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U.S. Nuclear Regulatory Commission
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Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Request for License Amendment to Revise the Secondary Containment Design Basis to Credit the Fuel Building Railroad Airlock

In accordance with 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," Constellation Energy Generation, LLC (CEG) requests an amendment to Facility Operating License No. NPF-62 for Clinton Power Station (CPS), Unit 1. Specifically, CEG requests approval for a change to the Updated Safety Analysis Report (USAR) to support a revision of the Secondary Containment design basis to credit the Fuel Building Railroad Airlock.

This request is subdivided as follows.

- Attachment 1 provides a description and evaluation of the proposed change.
- Attachment 2 provides a markup of the affected USAR pages.

A pre-application meeting with the NRC was held on January 31, 2022, to provide a summary of the proposed license amendment request, ensure a common understanding of the proposed change and scope of the planned submittal, summarize supporting analyses and activities that have been performed, and to obtain NRC feedback prior to formal submittal. NRC feedback has been incorporated into Attachment 1.

The proposed change has been reviewed by the Plant Operations Review Committee in accordance with the requirements of the CEG Quality Assurance Program.

CEG requests approval of the proposed change by April 7, 2023. Once approved, the amendment will be implemented within 60 days. This implementation period will provide adequate time for the affected station documents to be revised using the appropriate change control mechanisms.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b), CEG is notifying the State of Illinois of this application for license amendment by transmitting a copy of this letter and its attachments to the designated State Official.

There are no regulatory commitments contained in this letter. Should you have any questions concerning this letter, please contact Mr. Kenneth M. Nicely at (630) 657-2803.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 7th day of April 2022.

Respectfully,

Patrick R. Simpson
Sr. Manager Licensing

Attachments:

1. Evaluation of Proposed Change
2. Markup of Proposed Updated Safety Analysis Report Pages

cc: NRC Regional Administrator, Region III
NRC Senior Resident Inspector – Clinton Power Station
Illinois Emergency Management Agency – Division of Nuclear Safety

ATTACHMENT 1
Evaluation of Proposed Change

1.0 SUMMARY DESCRIPTION

In accordance with 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," Constellation Energy Generation, LLC (CEG) requests an amendment to Facility Operating License No. NPF-62 for Clinton Power Station (CPS), Unit 1. Specifically, CEG requests approval for a change to the Updated Safety Analysis Report (USAR) to support a revision of the secondary containment design basis to credit the Fuel Building Railroad Airlock (FBRA).

2.0 DETAILED DESCRIPTION

The secondary containment design basis currently does not include the FBRA structure as part of the secondary containment boundary. Rather, the FBRA inner door (i.e., the door that serves as the interface between the Fuel Building and the FBRA) currently forms part of the secondary containment boundary. Each time the FBRA inner door is opened to move equipment in and out of the Fuel Building (i.e., when CPS Unit 1 is in Mode 1, 2, or 3), the secondary containment is declared inoperable, and Technical Specifications (TS) 3.6.4.1, "Secondary Containment," Condition A is entered. Required Action A.1 requires the secondary containment to be restored to operable status within four hours, which imposes a burden on plant operations, especially during Independent Spent Fuel Storage Installation (ISFSI) cask loading campaigns where large dry casks are moved into and out of the Fuel Building. Should movement of a spent fuel cask be stalled in the FBRA such that it prevents closure of the inner door within four hours, CPS Unit 1 would be required to commence an orderly shutdown.

To alleviate these concerns, the proposed change revises the definition of the secondary containment boundary at the FBRA to ensure that both secondary containment capability and tornado protection are maintained when required. This involves using the FBRA and outer door (i.e., the door that serves as the interface between the FBRA and the outside environment) as the secondary containment boundary when the inner door is open and no adverse weather conditions exist. NRC review and approval of this change is required because the FBRA does not meet all the requirements of the secondary containment. Specifically, CPS USAR Section 6.2.3.1 states "The secondary containment structures is of Seismic Category I design…" and USAR Table 3.2-1 states "All civil structures classified as Seismic Category I are designed for the effects of CPS natural phenomena such as tornado, wind loads, external missiles, floods, etc., except the containment gas control boundary (CGCB). The CGCB is a Seismic Category I structure capable of withstanding all of CPS natural phenomena except the tornado and external missiles." The FBRA is similar to the CGCB in that it meets the requirements for secondary containment except for being able to withstand tornado winds and missiles.

In addition, a manual action for specific, situational control of the inner door when it is open is used to ensure adequate tornado missile protection for structures, systems, and components (SSCs) located within the Fuel Building that are protected by the FBRA inner door. The specific, situational control of the inner door involves operation of the FBRA inner door in the event of a severe weather or radioactive release occurrence (i.e., from a design basis loss-of-coolant accident (LOCA)) by dedicated personnel to close the inner door. Collectively, these

activities justify secondary containment integrity under the required post-LOCA conditions and tornado protection for SSCs that are protected by the FBRA inner door.

A markup of the affected USAR pages is provided in Attachment 2.

3.0 TECHNICAL EVALUATION

3.1 Background

In March 2020, an evaluation was completed in accordance with 10 CFR 50.59, "Changes, tests and experiments," to support a revision to the definition of the secondary containment boundary at the FBRA to ensure that both secondary containment capability and tornado protection are maintained when required. Specifically, the change involved utilizing the FBRA and outer door as the secondary containment boundary when the inner door is open and no adverse weather conditions exist. This evaluation included specific, situational control of the FBRA inner door to ensure tornado protection when required.

The NRC reviewed the 10 CFR 50.59 evaluation discussed above as part of a baseline inspection that was completed on June 30, 2021. The results of the inspection are documented in Reference 1. The NRC issued a Green finding and Severity Level IV non-cited violation of 10 CFR 50.59(d)(1) for the failure to provide a written evaluation describing the basis for determining that the change to the secondary containment completed in March 2020 did not require a license amendment. Reference 1 stated, in part:

> Specifically, the licensee revised the definition for the secondary containment boundary to include the Fuel Building Railroad Airlock (FBRA) without ensuring that the building meets all the Seismic Category I requirements. This change involved utilizing the FBRA and outer door as the secondary containment boundary when the inner door is open and no adverse weather conditions exist. In the event of a severe weather or radioactive release occurrence, the licensee credited dedicated personnel to close the FBRA inner door. This operator action was necessary because the licensee determined that the FBRA meets all requirements of Seismic Category I structures and the secondary containment except for protection from tornadoes. However, no written evaluation was provided describing adequate basis for determining that this change would not result in more than a minimal increase in the likelihood of occurrence of a malfunction of an SSC important to safety…
>
> …The licensee relied on these operators' manual actions because the licensee determined that the FBRA meets all requirements of Seismic Category I structures and the secondary containment except for protection from tornado wind and tornado missile. However, there was no evaluation of the manual actions, which is a change in its own right as to whether the use of these actions was acceptable and [would] not result in more than a minimal increase in the likelihood of occurrence of a malfunction of an SSC important to safety.

In response to this violation, CEG has elected to request NRC approval of the proposed change via a license amendment.

3.2 System Description

The secondary containment is a structure that completely encloses the primary containment, except for the upper personnel hatch, and consists of the CGCB, the CGCB extension (i.e., siding within the Auxiliary Building), the Fuel Building, the emergency core cooling system (ECCS) Residual Heat Removal (RHR) heat exchanger rooms, the ECCS pump rooms, the Reactor Water Cleanup (RWCU) pump room, and the main steam pipe tunnel. The function of the secondary containment is to contain, dilute, and hold up fission products that may leak from primary containment following a design basis accident. In conjunction with operation of the Standby Gas Treatment (SGT) system and closure of certain valves whose lines penetrate the secondary containment, the secondary containment is designed to reduce the activity level of the fission products prior to release to the environment and to isolate and contain fission products that are released during certain operations that take place inside primary containment (e.g., during core alterations or during movement of irradiated fuel assemblies in the primary or secondary containment), when primary containment is not required to be operable, or that take place outside primary containment. The secondary containment boundary is described in CPS USAR Sections 6.2.3.1, 6.2.3.2, and 6.2.3.3. The general arrangement of the various structures that comprise the secondary containment are shown in USAR Figure 6.2-132, "Secondary Containment Boundary."

The only accident that credits the secondary containment is the design basis LOCA described in USAR Section 15.6.5. The fuel handling accident discussed in USAR Section 15.7.4 does not credit the secondary containment. The secondary containment, in conjunction with the operation of the SGT system is designed to limit the total effective dose equivalent (TEDE) within the guidelines of 10 CFR 50.67, "Accident source term," at the site boundary and low population zone. Also, the design limits the TEDE dose for the control room within the guidelines of 10 CFR 50, Appendix A, General Design Criterion (GDC) 19, "Control Room." Both the secondary containment and the SGT system are designed to permit periodic inspection and testing of principal systems and components such as fans, dampers, and filters.

The performance objective of the secondary containment is to provide a volume completely surrounding the primary containment which can capture fission products that might otherwise leak to the environment following a design basis accident. To achieve this, the Fuel Building and portions of the Auxiliary Building are constructed of reinforced concrete, which has an inherently low leak rate. In addition, a low-leakage metal-siding enclosure is provided for the remainder of the secondary containment boundary in the Auxiliary Building and the CGCB. Following the postulated design basis accident, the SGT system functions to achieve and maintain the secondary containment volume at or below a negative pressure of 0.25-inch water gauge. The exhaust air discharge required to maintain this negative pressure is routed through the SGT system equipment trains which are designed to remove 99 percent of the elemental iodine and organic iodides.

As discussed above, the CGCB forms part of the secondary containment boundary. The CGCB is a limited leakage structure which surrounds the containment structure above the Auxiliary and Fuel Buildings. The enclosure conforms to the shape of the containment and is separated from it by a distance of approximately four feet. The enclosure is made up of steel siding supported by structural steel framing attached to the containment. The CGCB is a fission product barrier

only, designed to be held under a negative pressure of 0.25-inch water gauge when design basis infiltration flow rates are being passed through the SGT system.

In addition to the secondary containment function to capture fission products following a design basis LOCA, portions of the secondary containment structure also provide protection for equipment within the Fuel Building and Auxiliary Building from the effects of tornado winds and missiles. Specifically, the secondary containment structure, including the CGCB, is of Seismic Category I design. All civil structures classified as Seismic Category I are designed for the effects of CPS natural phenomena such as tornado, wind loads, external missiles, floods, etc., with the exception of the CGCB. Seismic Category I structures are designed to withstand postulated external missiles, thereby protecting the systems and components located within. USAR Section 3.5.1.4 states that tornadoes are the only natural phenomenon occurring in the vicinity of CPS that can generate missiles, and USAR Section 3.5.1.5 states that based on a review of the nearby industrial, transportation, and military facilities, there are no potential missiles resulting from accidental explosions in the vicinity of the site. USAR Table 3.5-5 lists, in general terms, the protection systems and/or component and the barrier for its protection from tornado missiles.

