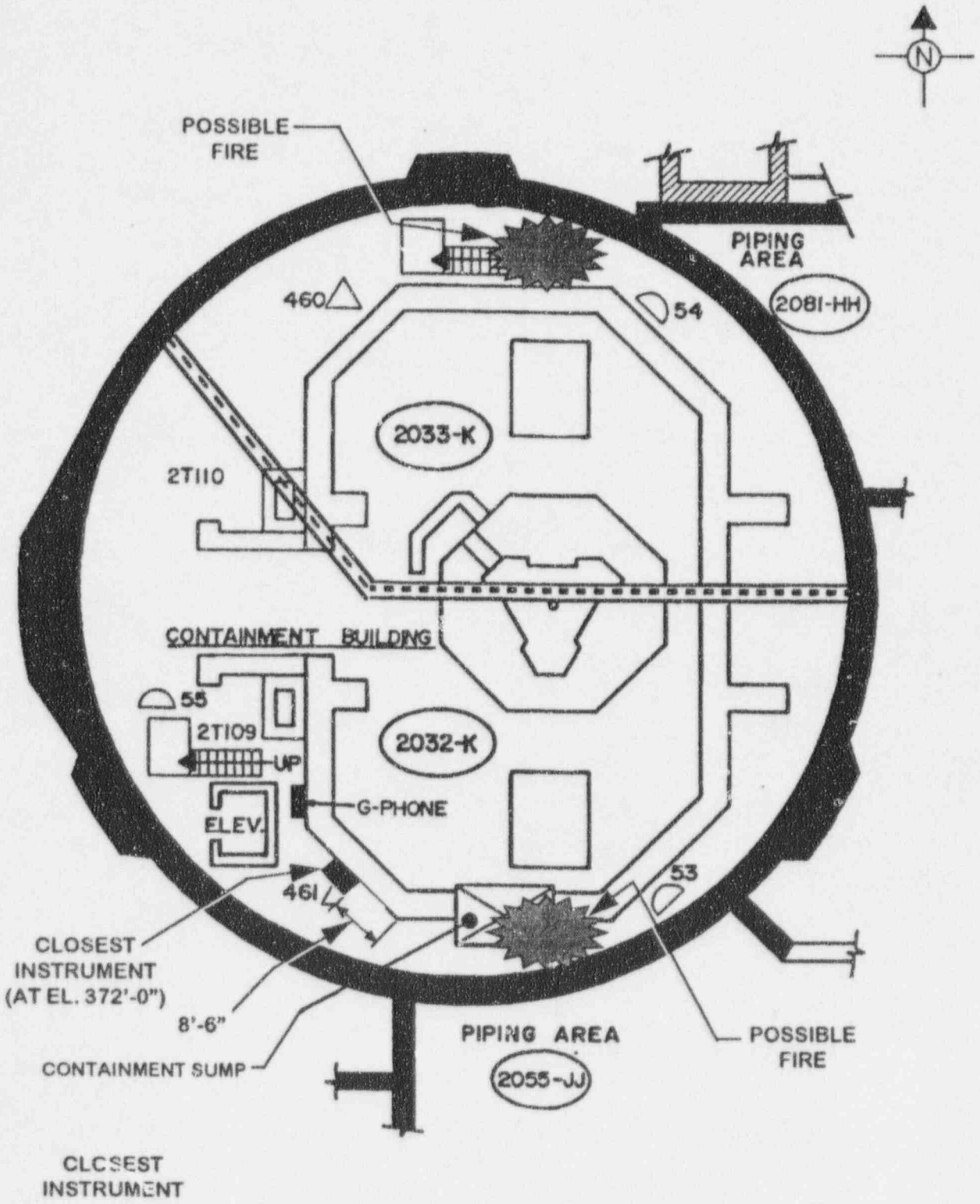

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