As stated in USAR Table 3.2-1 Note (c), the CGCB is a Seismic Category I structure capable of withstanding all of CPS natural phenomena except the tornado and external missiles. Additional detail is provided in USAR Section 3.8.4.3, which states that the CGCB is not designed to withstand the effects of missiles. The CGCB siding is designed to fail for wind speeds of 200 miles per hour (mph), which is less than the design basis tornado, to reduce loads on the structure. However, the steel framing for the CGCB is designed to withstand the effects of tornado loading. The secondary containment, in conjunction with the SGT system, cannot perform the design function to maintain a negative pressure at or below 0.25-inch water gauge if the CGCB siding fails due to tornado winds and/or missiles. In addition, the Seismic Category I structures and structural components are designed for the vertical and horizontal accelerations associated with both the safe shutdown earthquake (SSE) and the operating basis earthquake (OBE).

The secondary containment design basis currently does not include the FBRA structure or the FBRA outer door (i.e., the door that serves as the interface between the FBRA and the outside environment) as part of the secondary containment boundary. Rather, the FBRA inner door (i.e., the door that serves as the interface between the Fuel Building and the FBRA) currently forms part of the secondary containment boundary. The FBRA is similar in design and construction to the CGCB. The FBRA is a limited leakage structure constructed of structural steel and steel siding that includes the inner door and outer door. The inner door is Seismic Category I and is designed to with withstand tornado winds and missiles. The FBRA and outer door are capable of maintaining, in conjunction with the SGT system, a negative pressure at or below 0.25-inch water gauge in the secondary containment. The FBRA and outer door are qualified for Seismic Category I loads except for tornado winds and missiles. Similar to the CGCB, the FBRA siding is designed to fail for wind speeds of 200 mph to reduce loads on the structure. The steel framing of the FBRA is designed to withstand the effects of tornado loading. Therefore, the FBRA design and construction is equivalent to the CGCB.

3.3 Evaluation of Proposed Change

The proposed change revises the secondary containment design basis to extend the secondary containment boundary to include the FBRA. CEG has performed evaluations to verify that the FBRA, including the outer door, meets the requirements for Seismic Category I structures and the secondary containment, except for protection from tornado winds and missiles. The following activities were performed.

1. Assessed the FBRA against the CPS design and licensing basis requirements for secondary containment. Based on the results of the assessment, including physical inspections of the FBRA structure, necessary analyses and physical modifications were done to ensure the FBRA meets the design and licensing requirements of the secondary containment.

2. Revised design basis analyses to evaluate the addition of the FBRA volume and ISFSI cask heat load has on the secondary containment temperature and pressure profile, on the ability of the SGT system to meet secondary containment requirements, and on the environmental qualification for equipment within the secondary containment and on post-accident dose. NRC approval was granted in Reference 2.

3. Evaluated the FBRA structural steel, siding, and roofing for required loads to meet Seismic Category I requirements, including normal wind loads and SSE. The structural steel is evaluated for tornado loads while the siding and roofing are evaluated to blow off in a tornado.

4. Inspected the FBRA for verification that the as-installed siding and roof panels meet the requirements of applicable design specifications and design drawings. Deviations were either repaired or evaluated.

5. Performed material testing to verify the FBRA siding meets secondary containment material requirements.

6. Performed SGT system drawdown testing to ensure the functional capability of the secondary containment was maintained with the inner door open and outer door closed.

7. Identified that the FBRA inner and outer doors are electrically interlocked, which meets the requirements of USAR Section 6.2.3.2 for secondary containment access openings.

CEG's evaluations concluded that the FBRA, including the outer door, meets the requirements for Seismic Category I structures and the secondary containment, with the exception of tornado wind and missile loads. Therefore, CEG is only requesting approval of the proposed change with respect to tornado wind and missile loads, since the other activities discussed above either do not require prior NRC approval in accordance with 10 CFR 50.59, or NRC approval has already been received.

Periodic Drawdown Testing

TS 3.6.4.1, "Secondary Containment," requires the secondary containment to be operable in Modes 1, 2, and 3, as well as during movement of recently irradiated fuel in the primary or secondary containment. For CPS, recently irradiated fuel is defined as fuel that has occupied part of a critical reactor core within the previous 24 hours. Periodic drawdown testing of secondary containment is performed in accordance with Surveillance Requirement (SR) 3.6.4.1.4 and SR 3.6.4.1.5. Specifically, SR 3.6.4.1.4 requires verification that the secondary containment can be drawn down to greater than or equal to 0.25 inch of vacuum water gauge within the time required using one SGT subsystem. The TS Bases state that the required drawdown time is 19 minutes (i.e., 17 minutes from start of gap release which occurs two minutes after LOCA initiation). In addition, SR 3.6.4.1.5 requires verification that the secondary containment can be maintained greater than or equal to 0.25 inch of vacuum water gauge for one hour using one SGT subsystem at a flow rate of less than or equal to 4400 cubic feet per minute (cfm). Since the drawdown time is dependent upon secondary containment integrity, the drawdown requirement cannot be met if the secondary containment boundary is not intact.

No changes to SRs 3.6.4.1.4 and 3.6.4.1.5 are being made as part of the proposed change to revise the secondary containment design basis to credit the FBRA. As discussed above, CEG has performed initial SGT system drawdown testing to ensure the functional capability of the secondary containment was maintained with the FBRA inner door open and outer door closed. Future periodic surveillance testing of this configuration is required by SRs 3.6.4.1.4 and 3.6.4.1.5. In the event that a successful drawdown test cannot be achieved with the inner door open and outer door closed, the secondary containment could not be considered operable with the inner door open. However, secondary containment would remain operable with the inner door closed as long as the drawdown test in that configuration meets surveillance acceptance criteria.

In Reference 2, the NRC issued Amendment No. 210 to Facility Operating License No. NPF-62 for CPS. The amendment revised the post LOCA drawdown time for secondary containment from 12 to 19 minutes. During a pre-application meeting with the NRC on January 31, 2022, the NRC questioned the impact of the proposed change to credit the FBRA on Amendment No. 210. It was explained during the meeting that the analyses supporting the increased drawdown time of 19 minutes accounted for the increased secondary containment volume associated with expansion of the secondary containment boundary to include the FBRA. Therefore, no additional changes to the secondary containment drawdown time are required as part of the proposed change.

Manual Action for FBRA Inner Door

As discussed above, the proposed change involves using the FBRA and outer door (i.e., the door that serves as the interface between the FBRA and the outside environment) as the secondary containment boundary when the inner door is open and no adverse weather conditions exist. In addition, specific, situational control of the inner door is incorporated as part of this change to ensure adequate tornado missile protection for SSCs located within the Fuel Building that are protected by the FBRA inner door. The specific, situational control of the inner door involves operation of the FBRA inner door in the event of a severe weather or radioactive

release occurrence from a LOCA by dedicated personnel to close the inner door. This manual action is necessary because the FBRA meets the requirements of Seismic Category I structures and the secondary containment except for protection from tornado winds and missiles, and therefore is not credited for providing protection to SSCs located within the Fuel Building when the FBRA inner door is open.

USAR Section 3.5.2.4 provides the criteria for SSCs requiring tornado protection and gives NRC Regulatory Guide (RG) 1.117, "Tornado Design Classification," (i.e., Reference 3) as the basis. USAR Table 3.5-5 describes the SSCs that are protected against externally generated missiles. Per USAR Section 3.5.2.4 and RG 1.117, there are three types of SSCs that require tornado protection:

1. Those necessary to ensure the integrity of the reactor coolant pressure boundary;

2. Those necessary to ensure the capability to shut down the reactor and maintain it in a safe shutdown condition (i.e., this includes both hot standby and cold shutdown capability); and

3. Those whose failure could lead to radioactive release resulting in calculated offsite exposures greater than 25% of the guideline exposures of 10 CFR 100, "Reactor Site Criteria," using appropriately conservative analytical methods and assumptions. (Note: CPS uses the alternative source term methodology with criteria of 10 CFR 50.67 in lieu of 10 CFR 100 per USAR Chapter 15.)

The secondary containment and FBRA do not perform any function related to criteria 1 and 2 above, and criterion 3 only applies in the post-LOCA long-term cooling phase.

As discussed in RG 1.117, Revision 1, it is not necessary to maintain the functional capability of all Seismic Category I structures, systems, and components because the probability of the joint occurrence of low-probability events (e.g., LOCA with design basis tornado or smaller tornado) is sufficiently small. However, equipment used to provide long-term core cooling following a LOCA should be protected.

RG 1.117, Revision 2 (i.e., Reference 4) includes an additional discussion for why equipment used to provide long-term core cooling should be protected. Specifically, Reference 4 states (emphasis added):

> However, applicants and licensees should consider subsequently-occurring low probability events (e.g., loss-of-coolant accident followed by a design bases tornado).

The secondary containment is only credited for the design basis LOCA. The fuel handling accident does not credit the secondary containment. Since it is not required to postulate the joint occurrence of a design basis tornado or smaller tornado concurrent with the LOCA, the functional capability of secondary containment is not required for this combination of events. However, it is required to postulate a tornado in the long-term cooling phase following the LOCA (i.e., maintain the reactor in a safe shutdown condition with cold shutdown capability).

As such, the design of the secondary containment remains consistent with the regulatory requirements associated with the postulated occurrence of tornados. The design function of the secondary containment is to capture leakage from the primary containment during a LOCA to mitigate the dose consequences. While the combination of a simultaneous initiation of a LOCA and a tornado is considered not credible (i.e., based on Reference 3), the occurrence of a tornado is considered credible during the post-LOCA long term cooling phase, and therefore equipment used to provide long-term core cooling following a LOCA should be protected. As stated above, the CGCB siding is designed to fail due to tornado winds and missiles. Therefore, the secondary containment will not perform its design function due to a tornado in the post-LOCA long term cooling phase in its current design. Since the FBRA is designed and constructed to the same criteria as the CGCB, it can also fail due to tornado winds and/or missiles. Therefore, there is no change to the consequences of a LOCA followed by a tornado by including the FBRA in the secondary containment boundary. The secondary containment does not perform a function related to long-term core cooling. Therefore, by the descriptions in RG 1.117, the consequences of a failure of the secondary containment due to a tornado following a design basis LOCA are considered acceptable.

The proposed change incorporates manual actions when the FBRA inner door is open to ensure adequate tornado protection of equipment inside the Fuel Building. The manual actions do not support the secondary containment performance objective to capture fission products that might otherwise leak to the environment following a design basis accident because the FBRA structure and FBRA outer door support this function regardless of the position of the FBRA inner door. The manual actions include:

1. Prior to opening the FBRA inner door, verify none of the following are in effect or are projected to be in effect for the period the FBRA inner door will be open:

    a. Tornado watch or warning by the National Weather Service.

    b. Severe thunderstorm watch or warning by the National Weather Service.

    c. High winds warning based on CPS Meteorological (Met) tower data. Current station procedure define this as winds $\geq$ 40 mph (at 10 meters) for greater than one hour, or any winds $\geq$ 58 mph (at 10 meters).

    d. Indication of a LOCA or the possibility of a radioactive release from a LOCA occurring.

2. Verify FBRA area temperature and humidity allow for the ability to close the FBRA inner door without personnel heat stress concerns.

3. Once the FBRA inner door is open, monitor and assess the conditions described in item (1) above. Upon notification of any of the above conditions, dedicated personnel will immediately close the FBRA inner door and close the latching mechanism.

CEG plans to include the above actions in applicable site procedures and training programs upon implementation of the proposed change. The personnel implementing the manual actions to close the FBRA inner door are dedicated, having no other tasks to perform while the FBRA

inner door is open. This minimizes the time required to complete the actions. The requirements to verify no severe weather prior to opening the FBRA inner door ensures there is adequate time to complete the actions to close the door before the FBRA is challenged by severe weather.

The combination of a LOCA or other design basis event occurring with the FBRA inner door open is considered an extremely low probability event due to the short amount of time the door is open. However, since the LOCA is postulated to occur at any time per the CPS USAR Chapter 15, this combination is considered in the performance of manual actions. With the FBRA inner door open, the radioactive release from the LOCA will still be contained by the FBRA and outer door. The inner door is required to be closed to preclude failure of the FBRA from affecting equipment inside secondary containment that is needed for long-term core cooling if a tornado were to occur in the long-term cooling phase following a LOCA per Reference 3. Therefore, the manual actions to close the FBRA inner door are required on indication of a LOCA or potential for radioactive release from a LOCA. Reference 3 does not specify a time in which the tornado will occur following a LOCA, but requires that the ability to provide long-term core cooling be protected. The actions to close the FBRA inner door following a LOCA are considered to be of a short duration that they can be performed prior to the long-term cooling phase when the tornado is postulated to occur.

The Fuel Building is a harsh environmental zone following a LOCA due to dose rates as discussed in USAR Section 3.11. A mission dose analysis has been performed to determine dose rates and occupancy time for the operator action to close the FBRA inner door. The analysis shows an occupancy time of 12.9 minutes before reaching dose limits without respiratory protection, 21 minutes with the use of a powered air-purifying respirator (PAPR), or 26.5 minutes with the use of a self-contained breathing apparatus (SCBA). This is an adequate amount of time to close the FBRA inner door as discussed below.

Prior to opening the FBRA inner door, the temperature and humidity in the FBRA area will be verified to allow for closing the FBRA inner door. This will ensure there are no personnel heat stress concerns that would increase the possibility of a failure to promptly close the inner door. If a LOCA were to occur with the FBRA door open, temperatures in the Fuel Building will slightly increase in the early stages of a LOCA. The temperature in the Fuel Building does not significantly increase until about 5×10^4 seconds (i.e., over 13 hours) into the event. The temperature increase up to this time is less than 5 °F, which due to the slow increase is considered insignificant for heat stress concerns for this event.

There is nearby emergency egress lighting that is provided from emergency d-c powered lighting panels and turn on during a failure of the regular lighting system. These personnel will also have portable lighting to use in the event of a lighting failure.

Restoring the FBRA inner boundary involves shutting the FBRA inner door, closing the FBRA inner door latching system, and closing one of the personnel doors. The requirements to verify no severe weather prior to opening the FBRA inner door ensures there is adequate time to complete the actions to close the door before the FBRA is challenged by severe weather. As discussed above, if a LOCA occurs with the FBRA inner doors open, the actions to close the FBRA inner door following a LOCA are considered to be of a short duration that they can be

performed prior to the long-term cooling phase when the tornado is postulated to occur per Reference 3. Credible errors in the performance of manual actions include:

- The FBRA inner doors are swing-type on hinges for ease of movement. The latching system involves turning a handwheel that is labeled for opening and closing. The personnel doors are also easily closed and automatically latch. Errors related to shutting the FBRA inner doors and operating the latching system are recoverable prior to the potential for severe weather impacting the FBRA.

Closing the FBRA inner door will ensure equipment inside secondary containment is protected prior to severe weather conditions potentially causing loss of the FBRA.

CEG has also considered the consequence of not performing the manual action when required. For example, it could be postulated that the FBRA inner door cannot be closed due to an obstruction, such as a stalled dry cask transporter. Since the FBRA and outer door are capable of performing their post-LOCA dose mitigation function, regardless of the position of the inner door, the inability to close the inner door in and of itself would not render secondary containment inoperable. Rather, the inability to close the inner door would impact its ability to perform its tornado missile protection function only. Therefore, secondary containment would remain operable. Impacts to the equipment inside the Fuel Building due to lack of tornado protection would be assessed through the Barrier Impairment Program and the Corrective Action Program. If it is determined that the inner door is unable to perform its tornado protection support function (i.e., with a tornado watch or warning, severe thunderstorm watch or warning, high winds warning, or indication of a LOCA in effect) for supported system limiting conditions for operation, the applicable TS Conditions would be entered for the supported systems and the associated Required Actions and Completion Times would apply.

<u>Conclusion</u>

The proposed change revises the definition of the secondary containment boundary at the FBRA to ensure that both secondary containment capability and tornado protection are maintained when required. Specifically, this involves using the FBRA and outer door as the secondary containment boundary when the inner door is open and no adverse weather conditions exist. In addition, manual action performed by dedicated personnel is used to provide specific, situational control of the inner door to ensure adequate tornado missile protection for SSCs located within the Fuel Building that are protected by the FBRA inner door. This manual action is necessary because the FBRA meets the requirements of Seismic Category I structures and the secondary containment except for protection from tornado wind and missiles. Collectively, these activities justify secondary containment integrity under the required post-LOCA (i.e., the only accident that credits secondary containment) conditions. In addition, the change is justified since the FBRA and outer door meet the same design requirements as the CGCB (i.e., the limited leakage structure that surrounds the primary containment, which is designed to fail under high wind conditions).

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

10 CFR 50, Appendix A, "General Design Criteria for Nuclear Power Plants," Criterion 2, "Design Bases for Protection Against Natural Phenomena," requires, in part, that structures, systems, and components important to safety be designed to withstand the effects of natural phenomena such as tornadoes without loss of capability to perform their safety functions. Criterion 2 also requires that the design bases for these structures, systems, and components reflect: (1) appropriate combinations of the effects of normal and accident conditions with the effects of natural phenomena, and (2) the importance of the safety functions to be performed.

Section 1.8 of the CPS USAR indicates conformance of the CPS design with NRC Regulatory Guides. With respect to NRC RG 1.117, USAR Section 1.8 states that the CPS project complies with RG 1.117, Revision 1, with certain clarifications. RG 1.117, Revision 1, "Tornado Design Classification," provides an acceptable method for identifying those SSCs of light-water-cooled reactors that should be protected from the effects of the design basis tornado, including tornado missiles, and remain functional. In addition, RG 1.117 discusses GDC 2 with respect to tornados and tornado missiles. RG 1.117, Revision 1, states that it is not necessary to maintain the functional capability of all Seismic Category I structures, systems, and components because the probability of the joint occurrence of low-probability events (e.g., LOCA with design basis tornado or smaller tornado) is sufficiently small. However, equipment used to provide long-term core cooling following a LOCA should be protected. The proposed change maintains compliance with GDC 2 by ensuring tornado protection when required.

10 CFR 50.67, "Accident source term," allows certain licensees to voluntarily revise the accident source term used in design basis radiological consequence analyses. The alternative source term methodology described in 10 CFR 50.67 has been adopted at CPS using the methodology of RG 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors." The secondary containment, in conjunction with the operation of the SGT system, is designed to limit the TEDE within the guidelines of 10 CFR 50.67 at the site boundary and low population zone. The proposed change does not impact the radiological consequence analyses previously performed for CPS, and the requirements of 10 CFR 50.67 continue to be met.

Based on the review of the above requirements, CEG has determined that the proposed change does not require any exemptions or relief from regulatory requirements and does not affect conformance with GDC 2 or 10 CFR 50.67. In addition, compliance with applicable regulatory guidance is maintained.

4.2 No Significant Hazards Consideration

In accordance with 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," Constellation Energy Generation, LLC (CEG) requests an amendment to Facility Operating License No. NPF-62 for Clinton Power Station (CPS), Unit 1. The proposed change revises the secondary containment design basis to credit the Fuel Building Railroad Airlock (FBRA). Specifically, the proposed change revises the definition of the secondary

containment boundary at the FBRA to ensure that both secondary containment capability and tornado protection are maintained when required. This involves using the FBRA and outer door (i.e., the door that serves as the interface between the FBRA and the outside environment) as the secondary containment boundary when the inner door is open and no adverse weather conditions exist. In addition, specific, situational control of the inner door is incorporated as part of this change to ensure adequate tornado missile protection for structures, systems, and components located within the Fuel Building that are protected by the FBRA inner door. The specific, situational control of the inner door involves manual actions associated with operation of the FBRA inner door in the event of a severe weather or radioactive release occurrence (i.e., from a design basis loss-of-coolant accident (LOCA)) by dedicated personnel to close the inner door. This manual action is necessary because the FBRA meets the requirements of Seismic Category I structures and the secondary containment except for protection from tornado wind and missiles.

According to 10 CFR 50.92, "Issuance of amendment," paragraph (c), a proposed amendment to an operating license involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not:

(1) Involve a significant increase in the probability or consequences of any accident previously evaluated; or

(2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or

(3) Involve a significant reduction in a margin of safety.

CEG has evaluated the proposed change, using the criteria in 10 CFR 50.92, and has determined that the proposed change does not involve a significant hazards consideration. The following information is provided to support a finding of no significant hazards consideration.

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No

   The proposed change revises the secondary containment design basis to credit the FBRA. Specifically, the proposed change revises the definition of the secondary containment boundary at the FBRA to ensure that both secondary containment capability and tornado protection are maintained when required. This involves using the FBRA and outer door as the secondary containment boundary when the inner door is open and no adverse weather conditions exist. In addition, specific, situational control of the inner door is included as part of the proposed change. Neither the FBRA nor any equipment inside the FBRA are required to achieve and maintain safe shutdown during or following a design basis tornado event.

   The proposed change does not adversely affect accident initiators or precursors, and does not alter the design assumptions, conditions, or configuration of the plant or the manner in which the plant is operated and maintained. No new failure modes are

introduced. The only accident that credits the secondary containment is the design basis LOCA described in USAR Section 15.6.5. The fuel handling accident discussed in USAR Section 15.7.4 does not credit the secondary containment. The structures that form the secondary containment and the FBRA are passive components. These structures do not initiate any pipe breaks analyzed for the LOCA and do not initiate any other accident. The proposed change does not affect the frequency of occurrence of external events such as the design basis tornado or the safe shutdown earthquake.

The consequences of accidents previously evaluated are not affected because the proposed change does not alter the leakage acceptance criteria of the secondary containment nor the ability of the Standby Gas Treatment (SGT) system to achieve and maintain the required negative pressure following a design basis LOCA. This ensures the secondary containment, including the FBRA, will perform its design function to mitigate offsite release following a postulated LOCA. In addition, the manual action to close the inner door ensures that the capability to protect equipment inside the Fuel Building during the long-term cooling phase following a postulated design basis LOCA is preserved. Therefore, there is no change in the consequences of an accident previously evaluated.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

The proposed change does not alter the design function or operation of secondary containment (i.e., including the FBRA) or the SGT system, or the ability of each to perform its design function. The structures that form the secondary containment, including the FBRA, are passive components. These structures do not initiate any pipe breaks analyzed for the LOCA and do not initiate any other accident. No changes are made that affect failure modes of the secondary containment. Impacts to the SGT system have been evaluated, and the SGT system can perform its required design functions with the additional volume and leakage of the FBRA. No changes have been made to the SGT system that would introduce new failure modes or create a new type of accident.

The proposed change does not alter the safety limits, or safety analysis associated with the operation of the plant. Accordingly, the change does not introduce any new accident initiators. The proposed change does not introduce any new modes of plant operation. As a result, no new failure modes are introduced.

Manual actions to close the inner FBRA door do not introduce a new type of accident. Any failure mechanism or operator error that prevents closing of the FBRA inner door are the same as the current configuration and also apply to the other secondary containment access doors.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No

The proposed change revises the secondary containment design basis to credit the FBRA. The proposed change does not alter the design assumptions, conditions, or configuration of the plant or the manner in which the plant is operated and maintained. The only accident that credits the secondary containment is the design basis LOCA described in USAR Section 15.6.5. The fuel handling accident discussed in USAR Section 15.7.4 does not credit the secondary containment.

The structures that form the secondary containment and the FBRA are passive components. The function of the secondary containment is to contain, dilute, and hold up fission products that may leak from primary containment following a design basis accident. In conjunction with operation of the SGT system and closure of certain valves whose lines penetrate the secondary containment, the secondary containment is designed to reduce the activity level of the fission products prior to release to the environment. The proposed change does not alter the secondary containment leakage acceptance criteria and does not impact the ability of the SGT system to perform its design function. The proposed change does not affect the inputs or assumptions of any of the analyses that demonstrate the integrity of the fuel cladding, reactor coolant system, or containment during accident conditions. There is no impact to the dose consequences of the design basis LOCA. In addition, the manual action to close the inner door ensures that the capability to protect equipment inside the Fuel Building during the long-term cooling phase following a postulated design basis LOCA is preserved.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above evaluation, CEG concludes that the proposed change presents no significant hazards consideration under the standards set forth in 10 CFR 50.92, paragraph (c), and accordingly, a finding of no significant hazards consideration is justified.

4.3 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or the health and safety of the public.

5.0 ENVIRONMENTAL CONSIDERATION

CEG has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, "Standards for Protection Against Radiation." However, the proposed amendment does not involve: (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22, "Criterion for categorical exclusion; identification of licensing and regulatory actions eligible for categorical exclusion or otherwise not requiring environmental review," paragraph (c)(9). Therefore, pursuant to 10 CFR 51.22, paragraph (b), no environmental impact statement or environmental assessment needs to be prepared in connection with the proposed amendment.

6.0 REFERENCES

1. Letter from R. A. Skokowski (U.S. NRC) to D. Rhoades (Exelon Generation Company, LLC), "Clinton Power Station – Triennial Inspection of Evaluation of Changes, Tests and Experiments Baseline Inspection Report 05000461/2021011," dated August 20, 2021

2. Letter from E. A. Brown (U.S. NRC) to B. C. Hanson (Exelon Generation Company, LLC), "Clinton Power Station, Unit No. 1 – Issuance of Amendment Concerning Incorporation of Revised Alternative Source Term (CAC No. MF7336) (RS-16-019)," dated August 17, 2016

3. NRC Regulatory Guide 1.117, "Tornado Design Classification," Revision 1, dated April 1978

4. NRC Regulatory Guide 1.117, "Protection Against Extreme Wind Events and Missiles for Nuclear Power Plants," Revision 2, dated July 2016

ATTACHMENT 2
Markup of Proposed Updated Safety Analysis Report Pages

Clinton Power Station, Unit 1

Facility Operating License No. NPF-62

REVISED USAR PAGES

3.2-25
3.2-32
3.5-11
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3.8-31
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6.2-51
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Figure 6.2-132 (Sheet 2 of 6)
Figure 6.2-132 (Sheet 5 of 6)
Figure 6.2-132 (Sheet 6 of 6)
Figure 6.4-3

TABLE 3.2-1
CLASSIFICATION OF SYSTEMS, COMPONENTS AND STRUCTURES (CONTINUED)

PRINCIPAL COMPONENTS(s)	SAFETY CLASS(b)	SEISMIC CATEGORY(c)	QUALITY GROUP CLASSI-FICATION(d)	QUALITY ASSURANCE REQUIRE-MENTS(e)	COMMENTS	LOCATION(s)	ELECTRICAL CLASSIFICATION(t)
XXXIV. Miscellaneous Components							
1. Containment Polar Crane	3	I	N/A	B		C	non-1E
2. Fuel Building Crane	3	I	N/A	B		F	non-1E
3. Turbine Building Cranes	Other	N/A	N/A	N/A		T	non-1E
4. Fuel pool gates	Other	I	N/A	B	(tt)	C,F	Non-1E
XXXV. Civil Structures (Section 3.8)							
5. Fuel Building Railroad Airlock	N/A	I	N/A	B	(c)		N/A
1. Containment	N/A	I	N/A	B			N/A
2. CGCB structure	N/A	I	N/A	B	(c)		N/A
3. Auxiliary building	N/A	I	N/A	B			N/A
4. Fuel building	N/A	I	N/A	B			N/A
6. Control building	N/A	I	N/A	B			N/A
7. Diesel generator and HVAC building	N/A	I	N/A	B			N/A
8. Radwaste substructure	N/A	I	N/A	B			N/A
9. Circulating water screen house	N/A	I	N/A	B			N/A
10. Turbine building	N/A	N/A	N/A	N/A			N/A
11. Service building	N/A	N/A	N/A	N/A			N/A
12. Ultimate heat sink	N/A	I	N/A	B			N/A
13. Radwaste building, above grade	N/A	N/A	N/A	N/A			N/A
14. RPV Pedestal	N/A	I	N/A	B			N/A
15. Safety-related masonry walls	N/A	I	N/A	B		A,C,E,F,S,W,X, H	N/A
16. Fuel pools and pool liners	N/A	I	N/A	B		F	N/A
XXXVI. Other Structures							
1. Those supporting or protecting safety related equipment	N/A	I	N/A	B			N/A
2. Cable trays and tray hangers, conduit and conduit hangers in Seismic Category I areas.	N/A	I	N/A	B	(hh)		N/A
XXXVII. Miscellaneous							
1. Component cooling water system	2/3/Other	I,N/A	B/C/D	B,N/A		A,F,C,D,M,X	1E, non-1E

TABLE 3.2-1
CLASSIFICATION OF SYSTEMS, COMPONENTS AND STRUCTURES (continued)

NOTES

(a) The word "within" as defined in the table defines those portions of systems, components or equipment in the piping direction from the component toward the Reactor Pressure Vessel regardless of whether a portion of the system is influent or effluent. The word "beyond" defines those portions of system, components or equipment in the piping direction from the component away from the Reactor Pressure Vessel.

A module is an assembly of interconnected components which constitute an identifiable device or piece of equipment. For example, electrical modules include sensors, power supplies, and signal processors; mechanical modules include turbines, strainers and orifices.

(b) 1, 2, 3, or Other are safety classes defined in Subsection 3.2.3. N/A and * are also denoted in subsection 3.2.3.

(c) I = The equipment is constructed in accordance with the seismic requirements of Seismic Category I structures and equipment as described in Section 3.7.

All civil structures classified as Seismic Category I are designed for the effects of CPS natural phenomena such as tornado, wind loads, external missiles, floods, etc., except the containment gas control boundary building (CGCB). The CGCB ~~is a~~ Seismic Category I ~~structure~~ capable of withstanding all of CPS natural phenomena except the tornado and external missiles.

and fuel building railroad airlock (FBRA).

and FBRA are

structures

N/A= The seismic requirements for the safe shutdown earthquake are not applicable to the equipment.

(d) A, B, C, D, - NRC quality groups defined in Regulatory Guide 1.26. The equipment is constructed in accordance with the codes listed in Table 3.2-3.

N/A = Quality Group Classification not applicable to this equipment. All piping systems penetrating and forming a part of the containment barrier or structure are at least Quality Group B, Quality Assurance B, Seismic Category I at the penetration location and up to and including the containment isolation valves. Beyond isolation valves, classification can change to that detailed in the table.

(e) B = Quality Assurance program described in Chapter 17 implements the requirements of 10 CFR 50, Appendix B and is applicable to this equipment. H = Quality Assurance Program described in the Clinton Power Station Quality Assurance Manual implements the requirements of 10CFR71, Subpart H and is applicable to this process.

N/A = Quality Assurance program requirements are not applicable to this equipment.

boundary is not breached, and the reactor can be safely shut down even with a loss of offsite power.

3.5.2 Structures, Systems and Components To Be Protected from Externally Generated Missiles

3.5.2.1 General

Missile selection and description for those external missiles which, if generated, could damage plant structures, systems or components important to safety, are identified in Subsections 3.5.1.4 and 3.5.1.5.

, with the exception of the containment gas control boundary building (CGCB) and the fuel building railroad airlock (FBRA),

3.5.2.2 Structures Providing Protection Against Externally Generated Missiles

Seismic Category I structures are designed to withstand postulated external missiles, thereby protecting the systems and components located within. Openings in the Unit 1-Unit 2 (Unit 2 has been cancelled) interface walls of Category I structures are closed with tornado missile resistant concrete barriers. These concrete barriers are considered part of the Category I structure, and the missile proof walls are shown in Figure 3.5-3. Protective characteristics of Seismic Category I Structures are summarized in Table 3.5-6.

There are no systems or components housed within the CGCB or FBRA that are required to be protected from external missiles per the criteria of Regulatory Guide 1.117.

3.5.2.3 Barriers (Other Than Structures) Providing Protection Against Externally Generated Missiles

Those structures, systems and components to be protected from externally generated missiles, and the missile barrier associated with each, are identified in Table 3.5-5. The missile barriers indicated are designed for tornado-generated missiles using the procedures given in Subsection 3.5.3. Structures which protect plant systems and components from missiles generated outside the plant are identified in Subsection 3.5.2.2.

Protection for those safety related systems and components not located within Seismic Category I structures (i.e. outdoors) is also identified in Table 3.5-5.

The location of missile barriers is shown in Figures 3.5-3 through 3.5-5.

3.5.2.4 Systems/Components Not Requiring Unique Tornado Missile Protection

A limited amount of safety related systems and components located near penetrations in Seismic Category I structures or located outside of such structures are evaluated as not requiring unique tornado missile protection barriers. Two approaches were used in the evaluation (reference 15):

1. Certain safety related systems and components are screened out using the criteria of Regulatory Guide 1.117, Tornado Design Classification, including its Appendix, which together, detail the items that should be protected from the effects of tornadoes. The criteria in the Regulatory Guide are summarized as important systems and components required to ensure the integrity of the reactor coolant pressure boundary, ensure the capability to shut down the reactor and

TABLE 3.5-5 (Cont'd)

COMPONENT	BARRIER
d. Station common exhaust vent	Barrier not required because missile trajectory through this opening cannot endanger safety-related structures,systems or components
e. Access doors	Doors are designed to withstand tornado missiles or they are protected by a minimum 2-foot-thick reinforced concrete missile barrier
f. Diesel fuel oil storage tank fill lines	Protected by diesel-generator building except as noted in Subsection 9.5.4.3
6. Fuel building	
a. Access doors	Doors are designed to withstand tornado missiles or they are protected by a minimum 2-foot-thick reinforced concrete missile barrier The fuel building railroad airlock and outer door are not designed to withstand tornado missiles. The inner door is designed to withstand tornado missiles. Administrative control of the inner door ensures adequate tornado protection. The inner door is opened and will be closed immediately on notification of severe weather or radiological release in accordance with site procedures.

3.8.4 Other Seismic Category I Structures

3.8.4.1 Description of the Structures

The Seismic Category 1 structures, excluding the containment and containment internal structures, are:

a. auxiliary building,

b. ~~fuel building,~~ fuel building (including railroad airlock),

c. control building,

d. diesel generator and HVAC (DG & HVAC) building,

e. radwaste building substructure,

f. containment gas control boundary,

g. portions of circulating water screen house (CWSH), and

h. UHS discharge structure.

Refer to Section 1.2 for general arrangement drawings which show the relative size and location of the above structures.

3.8.4.1.1 Auxiliary Building

The reinforced concrete auxiliary building is located adjacent to and fits the contour of the containment building on one side. This structure is supported on a mat foundation which is continuous with the mats under the containment structure, the control building, and the turbine building. Above the foundation mat, the auxiliary building is structurally isolated from the containment structure, but structurally connected to the control and turbine buildings.

The main steam tunnel extends from the containment to the turbine room through the auxiliary building. It houses the process piping and protects it from the effects of external missiles. In the unlikely event of pipe rupture inside the tunnel, it protects the control room and other Seismic Category I equipment and components from the effects of radioactive steam and pipe rupture loads. The tunnel also provides supports and restraints for the process piping.

The ECCS pump rooms, in the lowest level of the auxiliary building, are in flood protection compartments with watertight doors. In the event of a pipe rupture, the flooding in one compartment will not result in the flooding of any other compartment, and the failure of a pump suction line will not drain the suppression pool. The second or grade level of the auxiliary building houses pump room access hatches and a cable tunnel. The third and fourth levels are provided for electrical switchgear and electrical penetrations.

3.8.4.1.2 Fuel Building

The fuel building fits the contour of the containment structure on one side and is adjacent to the DG and HVAC building. One side of the building accommodates the fuel shipping cask railroad

and the railroad airlock (FBRA).

car or transporter used for dry cask storage operations. The reinforced concrete structure is supported on a concrete mat which is continuous with the mats under the containment structure and the DG and HVAC building. The fuel building above the mat is structurally isolated from the containment building, but structurally connected to the DG & HVAC and auxiliary buildings.

The three pools in the fuel building provide for fuel transfer, spent fuel storage, and cask loading. The pools are lined with seam-welded stainless steel plate welded to reinforced members embedded in the concrete. Channels are located behind the weld seams of the pool liners and are monitored to detect possible leakage from the pools. The reinforced concrete construction above the main floor provides missile and tornado protection.

Crane seismic safety features, Figure 3.8-35, are provided for the fuel building crane. The jurisdictional boundary between components of the crane system is described in USAR Figure 3.8-35. The crane is evaluated to comply with NUREG-0554 as described in USAR Section 9.1.4.2.2.2. The requirements of USAR Section 3.8.4.5 do not apply to the rails, rail clips, and rail clip to girder bolts.

3.8.4.1.3 Control Building

The reinforced concrete control building is located next to the auxiliary building. It is also adjacent to the DG & HVAC and radwaste buildings. The control building is supported by a reinforced concrete basemat which is continuous with the basemats of the adjoining buildings. The building is structurally connected to the adjoining buildings above the basemats.

HVAC equipment is located in the lower two and the top levels of the control building. Laundry facilities and laboratories are located at the grade or third level. The component cooling water heat exchangers are on the fourth level. The fifth level houses switchgear and provides a cable spreading area. The control room is located on the sixth level.

The reinforced concrete walls and slabs of the control building provide tornado and missile protection for the control room and other Seismic Category I systems.

3.8.4.1.4 Diesel Generator and HVAC Building

The reinforced concrete DG & HVAC building is located next to the fuel building and adjacent to the control building. The DG & HVAC building is supported by a reinforced concrete base mat which is continuous with the basemats of the adjoining buildings. The building is structurally connected to the adjoining buildings above the basemat.

The fuel oil storage tanks are located on the lower level, and diesel generators are located at grade level. HVAC equipment is located above the grade floor. The reinforced concrete construction provides tornado and missile protection.

3.8.4.1.5 Radwaste Building Substructure

The reinforced concrete radwaste building is located adjacent to the turbine building and the control building. The radwaste building is supported by a concrete basemat which is continuous with the basemats supporting the turbine building and the control building.

In addition to their own dead loads including the weight of equipment, piping, cable pans, etc., floors are designed for conservative live loads resulting from the movement of the largest piece of equipment. The roofs are designed for a uniform live load of 25 psf in addition to snow loads and loads from probable maximum precipitation. The roofs are also designed to withstand suction pressure induced by the design wind and tornadic wind as discussed in Section 3.3. Pattern live loads are applied to determine maximum moments and shears in each slab. All slabs are designed for the effects of internal missiles, thermal gradients, and pipe rupture loads, wherever applicable. Floors and roofs are checked for their ability to transfer shear through diaphragm action.

The walls, interacting with the floor slabs, are designed to withstand the effects of seismic induced shears and moments. All walls are designed for external and internal missiles, transient thermal gradients, tornado-induced pressure, lateral soil and hydrostatic pressure and pipe rupture loads, wherever applicable, in addition to their own weight and associated loads from slabs and beams framing into the walls. For the design of subgrade walls a surcharge load of 500 psf, 1000 psf for E-70 or 300 psf for AASHO H-20 wheel loading is considered.

The CWSH is also designed for the hydrostatic and hydrodynamic effects of the cooling lake water.

The pools in the fuel building are designed for, in addition to applicable loads listed above, hydrostatic loads and hydrodynamic loads associated with water set in motion by seismic accelerations. The pools are designed for the effects of a maximum water temperature of 212°F.

The containment gas control boundary ~~is~~ and the FBRA are designed to be held under a negative pressure equivalent to 1/4-inch of water when infiltration flow rates given in Subsection 6.2.3 are being passed through the standby gas treatment system. The containment gas control boundary ~~is~~ and the FBRA are not designed to withstand the effects of missiles. The siding of the containment gas control boundary is designed to fail for wind speeds of 200 mph, which is less than the design basis tornado. The gas control boundary ~~is~~ and the FBRA are a fission product barrier only, and ~~is~~ are not designed for the high temperatures and pressures which are postulated for the containment. The steel framing for the containment gas control boundary is designed to withstand effects of tornado loading.

In all instances, the Seismic Category I structures and structural components are designed for the vertical and horizontal accelerations associated with both SSE and OBE.

In Radwaste, Control and Diesel Generator Buildings, the effects of pool dynamic loads associated with SRV actuation and LOCA are considered negligible and shall not be used for the analysis and design of these buildings.

The Category I manholes, buried piping, electric ducts and tunnels were designed for both dead and live load, and seismic loading conditions. In addition, the buried piping was designed for thermal expansion. The manholes, electrical ducts and tunnels are designed using the strength design method. The buried piping is designed using the ASME Section III (1977) stress equations.

The design procedure complies with the criteria contained in SRP, Section 3.8.4. (Q&R 220.54)

6.2.2.4 Tests and Inspections

Preoperational tests were performed to verify individual component operation, individual logic element operation, and system operation up to the containment spray nozzles. A sample of the sparger nozzles were bench tested for flow rate versus pressure drop to evaluate the original hydraulic calculations. Refer to Subsection 5.4.7.4 for further discussion of preoperational testing.

The containment spray nozzles may be operationally tested by connecting an air line to a test connection on the spray header, and blowing air out the nozzles. Unobstructed (free) air flow will be verified for each nozzle by either thermography (infrared camera) or physical inspection, which may include the addition of streamers to the nozzles or actual inspection of each nozzle for air flow.

6.2.2.5 Instrumentation Requirements

The details of the instrumentation are provided in Subsection 7.3.1.1.4. The suppression pool cooling mode of the RHR system is manually initiated from the control room.

(including the railroad bay air lock, FBRA)

6.2.3 Secondary Containment Functional Design

The secondary containment completely encloses the primary containment, except for the upper personnel hatch, and consists of the containment gas control boundary, the containment gas control boundary extension (siding within the auxiliary building), the fuel building, the ECCS RHR heat exchanger rooms, the pump rooms, the RWCU pump room, and the main steam pipe tunnel. During normal operation, the fuel building ventilation system maintains the secondary containment at a slightly negative pressure. Following a design basis accident, the standby gas treatment system (SGTS) achieves and maintains a negative pressure in the areas that comprise the secondary containment.

In addition, the SGTS provides the capability to remove potential contamination released to the secondary containment volume after an accident in primary containment. The design and operation of the fuel building ventilation system and the SGTS are discussed in Subsections 9.4.2 and 6.5.1 respectively. Chapter 15 discusses the operation of these systems under accident conditions.

6.2.3.1 Design Basis

The functional requirements for the secondary containment arise from the Code of Federal Regulation limits for the release of radioactive materials within the plant and at the plant boundary during normal operation and following postulated accidents within the primary containment. The specific design criteria implemented to meet these functional requirement are set forth below.

a. The secondary containment structures is of Seismic Category I design and is sufficiently leak tight that the SGTS can maintain the required negative pressure within the secondary containment volume for wind speeds up to approximately 30 mph. The secondary containment, in conjunction with the operation of the SGTS, is designed to achieve and maintain an 0.25-inch water gauge negative pressure in the boundary region within 19 minutes of the initiation of SGTS.

The pressure will prevent exfiltration of the secondary containment atmosphere for wind speeds less than 20 mph.

b. The secondary containment, in conjunction with the operation of the SGTS is designed to limit the total effective dose equivalent (TEDE) within the guidelines of 10 CFR 50.67 at the site boundary and low population zone. Also, the design limits the TEDE dose for the control room within the guidelines of 10 CFR 50, General Design Criteria 19.

c The internal and external design pressures and leak tightness of the secondary containment structures are discussed in Chapter 3. A description of the potential paths of primary containment leakage bypassing the secondary containment is given in Table 6.2-47.

d. The secondary containment and the SGTS are designed to permit periodic inspection and testing of principal systems and components such as fans, dampers, and filters.

6.2.3.2 System Design

The secondary containment consists of the fuel building (including the FBRA); the portion of the auxiliary building enclosing the ECCS pump rooms; the RWCU pump and heat exchanger rooms; and the main steam tunnel to S-line; the gas control boundary that encloses the primary containment above the level of the auxiliary and fuel building roofs; the radwaste tunnel; the auxiliary building pipe tunnel; MSIV rooms (for MSIV blowers); auxiliary building floor drain pump room and the gas control boundary extension in the auxiliary building. The general arrangement of the various structures that comprise the secondary containment are shown in Figure 6.2-132 Sheets 1-6.

The free volume of the Secondary Containment is approximately ~~1,710,000 ft^3~~. 1,767,000 ft^3

The performance objective of the secondary containment is to provide a volume completely surrounding the primary containment which can capture fission products that might otherwise leak to the environment following a design basis accident. To achieve this, the fuel building and portions of the auxiliary building are of reinforced concrete construction, which has an inherently low leak rate. In addition, a low-leakage metal-siding enclosure is provided for the remainder of the secondary containment boundary in the auxiliary building ~~and~~ the containment gas control boundary, and the FBRA. Following the postulated design basis accident, the SGTS functions to achieve and maintain the secondary containment volume at or below a negative pressure of 0.25-inch water gauge. The exhaust air discharge required to maintain this negative pressure is routed through the SGTS equipment trains which are designed to remove 99% of the elemental iodine and organic iodides. (Refer to Subsection 6.5.1 for a discussion of the SGTS filter system.)

The secondary containment is designed for a conservative inleakage at 0.25-inch water gauge differential pressure. The secondary containment is also designed to ensure that a uniform negative pressure is maintained throughout the volume during normal operating and post-accident conditions.

The design and construction codes, standards, and guides applied to the auxiliary and fuel buildings are discussed in Section 3.8.

In order to minimize the amount of radioactive material that leaks to the secondary containment following a design basis accident, all primary containment penetrations are provided with redundant, ASME code, Section III, Class 1 or Class 2, Seismic Category I isolation valves. These isolation valves are located in the primary and/or secondary containment and thus minimize the possibility of leakage bypassing the secondary containment. Table 6.2-47 presents a list of all piping penetrations for the primary containment along with attendant information relating to the types and location of isolation valves, the types of valve operators, power and isolation signal sources, etc. Subsection 6.2.4 provides a discussion of the design of the containment isolation system; the containment and reactor vessel isolation control systems are described in Subsection 7.3.1.1.2.

The primary containment leakage rate is specified in Subsection 6.2.1. To ensure that this leakage rate is not exceeded, the primary containment and containment components are subject to a leak rate testing program which is described in Subsection 6.2.6. Primary containment integrity is verified and assured in accordance with the CPS Technical Specifications.

Access openings into the secondary containment have been provided with air locks or are otherwise administratively controlled so that there will be one door closed at all times, in accordance with the CPS Technical Specifications. Access openings will have no adverse impact on operation of the SGTS and the integrity of the secondary containment.

Access openings are shown on plant general arrangement Drawings M01-1105-1, M01-1106-1, M01-1107-1, and M01-1109-1.

Instrumentation to monitor the status of the openings or position indicators and alarms with alarm capability in the main control room are not provided.

However, the integrity of the secondary containment is maintained because the access doors , ~~and~~ hatches , and FBRA doors have been provided with one of the following:

a. Electrical interlocks between the two airlock personnel access doors and between the two FBRA doors to prevent both being simultaneously opened.

b. Administrative controls which will preclude access hatches being opened during reactor operation or during refueling operations. (Q&R 480.04)

6.2.3.3 Design Evaluation

6.2.3.3.1 Standby Gas Treatment System

The standby gas treatment system will maintain the secondary containment at a negative pressure with respect to the environment following the design-basis loss-of-coolant accident. The design flow rate of the SGTS is based on the following criteria:

a. The exhaust flow is based on the sum of potential inleakages when an 0.25-inch water gauge negative pressure is maintained in the secondary containment.

   The standby gas treatment system flow rate is nominally 4,000 cfm.

The time period until the secondary containment reaches a negative pressure of 0.25-inch water gauge should not be considered as a period of direct outleakage for the following reasons:

a. The pressure gradient forcing leakage from the primary containment is less than 4 psig during this time period. The containment design and construction, and testing requirements provide leakage integrity and such a small pressure difference provides little driving force for leakage across small leak paths.

b. The most predominant potential containment leak paths are piping penetrations and door seals which are located in the containment at elevations which are enclosed by the secondary containment which consists of the ECCS pump rooms, steam tunnel, and fuel building. Due to the large volume of these areas, the small amount of radioactive gases leaking through would require some interval of time to diffuse through the secondary containment to the outside.

(including the FBRA)

c. Fuel cladding does not fail for at least several minutes.

d. The entire secondary containment, including the containment gas control boundary (CGCB), is maintained at a slight negative pressure during normal operations.

Thus, any primary containment leakage will be contained within the secondary containment and only will reach the outside after passing through the standby gas treatment system.

6.2.3.3.2.2 Long-Term Temperature Analysis

The secondary containment is the modeled using multiple nodes. The outside environment and primary containment are used as boundary nodes. The calculation consisted of a balance of energy addition, removal, and accumulation within each of the nodes. Energy addition was due to heat transfer through the primary containment wall as well as other walls, the operation of various safety-related and non-safety-related equipment, the spent fuel cask heat load, and sensible and latent heat of equipment and piping which was hot before the start of the transient. Energy removal was due to heat transfer to walls and operation of safety-related fan coolers.

the solar heat load on the FBRA,

6.5 FISSION PRODUCT REMOVAL AND CONTROL SYSTEMS

Fission product removal and control systems are considered to be those systems for which credit is taken in reducing accidental release of fission products. The filter systems and containment spray systems for fission product removal are discussed in Subsections 6.5.1 and 6.5.2, and the fission product control systems in Subsection 6.5.3.

6.5.1 Engineered Safety Feature (ESF) Filter Systems

The following filtration systems which are required to perform safety-related functions are provided:

a. Standby gas treatment system: This system is utilized to reduce iodine and particulate concentrations in gases leaking from the primary containment and which are potentially present in the secondary containment following an accident.

b. Control room HVAC makeup air filter packages: This system is utilized to clean the outside air of radioactive and nonradioactive iodine and particulates, which are potentially present in outside air following an accident, before introducing air into the control room HVAC system.

c. Control room HVAC recirculation air filter packages: This system is utilized to clean internally recirculated air of residual radioactive and non-radioactive iodine.

6.5.1.1 Design Bases

6.5.1.1.1 Standby Gas Treatment System

a. The standby gas treatment system can be started manually and is designed to automatically start in response to any one of the following signals:

   1. high drywell pressure,

   2. low reactor water, level 2,

   3. high radiation level in exhaust air from the fuel transfer floor of the containment,

   4. high radiation level in the containment building ventilation exhaust,

   5. high radiation level in the exhaust air from the fuel building fuel handling floor, and

   6. high radiation level in the continuous containment purge exhaust duct.

b. The radioactive gases leaking from the primary containment to the secondary containment (which consists of containment gas control boundary extension, fuel building, ECCS pump rooms, RWCU pump rooms, and main steam tunnel) after a LOCA are treated in order to remove particulate and gaseous forms of iodine. This is to limit the offsite and control room dose to the guidelines of 10 CFR 50.67.

(including the fuel building railroad airlock (FBRA))

c. The standby gas treatment system (SGTS) equipment train air handling capability is based on the total inleakages to the secondary containment while all of the areas in the secondary containment are maintained at 0.25 inch water gauge negative pressure with respect to outside ambient pressure to preclude ground level leakage of untreated air to the environment. The secondary containment air pressure begins to decrease exponentially after the standby gas treatment system is started. For low wind speeds, a design pressure of 0.25 inch water gauge is reached within 19 minutes after this design basis LOCA. The time period until the secondary containment reaches a negative pressure of 0.25 inch water gauge should not be considered as a period of direct outleakage for the following reasons:

1. The pressure gradient forcing leakage from the primary containment is less than 4 psig during this time period. The containment design and construction, and testing requirements provide leakage integrity and such a small pressure difference provides little driving force for leakage across small leak paths.

2. The most predominant potential containment leak paths are piping penetrations and door seals which penetrate the containment at elevations enclosed by the secondary containment which consists of the ECCS pump rooms, steam tunnel, RWCU pump rooms, and fuel building. Due to the large volume of these areas, the small amount of radioactive gases leaking through would require some interval of time to diffuse through the secondary containment to the outside.

3. Fuel cladding is not postulated to fail prior to containment isolation.

4. The entire secondary containment, including the containment gas control boundary (CGCB), is maintained at approximately 0.25 inch water gauge negative pressure during normal operations.

(including the FBRA)

d. Primary containment leakage, except for bypass leakage through the upper personnel air lock, will be contained within the secondary containment and will be processed through the SGTS. The secondary containment inleakage is determined by utilizing published leakage data for applicable building construction and incorporating known leakage values for piping, electrical, and duct penetrations at pressure control boundaries. The expected SGTS flow rate is approximately equal to the total free air volume of the fuel building, ECCS pump rooms, RWCU pump rooms, steam pipe tunnel, and the containment gas control boundary evacuated at a rate of one per day. The design flow rate through the SGTS also accounts for volumetric expansion of building air volumes due to temperature rises as equipment residual heat is released after the non-safety-related ventilation and process system shutdown.

6.5.1.2 System Design

6.5.1.2.1 Standby Gas Treatment System

(including the FBRA)

a. The schematic design of the SGTS is shown in Drawing M05-1105. Nominal sizes of principal system components are listed in Table 6.5-1. The equipment environmental design criteria are listed in Section 3.11 and redundant trains are physically separated as illustrated in Drawing M05-1073.

b. The SGTS is automatically or manually started to treat air exhausted from the CGCB, fuel building, steam tunnel, and ECCS pump rooms. Two completely redundant parallel process systems are provided, each having a minimum capacity of 4000 cfm (at 175° F) of which approximately 2000 cfm comes from the fuel building, 1000 cfm from the containment gas control annulus, 1000 cfm from all ECCS pump rooms and steam pipe tunnel.

   As indicated on the schematic in Drawing M05-1105 each process system may be considered as an installed spare, with either standby gas treatment system equipment train (SGTSET) capable of treating the required amount of air. The process systems have separate equipment trains, isolation valves, power feeds, controls and instrumentation. Each SGTSET is provided with segregated and independent suction and discharge pipes. The SGTSET are located in completely separate concrete equipment cubicles. Separation of filter trains is maintained in areas where credible internal missiles or pipe whips might compromise redundancy.

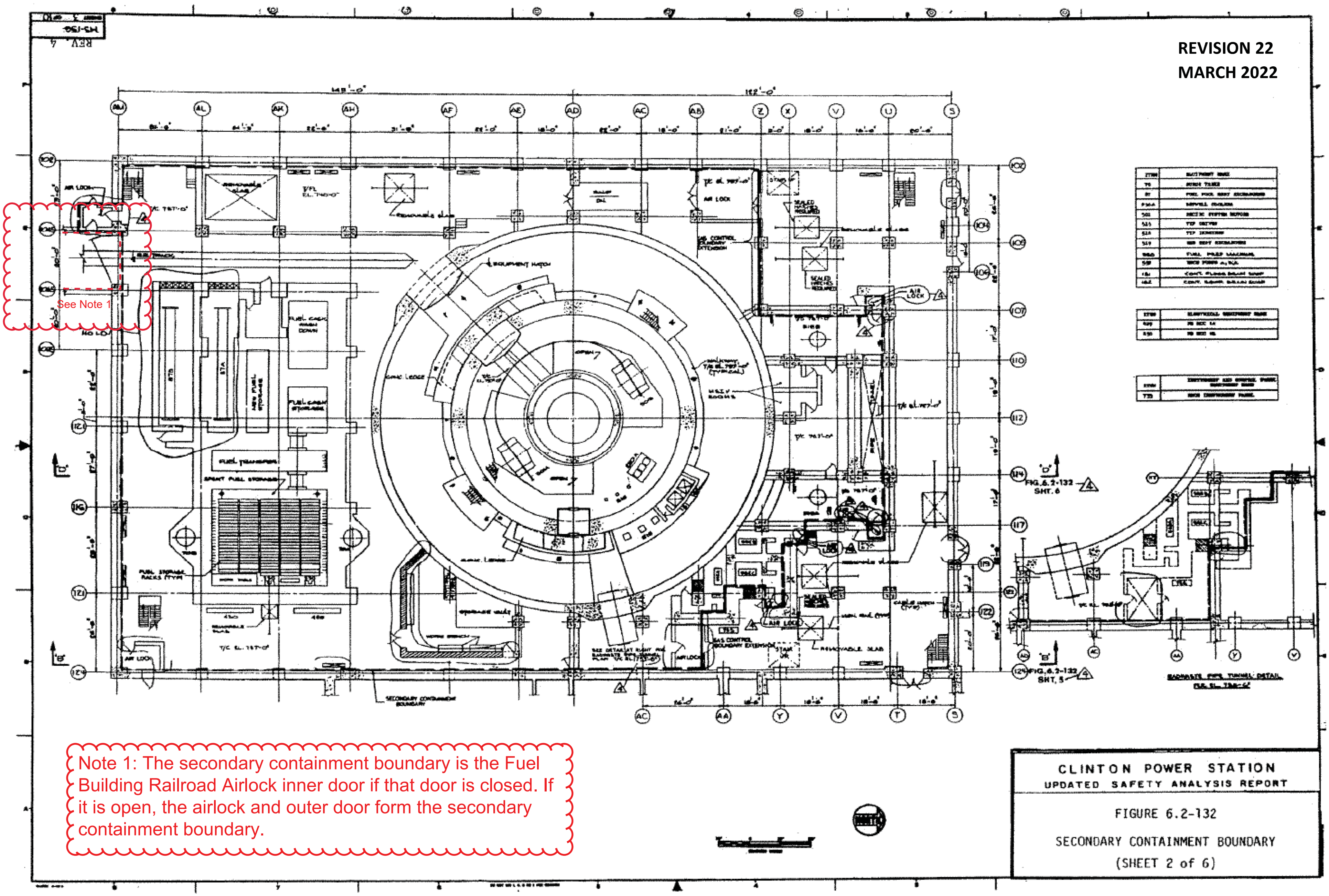
c. Each SGTSET has the following components:

   1. A primary fan for inducing the air from the spaces listed previously and through the filter train to the discharge pipe for the elevated release to atmosphere. The fan performance and motor selection are based on inducing maximum density (worst pressure condition) 40° F air from previously mentioned areas and forcing it through a filter train containing filters operating at a pressure drop of no less than twice their clean value. The flow and pressures are listed in Table 6.5-1. The fans are statically and dynamically balanced in conformance with ANSI N509-1976, Article 5.7.3.

   2. A standby cooling air fan is sized to dissipate heat generated by fission product decay on the filters. The fan is used only after train shutdown and when the electric heater and primary fan are not operating.

   3. A demister which removes any entrained water droplets and moisture to prevent blinding of filters which reduces iodine removal efficiency of charcoal adsorbers. The demister meets qualification requirements of those specified in ANSI N509-1976, Section 5.4.

   4. A single stage electric heater is sized to maintain the humidity of the airstream to no more than 70% relative humidity for the worst inlet conditions. A 20-kW heater is provided. The electric air heaters meet the requirements of ANSI N509-1976, Article 5.5.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See Note 1
Note 1: The secondary containment boundary is the Fuel Building Railroad Airlock inner door if that door is closed. If it is open, the airlock and outer door form the secondary containment boundary.
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FIGURE 6.2-132
SECONDARY CONTAINMENT BOUNDARY
(SHEET 2 of 6)

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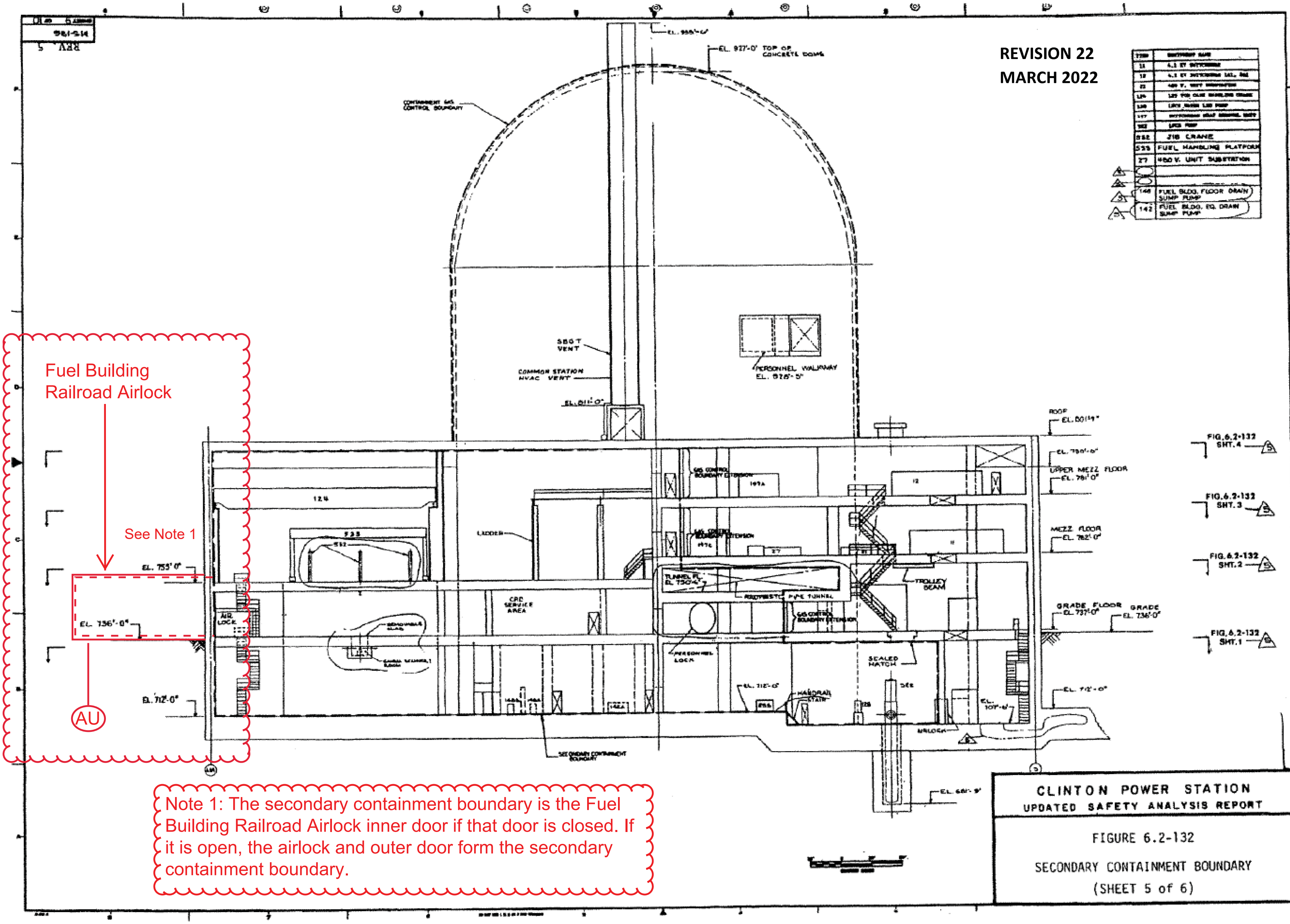

Note 1: The secondary containment boundary is the Fuel Building Railroad Airlock inner door if that door is closed. If it is open, the airlock and outer door form the secondary containment boundary.

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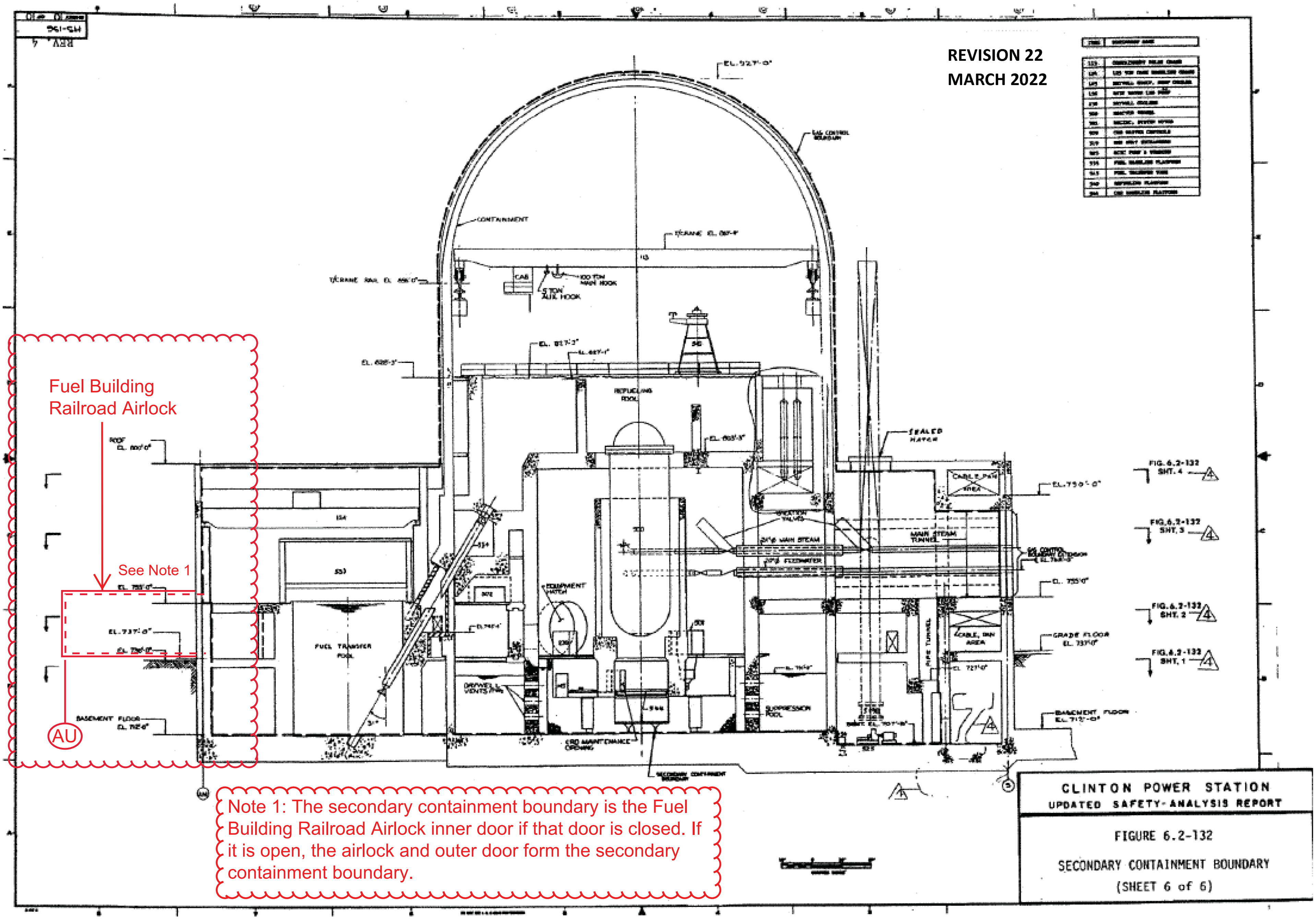
FIGURE 6.2-132

SECONDARY CONTAINMENT BOUNDARY

(SHEET 5 of 6)



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Fuel Building
Railroad Airlock
See Note 1
AU
Note 1: The secondary containment boundary is the Fuel Building Railroad Airlock inner door if that door is closed. If it is open, the airlock and outer door form the secondary containment boundary.
CONTAINMENT
REFUELING POOL
SEALED HATCH
FUEL TRANSFER POOL
EQUIPMENT HATCH
SUPPRESSION POOL
CRD MAINTENANCE OPENING
MAIN STEAM TUNNEL
CABLE PAN AREA
PIPE TUNNEL
GRADE FLOOR EL. 737'-0"
BASEMENT FLOOR EL. 712'-0"
EL. 755'-0"
EL. 737'-0"
EL. 781'-0"
SECONDARY CONTAINMENT BOUNDARY
FIG. 6.2-132 SHT. 4
FIG. 6.2-132 SHT. 3
FIG. 6.2-132 SHT. 2
FIG. 6.2-132 SHT. 1
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FIGURE 6.2-132
SECONDARY CONTAINMENT BOUNDARY
(SHEET 6 of 6)

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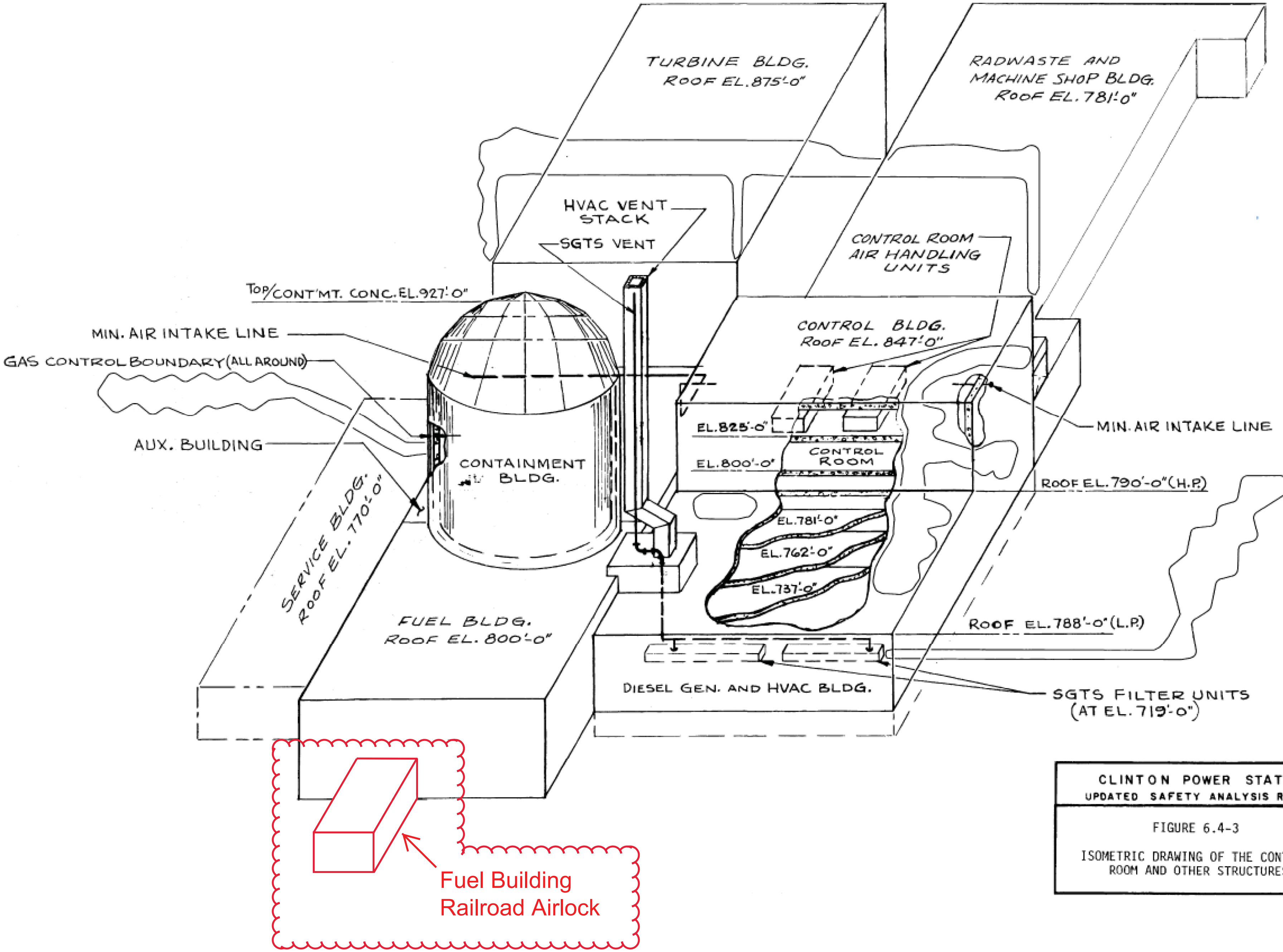

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FIGURE 6.4-3

ISOMETRIC DRAWING OF THE CONTROL ROOM AND OTHER STRUCTURES